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Plant Biodiversity in West Bank: Strategic tools for Conservation and Management

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DEDICATION

This Thesis dedicated to

My Father, who has raised me to be the person I am today, thank you for all the unconditional love, guidance, and support that you have always given me, thank for everything that you have done, you are to me what to earth the sun is. I don't think that even if I searched the world for years and years and years I would find someone that is as caring, as thoughtful, and as hardworking as you.

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Yours sincerely

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وإلى أمي التي ذودتني بالحنان والمحبة

أقول لهم: أنتم وهبتموني الحياة والأمل والنشأة على شغف الاطلاع والمعرفة

وإلى إخوتي وأسرتي جميعاً

ثم إلى كل من علمني حرفاً أصبح سنا برقه يضيء الطريق أمامي
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ABSTRACT

Biological Diversity (Biodiversity), it says, refers to variety in nature, variety within the living world. The term Biodiversity is commonly used to indicate the number, variety and variability of living organisms. The action of management requires capacity of measurement, and measures of diversity only become possible when a quantitative value can be ascribed to them and these values can be compared.

And in Palestine, like other countries of the world the biodiversity conservation has become an urgent need, and it has been preparing this study to introduce a part of the reality of the environmental situation in general and the reality of plant life in particular in West Bank-Palestine, whereas; the information and data contained in this research constitute an important tool is discussing the problems associated with the environmental realities of biodiversity and the factors that affect it, it is essential to take action in a general way: in order to obtain that Biodiversity reaches an acceptable level everywhere, globally in the territory, and everyone must learn how to contribute to its preservation and defence by thinking globally.

The most important steps that have been taken to perform this study is select the study areas within the specific criterias (will be mentioned later), collect information of each site before starting the fieldtrips.

Tha main aim of the current studt to set up a wide framework of activities to be inserted as starting point of Guide Lines and best practices to be performed for Biodiversity “inventory” and Biodiversity “strengthening and enhancement with regard to the West Bank, with a specific attention to some areas (selected sites) representative of the main forest environments occurring in West Bank, by providing an ecological description of the investigated species and their habitats, relying on the current data availability to conserve the existing species to preserve the biodiversity through; perceive and understand the status of the main plants species and their distribution in order to protect them, and give warnings and appropriate solutions and/or best practices when any risk act.

For arrivals to achieve these goals is through learning and applying some teaching techniques that will link between reality and science. This study highlights on the environmental situation and the plant diversity in the areas under study (six selected sites) at the level of West Bank, and

it also highlights the plant species characteristic in West Bank, the forests and their types and the deterioration in them and the green area in West Bank.

Based on this study, including those related action plan, analysis and results, put the most important tools (herbarium, seeds bank, GIS and DNA barcode) and select the most important sites that need protection and management in West Bank, this study can be considered as project can adobted by the stakeholders to extend and include all forests and important plant areas.

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LIST OF ABBREVIATIONS	
ARIJ	the Applied Research Institute of Jerusalem
BERC	Biodiversity and Environmental Research Center
BERC	the Biodiversity and Enviromental Research Center
bp	Base Pair
CBOL	Consortium for the Barcoding of Life
CBOL-PWG	Consortium for the Barcoding of Life – Plant Working Group
Cm	Centimeter
CO1	Cytochrom C Oxidase I gene
CTAB	Cetyltrimethyl – Ammonium Bromide
DNA	Deoxyribonucleic Acid
EDTA	Ethylenediaminetetetracetic acid
EQA	Environment Quality Authority
GIS	Geographic Information System
GPS	Global Position System
ha	Hectare
IPA	Important Plant Area
ISTA	International Seed Testing Association
IUCN	International Union for Conservation of Nature
Km^2	Square kilometre
M	Mole
matK	Maturase K
MEnA	Ministry of Environmental Affairs
Mg	Milligram
Min	Minute
Mm	Millimetre
MTEs	Mediterranean – Type Ecosystems
NARC	National Agricultural Research Center
Ng	Nanogram

NGO	Non Governmental Organization
OPT	Occupied Palestinian Territort
PARC	Palestinian Agricultural Releif center
PCR	Plymerase Chain Reaction
PEnA	Palestinian Environmental Authority
PLO	Palestine Liberation Organization
RNase	Ribonuclease
rpm	Revolutions per minute
RuBisCO	Ribbulose – 1,5 – bisphosphate Carboxylase/Oxygenase
Sec	Second
SP	State of Palestine
TBE buffer	Tris/ Bromide/ EDTA
TE buffer	Tris – EDTA buffer
UAWC	Union of Agricultural Working Committes
µl	Micro litre

Chapter one: Introduction

1.1. What is biodiversity?

The word biodiversity is used to explain the variety of life on earth which includes variation at all levels of biological organization from genes to species to ecosystems. This includes diversity within and among species (Shtayeh et al., 2014), (UNEP –Nairobi; 2002, Vere; 2008, Ghattas et al.; 2006)

Biodiversity, is the entirety of individuals of all species combined (animals, plants and micro-organisms) that live and function in the environment, and together with it comprise a functional system, called an ecological system, or "ecosystem."

Biodiversity is most often understood in terms of the number of species or other taxa and it can be considered at different spatial scales such as Whittaker's definitions of alpha, beta and gamma diversity (Whittake 1960). Biodiversity is not distributed evenly over the world. (Vere; 2008, Wanjui; 2013)

Humans use the biodiversity directly (includes things like food, fibers, medicines and biological control) and indirectly (includes ecosystem services such as atmospheric regulation, nutrient Cycling and pollination). In view of this, we cannot exist without biodiversity; whereas the biodiversity is actively involved, directly or indirectly, in the provision of all ecosystem services, not only due to the mere size of the species assemblage of each ecosystem, but also, or even mainly, due to the degrees of differences in both form and function among the species within the assemblage (Mutia; 2009, NBSAP; 2007, Wanjui; 2013). These services not only support the functions and secure the daily existence of human beings, but they also sustain the momentum of development, which has accelerated since the agricultural revolution. (NBSAP; 2007)

Global biodiversity is changing at an unprecedented rate; the most important drivers refer to many reasons such as habitat change, climate change, invasive species (the introduction of exotic specie), over-exploitation (unsustainable harvesting of natural resources) (NBSAP; 2007, Mutia; 2009).

The flora of Palestine is estimated to be 114 families, with 2,483 species including 149 endemic species which represents 6% of total flora. The distribution of these species is: 43% are common, 27.5% rare and 25.6% very rare.

The term biodiversity refers to the totality of genes, species and ecosystems of a region. Conservation of biodiversity is done in two ways: In-situ and ex-situ conservation, each composed of various techniquies, are employed to conserve genetic diversity: in situ and ex situ conservation.

In situ:

In situ conservation is based on the creation of habitat protected areas that is a forest area evaluated from its present structure, species composition, history and physical environment being of great significance for the forestry flora and fauna. It contains or it is expected to contain red-listed species (Eriksson et al.; 2006, Wanjui; 2013). It is the process of protecting an endangered plant or animal species in its natural habitat, either by protecting or cleaning up the habitat itself, or by defending the species from predators.

The conservation of genetic resources through their maintenance within natural or even human made ecosystem in which they occure.

In the case of non-domesticated species, in situ conservation is probably the most important strategy and sometimes the only viable approach. Where extinction rates of species are high because of land-use changes, setting conservation priorities is critical; this is particularly evident in developing countries, where resources allocated for conservation are scarce and baseline information on species distribution and richness of data are lacking (DEBPAL 2).

1. The conservation within natural or even manmade ecosystem where the organism occur.

2. Conservation in the natural environment itself.

3. Include national parks, sanctuaries, biosphere reserve...etc.

Ex situ conservation:

Ex situe conservation means the conservation of ecosystems and natural habitats and the maintenance and recovery of viable population of species and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties. These two basic conservation stratigies are further subdivided into specific techniques including seed storage, in vitro storage, DNA storage, pollen storage, field genebank, and botanical garden conservation for ex situ, and protected are, on-farm and home garden conservation of in situ, each techniques presenting its own advantages and limitations (Engelmann et al.; 2002, Wanjui; 2013). The essential elements of ex situ conservation are related to the need to identify, then

conserve and manage the range of variability within the species, primarily through the development and management of regeneration, in various forms, in the field. Molecular genetic techniques, primarily with genetic markers, can also help in some of the management tasks for ex situ populations, by confirming the identity of accessions and monitoring genetic changes in collections. However, the allocation of resources in genetic conservation should be need-driven rather than technology-driven.

1. The conservation ouside their habitats by perpetuating sample populations.

2. Conservation in an artificially created environment.

3. Include Zoos, Botanical gardens, Gene banks, Aquarium, and Cryopreservation…etc (Withers; 1993, Wanjui; 2013).

1.2. The geopolitical situation:

Palestine, as it stands now, is divided into two distinct regions covering a total area of approximately 6,065 km2 (606.5 Ha). The larger of these two areas is called the West Bank covering 5,700 km^2 (570 Ha), with the Gaza Strip covering only 365 km^2 (36500 Ha) (Isaac et al.; 1995, Safar et al.; 2001, El-Atrash; 2013).

Historical Palestine consists of "48 area" (i.e., the land assigned for a Jewish state after the demarcation lines set out in the 1949 Armistice Agreements), West Bank and Gaza strip (Occupied Palestinian territory "OPT") Palestine (defined here as West Bank and Gaza) lies in the heart of the fertile crescent. These lasts comprise two physically separated land masses (Fig.1). Their total area including the area of the Dead Sea reaches approximately 6221 km^2 (622100 Ha) (constituting around 23% of the total area of historic Palestine which is estimated of 27,000 km^2 (2700000 Ha). Gaza Strip is a coastal zone located at the eastern extreme of the Mediterranean Sea and on the edge of the Sinai Desert. It covers an area of 362 km^2 and is surrounded by Israel from the north and east, Egypt from the south and the Mediterranean Sea from the west. The West Bank, which occupies an area of 5856 km2 (including the Dead Sea area), is surrounded by Israel from the west, south and north, and the Jordan River from the east Egypt from the south and the Mediterranean Sea from the west (Isaac; 2011, Ghattas; 2006). According to Israeli, West Bank divided into three different zones; A zones, B zones and C zones (Fig.2) (EQA; 2010, El-Atrash; 2013, ARIJ; 1997). Whereas In 1993, the Palestine Liberation Organization (PLO) signed the Oslo Accords with the State of Israel, accepting just 22% of historic Palestine as the basis for a Palestinian state. The 'Oslo II' Interim agreement, signed in

1995, sets out the interim stage for Palestinian Autonomy in the West Bank and Gaza Strip, pending 'final status negotiations' which were scheduled to begin in 1996 and end by 1999. However, the Palestinian inhabitants are trapped and cantonized into military administrative designations of area A, B, C, and Nature Reserves. The current distribution of the Palestinians into area A, B, C, and Nature Reserves is 52.1%, 41.4%, 6.4%, and 0.1%, respectively. This means that 93.5% of the Palestinian West Bankers inhabit only 36% of the West Bank mass area that falls under the Occupied Palestinian territory (OPT) planning jurisdiction (i.e. area A and B) (ARIJ; 2011,EQA; 2006, Safar et al.; 2001, EQA; 2010, El-Atrash; 2013).

(Fig.1: *west bank and Gaza strip, UN 2010*)

(Fig.2: *The Palestinian territorie, ref: http://www.polgeonow.com, (9th Jan., 2015 at 2:07 pm).*

1.3. Biodiversity in Palestine (at level of historical Palestine):

Historically, Palestine was famous for its rich vegetal green cover and species, as well as for its variety in climate, topography, and environmental characteristics, which allow for different vegetation assemblages to exist in such a small area (Al-Joaba; 2006, Safar et al.; 2001, ARIJ; 2010). In Palestine prevails the Mediterranean climate; which is characterized by dry mild summer and cold rainy winter,; in the West Bank the average temperature in the summer ranges between 21.7- 23.7˚C and in winter between 8-14.2˚C . The annual rate of rain is between 500 and 600 mm. This climatic feature gave the Palestinian territories special agricultural trait i.e. the opportunity to cultivate a variety of crops and under different dates throughout the year (Safar et al.; 2001).

Despite the small size of Palestine, it hosts over a big amount of plants species. By using the Palestinian and Israeli references an official acknowledged number of species con not be retrieved, both at historical Palestine and Occupied Palestinian Territories (OPT) level. Indeed, the literature is controversial about this topic, as reported below.

The third national report by the Agriculture Ministry of Palestine reports the number of wild plant species to be 2780 (EQA; 2006). This because, the similarity in numbers for plants results from Palestinian reliance on Israeli survey figures. The Israeli figures only include plants found in OPT areas (Occupied Palestinian territory). The reason is that many Israelis consider

geographic Palestine to be the land of Israel and thus include species surveys as part of those in Israel. In addition to depending on Israeli studies the majority of existing Palestinian literature on biodiversity describes only the current status of biodiversity; there are limited studies of biodiversity prior to the division of Palestine in 1948(Albaba; 2014)

On the other side, Shmida estimated 2,483 species of plants for the historical Palestine (Shmida; 1995, Ghattas et al.; 2006).

The Applied Research Institute of Jerusalem (ARIJ) established that Palestine, intended as OPT, hosts 2,500 species of wild plants with new ones discovered each year. Approximately 800 of these plants are considered rare, and around 140 are endemic (Isaac et al.; 1995).

Palestine contains 104 species of which are not present in any other region in the world, it was recorded in local literatures that 636 species are listed as endangered (53%), 990 species are very rare so they need urgent conservation (Safar et al.; 2001, EQA; 2006).

Historical Palestine consists of a variety of plant formations, ranging from dense forests to thin patches of desert herbs, passing through different forms of woodland, such as maquis, garrigue. Each geographical territory represents one or more different ecosystems, according to Zohary (Zohary; 1966, ARIJ; 2007, ARIJ; 2011, Al-Joaba; 2006) they are: Mediterranean, Irano-Turanian, Saharo- Arabian, and the Sudanian. These territories differ greatly from each another in their annual rainfall and temperature, as well as in their rock and soil cover (Leipzig;1996, Al-Joaba; 2006, ARIJ; 2007, Ishtie et al.; 2002) Half of Palestine's endemic species are restricted to the Mediterranean Territory, a third to the Irano-Turanian and only a sixth to the Saharo-Arabian territory. Jordan valley with about 25 endemic species is considered as one of the main three centers of endemic species in Palestine.

The chorological type is defined by the current distribution of the species (Pignatti, 1982) with respect to each study area; according to it, and following Feritg Gruenberg (Gruenberg-Fertig, I.; 1966), 9 chorological types have been identified (Fig.3):

1. Mediterranean (M) species, which are distributed around the Mediterranean sea.
2. Irano-Turanian (IT) species, which inhabit Asian steppes of the Syrian desert, Iran, Anatolia in Turkey, and the Gobi desert.
3. Saharo-Arabian (SA) species, which grow in the Sahara, Sinai, and Arabian deserts.
4. Sudano-Zambesian (S) species, typical to the subtropical savannas of Africa.

5. Euro-Siberian species, also known in countries with a moister and cooler climate than that of Israel; grow-ing mainly in wet habitats and along the Mediterranean coasts.
6. Bi-regional, tri-regional, and multi-regional species (F) that grow in more than one of the regions mentioned above. The most common of these are M-IT species.
7. Alien species from remote countries which grow without hum assistance. The principle countries of ori- gin of these plants are the Americas, Australia, and South Africa.
8. Thm thermophilous, including Sudanian, Tropical and Subtropical.
9. other chorotypes.

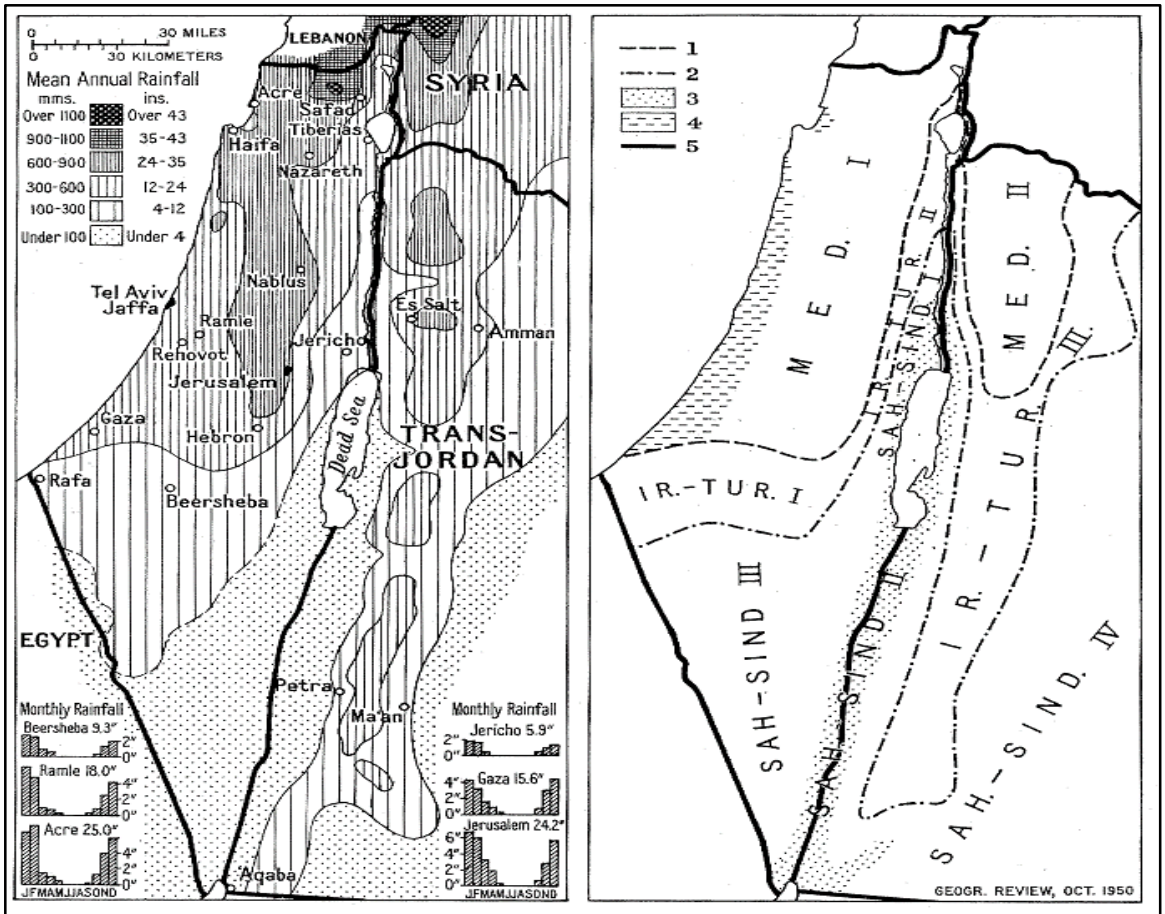


FIG. 1—Rainfall map of Palestine, with graphs of monthly rainfall at six selected stations.

FIG. 2—Phytogeographical zones of Palestine, after Eig: Mediterranean (I, Cisjordan; II, Transjordan), Irano-Turanian (I, Judean Desert; II, Near Negeb; III, Transjordan), and Saharo-Sindian (I, Lower Jordan Valley; II, Wadi 'Araba; III, Far Negeb; IV, Transjordan).

Key: 1, boundary between Mediterranean and Irano-Turanian zones; 2, boundary between Irano-Turanian and Saharo-Sindian zones; 3, principal area of occurrence of Sudano-Deccanian enclaves; 4, area of Saharo-Sindian penetrations; 5, pre-partition international boundaries.

Fig.3: Phytogeographical zones of Palestine (Whyte 1950).

1.4. Biodiversity Occupied Palestinian territory (OPT):

The West Bank has about 0.26 km^2 (26000 Ha) as forested area, comprises of five main agro-ecological zones: the Jordan Valley, the Eastern Slopes, the Central Highlands and the Semi-coastal Plain (West Bank)(Fig.4), and the Coastal Plain 'Gaza Strip'(Isaac; 1995, ARIJ; 1997, Leipzig; 1996, Albaba; 2014). Climate varies abruptly between these different zones, despite their small geographic area. And so, flora and fauna vary accordingly, although there is also a good deal of overlap in species distributions between the different zones (ARIJ; 2007, Issac et al.; 1995).

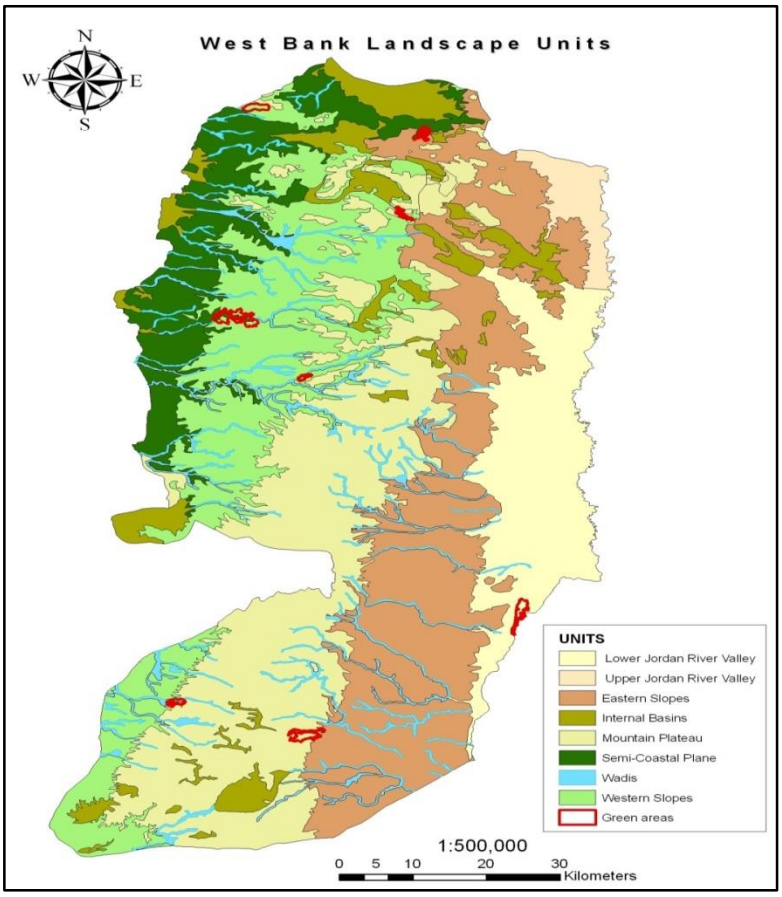


Fig.4: Landscape units in West Bank as retrieved from data by ARIJ. Red polygons show the green areas system of DEBPAL2 project.

The OPT contain 2076, dominant families are the Compositae with 96 genera and 260 species, Gramineae with 87 genera and 198 species, Leguminaceae with 62 genera and 268 species, Cruciferae with 63 genera and 124 species, Labiatae which includes many famous as medicinal plants, with 23 genera and 99 species, Liliceae known for its beautiful flowers, with 23 genera and 97 species (PEnA; 1999). Palestine is an ecological center for many indigenous native

species, some of them are adapted for arid land environment like: Acacia spp, Artemisia spp, Prosopis spp (Aljoaba; 2006, Ghattas et al.; 2006).

There are 1959 species (in 115 families) are growing in the West Bank and (16 families that grow in West bank but not in the Gaza strip), the number of threatened plants in the West Bank is about 334 species that belong to 222 genera from 81 families. Among the threatened species there are 33.8 % annuals and 18 % are trees (Aljoaba; 2006, ARIJ; 2007). And 1290 species (in 105 families) are growing in the Gaza Strip (5 families that grow in the Gaza strip but not in the West bank). There are 102 endemic species (in 28 families), forming 5% of the total species, of which 12% are rare endemic species. Up to 92 endemic species (in 26 families) are growing in the West Bank, forming 4.7% of the total species, and 30 endemic species (in 18 families) are growing in Gaza Strip, forming 2.3% of the total species. Most of the endemic species growing in the West Bank belong to *Compositae* family that constitutes 12.8% of total endemics. Most of the endemic species growing in the Gaza Strip belong to the *Papilionaceae* family (13.3%). Examples of the endemic species growing in the West Bank are *Capparis spinosa L* (Capparaceae), *Suaeda palaestina* Eig & Zohary (*Chenopodiaceae*), *Origanum dayi* Post (*Labiatae*), and others. Examples of endemic species growing in the Gaza Strip are *Erodium subintegrifolium* Eig (*Geraniaceae*), *Iris atropurpurea* Baker (*Iridaceae*), *Paronychia palaestina* Eig (*Caryophyllaceae*), and others (ARIJ; 2007, EQA; 2006, Safar et al.; 2001).)

The OPT differs from other countries as it is characterized by the presence of two contradictory planning schemes that aim at exploiting its natural resources to serve two peoples: the endogenous Palestinian population and the Israeli settlers and army, which has controlled the area since 1967 (Issac et al.; 2011).

1.5. Changes in the Green Cover by Human Impact, Israeli Occupation and Other Threats to the Biodiversity of Species

Palestine's biological diversity undergoes to several factors that affect and change the plant structure and composition of the vegetation; these factors are: Climate change and desertification, with the related problems of overgrazing and over use of water resources, as well as deterioration and pollution of soils with plastic and chemical wastes and extensive use of agricultural chemicals (Albaba; 2014, PEnA; 1999, Aljoaba; 2006, ARIJ; 2010). Human infringement upon the composition of Palestine's native vegetative cover has occurred; old Testament references indicate that the cutting of forests in Palestine began centuries ago, a practice which has continued ever since with varying degrees of intensity. Canaanites, Hebrews, Romans,

Byzantines, Arabs, Crusaders, Mamluks, Turks and Zionists have all played their role, gathering of wood for fuel and lumber Charcoal production and commercial lime kilns consumed many trees, During the Turkish occupation of Palestine, vast areas of remaining natural forest were lost as large numbers of trees and shrubs were cut to provide fuel for Turkish railways. Many naturally occurring forests across Palestine disappeared and the consequent reshuffling of the vegetal composition led to the loss or marginalization of large numbers of native flora. Overgrazing by domesticated sheep and goats, conversion of woodlands to arable land, and forest fires; even within the past several years, thousands of hectares of forests have been lost to forest fires, both planned and accidental, and the intensity of air pollution in the north, especially near Haifa, is killing thousands of trees in the Carmel hills (Aljoaba; 2006, PEnA; 1999, ARIJ; 2010).

The presence of the Israeli occupation contributed to the change of vegetation cover whereas they occupied our lands for more than 30 years and left us with many social, political, economic and environmental problems. Living under occupation, with our land and its resources out of our control, we are obliged to put more pressure on what little of the natural environment is left for us to use for subsist and survival, while the Protection of the environment and its biological diversity is not a luxury for the Palestinians, but a fundamental necessity for survival and prosperity (PEnA; 1999, Aljoaba; 2006, Safar et al.; 2001). The Israeli occupation, had caused a high rate of soil and land degradation, which led to an accelerating decrease in vegetation cover and productivity(Aljoaba; 2006), the Palestinian landscape falls under intrinsic and extrinsic pressures that reserve its development to provide a clean healthy environment to Palestinians. The land is highly fragmented and there are no laws or regulations to protect the whole eco systematic, holistic, social, economic and environmental concept of the landscape. As a result, landscape is chaotically shaped into a disintegrated, highly fragmented mosaic, Ecosystem fragmentation is the major cause of biodiversity deterioration. As a result of land confiscation, the building of settlements and "security" areas, and Palestinian and Israeli urbanization, macro and microhabitats have been fragmented to the extent that their viability has become of great concern to naturalists. Urgent intervention measures must be instituted, including establishing "secure" ecological zones, such as natural reserves and managed parks. Intervention may also entail rehabilitating damaged ecosystems and reintroducing species that once lived in these areas (EQA; 2006, PEnA; 1999, Safar et al.; 2001). The OPT is facing a serious crisis in its landscape development and sustainability (ARIJ; 2011), whereas under Israeli occupation, new sets of rules affecting the environment and natural resources were imposed to serve the objectives of the occupier. Afforestation was forbidden throughout most of the occupied territories and water use

was limited through the closure or confiscation of irrigation wells and through strict drilling restrictions. Partially because rainfall was so minimal, particularly in the eastern parts of the West Bank, many Palestinian farmers were forced to leave their land and join the labor market in Israel. Sizeable areas of land were neglected and returned to semi desert in yet another chapter in the long legacy of environmentally disruptive displacement (Issac et al.; 1995). The Israeli occupation authorities have both grabbed the Palestinian lands from their owners, and have also practiced several violations in the West Bank and Gaza Strip: razing agricultural lands, uprooting trees, causing great losses to the Palestinian agricultural sector. Illustrates the number of trees uprooted by the Israeli Occupation forces. Moreover, the Israeli Occupation contributes greatly to the decrease in the forest area in the OPT, by taking land in the forested area for colonist settlements, military bases and bypass roads. One case in particular illustrates this impact on forests. The Israeli–Palestinian conflict has negatively affected all elements of the natural environment including the quality of human life (Issac et al.; 2011). World attention has focused on the political conflict between Israelis and Palestinians with less attention to the environment of the area. While environmental problems do not recognize political, racial or religious boundaries, there is an organic relationship between environmental degradation in the Occupied Palestinian Territory (OPT) and the political conflict. In addition, the already tight pieces of agricultural land that Palestinian farmers are tilling are diminishing every day by toxic wastes and pollution dumped by Israeli settlements in illegally seized Palestinian lands(PEnA; 1999).

1.6. Forests and protected areas

In Palestine, as is the case in any country of the Mediterranean basin countries, the forest areas have merged with the overall inherited social behavior patterns, beliefs, culture and human history. The forest is particularly important in the protection and purification of the environment and the provision of products and the provision of pasture.

Forests in Palestine divided into natural forests and planted forests (man-made forest). The natural forests in the West Bank mostly considered as natural reserves where the estimated area in 1971was about 197.472 Km^2 (ARIJ; 2010, Leipzig; 1996, Safar et al.; 2001).

The West Bank contains about 0.26 Km^2 of forested area, according to the forestry department of the Ministry of Agriculture. Of this, more than 1.950 Km^2 are natural forests and just over 0.0371 Km^2 are man-made forest areas (Leipzig; 1996). An additional 0.0284 Km^2 are unplanted area with forest potential. In the southern areas (Hebron, Bethlehem, Jerusalem) the majority of the forested areas about 0.02 Km^2 of the 0.0213 Km^2, (8%), are introduced and mostly coniferous

made up mostly of pine species planted either by the British, Jordanian or Israeli authorities, while not native, in many cases they often harbor significant wildlife and plant genetic resources (Abed Rabboh; 1995, Leipzig; 1996, Safar et al.; 2001). Historical and recent natural data indicate that these areas were probably naturally planted with tree species such as juniper, carob and oak, as well as cultivated species such as olives and fruit trees (Leipzig; 1996, Albaba; 2014, Issac et al.; 1995, ARIJ; 2007). There are 93 major forests in the West Bank and 13 in the Gaza Strip, covering about 0.22595 Km^2 and 2 Km^2, respectively.

Forests cover approximately 4% of the total area of the West Bank and 0.6% of the Gaza Strip most of these forests are located on fertile soil types (Terra Rossa, Brown Rendzina, and Pale Rendzina) and in areas enjoying favorable climatic conditions for agriculture. Natural forests form 79.1% of the total forested area in the West Bank; On the other hand, the planted forests cover 12.1% of total country forested area, being mostly concentrated in the Hebron governorate (28.9% of total planted forests in the West Bank). Gaza includes only planted forests, which represent 0.9% of the total forests in Palestinian Territories. In addition, the total area of nature reserves in the West Bank and Gaza Strip is about 774 km^2, forming 12.8% of the total area of the OPT (Ghattas et al.; 2006, PEnA; 1999). Afforestation programs in the West Bank were first implemented during the British Mandate, and then the Jordanian Administration. In 1927, the first law for the protection and development of forests in Palestine were legislated by the British. About 2.306 km^2 of mountainous and steep land in the West Bank were planted with *Cupressus* spp and *Pinus* spp., afforestation continued during the Jordanian Administration and after that by the Israeli occupation authorities. Forest rangers were appointed to implement the law enforcement on the site and all over Palestine. In the early '30s, nurseries were established to distribute seedlings to the local governments and people as part of a Grand National afforestation scheme. In 1935, at the British mandate period in Palestine, only 0.9 Km^2 were forested in Hebron and Nablus areas. In 1950, the total planted forest area was very little. Afterwards, the Jordanian administration started to plant forest in West Bank at a rate of almost 1.7 km^2 per year. The main species were Pinus spp. (Pinus pinea L., *Pinus halepensis Miller*, Pinus brutia Ten., *Pinus canariensis* C. Sm.), *Eucalyptus camaldulensis* Dehn., *Cupressus* spp., and *Acacia* spp. The total planted forest area of West Bank until 1971 was 0.03535 km2 (PEnA 1999, Safar et al. 2001).

Until 1971, forests were distributed over different parts of the West Bank and Gaza Strip and nurseries were present. Estimates of forest cover are based on the official forest area from Jordanian time (until 1971) and its changes up to now. This comprises most of the forests except

for an estimated 0.01 km2 of unregistered private forests. Table.1shows a detailed overview is given about the forest types and areas referred to 1971 and 1999(Ghattas et al.; 2006, Safar et al.; 2001).

Origin	District	Area in 1999		Area in 1971	
		Ha	% of total	Ha	% of total
Bare land with sparse vegetation	Jenin	686	3.0%	1.203	4.0%
	Tulkarm	10	0.0%	10	0.0%
	Tubas	590	2.5%	600	2.0%
	Qalqilia	185	0.8%	209	0.7%
	Selfit	540	2.3%	540	1.8%
	Hebron	30	0.1%	30	0.1%
	Total	**2.040**	**8.8%**	**2.591**	**8.6%**
Natural forests	Jenin	1.955	8.4%	3.093	10.3%
	Tubas	15.632	67.5%	15.730	52.3%
	Qalqilia	0	0.0%	150	0.5%
	Selfit	631	2.7%	651	2.2%
	Ramallah	45	0.2%	60	0.2%
	Hebron	63	0.3%	63	0.2%
	Total	**18.326**	**79.1%**	**19.747**	**65.7%**
Planted Forests	Jenin	680	2.9%	861	2.9%
	Tulkarm	109	0.5%	109	0.4%
	Tubas	165	0.7%	170	0.6%
	Nablus	239	1.0%	334	1.1%
	Qalqilia	68	0.3%	130	0.4%
	Selfit	12	0.1%	12	0.0%
	Ramallah	163	0.7%	408	1.4%
	Jerusalem	199	0.9%	279	0.9%
	Hebron	807	3.5%	972	3.2%
	Bethlehem	149	0.6%	259	0.9%
	Gaza	200	0.9%	4.200	14.0%
	Total	**2.792**	**12.1%**	**7.735**	**25.7%**
Total	**23.158**			**30.073**	

Table.1: Officially designated forest area in 1971 and 1999 (Ghattas et al. 2006)

The Israeli authorities used to declare a part of the Palestinian territories as natural reserves to prevent Palestinians to use these territories for agriculture or for other purposes; the Israeli intentions have revealed when part of these reserves later became as Israeli colonies (Leipzig; 1996, Safar et al.; 2001). Israeli authorities have announced the 48 nature reserve in the West Bank with total area around 1338.29 km2, Equivalent 6.5% of the total area of the West Bank. Most of the declared protected areas in the West Bank located in areas "C" which fully controlled by Israel (land and natural resources and security), For nature reserves in" A and B" areas there are 19 protected area with total area around 662.85 km2, but the Palestinian Authority received 220.38 km2 just. These reserves were handed over to the Palestinian side gradually through three stages in the years 1995, 1999 and 2000 (Shtayeh et al.; 2002, Safar et al.; 2001)

Palestinian authorities did not announce at the present time for natural reserves other than those declared by the Israeli side, but it was appointed areas characterized by sensitive environments and value in order to protect and subject them to the use controls to Reduce of urban development and pollution. In the West Bank has been listed the Forests and the nature reserves under Region that requires absolute protection (Safar et al.; 2001).

In Gaza, the areas with natural value before 1948 comprised mainly shifting sand dunes along the coast. Afterwards, the Egyptian administration started to plant forest to stabilize the shifting sand dunes and the total planted forest area amounted to 0.042 Km^2 in 1971. Planting forest on sand dunes was a necessity to protect the hinterland, but had a controversial effect on biodiversity. It was done with a low density. Main species being planted were *Eucalyptus* spp., *Acacia* spp., *Tamarix* spp. and *Atriplex* spp. Other abundant natural perennial plants were *Retama raetam* (Forssk.) Webb & Berthel.and *Artemisia monosperma* Delile.

1.7. National Parks, Nature Reserves and Landscape Reserves

The Palestinians have not yet set up their own national parks, nature reserves and landscape reserves. Those that do exist were set up by the Israeli civil administration. Although the Ministry of Planning issued publications on ecologically important areas and landscape areas, no legal setup has been proposed for any of them. NGOs and academic institutions have likewise identified many ecologically important areas. These areas need to be evaluated for their national or local significance to natural heritage and ranked accordingly. Such ranking is important in order to classify them as national parks, nature reserves or landscape reserves and offer the requisite level of protection. This should be followed by officially declaring them as such if they

meet necessary evaluation criteria. It should be noted that some of the areas mentioned by the Ministry of Planning publication are only of local significance if any (EQA; 2006, PEnA; 1999).

1.8. The problems and difficulties facing the forest and nature reserves management in OPT

There are No specific systems for the management of forests and nature reserves for a number of reasons, including: Political aspects that prevent Palestinians to manage their natural sources; in addition to the absence of legislation that stipulates to the necessity of managing these resources sustainably, also, lack of knowledge affect negatively on the management process.

The things that must be considered when forests and nature reserves management are: 1) fire: where there are no special regulations to control in case of eruption and this forming a serious threat to destroy through Losing the vegetation and soil erosion, Fires may break out naturally at higher temperatures in summer, or deliberately in order to find a pastoral areas, or as a result of malpractice of some people when they are in these protected areas like throwing cigarette butts or fire dry herbs or not to put out the fire by hikers. 2) Overgrazing: is difficult to control the over-grazing as a result of the closure imposed on the Palestinian people, which led to reduced grazing places, in addition to the absence of laws that limit this phenomenon. 3) The vegetation, Palestine suffers from a lack of human capacity in the subject of natural resource and forests management, where this subject is not covered in the academic or non-academic curriculum (PEnA; 1999, Safar et al.; 2001, Shtayeh et al.; 2002).

1.9. Aims of present studty:

Taking into account the problems and the concerns of the geopolitical situation and the status of conservation, including the managing efforts done by the Palestinian Authority, the present work would focus on the following items, with a specific attention to some areas (namely, selected sites) representative of the main forest environments occurring in West Bank. The goals listed below are intended to be achieved after a preliminary investigation of the state of the art of the environment and practices already existing, but adding the multidisciplinary approach usually needed in such a complex analysis, in order to set up a wide framework of insights and recommendations to be applied in the whole West Bank. What this study would investigate is devote to:

- To perceive and understand the status of the main plants species and their distribution in order to protect them.

- To set up the most important guidelines for conserving plants.
- To know and recognize real and potential risks affecting species occurrence in West Bank.
- Give warnings and appropriate solutions and/or best practices when any risk act.
- Protecting the genetic resources of the plant biodiversity.
- Collecting, preserving and documenting of plant germplasm in the gene bank, the seeds bank, and the herbarium.
- Contribute to the development of legislation and social awareness for the protection of plant genetic resources and the optimal use of them.

Chapter two: Materials and methods

2.1 The Work Flow:

The existing protected areas in the West Bank preserve and conserve important resources (biological, historical, archaeological, and cultural resources). Very little of the West Bank is designated for nature protection and in actuality many important ecosystems are wholly unprotected and under threat. In this view, six study cases have been identified and considered as conservation areas, paying peculiar attention to native and protected plants species and to reforestation programs established in the recent past (DEBPAL 2).

The main idea is to contribute to widening our knowledge by means of a full description of species occurrences both in West Bank and in the study sites, and providing an ecological description of the investigated species and their habitats, relying on the current data availability.

This project will be done through several steps as follows:

Historical documentation, current botanical checklist, GIS applications, field observations, herbarium assemblage, seeds bank development, and molecular (DNA) analysis (fig.5).

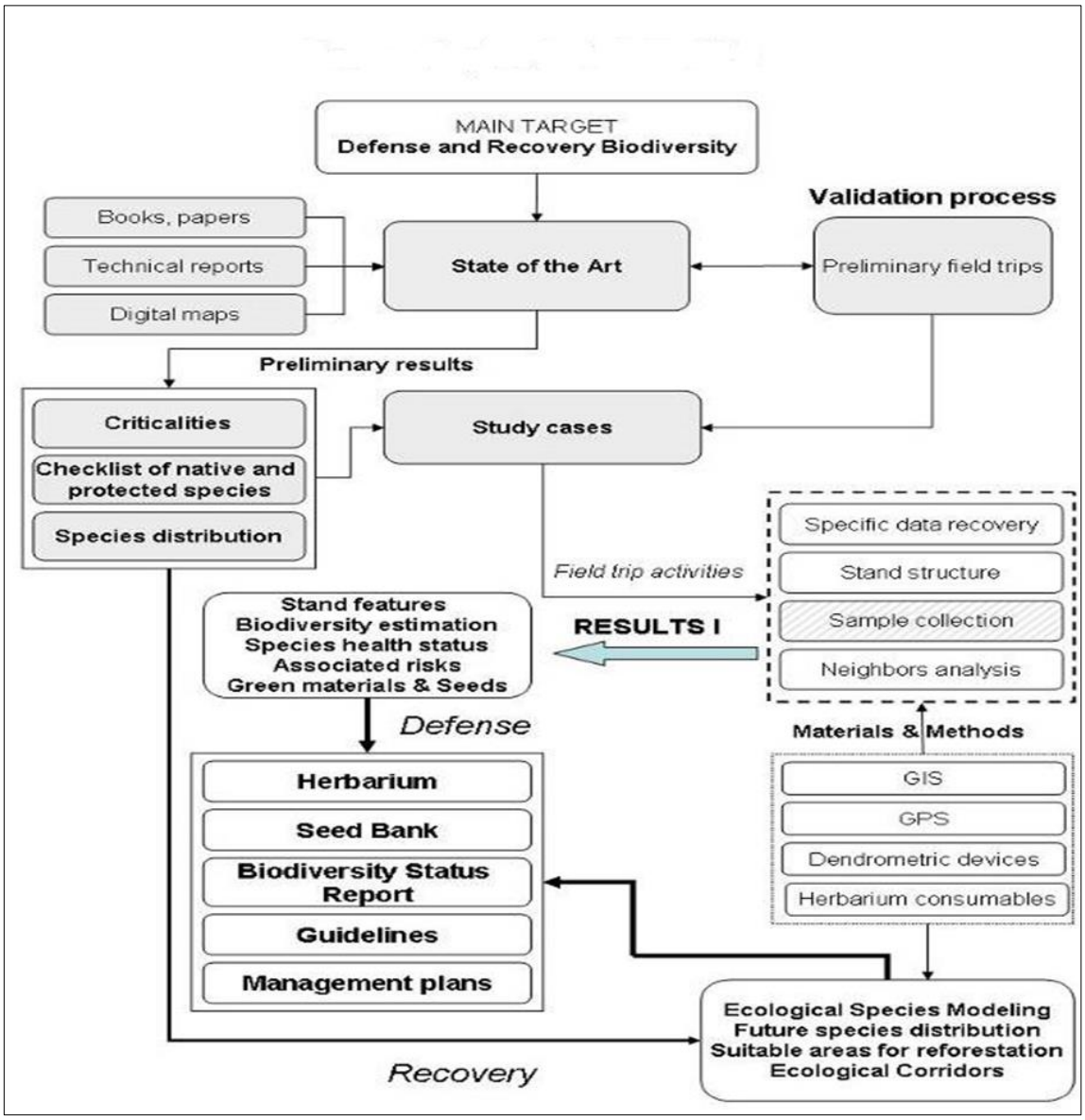


Fig.5: the workflow of the study

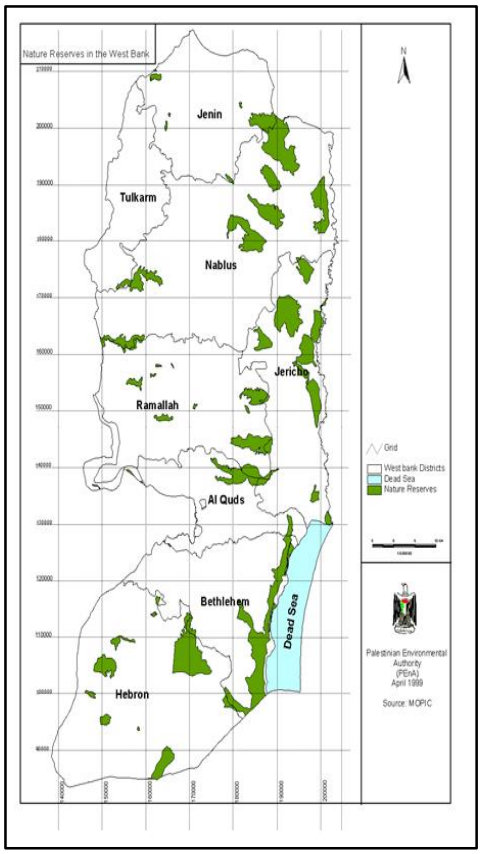
2.2 Selected sites:

This study has represented six of the West Bank sites in the north and the south (Fig.6), where the samples were collected from the sites mentioned below, Each site visit has nearly five times during the period between April and October. The sites have been chosen on the basis of:

1. Typology and condition of the vegetation (natural-spontaneous; or, deriving from old "plantations", reforestations and afforested stands);
2. Phytogeographical zone of pertinence.
3. In the cases of "plantations", reforestations and afforested stands, the age of the intervention is taken into account also for its consequences on the structure of the vegetation;

4. Legal status of the site (Protected, Private, Governmental, etc.);

5. The diversity-complexity of the existing Flora.



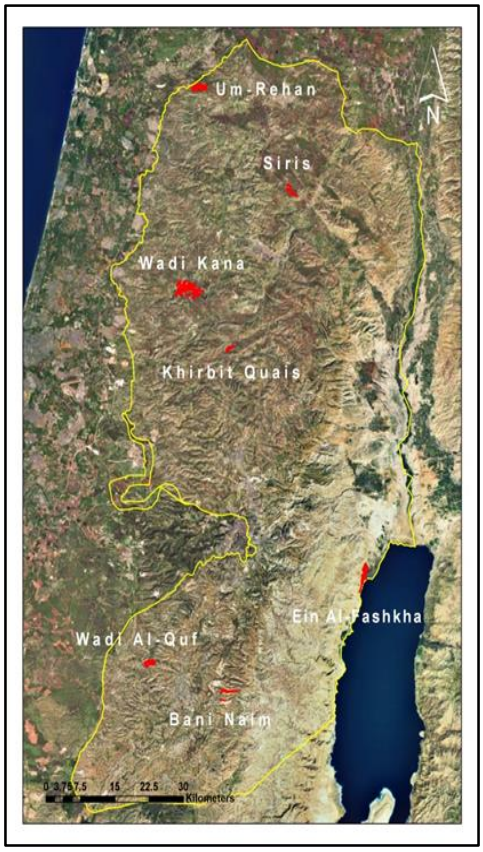


Fig.6a *Fig.6b*

Fig.6: a- Protected Areas in the West Bank, as declared by the Israeli Authorities (PEnA, 1999/http://www.mena.gov.ps). b- The six selected sites have been studied.

Each site represents a specific case of study and experience and it is here presented toward a summary description, a historical reconstruction of the landscape variation and the results achieved from the surveys done in 2014, during the second year.

2.2.1. Hebron:

There are currently about 14.949 Km^2 of forest-covered areas in Hebron, and this form 22% of the total forest area in the West Bank, forest in Hebron falling under two main types (Planted coniferous forest and Scelrophyllous Oak Forest and Maquis).

1- Wadi Alquf:

Coordinates: 31 33`N 35 07`E

Located in the south of the West Bank in the southern province of Hebron, it considered as the large region located west of Hebron with an estimated total area is 0.0025 Km^2 with altitude 500-700 m. It is surrounded by Palestinian villages of Beit Kahil, Tarqoumia and Halhul and Beit Ula (fig.7). The area is rich in biodiversity because of its trees and plentiful water (it contains springs, among them Al Sukar, Al Haska and Al Majnounha) (EQA; 2006) and it considered as a pathway and a stopover for migratory birds travelling from the coastal region and going to the depression areas (Fig.8). (EQA; 2006, ARIJ; 2010).

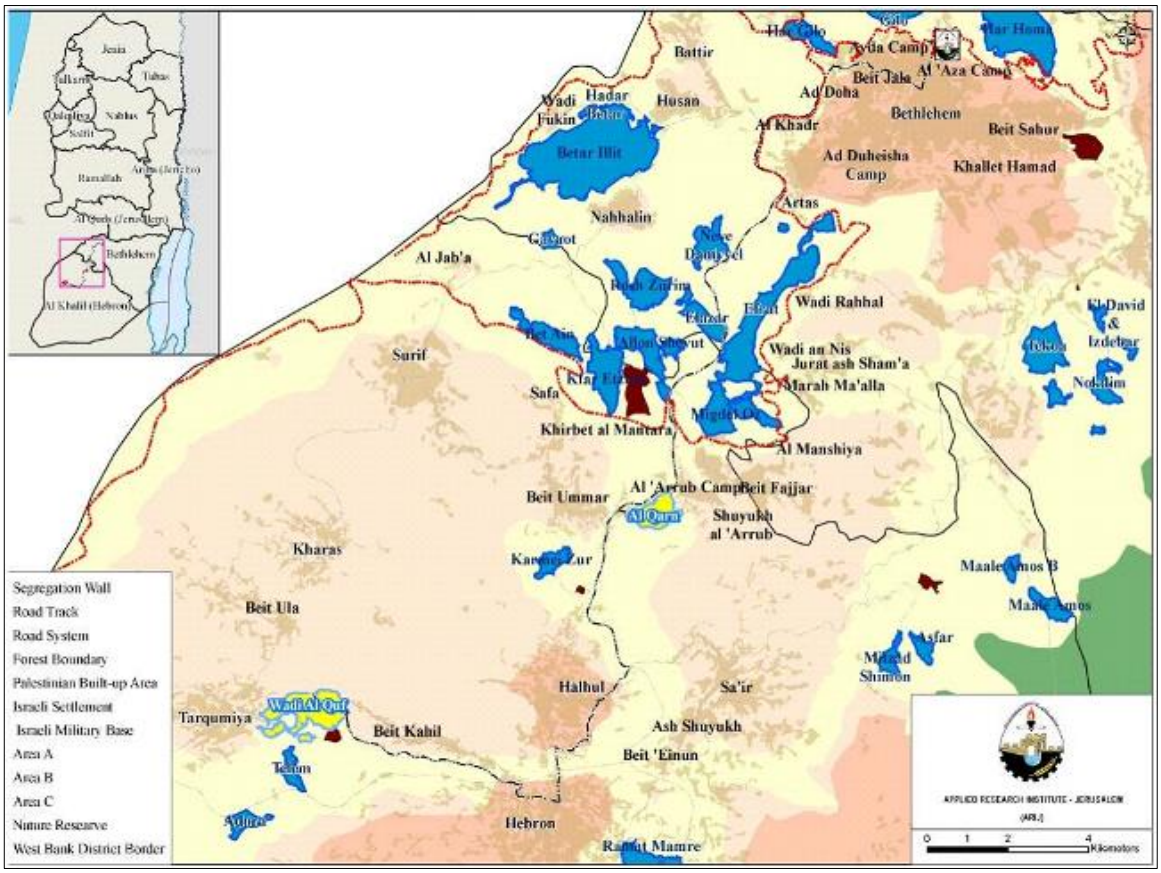


Fig.7: location of Wadi alquf and the villages all aorund in West Bank, ARIJ;2010

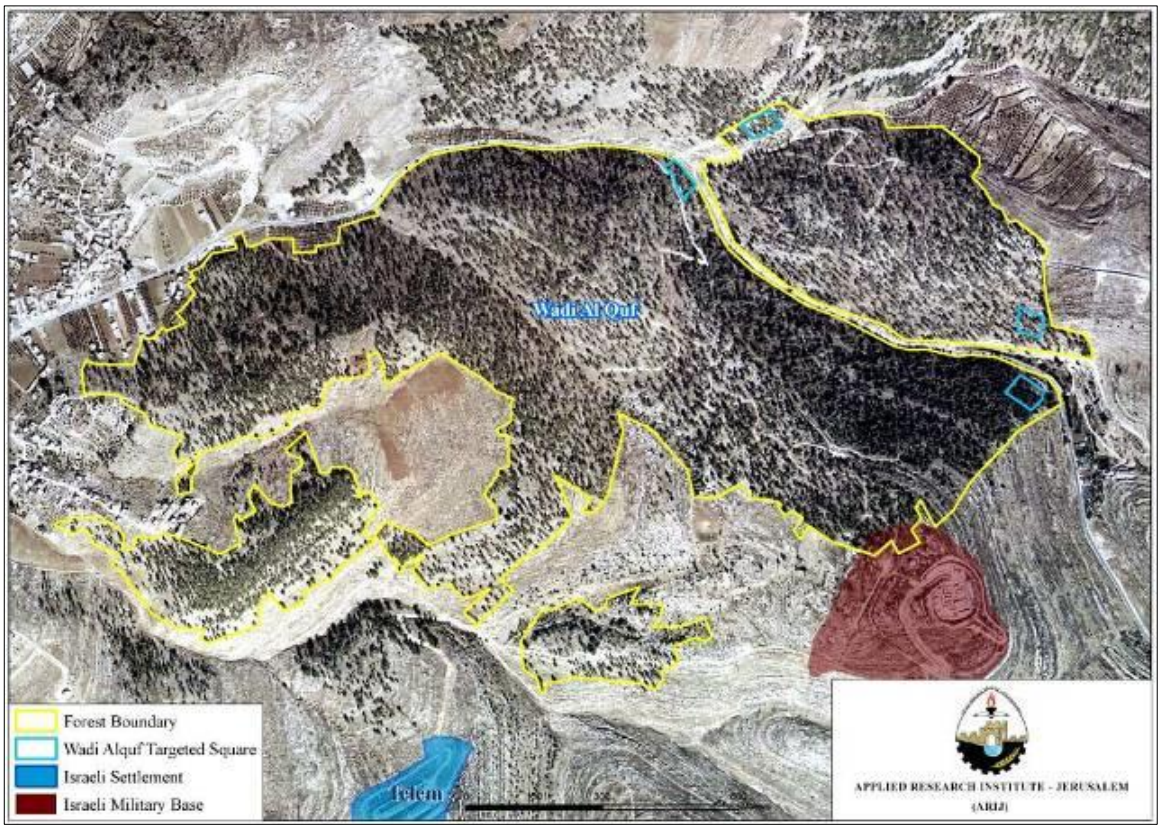
The forest floor is located in the geopolitical region 'B and C' is under the administration of the Palestinian Ministry of Agriculture, but there is Israeli control. The Region is characterized by

high moisture (60.5%) resulting from the decline in the direction of opposite to the sun. The average rainfall in the area of forestry 400-500 mm per year, with a relative moderation in winter temperatures up to 16.5 ° C and tend to rise in the summer (ARIJ; 2010). The history of these forests return to the old era, the fantasy of these forests attract the British delegation, which is signed one of the nativity person to develop the area in 1923, and opened side way to enter to the site and founded for plantation, with subsequent intervention of "plantation" during the Jordanian Period, inserted on a pre-existing kernel of Natural Plants.

Wadi Alquf forest represents a model of South-west of the eastern Mediterranean forest (subordinate to two types of forests: Planted coniferous forest and Scelrophyllous Oak Forest and Maquis). The native plants are dominated in this forest are: *Pinus halepensis* Mill., *Cupressus sempervirens* L., *Teucrium divaricatum* Sieber ex Heldr., *Clematis cirrhosa* L., *Smilax aspera* L., *Asparagus aphyllus* L., *Sarcopoterium spinosum* (L.) Spach and dozens of other types of plants. The climatic conditions such as rain rate and slightly higher average temperature provides appropriate conditions for the existence of *Pistacia lentiscus* L., *Ceratonia siliqua* L. in the region; where both these two species are (thermal plants), the soil types prevailing in the forest encourage the growth of certain types of vegetarian; whereas there mixture of *Terra rossa* and *Light Rendzina* which encourages growth of : *Pistacia palaestina* Boiss., *Pistacia lentiscus* L., while the soil in the northwestern part of the forestry is *Light Rendzina* just; therefore, we find that the dominant species are: *Thymbra capitata* (L.) Cav.

The northern part steep reverse the direction of the sun characterized by gowitng of: *Teucrium divaricatum* Sieber ex Heldr. This needs high humidity. The presence of a high percentage of rocks, we can find other species Favor growth in the forest as: *Linum pubescens* Banks & Sol., *Chiliadenus iphionoides (Boiss. & C. I. Blanche) Brullo*. The northeast side features of some of the exotic species that have been planted in the sixties as: Pinus canariensis. Evergreen sclerophyllous maquis inside the reserve is dominated by *Quercus coccifera L.,Rhamnus lycioides* L., and *Pistacia* spp. (ARIJ; 2010, DEBPAL 2).

The Pressures and threats facing this forest are: unstable climatic conditions (pins spp is the most spp at risk of heavy snow), overgrazing, Throw waste, Israeli military practices in the forest, in addition to forest fires and cutting the trees that negatively affect the safety and sustainability of the forest.



(*Fig.8): Wadi Alquf forest, ARIJ; 2010*

2- Wadi Al-Quf nursery:

The nursery of Wadi Al-quf established in 1927with estimated total area around 6 acres. The Production in the nursery began in 1929 and continued in the production between 60-100 thousand seedlings per year until 1974. In the period between 1974 - 1995: the Occupation authorities reduced the production of nursery to about 12 thousand seedlings per year.

The Palestinian Authority cooperated with American Near East Refugee Aid (ANERA) for Rehabilitation and re-restored the nursery in 1996.

The current production capacity about 160 thousand seedlings per year, and the currently producing at a rate of 120 thousand seedlings per year. The nursery is specialized in production of saplings of forest shade and ornamental Shrubs and trees and bushes (Ghattas et al.; 2006, ARIJ; 2010).

3- Bani Nai'm:

Located in the southern West Bank located 8 kilometers east of Hebron-city in the Hebron Governorate with total are around 0.9 km^2 with altitude833-958m, It is bordered by Ar Rawa'in areas to the east, Sa'ir and Ash Shuyukh towns to the north, Hebron city to the west, and Yatta

town to the south, it is located in "A" area and managed by Palestinian Authorities (Fig.9). The mean annual rainfall in Bani Na'im town is 369 mm, the average annual temperature is 16° C, and the average annual humidity is 61 % the mean annual precipitation is422 mm (ARIJ; 2009, DEBPAL 2). Bani Na'im is an ancient town dating back to the Romanian period. At that time, it was known as Kafr Brukha. However, during the Islamic era, the name was misrepresented as Kafr Breek. And when Bani Na'im tribe settled south Palestine, the town became known as Bani Na'im until our day (ARIJ; 2009).

It is example of spots of Natural Vegetation on mountainous – tall hills slopes. Going East toward Eastern Slopes of the West Bank, old Natural trees and shrubs with less density (dry natural habitats). The dominant types of soils in Bani Nai'm are Brown *rendzinas* and *pale rendzinas*. The lands of the city are about 0.071 667 Km^2, some of it is much fertilized and it is used to grow serials, vegetables and some trees like Olive, Grapes, Almond, Figs and apricot. The mountains and eastern slopes of Bani Naim is part of natural beauty in Palestine. The wild life in the eastern slopes is rich with medicinal plants making nature as treasure of biodiversity and ecotourism to be explored. Over the city neighbours the environment is characterized by the

desert.

The dominant species are: *Olea europaea* L. (cultivated, scattered) *Teucrium capitatum* L., *Salvia dominica* L., *Iris chrysographes* Dykes, *Papaver rhoeas* L., *Cota palaestina* Kotschy, *Rhus coriaria* L, *Anchusa strigosa* Banks & Sol., Gundelia tournefortii L., *Thymbra capitata* (L.) Cav., *Rosamarinus officinalis* L., *Crataegus azarolus* L., *Colchicum ritchii* R.Br., *Cistanche tubulosa* (Schenk) Hook.f., *Dittrichia viscosa* (L.)Greuter, *Anemone coronaria* L., Helianthus *annuus* L., *Capparis zoharyi* Inocencio & al., *Ziziphus lotus* (L.) Lam (DEBPAL 2).

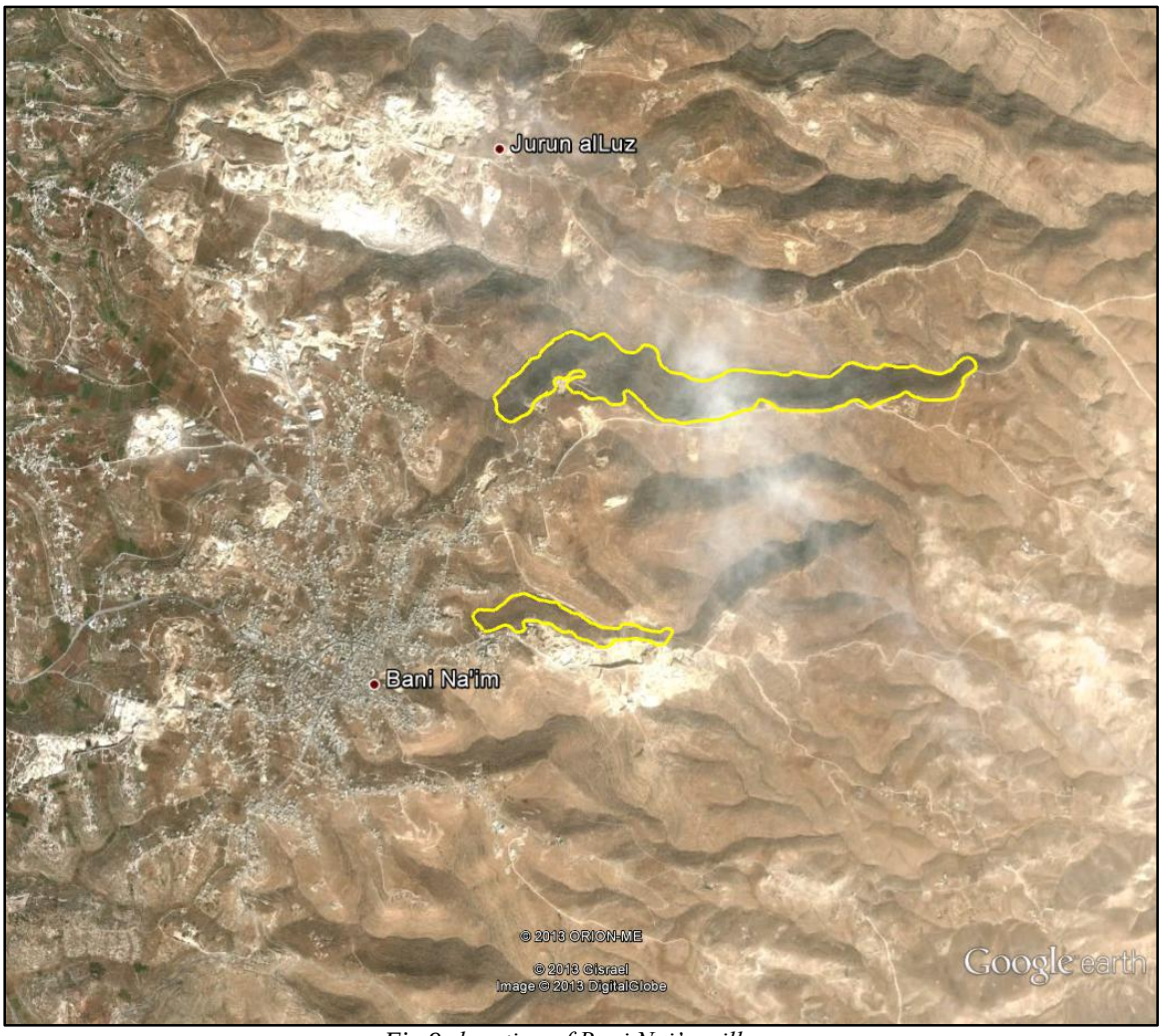


Fig.9: location of Bani Nai'm village

2.2.2. Salfit:

1- Wadi Qana:

Is the Palestinian nature reserve, which lies between Qalqilya and Salfit, but followed Salfit administrative zone in the northern part of West Bank (fig.10), with an estimated area is 9.39 km2 with altitude 500–775 meter and with mean annual rainfall of 676 mm. It surrounded with Palestinian villages; From the northern villages of Jeansafout, Kafir lakef and Azoun, from the west it Surrounded by villages of Sineria and Kafir thoulth, from south it surrounded by village of Krawet Bani Hassan and it surrounded by villages of Deir Istya and Ammatin From East; most of the land owned by farmers from the town of Deir Istya with total area of more than 40.47 Km^2 (IWPS; 2005, IWPS; 2013, http://maannews.net).

Wadi Qana located in the geopolitical region "C" so it is under the control of the Israeli authorities, between 1978 and 1986, several settlements were established on the hills overlooking

both banks of the wadi: Immanuel and Karnei Shomron to the north; Yaqir and Nofim to the south. Later, the settlement of Karnei Shomron expanded to several nearby hills as well. Between 1998 and 2000, the settlement outposts of Alonei Shilo, El Matan, and Yair Farm were established by these settlements (http://www.btselem.org, IWPS; 2005). Wadi Qana is a fertile valley, where it is one of the tributaries of the Yarkon Rive with seven main natural springs and nine smaller ones, is in Area C and includes several springs (http://www.btselem.org, IWPS; 2005, IWPS; 2013).

Wadi Qana is between two ranges of hills, making it very suitable for citrus plantations. (http://www.btselem.org, IWPS; 2005) but the beauty of the Wadi Qana valley hides rampant pollution that has plagued the village since the surrounding Israeli settlements were built, whereas Wadi Qana is surrounded by nine Israeli settlements, all illegal under international law(fig.11). But the river is black and grey by sewage pours down the hillsides into the valley, some through pipes and some directly onto the landscape. Ironically, this valley has been classified as a nature reserve by the Israeli Authority (IWPS; 2005, IWPS; 2013).

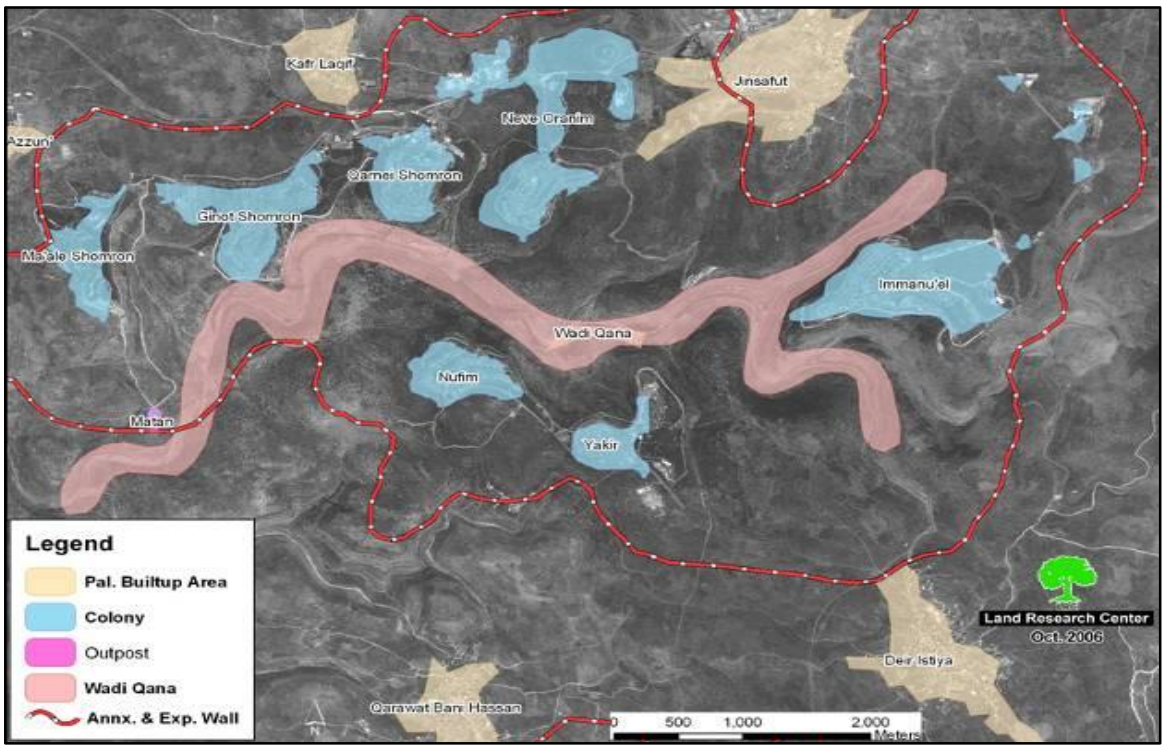


Fig.10: location of Wadi Qana and the settelments around it

In 1983, the Nature Reserves and National Parks Unit of the Civil Administration established the Qana River Reserve, despite the land being privately owned by Palestinians, declaring a nature reserve on an area of roughly0.14 Km^2 along the valley floor of Wadi Qana and its surrounding

slopes. Paradoxically, the Administration has been issuing orders to farmers to uproot olive trees on this land since 1986 with the explanation that this must happen because it's a Natural Reserve (http://www.btselem.org).

The natural environment of Wadi Qana is indeed unique and impressive and is worthy of protection, whereas around the year 1999, the trees started dying and water tests proved that more than 70% of the water supply was severely polluted from sewage waste pumped down from the settlements. A few hundred trees died (IWPS; 2013).

Wadi Qana is example of Plantation of the Jordanian Period, around a pre-existing kernel of Natural Plants with mixed natural stand and plantation dominant, the types of soil in this area are *Loessial Serozem, Terra Rossa* and brown *Rendzina*.

The dominant types of palnt species are *Pinus halepensis* Mill., *Quercus infectoria G. Olivier*, *Quercus coccifera* L., *Olea europaea* L., *Pistacia palaestina* Boiss, *Pistacia lentiscus* L., *Rhamnus lycioides* L., *Cistus creticus (L.)*, *Cistus. salviifolius* L., *Smilax aspera* L, *Calicotome villosa* (Poir.) Link, *Styrax officinalis* L., *Lonicera etrusca* G Santi, *Ruta chalapensis* L., *Sarcopoterium spinosum* (L.) Spach, Dittrichia viscosa (L.) Greuter, *Ceratonia Siliqua* L., *Salvia fruticosa* Mill., *Origanum syriaca* L., *Thymbra spicata* L., *Teucrium polium* L.

The area is a reservoir of medicinal plants for Salfit and Nablus cities and contains many species protected by law such as *Ophrys* spp and *Tulipa agenesis* DC. (DEBPAL 2)

In addition to the pollution from the settlements sewage the valley suffers of wood cutting, over harvesting of medicinal plants, agricultural expansion and road construction, all threaten this IPA (Important Plant Area).

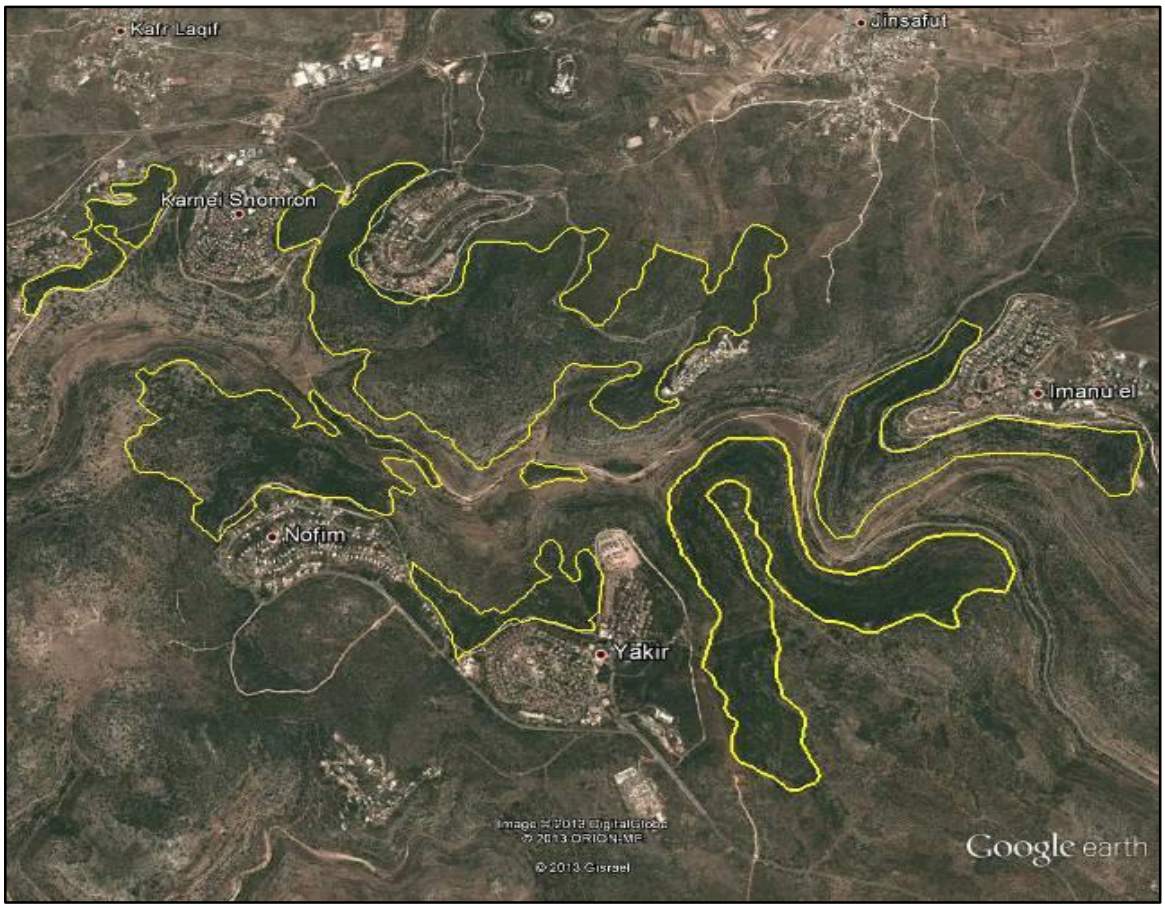


Fig.11: the protected area of Wadi Qana

2- Kherbit Qais**:**

The village of Khirbet Qais located to the south of the city of Salfit at a distance of 4 km, with an estimated total area is 0.49 km2, Located in area "C" on a hill with altitude 400-490 m. It surrounded by the city of Nablus in the north, the village of Farkha in the northwest, the village of Amouria in the East, the village of Krawat Bani Zaid in the East, the village of Mzare' Alnobani in the Southwest, the village of Aroura in the south and the village of Abwein in the South East, it surrounded by mountains on all sides (Fig.12) (http://jamilabboud.com).

Fig. I2: Location of Kherbit Qeis village

Kherbit Qeis considered as an Important Plant Area (IPA) but it is unprotected area so it needs managing and protecting especially because it managed by private owners.

Kherbit Qais has a semi-arid climate, classified as a Mediterranean (mild with dry, hot summer), with a subtropical thorn woodland bio zone. Mean annual temperature of 19.3 °C; mean annual precipitation of 550 mm the types of soil covered this area cambisols and moderately developed soils with lower horizons having color or structure changes from the parent material which permit the identification of a Cambic B horizon.

The dominant species are: *Pinus halepensis* Mill., *Quercus coccifera* L., *Quercus infectoria* G.Olivieri, *Allium daninianum* Brullo, *Asparagus aphyllus* L., *Asphodelus ramosus* L., *Atractylis cancellata* L., *Ballota saxatilis* Sieber ex C.Presl , *Calicotome villosa* (Poiret) Link, *Carlina curetum* Heldr. ex Halacsy, *Carthamus tenuis* (Boiss. & Blanche) Bornm., *Ceratonia siliqua* L., *Chiliadenus iphionoides* (Boiss. & C.I.Blanche) Brullo, *Cichorium endivia* L., *Crataegus aronia* (L.) DC., *Echinops adenocaulos* Boiss. *Eryngium creticum* Lam., *Hedypnois rhagadioloides* (L.) F.W.Schmidt, *Medicago rotata* Boiss., *Micromeria myrtifolia* Boiss. & Hohen. *Micromeria nervosa* Desf. *Notobasis syriaca* (L.) Cass. *Picnomon acarna* (L.) Cass.

Plantago cretica L., *Rhagadiolus stellatus* (L.) Gaertn., *Sarcopoterium spinosum* (L.) Spach, *Scolymus maculatus* L., *Teucrium capitatum* L., *Urginea maritima* (L.) Baker. (DEBPAL 2)

The landscape is mostly covered with mosaic vegetation/croplands and some remnants of evergreen broadleaved sclerophyllous woodland.

2.2.3. Jenin:

Natural forests were occupying an area of 19,541 hectares with the Jenin district featuring the largest part 0.18637Km^2 (Ghattas et al.; 2006).

The most prevalent trees were *Ceratonia siliqua* L., *Pistacia palaestina* Boiss., *Rhamnus* spp., *Styrax officinalis* L., *Crataegus azarolus* L., *Arbutus andrachne* L., wild *Pyrus* and *Prunus,* and *Olea europaea* L. The dominant shrubs and woody plants are *Sarcopoterium spinosum* (L.) Spach, *Phlomis* spp., *Salavia* spp.and *Clematis cirrhosa* L. (Ghattas et al.; 2006).

There are currently 0.017428Km^2 of forested areas in Jenin, and this form 22, 3% of the total forest area in the West Bank. There are in Jenin three types of forests: Natural forests (43.2%) of the total area of Jenin, Planted Forests 53, 1% and mix forest between these two types (3, 7%) (Ghattas et al.; 2013).

Most of the forest areas in Jenin are governmental Lands, Only 14.6% of the forest areas in Jenin, located in the geopolitical region (A) where the land is under the control of the Palestinian Authority and fully managed by the Palestinian Ministry of Agriculture; 8.3% where control of the Ministry of Agriculture partial Palestinian control where the control of the Palestinian Ministry of Agriculture is partially but it does not have administrative control there; and 77,1% of forest areas are located in the region geopolitical (C) Where forests under the full Israeli control nor control of the Palestinian Ministry of Agriculture there. There are three forest areas in Jenin was confiscated by Israel and isolated behind the segregation wall with an area about 6.635 Km^2, and it forms about 38% of woodlands in Jenin (Ghattas et al.; 2013).

1- Em El-tut:

The protected area Em El-tut is located in the northern part of the West Bank to the east of Jenin, surrounded by the villages of EmEltutu, Abu Daif, Jalqamous and qbatia, with an estimated area around 0.505 Km^2 (Ghattas et al.; 2013), Em El-tut considered as a part of Al-Naseir forest, Abu Daif forest and Em El-tut forest, and all of these forests occupy an estimated area around 3.196 Km^2 (Safar et al.; 2001).

Em El-tut characterized with the Mediterranean ecosystem, it includes many of the trees as: Cupressus spp, Pistacia spp, Quercus and (Ghattas et al. 2013, Safar et al. 2001), the region characterized by moisture 55%, the rate of the rainfall is 430mm/year, with the relatively mild temperatures in the winter, warm and semi-dry summers, where the rate up to 20 ° C. Regarding soil types there are *Brown and Pales Rendzinas* and *Terra rossa*, there is also a 40-50 ratio of scattered rocks in the forest allowing of the composition of water on the edges of the rocks allowing the growth of annuals plants as: *Notobasis* spp, *Trifolium* spp, *Erodium* spp and *Cyclamen* spp and others (DEBPAL 2).

The most dominant spp are: *Pistacia lentiscus L.*, *Quercus coccifera* L., *Phillyrea latifolia* L., *Ceratonia siliqua* L., *Rhamnus lycioides* L., *Pistacia atlantica* Desf., *Asphodelus ramosus* L., *Asphodeline lutea* (L.) Rchb., and another species as: *Clematis cirrhosa* L., *Calicotome villosa* (Poiret) Link, *Asparagus horridus* L., *Teucrium capitatum* L., *Teucrium divaricatum* Heldr, *Majorana syriacum* (L.) Kostel. (DEBPAL 2, Gattas et al. 2013).

The forest uses to grazing sheep and the timber cutting and People used to entertain; region lacks management to regulate the using of forest resources which negatively affects the sustainability of the forest. At the north part of the forest there dense forest has grown in the period of Jordanian Mandate, has been implanted with *Pinus halepensis* Miller. Because of the density of pine trees, the forest is shaded almost entirely which does not allow the growth of other trees and shrubs especially for the non-arrival of the sun in sufficient quantities; However, there are some species grow in the spaces between the pine trees as: *Asphodelus ramosus* L., *Asphodeline lutea* (L.) Rchb (Gattas et al.; 2013).

2- Siris:

Located to the south of the province of Jenin and lies about 22 km from the city, with an estimated area is 10.64 Km^2, 6.87 $Km^2$of them are natural forest and the remaining area3.76 Km^2 is barren land, rising 500-630 m above the sea level (http://www.wepal.net, http://www.al-muttahida.org.ps, Safar et al.; 2001). Surrounded by Palestinian villages; it bounded on the north of Judeida, to the west Maythaloun , from the south Yasid and Wadi alfar'a to the east. Most of the surrounding areas are cultivated; some degraded garrigues are close to Siris, Aqra', Kashda and Judeida villages (Fig.13). This area is example of Natural Gariga evolving in Maquis, protected since the Jordanian Period. It is covered with two types of soils Terra rossa, Rendzinas and occasionally alluvium, the region characterized by mean Annual Temperature: 18.8-19.1 °C; mean annual precipitation: 474-494 mm.

There are currently remnants of trees due to cut a large portion of them during the past years, and it has been recorded as natural reserve for restoration the plants and trees in the future, the dominant species are *Quercus coccifera* L, *Quercus infectoria* G.Olivieri , *Pistacia palaestina* Boiss., *Pistacia atlantica* Desf.,*Ceratonia siliqua* L., *Asparagus aphyllus* L., *Calicotome villosa* (Poiret) Link, *Convolvulus dorycnium* L., *Crataegus aronia* (L.) DC., *Eryngium creticum* Lam., *Atractylis comosa* Cass. *Lomelosia prolifera* (L.) Greuter & Burdet, *Prosopis farcta* (Banks & Sol.) J.F.Macbr., *Rhamnus lycioides* L., *Teucrium capitatum* L.,*Verbascum sinuatum* L., *Ziziphus lotus* (L.) Lam., *Ziziphus spina-christi* (L.) Desf.(Safar et al.; 2001, DEBPAL 2).

Fig. I3: Location of Siris.

2.3. Herbarium

A herbarium is a collection of preserved plants stored, catalogued, and arranged systematically for study by professionals and amateurs from many walks of life. Herbarium specimens are useful as references for plant identification and for the determination of plant locations and ranges, abundance, habitat, and flowering and fruiting periods. They are used for studies in which the differences between plant species are evaluated and described (monographs) or in which the species growing in a region are reported (floras), a collection like this is a vital reference when you need to identify a plant and also serves to fix for ever the identity of thousands of plant names. A herbarium is a cross between a museum of priceless artefacts and a warehouse of birth certificates for plants; and acts as a source of information about plants - where they are found, what chemicals they have in them, when they flower, what they look like.

Preserved plant specimens can be used to provide samples of DNA and to validate scientific observations. A herbarium is therefore of immense practical use and of fundamental importance to science (http://www.kew.org). As discovering and describing living organisms is the starting-point in biodiversity science, the documentation of global species diversity deserves to achieve this goal by expending and improving herbaria; (Anzar; 2007, Wondafrash; 2008).

Herbarium (plural: herbaria) is a collection of preserved dried plants or specimens of plants, that are systematically arranged, usually either geographically or alphabetically (Middleton; 2009, Wondafrash; 2008, Tucker; 2005, Storrie; 2009, http://www.kew.org.uk).

Herbarium plants specimens that cannot be kept in the fresh state are preserved to serve as a reference collection for botanical comparison and research (Wondafrash; 2008), so form an important recorded of what plants grew where over time. They may have been produced as a voucher for an environmental survey or botanical research, and serve as a permanent record allowing anyone to go back and check the identification, re-sample or repeat research(Middleton; 2009) and herbarium collections can aid the rapid creation of comprehensive DNA barcode libraries(Myers *et al*.; 2000). So the key to accurate identification of plants is to supply the agronomist or botanist with good quality specimens and sufficient information about the plant, including details of the area from which it was collected and, if possible, supplementary photographs of the plant growing in its habitat (Storrie; 2009), Herbaria that organize their specimens systematically, by family, genus and species, serve as a working hypothesis of a classification of all plants. Specimens from related species are found close to one another thus facilitating their comparison (http://www.kew.org.uk).

The standared steps for preaparation herbarium are:

- collecting
- Pressing and drying
- mounting
- labeling

2.3.1. Collecting:

The importance of collecting good herbarium does not depend mainly on the number of specimens contained as much as depends on the quality of samples; a small number of really well reserved and annotated specimens is far more valuable than a large number of poor specimens(Bridson et al.; 1998)

The first step to establish the herbarium is collecting the plant samples, it is important to select the material as much information as possible by collecting sufficient sample of all orgabs available and all stages of development showing the morphology, size range, and other features of the whole plant to be represented and recorded in the herbarium (Bridson *et al.;* 1998). The purposes of collecting are: to obtain records and specimens of plants, either for a personal collection or to be stored in a herbarium and to identify an unknown specimen encountered during fieldwork (Wondafrash; 2008).

For the collection of samples it is very important to know the area of collection and its specific flora: the use of geographical and topographical maps is necessary to select the plants to be studied as plants from every different area must be introduced in the herbarium, When in the field it is a good idea to collect two samples of the plant, one for dissection and identification, and another for the herbarium specimen (Bridson *et al.;* 1998, Middleton; 2009).

Tools needed for collecting are field note book, spade or trowel to ease pull small plant specimens from the soil, leaving the roots and other underground organs intact, clippers, a sharp knife and a small pick, secateurs or a small saw, plastic bags, rubber bands, pencil or permanent marker, camera for recording plants in-situ and their habitat , Global Position System (GPS) for accurate location of collection site and during the collection in-field it is recommendable to wear suitable clothes (Middleton; 2009, Storrie; 2009, Tucker et al.; 2005).

Specimens for collection should be as complete as possible; the ideal specimen for identification and research is an entire plant, roots and all. Leaves alone are virtually useless specially because many plants have similar characteristics and it is not possible to identify them from leaves alone; therefore, it is important to supply representative portions i.e. the whole of small vascular plants should be collected including the underground portion. Roots, trailing or underground stems and storage organs are often helpful (and sometimes essential) in identifying specimens, particularly flowering parts and seedpods (Middleton; 2009, Wondafrash; 2008, Storrie; 2009).

For the identification of seasonal plants, samples must be collected in different periods of the year. It is recommendable to collect two plants for each species in order to have samples of the whole plant and to avoid losses in case of damage during transport or after identification.

The best period for sample collection is that of the advanced flowering of the plants, as flowers and fruits can be also collected. However, it is possible that basal leaves of the plants - an important diagnostic character have already disappeared by this time.

In some families (i.e. *Ranunculaceae*, *Cruciferae*, *Compositae*, *Cyperaceae*, *Juncaceae*, *Umbelliferae*, etc.) fruits are important as flowers for the correct identification of the species.

After collection, samples must be inserted in envelopes. It is recommendable to store fruits and plants of little dimensions in small bags of thin paper and to insert them in a larger bag of polyethylene containing the rest of the collection.

During collecting the plant samples is so important to write notes while in the field collecting and not rely on the memory especially as there may often be several months or more between collection and processing (Middleton; 2009, Wondafrash; 2008) because these notes may not only aid in identification of the material, but will later be used to complete the information on the herbarium label; the notes should contain the following information: collection number, the name of the plant, locality, description, habitat, date, names of collector(s) and other supplementary data as notes on the habit of the plant, flower colour and any other features may be halp for identification but connot be seen directly from the specimen(Wondafrash; 2008, Bridson *et al.*; 1998).

For the identification, the observation of the characteristics of flora is essential. The accurate observation of diagnostic features, especially for beginners, it is easier in the case of a fresh sample: it is suggested therefore to identify the plants immediately after harvesting or in the next 1-2 days (Middleton; 2009, Wondafrash; 2008). In case of numerous samples, identification takes much time and it is usually carried out when the sample is already dried. Special procedures are needed in this case: for example, flowers or other dried parts can be boiled in order to soften them (Wondafrash; 2008, Bridson *et al.*; 1998). By doing so, they can be opened and examined in detail with the aid of a lens, without damages. After its analysis, these parts can be dried again and stored in paper bags to be then fixed in the herbarium sheets near the sample to which they belong.

Specific texts containing "analytical keys" are generally used to identify a sample. The most used are the so-called dichotomous keys, a succession of pairs of propositions to examine plant morphological and anatomical features (i.e. number of stamens, features of the fruit, shape of the leaves, size and color of the corolla, presence or absence of hair, etc.); choosing the description which corresponds to the sampling, it is possible to identify its family and the lower hierarchical levels (genre, species and eventual sub-species).

After an accurate observation of all its significant parts (diagnostic features), samples must be assigned their specific Latin binomial (name of the genus and species), completed by the abbreviated name of the Author (patronymic).

In case of dried samples, identification can be carried out through a careful comparison between the dried samples (partially identified through analytical keys) and other similar samples already identified (i.e. same genre, similar species) in the herbarium.

In order to observe the smallest structures (ovary, stylus, etc.) the following instruments are needed:

- A good lens 8-20X or a microscope
- Tweezers as those used for stamps
- A mounted needle or some pins
- A cutter or a lancet.

2.3.2. Pressing and drying:

Pressing means to apply enough pressure to hold the plant in a position that best displays the botanical features while drying, it is important that the plants are put under sufficient pressure; otherwise more time will be required to achieve a good desiccation, besides they could be damaged by dampness and moulds. Every specimen in the press must be linked with its own written data.

The most important thing to do with fresh herbarium specimens preserved as fast as possible by pressing until dry, this prevents fungal infections and preserves Color (Middleton; 2009, Wondafrash; 2008). Plant presses come in various forms but usually consist of two wooden boards or lattices (30 x 45 cm), cardboard and newspaper arranged like a sandwich (fig.14). Straps or belts are wrapped around the press to hold it together. It is an important aspect of plant collecting that enough time be left at the end of the day to process the specimens. If this includes identification, this stage may be quite slow.

When plants have to be left overnight they should be put in a cool place. Sometimes woody specimens can be placed in water for a day or so to force buds or restore wilting leaves (Wondafrash; 2008).

The materials needed for drying are the following:

- Newspapers (glossy papers of magazines must be avoided)

- absorbing paper
- pressing
- Paper labels

Fig.14: Pressing and drying plant specimens to extract the moisture and preserve the morphological integrity of the plants.

Samples, cleaned from residuals of soil, insects, etc., must be positioned in the newspapers so that every part of the plant is visible. In case of plants with small and numerous flowers, it is recommended to unplug some and lay it wide open and flat, possibly by breaking glass, corolla, etc. In case of samples with dense foliage or with many shoots or lateral branches, especially if not yet fully developed, it is better to cut them paying attention to leave their basal part in order to see their original position, and in case of a specimen is too tall to fit in the press or on the herbarium sheet, make a zig-zag bend in the stem or cut and produce sheet of 1/3, 2/3 & 3/3(Wondafrash; 2008). Some of the eliminated elements can be arranged on another paper with the indication of the sample to which they belong.

During the first week absorbing paper must be changed every day and then every 2-3 days for 25-30 days. Then plants must be taken out from the newspapers and kept at room temperature for 30 days before treatment, not all the material of one number may dry at the same rate so the specimens will need carefully reassociating (Wondafrash; 2008, Bridson *at al.*; 1998)

Once in the press it is important that specimens are dried as quickly as possible to prevent them from going moldy (Middleton; 2009). Most plants usually dry in 15-20 days depending on the air temperature, humidity and the dampness and/or succulence of the plants. It must be considered, nevertheless, that drying times vary greatly depending on the species of the sample

and the period of its collection: 8-10 days is sufficient for plants containing little amounts of water as Graminee, and Cyperaceae or Ericaceous plants harvested in late summer or arid environment; succulent or geophytes plants need more than 30 days.

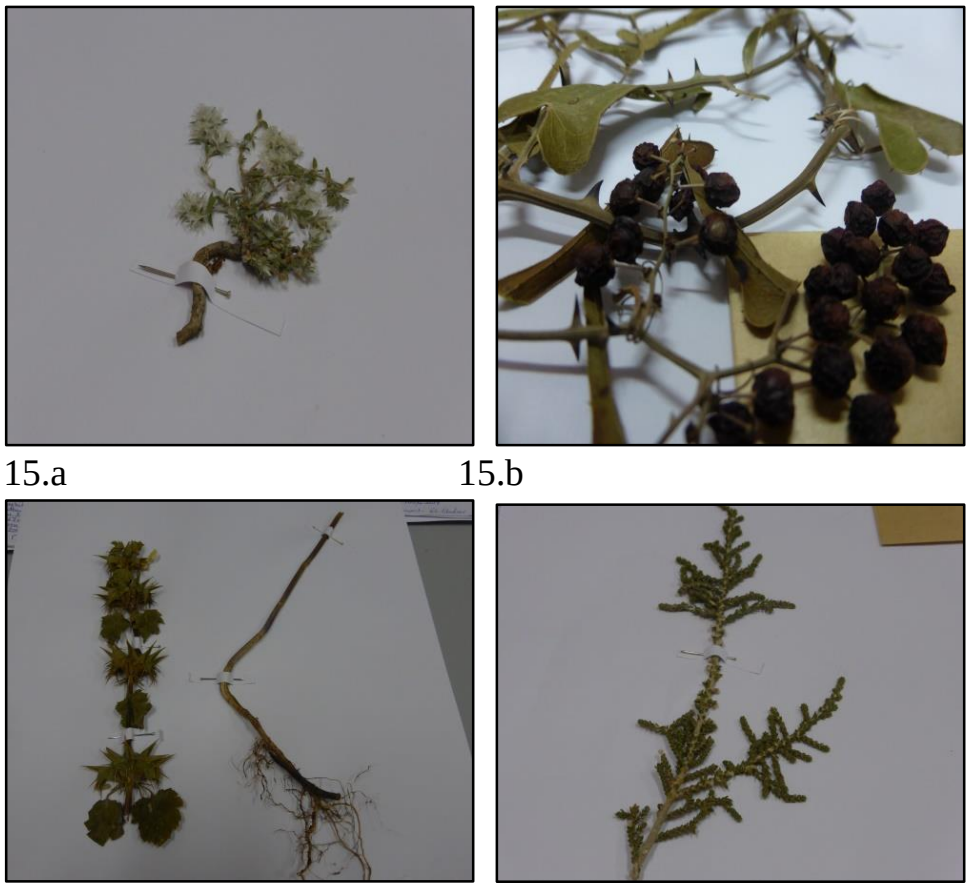
2.3.3. Mounting and fixation

Mounting is the process of affixing a dried pressed plant and its label to a sheet of heavy paper. This provides physical support that allows the specimen to be handled and stored with a minimum of damage (Wondafrash; 2008).

The materials used for fixation are the following:

- White or clear sheets, enough resistant (120 g/m2), generally 30x43 cm
- Strips of white paper (0, 4-0, 8 cm large and 2-3 cm long)
- Pins
- Small envelopes
- Identity labels

Generally there are two main procedures of mounting plant sample to the herbarium card; the first one is strapping method and the second is overall glueing, strapping is perhaps suitable for small herbaria with restricted access to visitors, whilst overall glueing can give better long-term protection to specimens in large, busy herbaria with free access to visitors (Bridson *et al*.; 1998, Tucker et al.; 2005, Middleton; 2009). Samples must be put with their diagnostic character in a visible position and fixed with paper stripes and pins on a sheet(Fig.15), 1cm border around the edge for the label must be left possibly in the lower right or, in general, in a corner of the sheet Leave edge to allow space for holding when picking up the card, single specimens should be centered on the mounting card and are usually placed vertically or diagonally across the sheet, In case of more material from a same plant, it is recommended to use more sheets (max. 3) and then fix all the sheets together. The small bags containing seeds, flowers or other small parts, detached from the sample, must be fixed with a pin on a sheet, Small plants with multiple specimens should be arranged in evenly spaced rows spread over the whole card, orientation of the plants should represent their habit, i.e. usually flowers to the top and roots towards the bottom, flip the specimens onto the side that displays the most botanical features (i.e. flowers, fruits, both sides of leaves, etc) (Middleton;2009).



15.a 15.b

15.c 15.d

Fig.15: fixed herbarium samples were collected from the selected sites; figure 14.a is Paronychia sinaica Fresen*, 14.b is smilax aspera* L*, 14.c is Moluccella spinosa* L.*, 14.d is Thymelaea hirsute* (L.) Endl.

While fixing the sample on the sheet it is necessary to avoid that:

• Parts of the sample are outside of the sheet or too close to its borders. Samples slightly longer than the sheet can be disposed diagonally, while those longer can be folded, even 2-3 times. This operation must be done on fresh vegetal material, in order not to damage the sample.

• Delicate organs as petals or those essential for the identification are hidden by paper strips or other parts of the plant.

• The sample remains partially detached or not properly fixed.

2.3.4. Labeling:

A plant specimen is incomplete without label data, the following information must be reported on the identity labels (Fig. 16):

- Scientific name: genus, species, authority, intraspecific information. In the phase of transcription of the Latin binomial of the species, it is important to write the name of the genre

(noun) with an initial capital letter and the specific and eventual sub specific epithet (adjective) in lower case (i.e. Centaurea cyanus). i used the official site to confirm the correct scientific names (www.emplantbase.org), to confirm the used names and Arabic names I used (www.flora.org.il, www.flowersinisrael.com, and Field guide to wild flowers of Jordan and neighbouring countries)

- Determiner: the name of the person who identified the plant
- Detailed location: the location is used by researchers on several levels: for general mapping to region, county or province; for detailed mapping, as in Geographic information system (GIS) computer applications; to physically locate the plant(s) in order to obtain further research material.
- Habitat: the type of plant community where the plant is growing and, if known, other plants growing in association.
- Plant habit: describes the form of the plant (tree, shrub, vine, and herb).
- Frequency: is the plant rare, occasional, frequent or common.
- Frequency: is the plant rare, occasional, frequent or common.
- Latitude and Longitude.
- Altitude is the height in meters above sea level where the specimen was collected.
- Collector name. (Middleton; 2009, Wondafrash; 2008).
- Collection number: Specimen number given to the specimen usually by the collector.
- Collection number: Specimen number given to the specimen usually by the collector.
- Date of collection (Wondafrash; 2008, Davis, 2011)).

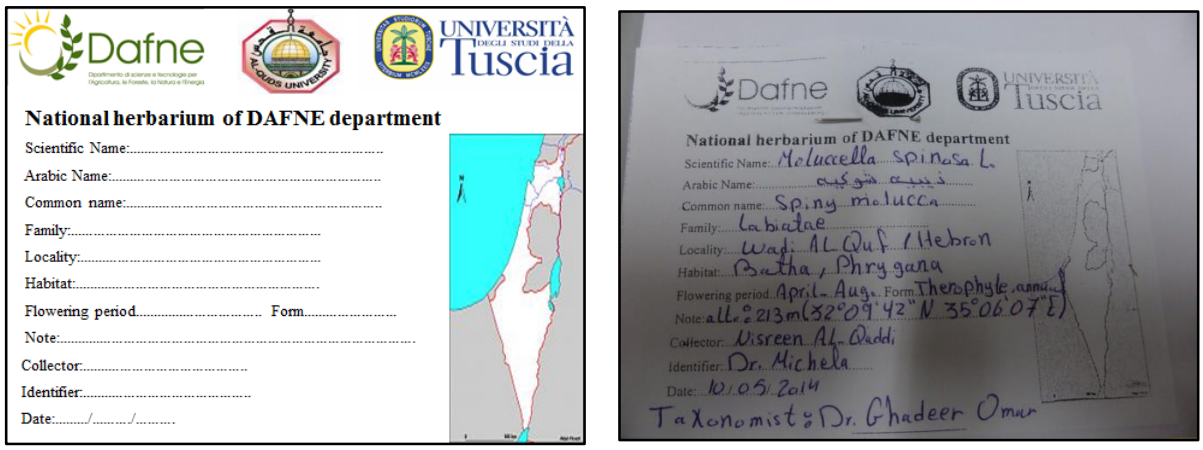


Fig.16: the Definitional card of the herbarium samples.

Each information of this list is extremely important for other Botanical Sciences:

• Taxonomy (science of classification)

• Chorology (or study of the geographical distribution of species)

• Ecology (study of the relationships between the species and the physical and biological environment where they live)

• Phenology (study of biological rhythms)

• Bibliography and History of Botanic.

During the fieldtrips two samples were collected for the herbarium, one copy conserved in Alquds University and another one at TUSCIA University. The herbarium samples were identified by Dr. Ghadeer Omar (Alnajah University), Dr. Michela celestini (Tuscia University) and Dr. Khaled Swalha (Alquds University).

2.4. Seeds Bank:

The regeneration and management of woodlands in the Mediterranean needs particular attention: the role of plant cover is essential for mitigating desertification processes because vegetation and connectivity of the 'green' strongly condition the quality and evolution of soil, what is to say the quality and evolution of life. Mediterranean flora is well described from a botanical point of view. Abundant information is available for what concerns botanical and ecological characteristics, distribution and occurrence, value and use of many species but little is known about their natural and artificial regeneration.

The absence of this information is particularly serious because it represents a lack of knowledge within a multipurpose approach to forestation, restoration and reclamation and may explain the reason why plantings are often limited to a narrow number of species which are easy to grow in the nursery. This practice greatly reduces levels of biodiversity and it is even more worrisome with regards to shrubs and minor hardwood which are the greater part (60 to 70%) of the Mediterranean woody flora.

However, many nursery strategies are focusing on the propagation of a large number of neglected Mediterranean native species and, fortunately, recent research results are having positive effects. Learning how to propagate these 'new' plants properly, including those deserving a wider uses as drought-tolerant ornamentals, can be a formidable challenge as well as a powerful tool to combat desertification and enhance biodiversity.

2.4.1. Why propagate from seed

Propagation from seeds ensures that genetic diversity is maintained by allowing genetic recombination to occur through sexual reproduction. The genetic diversity makes possible the survival and the natural evolution of species in continually changing environmental conditions.

The rearrangement of genes leads to the production of individuals that are different from their parents and are, therefore, unique and unrepeatable. On the contrary, reproduction without the intervention of sexuality (cloning) means that populations are formed with an identical genetic heritage and therefore it is difficult for them to meet the challenges arising from diseases, insect attacks, climatic changes, etc.

The existence of a marked genetic variability proves especially important in the case of plantations destinated to landscaping, shading, ecological restoration and screening scopes because these are often poorly tended after they have been planted out.

The degradation of the soil occurs most seriously in the southern Mediterranean areas, owing to their specific climatic and geomorphological features which, together with incorrect use of the land, results in a high general vulnerability. Within this context, the quality of the soil is very much influenced by the vegetation it supports; therefore plantations for environ- mental reclamation, using local flora and ecotypes, can ameliorate the problem. For this reason sustainable management as well as the development of nursery techniques for the propagation of Mediterranean species are measures to be taken to protect the soil. These protective measures should mitigate the negative effects that global climate changes (especially higher temperatures) may have on the growth and productivity of the Mediterranean forests. Curiously enough, the Mediterranean flora has been well described from the botanical point of view, but information about seed propagation is quite scarce, while actually, this is fundamental for the production of diversified nursery material destined for environmental reclamation. To sum up: propagation from seed and the necessary knowledge for accomplishing such a programme can contribute to both protection of biodiversity and also to attenuation of processes of desertification.

2.4.2. Fact sheets on the propagation of trees and shrubs from seed

In order to prepare and present the protocols for threatened trees and shrubs of West Bank, rules and recommendation from ISTA (International Seed testing Association) have been followed. Additional protocols have been added from those species not directly threatened, but emblematic for the landscape units of West Bank ecoregions.

Plants have been subdivided in Gymnospermae, in botanical terms species without true flowers in the division Pinophyta of the plant kingdom, and Angiospermae, trees with true flowers in the division Magnoliophyta. Within these two groups, trees and shrubs are listed alphabetically by genus. Common names are stated as well.

Information is presented as a series of fact sheets which contain the available information on collecting, storage, required pre-treatments to remove dormancy, sowing and practices to be carried out during the first growing stages. The average germination percentage and the number of seeds per kg are also provided where available. Due to the marked variability of seed size and weight, for the parameter 'number of seeds per kg' a range is indicated and within it, when available, the most frequent values for each species are considered between brackets.

All measurements are given in metric units. In nursery practice, the term seed refers to any material used for sowing, irrespective of the correct botanical definition, and in this sense it has been used in the text. For example, with regard to the ash tree, seed refers to the samara, which actually is not a seed but a winged indehiscent fruit.

As they are still widespread, risky pre-treatments (immersion in hot water or soaking in acids) have sometimes been described for scarifying legume seedcoats. However recent regulations make it difficult to use corrosive substances.

The following protocols are not to be intended as exhaustive of the whole Palestinian Flora, for which further specific projects and years of work are mandatory to achieve a complete guideline to propagate plants in Palestine, including the herbaceous ones.

1- Gymnospermae

A) *Cupressus sempervirens* L. (*Cupressaceae*):

verage germination: 20-40%
ımber of seeds per kg: 91,000-200,000 (125,000-150,000)
sempervirens var. horizontalis 145,000
sempervirens var. fastigiata 180,000
ollection must take place only in good seed crop years. The cones are gathered between the end

summer and the beginning of autumn, when the colour changes from shiny or greyish brown dark brown. Collection should not include the oldest fruits, which can remain on the tree for as ng as twenty years. After collection the cones must be placed in wide-meshed sacks and kept in ell-ventilated facilities; plastic bags and airtight containers must be avoided at this stage. The uits will open when dried in the sun or in drying-rooms at a temperature of +35°C, which can slightly increased when the moisture content gets close to 10%.

ne seeds are separated by shaking in a sieve.

the seeds are kept in airtight containers at +3°C and 5-6% moisture content, they will retain ability for a long time (7-20 years).

ne comparatively low germination of the seeds is usually due to the species' poor reproductive ficiency (lack of pollination) or to frequent damage by insects. The seeds are usually sown in pring in a seedbed, possibly with seeds subjected to 3-4 weeks cold stratification before sowing. cold stratification is not carried out, it is good practice to soak the seeds for 2 or 3 days before wing. When the seedlings have reached the required size, they are transplanted in containers or nursery beds the open air. In some cases transplanting is not carried out; the seeds are stratified d pre-germinated and afterward sown directly in containers. During the early stages of velopment the seedlings are shaded by nets; they are very sensitive to damping-off.

egetative propagation can be performed by either cuttings or grafting.

B) Pinus spp. (pines) - (Pinaceae)

Seeds of the Pinus are typically orthodox, thus they maintain viability for many years if they are stored at low temperatures (from –5°C, but even lower, and up to +5°C), with 5-8% moisture content. The sowing period is typically in spring, with seeds having been cold-stratified, or not, depending on the species. In the hot southern regions sowing in late summer is not infrequent.

The seeds of those species that require cold stratification allow stratification of naked seeds. In this case, they are immersed in water for 24-48 hours and then drained. Then the seeds are placed in plastic bags of no more than 10 kg (for practical reasons) in refrigerators or cold-stores. The bags must not be sealed, to allow gaseous exchange inside. Stratification of the seeds without a substrate permits a considerable saving of space and simplifies manual operations. Cold stratification of naked seeds is carried out at lower temperature (about +3°C) than traditional cold

stratification with a substrate (about +5°C). The soaked seeds contained in the bags are stirred periodically to improve aeration. Emanation of an odour of alcohol warns of limited aeration.

Propagation by cuttings and also by grafting is employed for some ornamental varieties.

Pinus halepensis Miller (Aleppo pine) - (*Pinaceae*):

verage germination: 80-85%
umber of seeds per kg: 50,000-100,000 (52,000-60,000).
owing is performed in spring. In very hot southern regions sowing is sometimes performed in te summer.

2. Angiospermae

a) *Ceratonia siliqua* L. (carob tree) - (*Leguminosae*):

verage germination: 60-95%
umber of seeds per kg: 4,500-6,000
eratonia siliqua L. seeds are brown, with extremely tough and impermeable seed coats that npede water absorption, thus hindering germination.
ne particular hard seed coats allow the formation of soil seed banks, the dispersal by large ammals that feed on them as well as the survival after fires (that are very frequent in the areas here this species occurs). There is a certain degree of variability between seeds as far as the ughness of the seed coats is concerned, both within one seed lot and also between lots from fferent provenances. Without any pre-treatment, the germination percentage rarely exceeds %, which in any case proves the existence of a certain number of seeds with less impermeable ed coats; however, if simultaneous germination is wanted the integrity of the seed coats can be tacked by scarification. One of the most used methods is based on soaking the seeds for 12-24 urs in water that is boiling when the seeds are plunged into it. The source of heat must be moved before the seeds are immersed and the whole, formed of ten parts of water to each part seeds, must be stirred from time to time until the water has cooled. Once they have been moved from the water, the seeds are dried in well-ventilated areas, not exposed to the sun, and wn as soon as possible. The treatment is not devoid of risks for both the people performing it, pecially when large quantities of hot water are being used, and also for the seeds themselves, cause the ones with the most vulnerable seed coats may be damaged and thus subjected to a

netic selection.

wo effective variations of the aforesaid treatment consist of immersion for 5 minutes in water : +90°C (5 volumes of water for each volume of seeds) or soaking in water for 24-48 hours at 0°C. Alternatively, scarification may be performed with acids or alkalis (chemical arification) or by the appropriate machines (mechanical scarification). The former method is t advisable, because of the risks that may arise from handling corrosive substances and because e seeds with the thinnest seedcoats may be damaged. However, one chemical treatment that akes it possible to achieve a high degree of germination is advised: it consists of immersing the eds for 20 minutes in 90% sulphuric acid (5 volumes of acid for each volume of seeds); the eds are then washed in running water for 48 hours. There is a vast bibliography relating to arification performed with acids or boiling water. In practice, however, it is always appropriate check the validity of the techniques described here, by means of preliminary tests carried out small samples of seed. Indeed, as already noted, there is a considerable variability in the ughness of the seed coats, while information relating to the pre-treatments to be employed is ten contradictory. Mechanical scarification, performed with electrically operated scarifiers, is a mple and effective technique, but it is almost unknown in Italy. It can considerably increase the gree and rapidity of germination. This technique employs mechanical equipment comprising a etal cylinder lined inside with sandpaper, and a series of central blades which spin at a high eed, propelling the seeds against the walls and scarifying the seed coats, only rarely damaging e embryo. The most suitable sandpaper and the optimum duration of scarification have to be tablished for each sample; the duration does not usually exceed 60 seconds at a speed of 1200 volutions per minute. In order to judge the effectiveness of the treatment after the preliminary arification test, the seeds are soaked in water and after several hours the percentage of imbibed eds is checked. If imbibition has occurred, it means that the seedcoats have been scarified. Ripe eds pre-treated by this technique germinate rapidly after having been placed in suitable nditions, but scarified seeds with moisture content not higher than 10% can otherwise be stored sealed containers or under vacuum at temperatures varying from -3°C to +3°C) for at least 18 onths without the quality of the same being altered in any way. Scarified seeds germinate well either constant temperatures of between +10° and +25°C or at alternating temperatures 15°/+25°C).

sum up, propagation of the carob tree by seed does not pose any particular problems, except r the necessity to subject the seeds to one of the following treatments: soaking in hot water, aking in concentrated sulphuric acid (with subsequent washing in water) or mechanical

arification.

r reasons of safety and effectiveness of the pre-treatment, spring sowing is to be preferred, ing mechanically scarified seeds. Moreover, for nursery growing, the use of containers that event from root coiling is advisable. The species does not easily bear damage to the roots.

egetative propagation by cuttings is possible, taking into account several factors that are cisive for successful rooting: the period of collection, the type of cutting (topophysis is portant) and the characters of the mother plant (rooting capacity varies according to the notypes). Micropropagation is also possible.

b) *Crataegus* spp. (hawthorn) - (*Rosaceae*):

Average germination: limited if there is no seed pre-treatment.

Number of seeds per kg: 9,500-20,000.

Dispersal of hawthorn seeds is usually performed by birds, an evolutionary characteristic related to the marked dormancy of the seeds. The seeds show the endogenous type of dormancy, which may be removed by warm stratification for 4-16 weeks (usually 4-8), followed by cold stratification for 12-36 weeks (usually 12-16). Scarification before the warm + cold pre-treatments may be useful. In nature, germination occurs during the second spring following dispersal. Some authors suggest scarification with sulphuric acid (from 30 minutes to 2 hours for C. monogyna), followed by 4 weeks of warm stratification and 12 weeks of cold stratification. Spring sowing is usually preferred using pre-treated seeds.

After dormancy has been removed, germination of rosaceae species is usually favoured by marked daily alternating temperatures (for example, +25° during the day and +5°C at night), as it occurs in early spring in the Mediterranean areas. Vegetative propagation is possible.

c) *Pistacia lentiscus* L. (lentisk, mastic-tree) & *Pistacia palaestina* Boiss. - (Anacardiaceae):

verage germination: very variable, 40-80%

umber of seeds per kg: 30,000-85,000.

ne seeds are rich in oily substances; therefore the quality of the seed, including viability, could lost in a comparatively short space of time. In actual fact, there have been no thorough studies the conditions required for good and lengthy storage of the seeds. It is advisable to remove the lp immediately after collection, completing the operation by washing, which enables the ating (empty) seeds to be removed.

the genus Pistacia, the epicarp may inhibit germination, while the endocarp may reduce the

te of imbibition. In the case of P. lentiscus, the endocarp actually proves to be a barrier, since it ows down the absorption of water and thus the germination process. In any case, the obstacle ay be overcome by mechanical scarification. Alternatively, cold stratification may be nployed, which acts by attacking the integrity of the seedcoats rather than by removing any ysiological dormancy. Sowing is usually done in autumn, immediately after collection, without y pre-treatment to seeds. Immersion of the seeds in water for 2-3 hours before sowing is visable.

r spring sowing either scarified seed or cold stratified (2-3 weeks) seed is employed. Under tural conditions, seed is bird-dispersed. Colonisation of an area is also favoured by the esence of trees and shrubs which, on the one hand, allows birds to perch and, on the other, eates a favourable microenvironment during the first stages of the seedlings development.

udies have recently been carried out on the variability of some genetic characters in wild pulations of lentisk in Sardinia. Marked differences have been pointed out among the ecotypes th respect to the extent of fruiting, the percentage of aborted ovaries, the viability of seeds and e speed of germination. A positive correlation has been found, also applicable to most of the ecies, between good seed crops and high germinability of seeds. Among Mediterranean ecies, the lentisk is considered very important indeed because of its widespread distribution, its eat ecophysiological variability and its highly-developed ability to adapt, survive and protect e soil. It is used as a rootstock for Pistacia vera.

d) *Quercus* spp. (oak) - (*Fagaceae*):

Growing interest in the management of woods for the production of acorns destined either for nursery production or for animal food has been noted. In the latter context, it is worth remembering that more than 200 animal species feed on acorns. The genetic resources represented by the Mediterranean oaks, their great variability and their key role in ecology make the Mediterranean area an important one as regards biodiversity. Especially in the eastern Mediterranean areas, the Mediterranean oaks often grow in isolated small populations. It cannot be said that they are threatened, but the innumerable obstacles placed in the way of their natural propagation, such as fragmentation of the territory and lack of animals that favour dispersal of the acorns, create difficulties for the maintenance of genetic variability. Generally speaking, it is considered that the morphology and manner of growth of seedlings belonging to the genus

Quercus show evolutionary responses to both the habitat and size of the seed. For example, wild species in a xerophytic environment generally prove to have comparatively small seedlings. Oak flowering and fruiting are conditioned by the climate, the length of the reproductive cycle, the presence of insects and predators, the age and size of the tree, the position of flowers and the individual genetic capacity for the production of acorns. The longer the reproductive cycle of a species (it lasts for one year in Q. ilex, for two in both *Quercus coccifera* L. and *Quercus suber* L., the more likely the danger of problems arising. Even fruiting is irregular in the oak species: large seed crops, exceeding 600,000 acorns/ha, occur every 2-5 years, according to the site and species, but the interval may increase owing to a number of factors, among them atmospheric pollution. In areas where there is no danger of frost, sowing is done in autumn immediately after collection; otherwise, sowing takes place in spring using acorns stratified during the winter, usually in the pen (stratification pits), but also in temperature regulated environments (between +1° and +5°C) (using pregerminated acorns if necessary). Cold stratification is of no use for removing dormancy (considered negligible or non existent in Mediterranean oak species), but is used above all to delay germination until the following spring. Autumn sown seed has to be protected from rodents and mulched in cold regions. The stratification medium (mixed with the acorns) must be checked periodically, particularly at the end of winter, to interrupt the pre-treatment before the tap-root has grown too long. To sow pregerminated acorns, the optimal length of the root is 0.5-5 cm, but seeds with longer tap-roots can be sown; when they are placed in the seed beds or in the containers these roots may be cut down to 3 cm without this having any negative effect on survival. The presence of insect larvae does not compromise germination, always provided that the embryo has not been damaged. Acorns are recalcitrant, i.e., the loss of moisture has a negative effect on their viability. From collection up until sowing, the acorns' moisture content should not fall below 40%. The ideal moisture content is between 42 and 48%, but it varies according to the species. It is possible to store acorns for 3-4 years in environments at temperatures between -3° and -1°C where excess of carbon dioxide can be removed. Acorns are mixed with dry (but not dehydrated) peat and arranged in 30-60 liter containers that permit gas exchange, usually ensured by perforated tubes (10 cm diameter and as high as the container) placed vertically in the center. Each container is covered with a sheet of paper (porous but strong) or perforated cardboard, on which the lid of the container is put. In some European seed processing plants the acorns are subjected to thermotherapy (soaking in water at +41°C for 2 or 3 hours) to attack the fungus *Ciboria batschiana.* After a superficial drying (returning moisture content to about 45%) they are treated with fungicides (methylthiophanate, benomyl or iprodione) and then stored, without being mixed with any substrate, in perforated plastic boxes

with a 30-50 litre capacity. Once they have been partially filled, these boxes are placed inside large containers (300-400 kg) which, in their turn, are piled up, allowing, however, a good oxygen/carbon dioxide ratio.

Before sowing the acorns stored in this way, it is advisable to soak them in water to restore the complete imbibition level and to easily separate non-viable seeds and various impurities. The method of separation by floating works quite well in the case of insect larvae infestation. The response of the various species to 3-4 years storage is not consistent. The quality of the acorn affects both the total number of the future seedling's roots and also the number of permanent secondary roots. Storage of recalcitrant seeds is nowadays considered one of the most difficult challenges in the field of forest nurseries and in the management of genetic resources. The storage of acorns of Mediterranean oaks has not been sufficiently studied or practised; however, the methods described above may be applied, taking into account the differences between species. Some steps to be taken in research aimed at solving this problem are suggested. First of all, it is necessary to identify the moisture content corresponding to the complete imbibition of the acorns of every species; secondly, medium-term conservation of acorns (3-4 years) should be carried out in structures similar to those described above, using acorns with a water level 5% less than that of maximum imbibition (Piotto B *et al.*; 2001).

2.5. **DNA barcoding:**

DNA barcoding is a global diagnostic technique (Laiou *et al.*; 2013, Lahaye *et al.*; 2007, Chen *et al.*; 2010) allowing the prompt and unambiguous identification of living organisms and species (Rydberg 2010; Laiou *et al.*; 2013; Songa et al.; 2009; Kirin *et al.*; 2013), The term " DNA barcode", was first coined by Hebert in 2003 who proposed to use the mitochondrial gene CO1 as the standard barcode for all animals (Rydberg 2010; Chen *et al.* 2010; Newmaster *et al.* 2006). It refers to a short standardized fragment of DNA (<1000 bp), isolated from a standardized portion of the genome (Rydberg 2010; Laiou et al. 2013; Lahaye et al. 2007; Songa *et al.* 2009, Ma *et al.* 2010; Kress *et al.*; 2015), that can be amplified and sequenced by use of universal primers, and that possesses sufficient to facilitate the taxonomically identified species (Rydberg 2010; Ma *et al.* 2010, Myers; 2000; Kirin *et al.*; 2013).

DNA barcodes therefore have the potentiality to function as molecular identifiers for unknown species, in the same way as the machine-readable black-and-white barcodes are used in the retail industry to identify commercial products (Rydberg; 2010). The scientific community is increasing embracing DNA barcoding as a practical tool for biodiversity studies, for example to

facilitate inventories of very diverse but taxonomically poorly known regions (Lahaye *et al*.; 2007).

Under this view, DNA barcoding can help in many different fields, for instance, based traditional taxonomy studies usually require the expertise of an experienced professional taxonomist to recognize the species correctly, but expertise taxonomists can not always be availbale in many countries and for each plant group. Therefore, a rapid and simple DNA- based identification system could be a useful and powerful tool for nonprofessional users such as customs officers, traditional drug producers and managers and forensic specialists (Song *et al*. 2009; Ma *et al*.; 2010,Chen *et al*.; 2010, Ferri *et al*.; 2015), for a veriety of biological applications including biodiversity inventories in poorly known areas(Laiou *et al*.; 2013), to make possible the identification of species whether abundant or rare, native or invasive, DNA barcoding could be also applied as a tool for environmental studies and ecosystem management(Kirin *et al*.; 2013), to asses species boundaries and distributions, their community ecology, and to Demonstrates the scientific value of collections (museums, herbaria, gardens and other biological repositories) (Kress *et al*.; 2015, De vere; 2008).

The mitochondrial cytochrome c oxidase I gene (CO1)in was proposed by Hebert in 2003 as the standard barcode for all animals; this fragment was then demonistrared to be able ,used to distinguish over 90% animal lineages species in most animal groups (Rydberg; 2010, Chase et al.; 2005,Song et al.; 2009, Ma et al.; 2008, Chen et al.; 2010, Ferri et al.; 2015), however the Consortium for the Barcoding of Life_ Plant Working Group [CBOL_ PWG] proved that (CO1) is not a suitable barcode marker in land plants and fungi species due to it's low amounts of variation ,as well as the variable structure of the plant mitochondrial genome (Kress *et al*.; 2015, Kirin *et al*.; 2013, Lahaye *et al*.; 2007,Chen *et al*.; 2010).

In plants, the ideal plant barcode would require to be amplifiable with only a single set of primers, so that it can be efficiently retrieved from any of the over 200,000 species of plants. A single barcoding locus combining these two traits has not been found, and a combination of two or more, probably plastid, loci will almost certainly be required to approach the level of species discrimination and universality that CO1 confers for animals. Several genes and non-coding regions in the plastid genome have been put forward asuseful candidate DNA barcodes such as (trnH-psbA, rbcL, atpB,atpH, rpoB, rpoC1, ndhJ, accD, YCF5, trnL-F, including one nuclear intergenic spacer (the rDNA ITS)(Rydberg 2010; Kress *et al*. 2005).

From the beginning, the Consortium for the Barcode of Life (CBOL) showed lack of agreement on a core plant barcode, reflecting the diversity of viewpoints , after a four-year effort, in 2009 the International Team of 52 scientists concluded to agree on standard markers and the tortuous search for a universal barcode for plants has been a close call with a definitive loci selection the CBOL-PWG promoted a multilocus solution comprising portions of the plastid genes rbcL and matK as the standard barcodes for land plants, Both of these genes have played a very important role in phylogenetic reconstructions for land plants due to their strong phylogenetic signal attaining the 70–75% of discrimination to the species level. (Kirin *et al*.; 2013, Kuzmina *et al*.; 2012, Ferri *et al*.; 2015).

The DNA barcode loci now most commonly used for plants consists of a combination of two different genes to represent the best tradeoff between universality across higher plants, ease of data retrieval, species resolution, and cost (Rydberg; 2010, Kress *et al*.; 2015). The [CBOL PWG] in 2009 officially recommended the two-locus combination of rbcL + matK as the standard plant barcode for routine use (Rydberg 2010) and Kress and Erickson proposed to combine the original trnH-psbA barcode from Kress et al. with rbcL, following analyses from Newmaster et al (Newmaster *et al*.; 2006, Lahaye *et al*.; 2007)

Based on the relative ease of amplification, sequencing, multi-alignment and the amount of variation displayed (sufficient to discriminate among sister species without affecting their correct assignation through intraspecific variation), three plastid loci are currently used in plants and also used in this study as shown in (table.3): rbcL (a universal but slowly evolving coding region), matK (a relatively fast evolving coding region) and trnH-psbA (a rapidly evolving intergenic spacer)(Laiou *et al*.; 2013, Newmaster *et al*.; 2006).

DNA barcoding markers' main features

- rbcL: known by the abbreviation Ribulose-1,5-bisphosphate carboxylase/oxygenase (RuBisCO), in the early 1980s, plant physiologist characterized a plastid gene, rbcL, encoding the large subunit of ribulose bisphosphate carboxylase, the most abundant enzyme on the earth. Because rbcL is akey photosynthetic genecommonly is an enzyme involved in the first major step of carbon fixation, the rbcL locus offers a high level of recoverability and a good but not outstanding discrimination power (Ferri et al.; 2015, Newmaster *et al*.; 2006, Savolainen *et al*.;

2003, Yang *et al.*; 2012). The most common gene used to provide sequence data for plant phylogenetic analyses is the plastid-encoded rbcL gene (rbcl.)

- Maturase K (matK) : The matK gene was first identified by Sugita et al. (1985) from tobacco (Nicotiana tabacum) (Barthet *et al*. 2007) when they sequenced the trnK gene encoding the tRNALys (UUU) of the chloroplast (all markers) offers higher species resolution but requires further development particularly as for the extent of universal primers(Ferri *et al*. 2015; Yang *et al*. 2012).

- trnH (The non-coding plastid region):proposed by Kress et al. (Kress *et al*. 2005Lahaye *et al*. 2007). as a third universal barcode marker for land plants, Chloroplast intergenic psbA-trnH spacer has recently become a popular tool in plant molecular phylogenetic studies at low taxonomic level and as suitable for DNA barcoding studies(Organization of chloroplast psbA-trnH intergenic spacer in dicotyledonous angiosperms of the family Umbelliferae.
  Degtjareva GV1, Logacheva MD, Samigullin TH, Terentieva EI, Valiejo-Roman CM.2012) but despite its strong potential, it suffered from technical problems that may require manual sequencing editing because of its complex molecular evolution(4,new barcoding markers). The psbA-trnH intergenic region contains two parts that differ in their evolutionary conservation: 1) the psbA 3'UTR, which is important for posttranscriptional regulation of
  psbA gene expression, and thus is subject to selection pressure, and 2) the psbA-trnH nontranscribed intergenic spacer, which appears to lack function because of its high variability across angiosperms.(Yang *et al*. 2012; Ferri *et al*. 2015), The psbA gene encodes the D1 reaction center protein of photosystem II. It expression depends on light intensity, the plant developmental stage and physiological state; It accumulates to high levels in chloroplasts (Ferri *et al*. 2015).

2.5.1. Samples Used in This Study

Investigated plants were collected throughout a 2-year campaign (2014-2015). Total (55) of Palestinian samples belonging to (23) families were collected from six protected sites presented the regions in south and north of West Bank (Siris, Em El-tut, Wadi Qana, Kherbit Qeis, Wadi Al-Quf and Bani Naim). These samples were collected during May and October, 2014 and in April, 2015.

2.5.2. DNA Extraction

DNA from young leaves was extracted using the cetyltrimethyl- ammonium Bromide (CTAB) method CTAB procedure as described by Murray and Thompson (1980) (Murray et al.; 1980, Rahimmalek et al.; 2009, (CTAB) Shiran et al.; 2002); Nearly 200 mg(3-5 leaves) of plant leaf tissue was grind, then, small amounts of dry plant tissue (0.5 cm2) were placed into racked sterile mini tube strips(new myres barcode). The powdered tissues were incubated with approximately 600µl 2x CTAB buffer(2.5% Cetyl- Trimethyl Ammonium Bromide (CTAB), 4 M NaCl, 25 mM Na2EDTA, 100 mM Tris-HCl (pH 8.0), polyvinylpyrrolidone)(Murray et al.; 1980, (CTAB)Shiran et al. 2002) at 65°C for 1 hour in a microfuge tube (Kuzmina et al.; 2012, Mukherjee et al.; 2010, Rydberg; 2010), then lyses buffer and plant tissue mixture were incubated for about 30 min at 65 ◦C in a recirculating water bath the samples were mixed (vortex) every 10 min. After incubation and centrifugation, 300µl of chloroform/isoamyl alcool (24:1) (Mukherjee et al.; 2010, Rydberg; 2010) was added to each tube, and did gently vortex for until the two phases were become one and spin at 9000rpm for 5 minutes, then approximately 300µl of the top aqueous layer was transferred to clean microfuge tubes . Then again 300µl of chloroform/isoamyl alcool (24:1) was added to each tube and spin at 9000rpm for 5 minutes, then approximately 300µl of the top aqueous layer was transferred to clean microfuge tubes, and 400 µl of ice-cold isopropanol and 50 µl of 3M K.Acetate, PH 4.8 were added to each tube. Samples were, in this step the precipitated DNA was became visible as a small pellet that stick to tubes bottom, incubated 5min at -20˚C to precipitate the DNA Spin at high speed (14,000 rpm) for 5min. The flow was thrown through, 250 µl of ice-cold ethanol 70% and spin Spin at high speed (14,000 rpm) for 2min., Alcohol from tubes was removed and then the tubes were incubated at room temperature for 15-2- min and let tubes air dry, finally 100µl of TE Elution buffer Type 6 and 4 µl of RNAase (10 mg/ml) were added to each tube. DNA quality was checked by agarose gel electrophoresis (Rahimmalek et al.; 2009).

2.5.3. Polymerase Chain Reaction (PCR)

PCR amplification was performed to examine the success of DNA extraction from plant (leaves and the universality of the DNA barcoding primers). Crucial factors influencing amplification success generally are: the extracted DNA amount and quality, the length of the DNA portion to be amplified, the choice of the DNA sequences to be used as primers, the utilization of the most suitable thermocycling conditions(Finkeldey et al. 2010; Rachmayanti et al. 2009). A molecular barcode usually flanked by conserved regions of the genome that can function as primer binding sites for PCR reactions (Rydberg; 2010), all across most taxa of the plant kingdom

(universality) and the three marker regions (rbcL, matK, trnH-psbA) used to amplify a DNA barcode region also have an optimal length (<1000 bp), and a set of primers as shown in (Table .2).

Extracted DNAs (ca. 40 ng) were amplified with the ready-togo (RTG) PCR beads (GE Healthcare) according to the manufacture's protocol in 25 µl final volume containing 5µl DNA templates and 2.5µl of each primer in PCR microtubes. The thermocycler programme was performed at the following conditions: 94 °C for 3 min, followed by 35 cycles of 94 °C for 30 s, 53 °C for 40 s and 72 °C for 40 s, with a final extension step of 10 min at 72°C.(Kirin et al. 2013; Laiou et al. 2013). As (Table.3) shows all the samples were tested by using PCR technique in this study.

Marker region	Primers	Refrence
RbcL	Fw – ATGTCACCACAAACAGAAAC	Kress et al. (2005)
	Rev – TCGCATGTACCTGCAGTAGC	
trnH-psbA	Fw - CGCGCATGGTGGATTCACAATCC	Shaw et al. (2007)
	Rev - GTTATGCATGAACGTAATGCTC	
matK_Kim	Fw - CGTACAGTACTTTTGTGTTTACGAG	Kim (unpublished)
	Rev - ACCCAGTCCATCTAAATCTTGGTTC	

Table.2: the primers list were used to amplify a DNA barcode region

SPP	code	location	PCR \ rbcl	seq/ rbcl	PCR\ Matk _ Kim	Seq/ MatK-Kim	PCR\ TRNH2	Seq/ TRNH 2
Anagallis arvensis L.	An	wadi qana	yes	yes	Yes	Bad	Yes	Yes
Anchusa azurea Mill.	20	Al'atara-jenin	yes	yes	N.T	No	Yes	Yes
angallis arvensis L.	21	Al'atara-jenin	yes	yes	No	No	Yes	Yes
Anthemis spp	19	Al'atara-jenin	yes	yes	N.T	No	Yes	Yes
Asparagus aphyllus L.	Aa	wadi alquf	yes	yes	N.T	No	Yes	Yes
Astoma seselifolium DC.	Ass	wadi alquf	yes	yes	Yes	Bad	Yes	Yes
Ballota saxatilis Sieber ex C.Presl	Bs	wadi Qana	yes	yes	N.T	No	Yes	Yes
Ballota undulata (Sieber ex Fresen.) Benth.	Bc	Bani naim	yes	yes	Yes	Bad	Yes	Yes
Berula erecta (Huds.) Coville.	Ber1	wadi qana	yes	yes	Yes	Bad	Yes	Yes
Calicotoma villosa (Poiret) Link	14	A'latara_jenin	yes	yes	N.T	No	Yes	Yes
Carlina hispanica Lam.	Ch	em al-Tut	yes	yes	Yes	Yes	N.T	No
Centaurea iberica Spreng.	Ci	siris	yes	yes	Yes	Yes	N.T	No
Chiliadenus iphionoides (Boiss. & Brullo	Chi	em eltut	yes	yes	N.T	No	Yes	Yes
Clinopodium serpyllifolium subsp. fruticosum (L.) Bräuchler	Mij	wadi alquf	yes	yes	Yes	Bad	Yes	Yes
Cota palaestina Kotschy	18	Al'tara-jenin	yes	yes	N.T	No	Yes	Yes
Crataegus azarolus L.	Cra1,2	Kherbi qeis	yes	yes	Yes	Yes	N.T	No
Cupressus spp.	Cu5	wadi alquf	no	no	No	No	Yes	Yes
Cyclamen persicum Mill.	Sp	Wadi alquf	yes	yes	N.T	No	Yes	Yes
Dittrichia viscosa (L.) Greuter	Iv	Wadi alquf	yes	yes	Yes	Bad	Yes	Yes
Ecballium elaterium (L.) A.Richard	Ee	Bani naim	yes	yes	No	No	Yes	Yes
Echium judaeum lacaite	Ejl	wadi alquf	yes	yes	Yes	Bad	Yes	Yes

Erodium gruinum (L.) L'Hér.	Erg	wadi alquf	yes	yes	No	No	Yes	yes
Ficus sycumrous L.	12a	Jericho	yes	yes	N.T	No	Yes	yes
Helichrysm sanguineum (L.) Kostel	Hs	Em altut	yes	yes	N.T	No	Yes	yes
Lonicera etrusca G Santi	Le	Bani naim	yes	yes	No	No	Yes	yes
Lythrum hyssopifolia L.	Lyh	wadi qana	yes	yes	Yes	Bad	Yes	yes
Medicago scutellata (L.) Mill	19	Sanour-jenin	yes	yes	N.T	No	Yes	yes
Medicoga orbicularis (L.) Bartal.	12	Sanour-jenin	yes	yes	N.T	No	Yes	yes
Molucella spinosa L.	Mop	wadi alquf	yes	yes	No	No	Yes	yes
Phagnalon rupestre (L.) DC.	Pr	bani naim	yes	yes	Yes	Yes	N.T	no
Phillyrea latifolia L.	Phyl	Siris	yes	yes	N.T	No	Yes	yes
Pinus halepensis Mill.	Ph1	Kherbit qeis	yes	yes	N.T	No	Yes	yes
Pistacia lentiscus L.	pL6	wadi alquf	yes	yes	No	No	Yes	yes
pistacia palaestina Boiss.	Pp5	Em altut	yes	yes	No	No	Yes	yes
Polygonum arenarium Waldst. & Kit.	22	Aljdaideh-jenin	yes	yes	N.T	No	Yes	yes
Pyrus syriaca Boiss.	Py2	wadi qana	yes	yes	N.T	No	Yes	yes
Retama raetam (Forssk.) Webb	Rm	wadi alquf	yes	yes	N.T	No	Yes	yes
Rhamnus lycioids L.	Z3	wadi alquf	yes	yes	Yes	Yes	N.T	no
Rosmarinus officiniallis L.	Ros	wadi alquf	yes	yes	Yes	Bad	Yes	yes
Rubia tenuifolia d'Urv	Rut	wadi alquf	yes	yes	Yes	Bad	Yes	yes
Rubus sanctus Schreb	Ru	Wadi alquf	yes	yes	No	No	Yes	yes
Salvia dominica L.	Sad	bani naim	yes	yes	No	No	Yes	yes
Salvia fruticosa Mill.	So	Kherbit qeis	yes	yes	Yes	Bad	Yes	yes
Salvia judaica Boiss.	SP3	Aljlajil- bani naim	yes	yes	No	No	Yes	yes
Salvia officinalis L.	Sf	Kherbit qeis	yes	yes	Yes	Bad	Yes	yes
Sarcopoterium spinosum (L.) Spach	Ss	bani naim	yes	yes	Yes	Yes	N.T	no
Satureja thymbra L.	Sot	Kherbit qeis	yes	yes	Yes	Yes	N.T	no

Smilax aspera L.	Sa	wadi alquf	yes	yes	No	No	No	no
Styrax officinalis L.	11a	siris	yes	yes	N.T	No	Yes	yes
Teucrium capitatum L.	Tc	wadi alquf	yes	yes	Yes	Yes	Yes	yes
Thymbra spicata L.	Ths	Kherbit qeis	yes	Yes	N.T	No	Yes	yes
Thymelaea hirsuta (L.) Endl.	Thh	Bani naim	yes	Yes	No	No	Yes	yes
Thymbra capitata (L.) Cav.	Coc	wadi alquf	yes	Yes	No	No	Yes	yes
Vitex agnus- Castus L.	Vac	Kherbit qeis	yes	Yes	N.T	No	Yes	yes
Ziziphus spina-christi (L.) Desf.	Zic	siris	yes	Yes	Yes	Yes	N.T	no

Table.3: Samplelist of all samples were amplified by

2.5.4. Gel analyses:

The PCR products were run on a 1.0 % agarose gel in TBE buffer (Tris base, Boric acid and EDTA).

2.5.5 DNA purification

The PCR products were cleaned by GFX PCR DNA and GEL band purification Kit (GE Healthcare, UK), according to manufacturers' instructions. And eluted in 30 ml type 6 elution buffer (Kirin et al.; 2013)

2.5.6. DNA Sequencing:

Standard aliquots of the purified PCR products were sent to Macrogen for sequencing (http://www.macrogen.com/) with the amplification primers. Electropherograms were edited with CHROMAS lite and checked visually (Kirin et al.; 2013, Laiou et al.; 2013).

2.5.7. Bioinformatics tools:

The DNA barcode provides an additional master key to knowledge about a species with a public library of sequences linked to named specimens available on-line, species discrimination ability of each marker was evaluated through the use of GenBank, a comprehensive global database,with publicly available nucleotide sequences, Before the discrimination assessment, the database was screened for the presence of the each marker sequences at the species and genus level relative to our data-set, using the NCBI Taxonomy database (Kirin *et al.;* 2013, Ferri *et al.;* 2015, http://www.ncbi.nlm.nih.).

A close match quickly identifies a species that is already represented in the database. The identification ability of every single marker was evaluated using the megaBLAST algorithm (http://blast.ncbi.nlm.nih.gov) with default parameters and adjusted to retrieve 5000 sequences. A query sequence was considered as successfully identified if the top Bit-score obtained in GenBank matched the name of the species (Ross *et al*.; 2008). Identification success was only inferred for species/sequences represented in GenBank. When more than one species shared a top Bit-Score or the species scored lower, the result was considered an identification failure.

2.6. Geographical Information Systems (GIS):

Loss of biodiversity reduces the ecosystem productivity too much, and thus reduces the nature of a basket of goods and services that we use always. It also destabilizes ecosystems, and weakens

their ability to deal with natural disasters such as floods, droughts, hurricanes, and the climate change because according to the International Panel for Climate Change (IPCC; 2007), Mediterranean-type ecosystems (MTEs) have the following vulnerabilities to climate change: a) warmer and drier conditions will force species to shift; b) land use, habitat fragmentation and intense anthropogenic pressures will further limit natural adaptation responses; c) fires may threaten specific species and plants; d) invasive alien species may be favored and threaten rare species of vegetation; e) overall, loss of biodiversity and carbon sequestration services may result from increased climate changes (Valavanidis *et al*.; 2011) ; in addition to those reasons caused by humans, such as pollution, the conservation of biodiversity remains one of the greatest challenges facing the modern world (Boteva *et al*.; 2004). The Geographical Information Systems (GIS) contributes to the conservation of biological diversity by collecting the data and the information about the wildlife and the nature reserves. The development of the Geographical Information Systems (GIS) and its use in research is improving the design of powerful spatial-analysis methods directly applicable to the conservation of biodiversity and land management (Benito *et al*.; 2009) whereas in the recent years, it considered as a useful tool to assess the potential geographical distribution of species, and has been applied to the fields of ecology, biogeography, evolution and conservation biology (Chefaoui *et al*.; 2005), by providing a detailed report by analyzing the available environmental information by supplying the program with the geographical coordinates of the site to be assessed , then displays the location on the map and give a report which facilitates the protection and development of wildlife and nature reserves and conservation.

Accurate descriptions of species ecological and geographical distributions are fundamental to understanding patterns of biodiversity and the processes that shape them (wisz *et al*.; 2008).

In this study, we used GIS data to investigate the environmental and climatic factors characterizing the geographic distributions of some plant species. We focused on trees and shrubs in the selected sites in West Bank. Locality data for the species were collected using a (GPS locator) and the characterization analysis was done using ESRI ArcGIS 9.3 software by using a set of environmental variables of the WorldClim Global Climate. GIS database included topographic and bioclimatic variables representing elevation (m), annual mean temperature (˚C), mean diurnal temperature range (˚C), isothermality, temperature seasonality (˚C), maximum temperature of warmest month (˚C), minimum temperature of coldest month (˚C), temperature annual range (˚C), mean temperature of wettest quarter (˚C), mean temperature of driest quarter (˚C), mean temperature of warmest quarter (˚C), mean temperature of coldest quarter (˚C),

annual precipitation (mm), precipitation seasonality (mm), precipitation of wettest quarter (mm), precipitation of driest quarter (mm), precipitation of warmest quarter (mm), and precipitation of coldest quarter (mm) (Miller *et al*.; 2008, Calleja; 2009). It has been identifying the areas that was a combination of them by using the geographic information system, where collected the information of each site (Altitude, and latitude and longitude and the most important plants located in the target area), this can help in further studies to identify environmentally suitable regions still not colonized, or where the species has become extinct; then the contribution of unique historical or geographical factors to the shaping of the current distribution of a species can be judged. With regard to conservation, potential distribution area identification can help to locate sites suitable for reintroduction programs, or faunistic corridors, favoring success in regional conservation planning (Chefaoui *et al*.; 2005).

Chapter three: Results

The research activities have been applied by visiting each sides several times in the period (April- June and September, 2014), permeated the initial visits to determine the sites (April,2014) followed by several fieldtrips to collect plant samples for the herbarium and choose the plots in each site, include the plant species, densities, and the plant's environments to ensure the most comprehensive and accurate survey(May-June, 2014) and identify each section by using the GPS device to determine the coordinates of the site, then collecting the seeds of fruitful trees (September, 2013)

Through these field trips we been identified the nature of each site and the existing vegetation and the dominant plant that will help in the preparation of the checklist, in addition to identifying the climactic nature and the type of the soil and the elevation, which helps to give a full description of each site and to understand the needs and the difficulties and obstacles that we face as Palestinians in the management and protection of biodiversity.

Actually the sites under study were eight sites but We have covered six of the eight sites where Um Al-rehan and Ein Al-faskha were located within the territories under Israeli administration 'C' that prevents any access to it without permission from the occupation authorities and is not easy as we have to provide the documents required to obtain permits, but we could not.

We selected Um Altut in the northern part of the West Bank because it is so similar to the ecosystem of Um Alrehan.

The sampling was performed by distributing the sample areas within each site in a totally random with defined size. The area has been defined from time to time with a signaling tape and stakes from the point further north.

The coordinates of the area by GPS were recorded. In some cases the study has been approached through the formation of circular areas with a radius 10. It is sufficient to use these types of approach, circular or square area, since all the areas visited observe a strong homogeneity.

It is recommended for other study areas in more depth, in the richest vegetation phases delimiting the 100 m^2 square essay area (plot), identified by means of random delimiting this area with signage tape and stakes from the point further north and then dividing it into four quadrants of 5 m from the side identified by their position (NW-NE-SE-SW). The small plot obtained shall be divided into subplot of 2.5 m to the side and numbered from 1 to 16. Once the plot constructed

for the study will proceed to a brief description of its main characteristics and harvesting for each subplot of this material also indicating the density of the presence of each species. At this method it can be replaced the classic method of research studying the whole area in its every point thus identifying each individual species present signal. The choice between one method and the other must be assessed according to the environmental conditions of each site.

Several trips were done for each site in order to study and understand existing vegetation and the dominant plant; in addition to collect plants samples and seeds, trips were done within the period from April to September, 2014 as shown below for each site:

3.1 Description of the selected sites:

3.1.1 um Al-tut:

Altitude: c.a. 330m.
Coordinates: 32˚26’07”(N) 35˚20’00”(E)
32˚26’03”(N) 35˚20’09”(E)

It is a protected area located in the northern part of the West Bank to the east of Jenin. This area is presently characterized by a protected area of about 0.505 km2 (Ghattas et al.; 2013), with two different exposures and two different plant physiognomies. It includes *Cupressus* spp, *Quercus* spp, *Acacia* spp, *Eucalyptus*, and Pines, but most of trees have been cut in the seventies and eighties.

This site is located in the northern part of Palestine with respect to all the sites studied. The plot area lies on the south side at about 264 m above sea level. The area has a typical Mediterranean degraded vegetation with prevalence of *Quercus coccifera* L. intercropped in Pistacia Palestine Boiss, Ceratonia siliqua L. and *Cistus* spp.

The individual oak trees do not exceed 4-5 m in height characterizing the entire shrub layer with a vertical conformation mosaic of 4-7 individuals per nucleus.

The southern slope defined by a characteristic degraded Mediterranean maquis of *Quercus Coccifera* L. (Fig. 17). (Regeneration of *Quercus Coccifera* L. closed to adult trees) the main species are: *Pistacia palaestina* Boiss, *Quercus Coccifera* L. and the presence of *Ceratonia siliqua* L., Olive and *Cistus* spp, *Sarcopoterium spinosum* (L.) Spach, *Chiliadenus iphionoides*

(Boiss. & C. I. Blanche) Brullo *Varthemia iphionoides* (Boiss. & C. I. Blanche), *Teucrium pruinosum* Boiss. and *Calicotome spinosa* (L.) Link, *Asparagus palaestinus* Baker, *Asphodelus aestivus* Brot, *Ballota saxatilis* Sieber ex C.Presl, *Calicotome villosa* (Poir.) Link, *Ceratonia siliqua* L., *Carlina hispanica* Lam. (Poir.) Link, *Cistus creticus* L. *Cupressus* sp., *Daucus carota* L., *Eryngium creticum* Lam., *Helichrysum sanguineum* (L.) Kostel., *Hordeum bulbosum* L., *Phagnalon rupestre* (L.), *Pinus halepensis* Mill., *Pistacia lentiscus* L., *Pyrus syriaca* Boiss., *Quercus coccifera* L., *Rhamnus lycioides* L. *Suaeda palestina* Eig & Zohary, *Teucrium capitatum* L.

17.a *17.b*

Fig.17a: General view of the southern part of Um Al-tut's slope defined by a characteristic degraded Mediterranean maquis of Quercus Coccifera L, b: tree of Quercus Coccifera L..

Species	Circumference	Height	Regeneration	# of Reg	Other species in the area	Notes
Pistacia lentiscus L.	4(10 cm)	120cm	yes	High reg		
Quercus coccifera L.	3(10) , 1(12 cm)	1m	yes			
Quercus coccifera L.	12cm	1.5m	yes			
Pistacia lentiscus L.	5(12cm)		yes	High reg		
		1.5m				
Pistacia lentiscus L.	4(20),3(15),3(10)	2m	yes	High reg		
Calicotome villosa (Poir.) Link	15cm	2m	yes		*Sarcopoterium spinosum (L.) Spach*	
Pistacia lentiscus L.	10,20,10,10,7,12,12,12,10	1.5m	yes	High reg		
Pistacia lentiscus L.	25,10,15,1	1m		High reg		
Quercus coccifera L.	15,15,15,10,7	1.5m	yes		*Rhamnuslycioides L.*, wild thyme	
Calicotome villosa (Poir.) Link	3(10)	1.5m	yes	High reg	*Rhamnus lycioides L.*	
Pistacia lentiscus L.	10(14)	1.5m	yes	High reg	Calicotome villosa (Poir.) Link	
Calicotome villosa (Poir.) Link	7,5,7	1.5	yes			
Calicotome villosa (Poir.) Link	7	1.5	yes			
Pistacia lentiscus L.	12,10	1.5	yes			
Rhamnus lycioides L.	10	1.5	yes			
Pistacia lentiscus L.	25,25,20,12,10,12,20	1.5	yes			
Quercus coccifera L.	10,10,12,12,15,12	2m	yes			
Pistacia lentiscus L.	10,15	1.5	yes			
Calicotome villosa (Poir.) Link	15	1.5	yes			
Quercus coccifera L.	15	1.5	yes		*Calicotome villosa (Poir.) Link*	
Calicotome villosa (Poir.) Link	15	1.5	yes			
Pistacia lentiscus L.	25	1.5	yes			
Quercus coccifera L.	10,15	1.5			*Pistacia lentiscus L.*	

Pistacia lentiscus L.	10,7,7	1.5	yes		*Calicotome villosa (Poir.) Link*	
Quercus coccifera L.	10,10,25,15	2m	yes		*Lentiscus Pistacia L., Calicotome villosa (Poir.) Link*	
Pistacia lentiscus L.	20,10,25,25,20,20,15	1.5	yes			
Quercus coccifera L.	10,10,10	1.5	yes		*Rhamnus*	
					Lycioides L.	
Pistacia lentiscus L.	10,10,12,12,25	1.5	yes		*Rhamnus Lycioides L., Calicotome villosa (Poir.) Link*	
Pistacia lentiscus L.	25,25,25	1.5	yes		*Calicotome villosa (Poir.) Link,* *Cistuscreticus L.*	
Pistacia lentiscus L.	25,10	1.5	yes			
Pistacia lentiscus L.	25,25,25	1.5	yes			
Quercus coccifera L.	90	4m	yes			
Quercus coccifera L.	25,20,25	2m	yes		*Calicotome villosa (Poir.) Link*	
Calicotome villosa (Poir.) Link	15	2m	yes			
Quercus coccifera L.	25	2.5	yes			
Pistacia lentiscus L.	25,25	1.5	yes		*Calicotome villosa (Poir.) Link*	
Calicotome villosa (Poir.) Link	25,25	1.5	yes			
Quercus coccifera L.	20,20,25	1.5	yes			
Pistacia lentiscus L.	15,10	0.5m	yes		*Calicotome villosa (Poir.) Link*	
Quercus coccifera L.	25,20,25	3m	yes	Highly reg		
Pistacia lentiscus L.	15,10,15,10	1.5	yes			
Pistacia lentiscus L.	15,10,10	1.5	yes			
Quercus coccifera L.	25,20	3m	yes		*Calicotome villosa (Poir.) Link*	

Pistacia lentiscus L.	25,25,10	1m	yes		Sarcopoterium spinosum	
Quercus coccifera L.	25,25	1.5	yes		Sarcopoterium spinosum	
Quercus coccifera L.	7,7	0.5m	yes		Sarcopoterium spinosum (L.) Spach ,wild thyme	
Pistacia lentiscus L.	25,25	1.5m	yes		*Rhamnus lycioides L.*	
Pistacia lentiscus L.	25	2m	yes			
Pistacia lentiscus L.	30	1.5	yes			
Pistacia lentiscus L.	30	2m	yes			
Quercus coccifera L.	25,25	2m	yes			
Quercus coccifera L.	30	2.5m	yes		*Pistacia lentiscu L.s, Rhamnus lycioidesL.*	
Pistacia lentiscus L.	25	1.5m	yes			
Calicotome villosa (Poir.) Link	15	1.5m	yes			

Table.4: the plot area in the southern side of Um al-tut indicates the dominant species, circumference, hight and the regeneration of these species.

Fig.17a: General view of the southern part of Um Al-tut's slope defined by a characteristic degraded Mediterranean maquis of *Quercus Coccifera* L., b: tree of *Quercus Coccifera* L.

Coordinates :

X : 0719623,Y:3590967

X: 0719612 ,Y:3590951

X: 0719645, Y:3590960

X:0719642,Y:3590974

As shown in Table 4the dominant species within the plot are: *Pistacia lentiscus* L. 48%, *Quercus coccifera* L. 33%, *Calicotome villosa* (Poir.) Link 17%, *Rhamnus lycioides* L. 2% (Fig.18), with circumferences and diameters ranged between 5-90 cm; the density of the main species is 900 trees/ ha.

This plot can be considered representative of the situation in this site; there is a good regeneration of the dominant trees whith 96% of *Pistacia lentiscus* L., 94% of *Quercus coccifera* L., and 100% of *Calicotome villosa* (Poir.) Link.

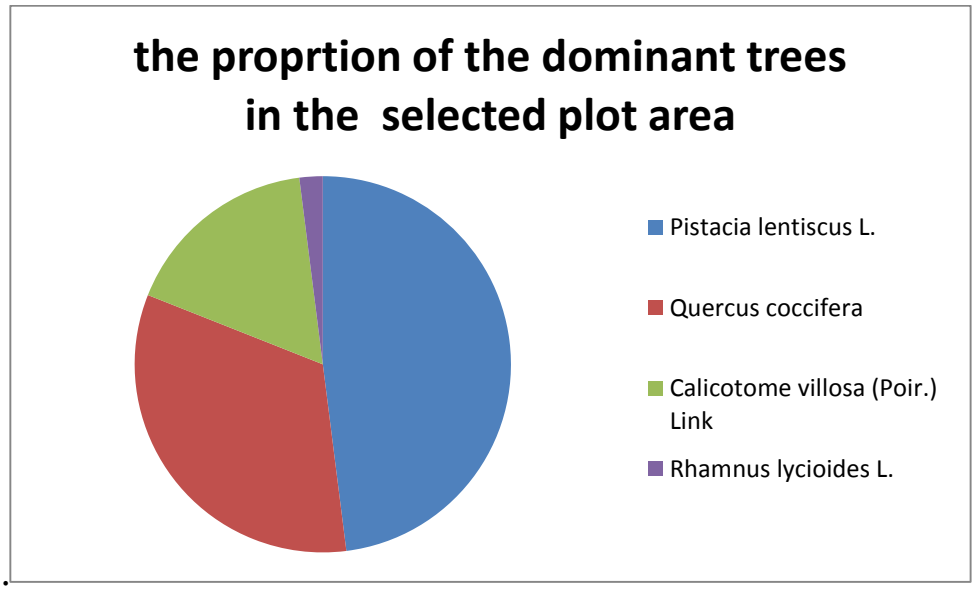


Fig.18: the proportion of the dominant trees in the selected plot area in the southern part of Um Al-tut.

On the other hand, the northern slope is planted with *Pinus halepensis* Mill., and isolated *Cupressus sempervirens* L. (Semi-coastal Plain) (Fig.19) delimiting an area with no shrub layer and few herbaceous, with a dominant layer of *Pinus halepensis* Mill., *Cupressus sempervirens* L. and some shrubs of *Sarcopoterium spinosum* (L.) Spach. This site also needs a plan for administrative protection and turn it into a protected area. There is no regeneration of Pines;

19.a *19.b*

Fi.g. 19 a: General views of the northern slope with Pinus halepensis Mill.*, and isolated Cupressus sempervirens* L. *(Semi-coastal Plain) and some herbaceous spp., b: Pinus halepensis* Mill. *forest*

Species	Circumference	Height	Regeneration	#of Reg	Other Species in the area	Notes
Pinus Halapensis Mill.	140cm	19m	No			
Pinus Halapensis Mill.	130cm	18m	No			
Pinus Halapensis Mill.	75cm	17m	No			Very slanted
Pinus Halapensis Mill.	120cm	19m	No			Very slanted
Pinus Halapensis Mill.	1m	18m	No			
Pinus Halapensis Mill.	85cm	18m	No			dry
Pinus Halapensis Mill.	120cm	19m	No			
Ceratonia Siliqua L.	1m	7m	No			
Pinus Halapensis Mill.	45cm	12m	No			dry
Pinus Halapensis Mill.	1m	17m	No			
Pinus Halapensis Mill.	70cm	13m	No			
Pinus Halapensis Mill.	65cm	15m	No			
Pinus Halapensis Mill.	75cm	22m	No			
Pinus Halapensis Mill.	85cm	18m	No			Slanted, dry
Pinus Halapensis Mill.	125cm	25m	No			
Cupressus Sempervirens L.	45cm	18m	No			dry
Pinus Halapensis	75cm	18m	No			

Cupressus Sempervirens L.	60cm	15m	No			
Cupressus Sempervirens L.	95cm	20m	No			
Cupressus Sempervirens L.	45cm	16m	No			

Table.6: Plot area in the northern side of Um al-tut indicates the dominant species, circumference, height and the regeneration of these species

The plot area were done 4th of June 2014 in the northern slope by selecting random plot with total area of 600 m2 (30X 20m), elevated 273m above the sea level ; the position of this area has been determined by the GPS :

Coordinates:

X : 0719399,Y :3591102

X: 0719426 , Y:3591117

X: 0719412 , Y:3591089

X: 0719423,Y:3591122

As shown in Table 5 the dominant species are: *Pinus halepensis* Miller 75%, *Cupressus sempervirens* L. 20%, *Ceratonia siliqua* L. 5%, with circumferences and diameters ranged between 45 cm-1m; the density of the main species is 333 trees/ ha.

The most important note in the northern slope that no regeneration of the dominant treeshas been recorded.

All the activities related with sampling and collecting herbarium samples have been done in Um Al-tut as shown in Table 6.

The date	Activities	Note
22 May, 2014	- Collecting samples for herbarium and DNA analysis - Records the coordinates	Temp: 27ºC Moist: 48% atmospheric pressure: 993.6
4 June, 2014	- Collecting samples for herbarium and DNA analysis - Records the coordinates - Plot: :30 X 20 m	Temp: 35 ºC Moist: 21% atmospheric pressure:995.8
14 June, 2014	- Collecting samples for herbarium and DNA analysis - Collecting seeds.	

Table.6: activities done in um Al-tut (May to June, 2014)

3.1.2 Siris

Altitude: c.a 400m

Coordinates: 32º22’15” (N) 35º18’24” (E)

32º18’52” (N) 35º18’23” (E)

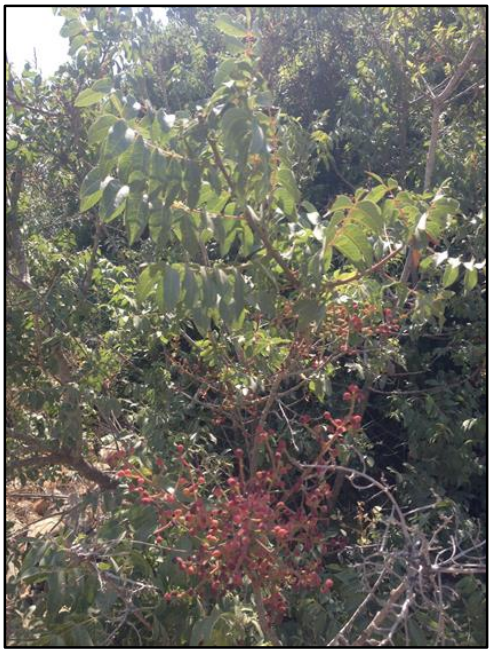
Table.6: activities done in um Al-tut (May to June, 2014)

Fig.20: Overview of the olive trees and the degraded maquis of Quercus coccifera L.

List of species present in the area: *Cota palaestina* Kotschy., *Asparagus palaestinus* Baker, *Asphodelus fistulosus* L., *Calicotome villosa* (Poir.) Link, *Centaurea eryngioides* Lam., *Centaurea iberica* Spreng., *Ceratonia siliqua* L., *Cistus creticus* L., *Eryngium creticum* Lam., *Hordeum bulbosum* L., *Ipomoea imperati* (Vahl) Griseb., *Notobasis syriaca* (L.) Cass., *Papaver umbonatum* Boiss., *Phyllyrea latifolia* L., *Pistacia palaestina* Boiss., *Polygonum aviculare* L., *Pyrus syriaca* Boiss., *Quercus coccifera* L., *Silybum marianum* (L.) Gaertn., *Smilax aspera* L., *Styrax officinalis* L., *Teucrium capitatum* L., *Ziziphus spina-christi* (L.) Desf. (Fig. 21). All the activities were done in this site during May to June 2014 devoted to collect herbarium samples as shown in Table 7.

21 a:

21.b



21.c *21.d*

Fig.21: Some dominant species in Siris, a: Styrax officinalis L. *B: Phyllyrea latifolia* L., *c: Crataegus azarolus* L., *d: Pistacia palestina* Boiss.

The date	The activities	Notes
15 Mat, 2014	- Collecting samples for herbarium and DNA analysis - Records the coordinates	Temp:26.6ºC Moisture: 31% Atmos. Pressure: 997.6
22 May, 2014	- Collecting samples for herbarium and DNA analysis - Records the coordinates - Circle plot	Temp:27ºC Moisture: 48% Atmos. Pressure: 993.6
4 june, 2014	- Collecting samples for herbarium and DNA analysis - Records the coordinates - Plot 30X20m	Temp:35ºC Moisture: 21% Atmos. Pressure: 995.8
14 June, 2014	- Collecting samples for herbarium and DNA analysis - Records the coordinates - Cpllecting seeds	

Table.7: Activities done in Siris (May to June, 2014)

The plot area were done on 4th of June 2014, with a total area of 600 m2 (30X 20m), 446m above the sea level. The position of this area has been determined by the GPS :

Coordinates:

X : 0717146,Y:35 77671

X: 0717164 ,Y:3577653

X: 0717136, Y:3577665

X:0717151,Y: 3577643

As shown in Table 8 the the dominant species are: *Quercus coccifera* L. 94%, *Calicotome villosa* (Poir.) Link 6% (fig.22), with the circumference and diameter ranged between 5-30 cm; the density of the main species is 283 trees/ ha. There is a good regeneration of the dominant species whith 88% of *Quercus coccifera* L., and 100% of *Calicotome villosa* (Poir.) Link.

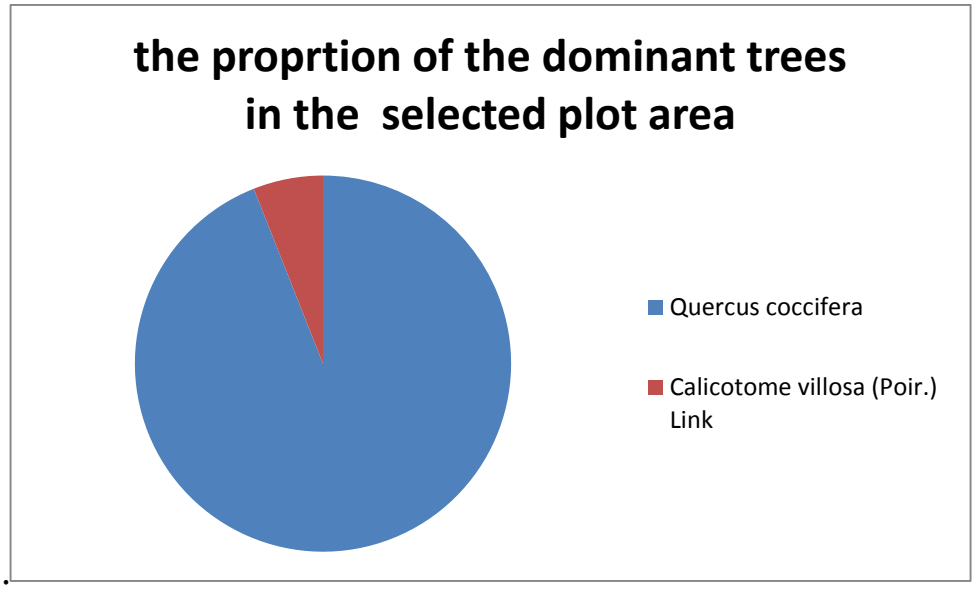


Fig.22: Proportion of the dominant tree species within theplot area in Siris

Species	Circumference	Height	Regeneration	# of Reg	Other species in the area	Notes
Quercus coccifera L.	30	3m	yes	4	*Smilax aspera* L., *Calicotome villosa* (Poir.) Link	
Quercus coccifera L.	6(20), 2(30)	4m	yes			Highly regenerated
Quercus coccifera L.	20,20,30,30	3m	yes			highlybranched
Quercus coccifera L.	20	1m	No			
Quercus coccifera L.	20,20,20,10	2m	yes		*Calicotome villosa (*Poir.) Link	
*Calicotome villosa (*Poir.) Link	10	2m	yes	1		
Quercus coccifera L.	5 (20)	3m	yes			
Quercus coccifera L.	30	3m	yes			
Quercus coccifera L.	35,30,35,20,20,20	4m	yes			
Quercus coccifera L.	35	3m	No		*Calicotome villosa* (Poir.) Link	
Quercus coccifera L.	25,25,30	2m	yes			
Quercus coccifera L.	20,20,20	2m	yes		*Calicotome villosa (*Poir.) Link	
Quercus coccifera L.	20,20,20	3m	yes		*Calicotome villosa (*Poir.) Link	
Quercus coccifera L.	30,30	3m	yes		*Calicotome villosa (*Poir.) Link	
Quercus coccifera L.	25,25,25	3m	yes			
Quercus coccifera L.	20,20,20	2m	yes			
Quercus coccifera L.	20,20	2m	yes			

Table 8: the plot area in Siris indicates the dominant species, circumference, hight and the regeneration

3.1.3 Wadi Qana:

Altitude: c.a 250 m

Coordinates: 32º09’32”(N) 35º06’50”(E)

32º09’29”(N) 35º06’52’’(E)

Wadi Qana is the Palestinian nature reserve, which lies between Qalqilya and Salfit, but followed Salfit administrative zone in the northern part of West Bank. The area was once a source of life, a fertile valley which provided the main sources of income for the surrounding villages: agriculture (oranges, lemons, plums, corn, vegetables, chickpeas, and lentils) and livestock (sheep, goats). Today Wadi Qana is one of the ecological emblems in the West Bank where it begins to be evident the pollution and the degradation of the natural landscape with the building of settlements on all sides, some of them with housing units falling within the limits of the Nature Reserve. The area is a reserve of medicinal plants for Salfit and Nablus and contains many species protected by law, e.g. *Ophrys* spp. and *Tulipa agenensis* DC. The site is characterized by a valley shaped by a main river and rocky outcrops (Fig.23); the vegetation is mainly made by *Quercus coccifera* L. forming limited spots.

23.a *23.b*

Fig.23: a- Overview of the Wadi characterized by the degraded vegetation of Quercus coccifera L., *b- The river and and rocky outcrops of Wadi Qana*.

The area that falls within the protected area is characterized by a typical degraded Mediterranean vegetation with a prevalence of *Quercus coccifera* L. on a very steep slope and with obvious

rock outcropping featuring a vegetation belt in Oak peers groups. Mostly all the oak trees are supposed to be young (Fig. 24). The downstream part of the area manifests a vegetation change due to the presence of the river which allows the existence of an herbaceous layer with species related to humid environment as *Juncus fontanesii* J.Gay ex Laharpe. .

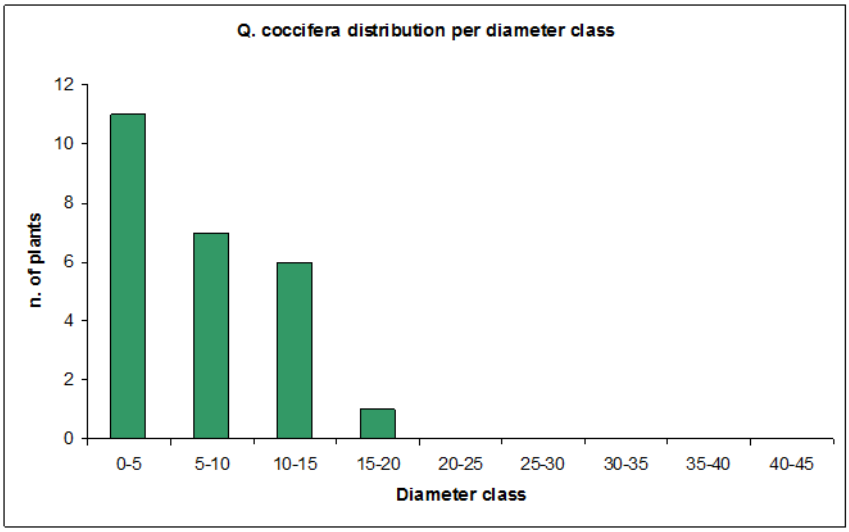


Fig.24: The distribution of Querqus coccifera L. *per diameter classes. Wotrhy of note is that many trees shows a reduced diameter range (1-20 cm)1-20 cm*

The plot area was randomly placed inside the study site. Measurements were done the 22nd of May 2014 covering a total surface of 600 m2 (30X 20m), elevated 277m above the sea level. The position of this area has been determined by the GPS:

Coordinates: X 0699351; Y 3559776

X 0699349; Y 3559811

The hemogenecity of the tree sizes does not claim for a full census of the stand structure. Individuals' habitat is typical of a degraded Mediterranean maquis, diameter ranged between 1-20 cm and hight range 2-5cm (Fig. 25); the density of the main species is 383 trees/ ha (Table. 9).

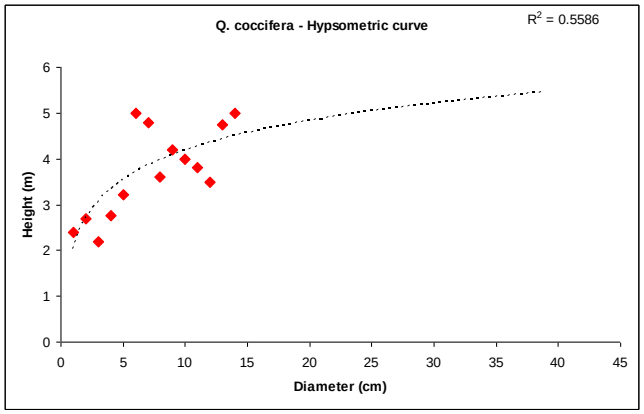


Fig.25: Hypsometric curve of Quercus coccifera L.

Number of species	1
Plants/Plot	28
Plants/ha	383
Mean height (m)	3.48
Mean diameter (cm)	9.45
Mean thinnes	0.42
Σg_{tot}/ plot (m^2)	0.592
Mean G (m^2)	0.031
G/ha (m^2)	9.86

Table.9: summarize table shows the the plot area

Table.10 shows the activities done in this site during May, 2014 for collecting herbarium samples.

The date	The activities	Notes
10 May, 2014	- Collecting samples for herbarium and DNA analysis - Records the coordinates	Temp:24ºC Moisture: 40% Atmos. Pressure: 948.6
22 May, 2014	- Collecting samples for herbarium and DNA analysis - Records the coordinates - Plot 30X20m	Temp:24ºC Moisture: 53% Atmos. Pressure: 946.2

Table.10: Activities done in Wadi qana.

The main problem of Wadi Qana is the absence of the management and the protection, which threatens the wildlife. The associated risks are: pollution of the river by pumping the wastewater from the surrounded settlements, which negatively affects the aquatic plants (Fig.26a), Israeli authorities that would not allow any administrative activities in order to protect and conserve the wildlife

there (Fig.26b), and overgrazing which destroys the vegetation (Fig.26c)

26.a *26.b*

26.c

Fig.26: Risks find out at Wadi Qana.

3.1.4 <u>Kherbit Qeis :</u>

Altitude: c.a 410 m above sea level.

Coordinates: 32º03’57”(N) 35º10’57”(E)

32º25’35”(N) 35º23’02”(E)

The village of Khirbet Qeis is located to the south of the city of Salfit, with an estimated area of 0.49 km2. It is located into area "C", the eastern slopes characterized with degraded maquis of evergreen oak mixed with *Pistacia lentiscus* L., Aleppo pine trees and planted Olives (Fig.27).

Fig.27: Overview of Kherbit Qeis characterized by mixed maquis of evergreen oak, Pines, Pisatacia spp and Planted Olive trees.

In Kherbit Qeis we found a rich site of plant cover whereas it considered as the important plant areas, there are a good level of regeneration of oaks, mastic and karoub (Fig.28). We noted a lot of *Arbutus andrachne* L. although there are no adult trees, meaning that the seeds were probably transferred by birds and animals from the neighbor sites. Also some dried and destroyed pine trees were observed (Fig. 29).

28.a *28.b*

Fig.28: a- New generation of Ceratonia siliqua L., b- new generation of Quercus coccifera L.

Fig.29: destroyed pine trees

All the herbarium samples were collected during the several visits to this site during May and June, 2014 (Table.11)

The date	The activities	Notes
10 May, 2014	- Collecting samples for herbarium and DNA analysis - Records the coordinates	Temp:24º.5C Moisture: 45% Atmos. Pressure: 946.2
4 June, 2014	- Collecting samples for herbarium and DNA analysis - Records the coordinates - Plot area	Temp:33º.5C Moisture: 21% Atmos. Pressure: 948
14 June, 4014	- Collecting samples for herbarium and DNA analysis - Records the coordinates	

Table. 11: Activities done in Kherbit Qeis.

The species are present in this site are:

Calicotome villosa (Poir.) Link; *Ceratonia siliqua L.*; *Olea europaea* L.; *Pistacia lentiscus* L.; *Pistacia atlantica* Desf.; *Pistacia palaestina* Boiss.; *Pinus halepensis* Mill.; *Quercus coccefira* L.; *Rhamnus lycioides* L.; *Sarcopoterium spinosum* (L.) Spach, *Crataegus azarolus* L., *Salvia fruticosa* Mill., *Salvia officinalis* L., *Satureja thymbra* L., *Thymbra spicata* L., *Vitex agnus-castus* L., and *Helichrysum sanguineum* (L.) Kosel., *Smilax aspera* L. , and *Dittrichia viscosa* (L.) Greuter (Fig.30).

30.a *30.b*

30.c *30.d*

Fig. 30: some palnt species growing in Kherbit Qeis; a: fruits of Smilax aspera L. and fruits of Quercus coccefira L., *b: fruits of Ceratonia siliqua* L., *c: Alcea acaulis* (Cav.) Alef., *d: Teucrium polium* L. *and Thymbra capitata* (L.) Cav.

The area were investigated the 4th of June 2014, by selecting a random plot with total area of 500 m2 (25 X 20m), elevated 416 m above the sea level; the position of this area has been determined by the GPS :

Coordinates:

X 0706205, Y 3550019

X 0706216, Y 3550043

X 0706230, Y 3550032

X 0706218, Y 3550012

Table. 12 shows the dominant species in the plot area: 10.8% *Calicotome villosa* (Poir.) Link, 2% *Pinus halepensis* Miller, 14% *Pistacia lentiscus* L., 11 *Rhamnus lycioides* L., 2% *Ceratonia siliqua* L., 11% *Pistacia atlantica* Desf.,49% *Quercus coccifera* L., and 2% *Ceratonia siliqua* L. (fig.31), with the circumference and diameter ranged between 3-50 cm. The density of the main species is 740 trees/ ha. This plot coul be considered representative of the entire site, due to its homogeneity. There is regeneration of some dominant trees, such as Quercus coccifera L. (72%), *Calicotome villosa* (Poir.) Link. (75%), *Pistacia lentiscus* L. (60%), *Rhamnus lycioides* L. (25%), and *Pistacia atlantica* Desf. (25%).

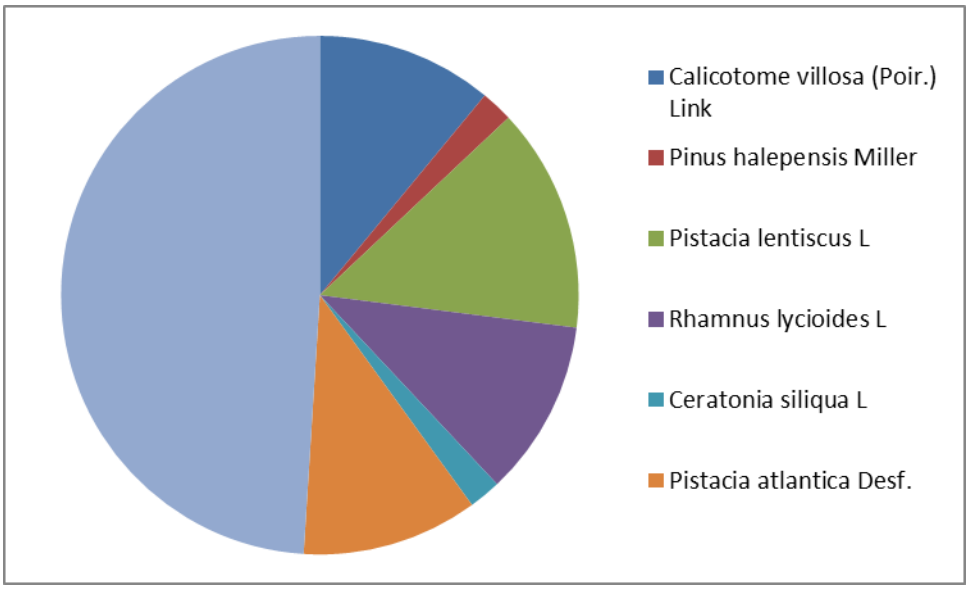


Fig.31: Repartition of the dominant trees in the selected plot area in Kherbit Qeis.

Species	Circumference	Height	Regeneration	#of reg	Other species in the area	Notes
Pinus halepensis Mill.	10cm	3m	No	-	*Cistuscreticus* L.	
Calicotome villosa (Poir.) Link	7,5,3,5 cm	3m	yes		*Cistuscreticus* L.	
Quercus Coccifera L.	20 cm	1.5m	yes	3	*Cistuscreticus* L.	
Calicotome villosa (Poir.) Link	7 cm	3m				
Pistacia atlantica Desf.	15cm	3.5m	No		*Calicotome villosa* (Poir.) Link, *Cistuscreticus* L	
Quercus Coccifera L.	30cm	4m				
Quercus Coccifera L.	5 (20) , 2(30)	5m	yes			
Rhamnus Lycioides L.	24cm	3m				
Pistacia lentiscus L.	20,10,10	3m	yes	multiple	*Calicotome villosa (Poir.) Link, Cistuscreticus* L.	
Quercus Coccifera L.	30cm	4m			*Rhamnus lycioides* L.	
Pistacia Atlantica Desf.	30cm	5m	yes		*Calicotome villosa (Poir.) Link, Cistuscreticus L.*	
Rhamnus Lycioides L.	30cm	5m	yes		*Calicotome villosa* (Poir.) Link, *Lonicera etrusca* G. Santi.	
Quercus Coccifera L.	7(25)	3m	yes			
Calicotome villosa (Poir.) Link	7,7,10	1.5m	yes			
Quercus Coccifera L.	40,20,20,30	4m	yes			
Quercus	30	4m	yes			

Coccifera L.						
Quercus Coccifera L.	30	5m				
Pistacia lentiscus L.	25,25	2m				
Quercus Coccifera L.	30,30,30,40,20	4m	yes			
Quercus Coccifera L.	40,50	6m	yes	multiple	*Calicotome villosa* (Poir.) Link, *Cistuscreticus* L.	
Rhamnus Lycioides L.	35	4m	No			
Quercus	25	1.5m	No			

Coccifera L.						
Quercus Coccifera L.	25,25	1.5m	Yes			
Pistacia lentiscus L.	25	1.5m	No		*Calicotome villosa (*Poir.) Link, *Cistuscreticus* L. *Rhamnus lycioides* L.	
Quercus Coccifera L.	30,25	3m	Yes			
Pistacia atlantica Desf	30,30,30	5m	No		*Calicotome villosa (*Poir.) Link, *Cistuscreticus, Quercus Coccifera* L.	
Quercus Coccifera L.	40	5m	Yes			
Rhamnus Lycioides L.	20	3m	No			
Quercus Coccifera L.	30,30,30	4m	Yes		*Calicotome villosa (Poir.) Link, Cistuscreticus* L.	
Ceratonia siliqua L.	25	3m			*Smilax Aspera* L.,*Arbutusandrache* L., *Rhamnus Lycioides* L.,*Lonicera ertusca* G. Santi	
Quercus Coccifera L.	30	4m	Yes			
Pistacia Atlantica desf.	25	3m	No		*Calicotome villosa (*Poir.) Link, , *Quercus Coccifera* L., *Cistuscreticus* L., *Pistacia Lentiscus* L.	

Pistacia lentiscus L.	30	2m	Yes			
Quercus Coccifera L.	30	4m	No			
Pistacia lentiscus L.	30,30,20	4m	Yes			
Quercus Coccifera L.	40,3(30),1(25)	6m	Yes			
Calicotome villosa (Poir.) Link,	20,20,20,15	2m	Yes		Calicotome villosa (Poir.) Link, Cistuscreticus L.	

Table.12: the plot area in Kherbit Qeis indicates the dominant species, circumference, hight and the regeneration of these species.

3.1.5 Wadi Alquf:

Altitude: c.a 800m

Coordinates: 31º34’42’’ (N) 35º02’19’’ (E)

31º34’15’’ (N) 35º04’40’’ (E)

Wadi Alquf is the natural reserve located in the south of West Bank in the administrative area of Hebron. It is considered the largest region located west of Hebron with an estimated total area of 0.0025 Km2. This area is a realized forest nursery still persisting today in Palestine, set up during the British mandate. Presently it has a potential production capacityreduced to only ten thousand tree seedlings per year. The quantity was reduced, whereas in 1971 Israel has stopped all the forest activities.

The production type concerns mainly trees for reforestation, such as: *Pinus* spp., *Cupressus* spp., *Quercus coccifera* L., *Pinus halepensis* Miller, *Ligustrum* spp., *Arbutus andrachne* L.(Fig. 32)

Fig.32: Seedlings processed for implanting or distributing to the farmers.

During the field trips from May to June (Table. 13), two sites have been visited, the eastern and the western slopes (Fig.33)

The date	The activities	Notes
17 April, 2014	- Collecting samples for herbarium and DNA analysis - Records the coordinates	Temp:19.8º.5C Moisture: 59% Atmos. Pressure: 894.9
21 May, 2014	- Collecting samples for herbarium and DNA analysis - Records the coordinates - Plot are 30X20m	Temp:25.6º.5C Moisture: 32% Atmos. Pressure: 894.6
2 June, 2014	- Collecting samples for herbarium and DNA analysis - Records the coordinates - Plot are - Collecting seeds	Temp:18º.5C Moisture: 67% Atmos. Pressure: 898

Table.13: the activities done in the site.

Fig.33: A general view of the western and eastern slopes of Wadi alquf.

The western slope is placed at about 600 m within the strict nature reserve in a predominantly woodland with *Pinus halpensis* Miller, it is homogeneous and of the same age with very little renovation.

In this side there is just one tree of *Arbutus andrachne* L., it is a big branched tree (Fig. 34a)

The species present in this side:

Asparagus aphyllus L., *Cupressus sempervirens* L., *Diplotaxis viminea* L.(DC.), *Pinus halepensis* Mill., *Pistacia lentiscus* L., *Pistacia palestina* Boiss, *Quercus coccefira* L., *Retama raetam* (Forssk.) Webb & Berthel., *Arbutus andrachne* L., *Dittrichia viscosa* (L.) Greuter, *Pyrus syriaca* Boiss., *Erodium* spp. *(Fig.34)*

34.a *34.b*

34.c *34.d*

Fig.34: some plant species present in the western slope of Wadi Alquf; a: Arbutus andrachne L., *b: Dittrichia viscosa* (L.) Greuter, *c: Erodium* spp, *d: Asparagus aphyllus L.*

The Eastern slope is steeper and more rugged than the western, and the vegetation density is higher, whereas the oak and pistacia trees grow close to each other. In addition, herbaceous species are present, due to peculiar exposition facing the sun.

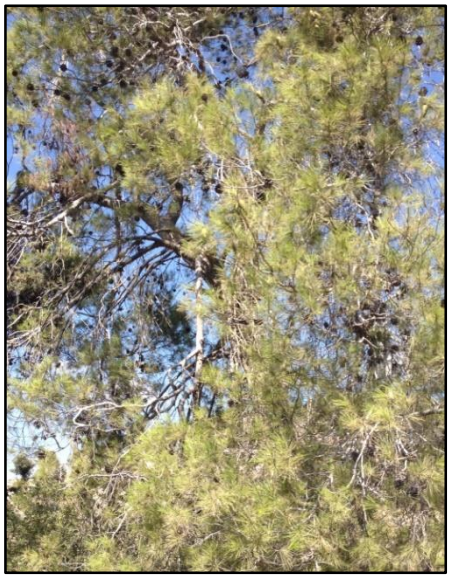
The present species are:

Anthemis bornmuelleri Stoj. & Acht., *Asparagus aphyllus* L., *Brassica tournefortii* Gouan, *Capparis spinosa* L., *Carlina hispanica* Lam., *Cistus creticus* L., *Cupressus sempervirens* L. ,*Cyclamen persicum* Mill., *Diplotaxis viminea* L.(DC.), *Helichrysum sanguineum* (L.) Kosel., *Phagnalon rupestre* (L.) DC., *Pinus halepensis* Mill., *Pistacia lentiscus* L., *Pistacia palestina* Boiss., *Quercus coccifera* L., *Retama raetam* (Forssk.) Webb & Berthel., *Rhamnus lycioides* L., *Sarcopoterium spinosum* (L.) Spach, *Silene aegyptiaca* (L.) L., *Smilax aspera* L., *Teucrium divaricatum* Sieber ex Heldr., *Thymbra capitata* (L.) Cav, *Trifolium tomentosum* L., *Erodium* spp (Fig.35).

35.a

35.b

35.c



35.d

Fig.35: some plant species present in the Eestern slope of Wadi Alquf; a: Quercus coccifera L., *b: Pistacia palaestina* Boiss., *c: Cupressus sempervirens* L., *d: Pinus halepensis* Mill.

Notably, two types of Cupressus can be observed: Cupressus sempervirens var. orizzontalis, and Cupressus sempervirens var. pyramidalis (Fig.36)

Fig.36: Cypress trees

Two plot areas were sampled in the site by selecting random plots represent the forest.

Plot 1 did the 2nd of June, 2014, with total area of 600 m2 (30X 20m), elevated 583m above the sea level in; the position of this area has been determined by the GPS :

Coordinates:

X :0693247 ,Y :3495657

X:0693257, Y: 3495709

X:0693267 ,Y :3495670

X :0693235 , Y :3495691

As shown in Table. 14the dominant species are: *Quercus coccifera* L. 80%, *Pinus halepensis* Miller 7%, *Pistacia lentiscus* L. 4%, *Rhamnus lycioides* L. 1%, *Cupressus sempervirens* L. 1%, and *Pistacia palaestina* Boiss. 7% (fig.37), with the circumference and diameter ranged between 5-190 cm; the density of the main species is1,250 trees/ ha. This plot represents is representative of the vegetation composition in Wadi Alquf. There is regeneration of some dominant trees whith 73% of *Quercus coccifera* L., 25% of *Pinus halepensis* Miller., 33% of *Pistacia lentiscus* L., and 50% of *Pistacia palaestina* Boiss.

Species	**Circumference**	**Height**	**Regeneration**	**#of Reg**	**Other Species in the area**	**Notes**
Pinus halapensis Mill.	190cm	30m	No	_	*Quercus Coccifera* L.	
Quercus Coccifera L.	(40 cm,10,7,7)	3m	Yes	3	*Cistuscreticus* L. *Sarcopoterium Spinosum* (L.) Spach	
Quercus Coccifera L.	10 cm	2m	Yes	2	*Cistuscreticus* L. *Sarcopoterium Spinosum* (L.) Spach	
Quercus Coccifera L.	12 cm	2m	No	_	*Cistuscreticus* L. *Sarcopoterium*	

					Spinosum (L.) Spach	
Quercus Coccifera L.	20 cm	3m	Yes	2		
Quercus Coccifera L.	25cm	2m	Yes	Multiple (8 or more)	*Cistuscreticus* L. *Sarcopoterium spinosum (*L.) Spach	Very branched
Quercus Coccifera L.	30cm	4m	Yes	20	*Cistuscreticus* L. *Sarcopoterium Spinosum (*L.) Spach	branched
2 (Quercus Coccifera L.)	40 cm , 25 cm, 25cm	4m	N0	-	Cistuscreticus L. Sarcopoterium Spinosum (L.) Spach	Very branched
2 (Quercus Coccifera L.)	40cm ,25 cm	4.5m	Yes	3	*Helichrysum Sanguineum*(L.) Kosel ,*Cistus Creticus* L. , *Sarcopoterium spinosum (L.) Spach*.	*Cistus creticus* is very common
Quercus Coccifera L.	5 cm , 5cm	1.5m	Yes	1	*Cistuscreticus* L. *Sarcopoterium spinosum* (L.) Spach.	Cistus very common
Quercus Coccifera L.	4 (25,15,15,7)	3m	Yes	2	*Cistuscreticus* L. *Helichrysum Sanguineum* (L.) Kosel, *Sarcopoterium Spinosum* (L.) Spach.	
Quercus Coccifera L.	3cm	1m	No	-	*Cistuscreticus* L.	
Quercus Coccifera L.	(10,10,5,3) cm	2m	Yes	3		
Quercus Coccifera L.	(10,10,10,10,10,15) cm	3m	Yes	5		
Quercus Coccifera L.	(20,15)cm	2m	No	-	-	-
Quercus Coccifera L.	(7 , 5) cm	2m	No	-	-	-
Pistacia palaestina Boiss.	10cm	2m	Yes	2	*Quercus spp.*	
Quercus Coccifera L.	(20, 10, 5 , 3)cm	3m	Yes	3		
Quercus Coccifera L.	(20, 10, 30)cm	3m	Yes	10	*Teucrium*	

					Divaricatum Sieber ex Heldr.	
Pinus halepensis Mill.	40 cm	10m	Yes	1		branched
Pistacialentiscus L.	10cm	1.5m	No	-		Very

Table.14: plot area number 1 in the forest of Wadi Alquf indicating the dominant species, circumference, hight and the regeneration of these species..

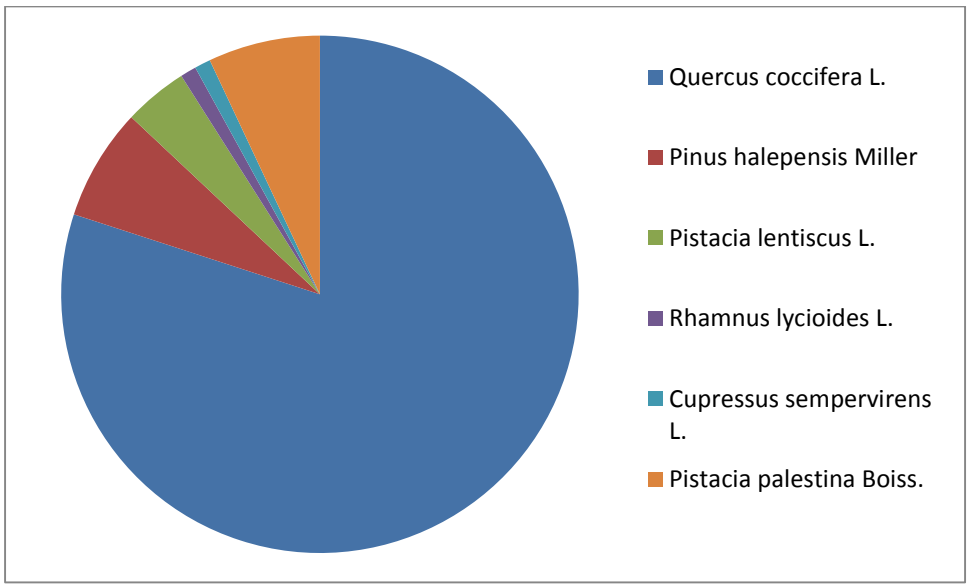


Fig.37: the proportion of the dominant trees in the selected plot area no. 1 in Wadi Alquf

Plot 2: did the 2nd of June 2014 with a total area of 200 m^2 (20X10 m), elevated 576m above the sea level. The position of this area has been determined by the GPS :

Coordinates:

X: 0693412, Y : 3495684

X: 0693406 , Y: 3495697

X: 0693430, Y: 3495704

X: 0693417, Y :3495701

As shown in Table. 15; the dominant species are: *Quercus coccifera* L. 25%, , *Pinus halepensis* Miller 12.5%, and *Cupressus sempervirens* L. 62.5%(fig.38), with the circumference and diameter ranged between 2 cm-1m; the density of the main species is 800 trees/ ha. This plot is representative of the forest stand. There is regeneration only of *Quercus coccifera* L. 100%.

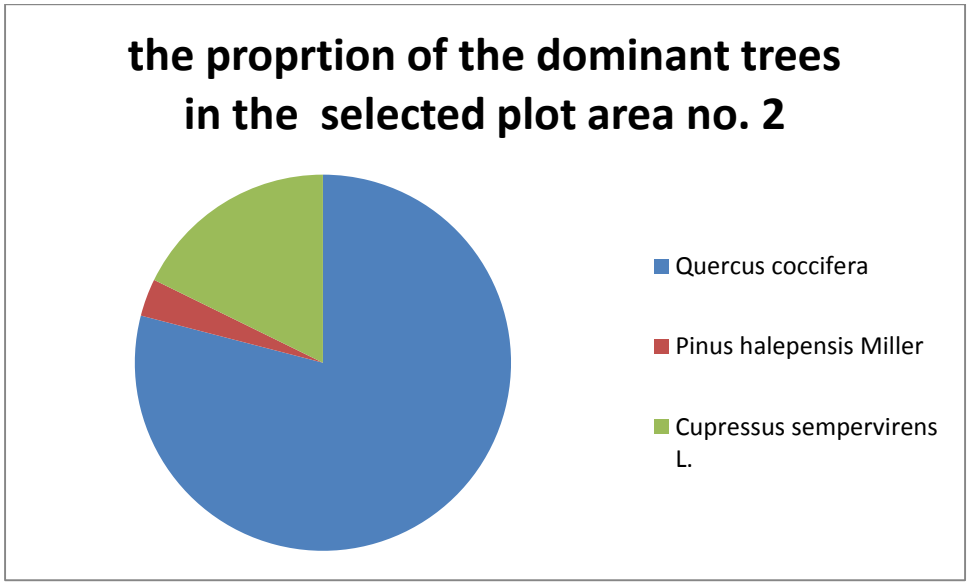


Fig.38: the proportion of the dominant trees in the selected plot area no. 2 in Wadi Alquf

Species	circumference	Height	Regeneration	#of Reg	Other species in the area	Notes
Pinus halapensis Mill.	1m	12m	No		*Cistuscreticus* L.	
Cupressus spp.	55cm	6m	No		*Teucrium divaricatum* Sieber ex Heldr.	
Cupressus spp.	65cm	7m	No			
Cupressus spp.	75cm	10m	No		*Cistuscreticus L.*	
Cupressus spp.	60cm	11m	No			
Cupressus spp.	60cm	11m	No			
Pinus halapensis Mill.	110cm	15m	No		*Teucrium divaricatum* Sieber ex Heldr.	
Cupressus spp.	30cm	1m	No			
Cupressus Sempervirens L.	25cm	3.5m	No			
Cupressus Sempervirens L.	60cm	8m	No		*Thymbra capitata* (L.) Cav., *Teucrium divaricatum* Sieber ex Heldr. *Divaricatum*	
Cupressus Sempervirens L.	60cm	8m	No			
Quercus coccifera L.	40cm	3m	yes	1	*Cistuscreticus* L.	
Quercus coccifera L.	(20,50,30,5,2,2)	3m	yes	3		
Quercus coccifera L.	(20,40,10,20)	4m	yes	5	*Pinus halapensis* Mill.(regenerated)	
Quercus coccifera L.	(7,10,7)	1.5m	yes	5	*Quercus coccifera* L.(regenerated),	
Cupressus Sempervirens L.	30	4m	No			

Table.15: plot area number 2 in the forest of Wadi Alquf indicates the dominant species, circumference, hight and the regeneration of these species..

Wadi Alquf is exposed to heavy snow fall a few years ago, causing breaks down many of the pines and cypresses trees. The management policy does not provide real planned actions, the only actions of intervention within the cultivated areas are devoted to remove crashed trees or branchescaused by the snow or by other random events, in adittion to Fires caused by hikers and throwing the solid waste by citizens in the forest (Fig. 39).

Fig.39: Results of burning waste in the forest

3.1.6 Bani Nai'm:

Altitude: c.a 900m

Coordinates:

31º30'22''(N) 35º08'31''(E)

31º31'53''(N) 35º08'03''(E)

Located in the southern West Bank 8 kilometers east of Hebron-city in the Hebron Governorate with a total of about 0.9 km^2, managed by the Palestinian authorities. It is the protected area falling into the administrative area of Hebron.

The study site in this area has been splitted intp two sub-zones, one at about 960m in a wholly anthropized zone (weastern slopes) with some remnants of Mediterranean maquis. Man made Public area surrounded by huge numbers of olive groves and vineyards.The vegetation is described in a mosaic characterized by small groups of *Quercus coccifera* L. trees, shrubs and herbaceous species as *Styrax officinalis* L. *Pistacia palestina* Boiss (fig. 40) with presence of

Sarcopoterium spinosum (L.) Spach and *Cistus creticus* (L.), *Paronychia palaestina* Eig, *Ruppia maritima* L., *Sinapis alba* L, and *Chiliadenus iphionoides* (Boiss. & C. I. Blanche) Brullo


Fig. 40: olive and oak trees

In this site a circular plot area with total surface of 314 m^2 (10radius) was done the 2nd og June 2014, elevated 960m above the sea level. The position of this area has been determined by the GPS :

Coordinates:

X 0702623; Y 3490469

As shown in Table. 16the dominant species are: *Quercus coccifera* L. 100%, with diameter ranged between 14 cm-20 cm; the density of this species is 96 trees/ ha, This plot andicative of the natural scattered vegetation survived there. Regeneration of *Quercus coccifera* L. (100%) has been observed.

Species	Diameter	Height	Regeneration	Other species in the area	Notes
Quercus coccifera L.	14 cm	3.50 m	yes	*Sarcopoterium spinosum* (L.) Spach and *Cistus creticus* (L.)	
Quercus coccifera L.	17 cm	3.50 m	yes		
Quercus coccifera L.	20 cm	3.80 m	yes		

Table.16: the plot area in Bani Nai'm

The second area is placed on the eastern slopes of Bani Nai'm, in a mountainous arid zone unique in West Bank, facing the eastern side of the Jordan valley(Fig. 41.a). The landscape is considered one of the most beautiful natural areas of Palestine, in a typically of high mountain with the absence of arboreal vegetation cover. Adjacent to the study area there is an eco-tourist

center, with botanical garden owned by the municipality of Bani Nai'm established in 2002-2003(fig. 41.b)

Fig.41: Bani Nai'm, a: the eastern slopes of the Jordan valley, b: the botanical garden of Bani Nai'm.

The date	The activities	Notes
17 April, 2014	- Collecting samples for herbarium and DNA analysis - Records the coordinates	Temp:20.8ºC Moisture: 54% Atmos. Pressure: 893.7
21 May,, 2014	- Collecting samples for herbarium and DNA analysis - Records the coordinates - Plot are	Temp:28ºC Moisture: 82% Atmos. Pressure: 892.3

Table. 17: Activites done in Bani Nai'm

Quarries represent the main human impact on that area, a problem that has become a real threat to human, animal and plant, where a large proportion of these quarries are spreading randomly and disorderly and thoughtfuly, without regard for the environment and sustainable development rules. Many piece of lands are being used as quarries for a period of time and then re-land reclamation and re-planted again (fig. 42)

Fig: 42: Quarries in Bani Naim and their effect for the environment.

The species occurring within the study area are:

Arum palaestinum Boiss., *Asphodelus aestivus* Brot, *Ballota saxatilis* Sieber ex C.Presl, *Ballota undulata* (Sieber ex Fresen.) Benth., *Carlina hispanica* Lam., *Cistus creticus* L., *Ecballium elaterium* (L.) A.Rich, *Echinops adenocaulos* Boiss., *Gundelia tournefortii* L., *Paronychia palaestina* Eig, *Pistacia palestina* Boiss., *Quercus coccefira* L., *Retama raetam (*Forssk.) Webb & Berthel., *Rhamnus lycioides* L., *Rhus coriaria* L., *Salvia dominica* L., *Sarcopoterium spinosum* (L.) Spach, *Sinapis alba* L., *Sinapis arvensis* L., *Styrax officinalis* L. *Suaeda palaestina* Eig & Zohary, *Teucrium capitatum* L. *Thymbra capitata* (L.) Cav., *Thymelaea hirsuta* (L.) Endl., *Tulipa systola* Stapf (fig. 43)

43.a

43.b

43.c

Fi.g.43: some plant species present in Bani Nai'm; a: Gundelia tournefortii L, *b: Ecballium elaterium* (L.) A.Rich, *c: Sarcopoterium spinosum (*L.) Spach,

3.2 DNA barcoding :

3.2.1 Markers' features description:

As shown in Table. 18, the highest amplification rate was observed with *trnH-psbA* (98%), which produced clear, single banded PCR products from all the tested samples except one species (*Smilax aspera* L.), *rbcL* amplifieds 96% of samples, while *matK* amplified only 60%. *rbcL* failed to amplify two species(*Cupressus sempervirens* L. and *Pinus halepensis* Miller) both of them are Gymnosperms. *MatK* failed to amplify 14 samples of the following families :(*Caprifoliaceae*, *Lamiaceae*, *Anacardiaceae*, *Liliaceae*, *Boraginaceae*, *Rosaceae*, *Cupressaceae, Thymelaeaceae,* and *Cucurbitaceae*). PCR products from *rbcL* and *trnH-psbA* were all successfully sequenced. *MatK* demonstrated sensibly lower sequencing rates; and it failed in 14 samples (57%) of families *Primulaceae, Lamiaceaes, Apiaceae, Boraginaceae, Compositae, Lythraceae,* and *Rubiaceae*.

All rbcL sequence was from 610 bp (*Anagallis arvensis* L.) to 720 bp (*Calicotome villosa* (Poir.) Link and *Polygonum arenarium* Waldst. & Kit), in length matK and trnH– psbA sequences varied greatly within the data-set, due to the presence of numerous insertion/deletions. Length range of the matK sequences was from 822 bp (*Sarcopoterium spinosum* (L.) Spach) to 853bp (*Carlina hispanica* Lam. and *Centaurea iberica* Spreng.). Sequences obtained with trnH–psbA ranged from 213 bp (*Astoma seselifolium* DC.) to 645 bp (*Pistacia palestina* Boiss.).

					DNA barcodes				
#	Major clade	Family	Genus	species	Site	Notes	rbcL	matK	trnH-psbA
1	Angiosperm	Lamiaceae	*Ballota*	*saxatilis* Sieber ex C. Presl	Wadi Qana	C	Ok	N.T	ok
2	Angiosperm	Rosaceae	*Sarcopoterium*	*spinosum* (L.) Spach	Bani Naim	CC	Ok	OK	N.T
3	Angiosperm	Rhamnaceae	*Rhamnus*	*Lycioids.* L	wadi ALquf	CC	Ok	OK	N.T
4	Angiosperm	Lamiaceae	*Salvia*	*dominica* L.	Bani Naim	C	Ok	NO	Ok
5	Angiosperm	Lamiaceae	*Salvia*	*judaica* Boiss.	Aljlajil-Bani Naim	C	Ok	NO	Ok
6	Angiosperm	Leguminosae	*Retama*	*raetam* (Forssk.) Webb	wadi alquf	CC	Ok	N.T	Ok
7	Angiosperm	Lamiaceae	*Teucrium*	*capitatum* L.	wadi alquf	F	Ok	Ok	Ok
8	Angiosperm	Rhamnaceae	*Ziziphus*	*spina-christi* (L.) Desf.	Siris	RP	Ok	Ok	N.T
9	Angiosperm	Styracaceae	*Styrax*	*officinalis* L.	Siris	CC	Ok	N.T	Ok
10	Angiosperm	Rosaceae	*Crataegus*	*azarolus* L.	kherbit qeis	RR	Ok	Ok	N.T
11	Angiosperm	Primulaceae	*Anagallis*	*arvensis* L	wadi qana	CC	Ok	bad sequence	Ok
12	Angiosperm	Anacardiaceae	*Pistacia*	*lentiscus* L.	wadi alquf	RP	Ok	NO	Ok
13	Angiosperm	Anacardiaceae	*pistacia*	*palaestina* Boiss	EM ALTuT	RP	Ok	NO	Ok
14	Angiosperm	Lamiaceae	*Ballota*	*undulata* (Sieber ex Fresen.) Benth.	bani naim	C	Ok	bad sequence	Ok
15	Angiosperm	Liliaceae	*Asparagus*	*aphyllus* L.	wadi alquf	C	Ok	N.T	Ok
16	Angiosperm	Compositae	*Carlina*	*hispanica* Lam.	Em ALtut	CC	Ok	Ok	N.T
17	Angiosperm	Liliaceae	*Smilax*	*aspera* L.	wadi alquf	CC	Ok	NO	NO
18	Angiosperm	Lamiaceae	*Salvia*	*fruticosa* Mill.	kherbit qeis	CC	Ok	bad sequence	Ok
19	Angiosperm	Apiaceae	*Astoma*	*seselifolium* DC.	Wadi ALquf	F	Ok	bad sequence	Ok
20	Angiosperm	Apiaceae	*Berula*	*erecta (*Huds.) Coville	Wadi Qana	F	Ok	bad sequence	Ok
21	Angiosperm	Compositae	*Chiliadenus*	*iphionoides* (Boiss. & C.I.Blanche) Brullo	Em Altut	CC	Ok	N.T	Ok
22	Angiosperm	Compositae	*Centaurea*	*iberica* Spreng.	Siris	CC	Ok	OK	N.T
23	Angiosperm	Boraginaceae	*Echium*	*judaeum* Lacaita	wadi Alquf	CC	Ok	bad sequence	Ok
24	Angiosperm	Lamiaceae	*Thymbra*	*capitata* (L.) Cav.	Wadi Alquf	CC	Ok	NO	Ok
25	Angiosperm	Boraginaceae	*Erodium*	*gruinum* (L.) L'Hér.	Wadi Alquf	CC	Ok	NO	Ok
26	Angiosperm	Compositae	*Dittrichia*	*viscosa* (L.) Greuter	Wadi Alquf	CC	Ok	bad sequence	Ok

27	Angiosperm	Lythraceae	*Lythrum*	*hyssopifolia* L.	Wadi Qana	-2	Ok	bad sequence	Ok
28	Angiosperm	Lamiaceae	*Clinopodium*	*serpyllifolium subsp. fruticosum* (L.) Bräuchler	wadi alquf	F	Ok	bad sequence	Ok
29	Angiosperm	Lamiaceae	*Molucella*	*spinosa* L.	Wadi Alquf	F	Ok	NO	Ok
30	Angiosperm	Oleaceae	*Phillyrea*	*latifolia* L.	Siris	RP	Ok	N.T	Ok
31	Angiosperm	Lamiaceae	*Rosmarinus*	*officiniallis* L.	Wadi Alquf		Ok	bad sequence	Ok
32	Angiosperm	Rosaceae	*Rubus*	*sanctus* Schreb.	Wadi Qana	C	Ok	No	Ok
33	Angiosperm	Cucurbitaceae	*Ecballium*	*elaterium* (L.) A.Richard	Bani Naim	C	Ok	No	Ok
34	Angiosperm	Rubiaceae	*Rubia*	*tenuifolia* d'Urv.	Wadi Alquf	C	Ok	bad sequence	Ok
35	Angiosperm	Lamiaceae	*Salvia*	*officinalis* L.	kherbit qeis	C	Ok	bad sequence	Ok
36	Angiosperm	Lamiaceae	*Satureja*	*thymbra* L.	Kherbit Qeis	O	Ok	Ok	N.T
37	Angiosperm	Lamiaceae	*Thymbra*	*spicata* L.	Kherbit Qeis	F	Ok	N.T	Ok
38	Angiosperm	Thymelaeaceae	*Thymelaea*	*hirsuta* (L.) Endl.	Bani Naim	R	Ok	No	Ok
39	Angiosperm	Lamiaceae	*Vitex*	*agnus-castus* L.	kherbit qeis	F	Ok	N.T	Ok
40	Angiosperm	Compositae	*Cota*	*palaestina* Kotschy	Atara-Jenin		Ok	N.T	Ok
41	Angiosperm	Polygonaceae	*Polygonum*	*arenarium* Waldst. & Kit.	aljdayde-Jenin		Ok	N.T	Ok
42	Angiosperm	Fabaceae	*Medicago*	*orbicularis* (L.) Bartal.	Sanour-Jenin		Ok	N.T	Ok
43	Angiosperm	Compositae	*Helichrysum*	*sanguineum* (L.) Kosel.	Em Altut	C	Ok	N.T	Ok
44	Angiosperm	Moraceae	*Ficus*	*sycumrous* L.	Jericho		Ok	N.T	Ok
45	Angiosperm	Compositae	*Anthemis*	*cotula* L.	Atara-Jenin		Ok	N.T	Ok
46	Angiosperm	Fabaceae	*Calicotome*	*villosa* (Poiret) Link	Atara-Jenin		Ok	N.T	Ok
47	Angiosperm	Primulaceae	Anagallis	arvensis L.	Atara-Jenin		Ok	N.T	Ok
48	Angiosperm	Anchusa	azurea Mill.	*tinctoria* (L.)Tausch	Atara-Jenin		Ok	N.T	Ok
49	Angiosperm	Fabaceae	*Medicago*	*scutellata (L.) Mill.*	Sanour-Jenin	C	Ok	N.T	Ok
50	Gymnosperm	Cupressaceae	Cupressus	*sempervirens* L.	Wadi alquf	C	No	NO	Ok
51	Gymnosperm	Pinaceae	*Pinus*	*halepensis* Mill.	Kherbit qeis	RP	No	N.T	Ok
52	Angiosperm	Caprifoliaceae	*Lonicera*	*etrusca* G Santi	Bani Naim	C	Ok	NO	Ok
53	Angiosperm	Compositae	*Phagnalon*	*rupestre* (L.) DC.	Bani Naim	C	Ok	Ok	N.T
54	Angiosperm	Rosaceae	*Pyrus*	*syriaca* Boiss.	Wadi Qana	RP	Ok	N.T	Ok
55	Angiosperm	Primulaceae	*Cyclamen*	*persicum* Mill.	Wadi ALquf	CC	Ok	N.T	Ok

Table.18: Molecular results of tested samples with rbcL, matK, and trnT.

3.2.2 GenBank assessment :

As a first step, GenBank was investigated for the presence of the species sequences relatively to the used markers. A high percentage of the specimen in my data-set are present at the level of genus (the same ability to identify the samples for both of *rbcL* and *trnH*-psbA)compared with species level, but the contrary regarding to the *rbcL* (47%), *matK* showed low ability to identify my samples at the species and genus level compared with *rbcL* and *trnH-psbA*

Marker	Spp level	Genus level	Family level
RbcL	25/53	24/53	2/53
MatK	1/21	6/21	7/21
TrnH	16/45	20/45	7/45

Table.19: pecimens present in GenBank at the species and genus level for each locus and ability of the barcoding markers to identify the sample.

Table.20 shows all the speciemens data-set and their matching in NCBI. As we can see some of samples gave matching at the family level, the reason of this being, that the NCBI data base does not include these species/genera for matching them (e.g *Phagnalon rupestre* (L.) DC. is not tested with matK on the data base at the level of species itself or just genus level, while *Satureja thymbra* L. tested with matK mixed with other primer), (*Chiliadenus iphionoides* (Boiss. & C. I. Blanche) Brullo is not tested with rbcL on the data base at the level of species itself or just genus level), (*Cyclamen persicum* Miller, Berula erecta (Huds.) Coville., *Chiliadenus iphionoides* (Boiss. & C. I. Blanche, *Moluccella spinosa* L, *Thymelaea hirsuta* (L.) End, *Calicotome villosa* (Poir.) Link are not tested with *trnH-psbA* at the level of species itself or just genus level), however; *Astomaea seselifolia* (DC.) Rauschert is not present as species or just genus in NCBI data base.

				NCBI match			
Family	**Species name**	**Site**	**Presence in NCBI**	**RbcL**	**MatK**	**trnH-psbA**	**Notes**
Lamiaceae	*Ballota saxatilis* Sieber ex C. Presl	Wadi Qana	No	highest match with *Ballota nigra*,(99%)	N.T	highest match with A. *Ballota nigra* subsp. *Meridionalis*,92% the same genus	The species is not present on GenBanK and the match was with the correct genus
Primulaceae	*Anagallis arvensis* L.	wadi qana	Yes	Yes	Bad sequence	Yes	
Compositae	*Centaurea iberica* Spreng.	Siris	YES	yes	highest match with *Centaurea melitensis* 99% the same genus	N.T	
Cucurbitaceae	*Ecballium elaterium* (L.) A.Richard	Bani Naim	Yes	Yes	No	highest match with *Ecballium elaterium* subsp. Elaterium trnH 94%	
Compositae	*Helichrysum sanguineum* (L.) Kosel.	Em Altut	Yes	highest match with *Helichrysum stoechas*, 98% the same genus	N.T	highest match with *Helichrysum stoechas* the same genus 95%	
Caprifoliaceae	*Lonicera etrusca* G Santi	Bani Naim	Yes	highest match with *Lonicera japonica*, 99% the same genus	No	highest match with *Lonicera hirsuta* 97% the same genus	
Compositae	*Phagnalon rupestre* (L.) DC.	Bani Naim	Yes	highest match with *Phagnalon niveum* 99% the same genus	highest match with *Athrixia phylicoides* 99% the same family	N.T	

Rosaceae	*Pyrus syriaca* Boiss.	Wadi Qana	Yes	highest match with *Pyrus syriaca* voucher 489-54A rbcL 98%	N.T	highest match with *Pyrus spinosa*, the same genus	
Primulaceae	*Cyclamen persicum* Mill.	Wadi Alquf	YES	YES	N.T	highest match with *Ardisia thyrsiflora* 91% the same family	
Rosaceae	*Sarcopoterium spinosum* (L.) Spach	Bani Naim	Yes	highest match with *Sanguisorba minor* 99% the same genus	highest match with *Sanguisorba minor* 99% the same genus	N.T	
Rhamnaceae	*Rhamnus lycioids* L.	wadi Alquf	YES/genus	YES	highest match with Rhamnus cathartica 99% the same genus	N.T	
Lamiaceae	*Salvia dominica* L.	Bani Naim	Yes/genus	highest match with *Salvia officinalis* 99% the same genus	No	highest match with *Salvia sclarea* 95% the same genus	
Lamiaceae	*Salvia judaica* Boiss.	Aljlajil-Bani Naim	Yes/genus	highest match with *Salvia dentata* 99% the same genus	No	highest match with *Salvia sclarea* 92% the same genus	
Leguminosae	*Retama raetam* (Forssk.) Webb	wadi alquf	Yes	High match with *Ephedra aphylla*	N.T	High match with *Ephedra equisetina* 92%	
Lamiaceae	*Teucrium capitatum* L.	wadi alquf	Yes	highest match with *Teucrium heterophyllum* 99% the same genus	high match with *Teucrium scorodonia* 99% the same genus	N.T	
Rhamnaceae	*Ziziphus spina-christi* (L.) Desf.	Siris	YES	YES	highest match with *Ziziphus spina-christi* voucher Hosam00003 matK	N.T	yes
Styracaceae	*Styrax officinalis* L.	Siris	YES	YES	N.T	highest match with *Styrax suberifolius* 94% the same	

						genus	
Rosaceae	*Crataegus azarolus* L.	kherbit qeis	yes	Yes	highest match with *Crataegus monogyna* 98% the same genus	N.T	The species is not present on GenBanK and the match was with the correct genus
Anacardiaceae	*Pistacia lentiscus* L.	wadi alquf	Yes	highest mach with *Pistacia chinensis* 99% the same genus	No	Yes	
Anacardiaceae	*pistacia palaestina* Boiss	EM ALTuT	No	highest mach with *Pistacia chinensis* 99% the same genus	NO	Pistacia t*erebinthus* subsp. *Palaestina* 99% the same genus	The species is not present on GenBanK and the match was with the correct genus
Lamiaceae	*Ballota undulata* (Sieber ex Fresen.)	bani naim	Yes	highest match with |*Ballota nigra*, 99% the same genus	Bad sequence	highest match with 96% with *Ballota nigra* subsp. Meridionalis the same genus	
Liliaceae	*Asparagus aphyllus* L.	wadi alquf	Yes	highest match with *Asparagus suaveolens* the same genus	N.T	Higest match with *Asparagus aethiopicus* 99% the same genus	
Compositae	*Carlina hispanica* Lam.	Em Altut	Yes	highest match with *Carlina vulgaris* 99% the	highest match with *Carlina vulgaris* 99% the	N.T	

				same genus	same genus		
Liliaceae	*Smilax aspera* L.	wadi alquf	Yes	Yes	NO	No	
Lamiaceae	*Salvia fruticosa* Mill.	kherbit qeis	Yes	YES	Bad sequence	highest match with *Salvia fruticosa* voucher PS0151MT01 99%	
Apiaceae	*Astomaea seselifolia* (DC.) Rauschert.	Wadi ALquf	No	highest match with *Dasispermum suffruticosu* 99% the same family	Bad sequence	Highest match with *Hellenocarum amplifolium* 98% the same family	The species is not present on GenBanK and the match was with the correct genus
Apiaceae	*Berula erecta* (Huds.) Coville	Wadi Qana	YES	YES	Bad sequence	Highset match with *Tiedemannia filiformis* 95% the same family	
Compositae	*Chiliadenus iphionoides (* Boiss. & C.I.Blanche *)* Brullo	Em Altut	Yes	highest match with *Dittrichia viscosa* 99% the same family	N.T	highest match with *Dittrichia viscosa* 99% the same family	
Boraginaceae	*Echium judaeum* Lacaita	wadi Alquf	Yes/genus	highest match with *Echium simplex* 99% the same genus	Bad sequence	highest match with *Echium vulgare* subsp. *Vulgare* 94% the same genus	
Lamiaceae	*Thymbra capitata* (L.) Cav.	Wadi Alquf	Yes	Highest match with *Thymbra capitata* voucher MIB:zpl:04829	No	yes	
Boraginaceae	*Erodium gruinum* (L.) L'Hér.	Wadi Alquf	YES	YES	NO	YES	
Compositae	*Dittrichia viscosa* (L.) Greuter	Wadi Alquf	YES	YES	Bad sequence	highest match with *Dittrichia viscosa* voucher Trift et al. 22 (S) PsbA (psbA) gene	

Lythraceae	*Lythrum hyssopifolia* L.	Wadi Qana	YES	YES	Bad sequence	high match with *Lythrum salicaria* 94% the same genus	
Lamiaceae	*Clinopodium serpyllifolium subsp. fruticosum* (L.) Bräuchler	wadi alquf	Yes	highest match with *Clinopodium vulgare* 99% the same genus	Bad sequence	highest match with *Clinopodium chinense* 94% the same genus	
Lamiaceae	*Moluccella spinosa* L.	Wadi Alquf	yes	highest match with *Moluccella laevis* 94% the same genus	NO	highest match with *Lamium garganicum* 94% the same family	
Oleaceae	*Phillyrea latifolia* L.	Siris	Yes	highest mach with *Phillyrea angustifolia* 99% the same genus	N.T	yes	
Lamiaceae	*Rosmarinus* spp.	Wadi Alquf	Yes	highest match with *Teucrium parviflorum* Schreb., 99% the same family	N.T	highest match with *Teucrium parviflorum* Schreb. 94% the same family	
Rosaceae	*Rubus sanctus* Schreb		YES	highest match with *Rubus caesius* 99% the same genus	NO	highest match with *Rubus ulmifolius* 91% the same genus	
Rubiaceae	*Rubia tenuifolia* d'Urv	Wadi Alquf	No	highest match with *Rubia agostinhoi* 99% the same genus	Bad sequence	highest match with *Rubia tinctorum* 94% the same genus	The species is not present on GenBanK and the match was with the correct genus
Lamiaceae	*Salvia officinalis* L.	kherbit qeis	YES	YES	Bad sequence	Yes	and with other markers

Lamiaceae	*Satureja thymbra* L.	Kherbit Qeis	yes	highest match with *Clinopodium menthifolium subsp. ascendens* 99% the same genus	highest match with *Marrubium vulgare* 99% the same family	N.T	
Lamiaceae	*Thymbra spicata* L.	Kherbit Qeis	Yes	Yes	NO	Yes	
Thymelaeaceae	*Thymelaea hirsuta* (L.) Endl.	Bani Naim	YES	YES	NO	highest match with *Wikstroemia indica* 84% the same family	
Lamiaceae	*Vitex agnus-castus* L.	kherbit qeis	YES	YES	NO	highest match with *Vitex negundo* 99% the same genus	
Compositae	*Cota palaestina* Kotschy	Atara-Jenin	Yes/genus	highest match with *Anthemis cotula* 99% the same genus	N.T	highest match with *Anthemis arvensis* 99% the same genus	
Polygonaceae	*Polygonum arenarium* Waldst. & Kit.	aljdayde-Jenin	Yes	highest match with *Polygonum rurivagum* 99% the same genus	N.T	highest match with *Polygonum aviculare* 995 the same genus	
Fabaceae	*Medicago orbicularis* (L.) Bartal.	Sanour-Jenin	Yes	highest match with *Medicago polymorpha* 99% the same genus	N.T	highest match with *Medicago sativa* 97% the same genus	
Moraceae	*Ficus sycumrous* L.	Jericho	Yes/genus	Yes	N.T	yes	markers
Compositae	*Anthemis cotula* L.	Atara-Jenin	yes	Yes	N.T	yes	
Fabaceae	*Calicotome villosa* (Poiret) Link	Atara-Jenin	Yes	Yes	N.T	highest match with *Lupinus luteus* 89% the same family	
Compositae	*Anagallis arvensis* L.	Atara-Jenin	Yes	YES	N.T	YES	
Boraginaceae	*Anchusa azurea* Mill.	Atara-Jenin	Yes	Highest match with yes with *Anchusa officinalis* 98%	N.T	highest match with *Anchusa leptophylla* the same genus 92%	

				the same genus			
Fabaceae	*Medicago scutellata* (L.) Mill.	Sanour-Jenin	Yes	Yes	N.T	Yes	
Cupressaceae	Cupressus sempervirens L.	Wadi alquf	Yes	NO	NO	Yes	
Pinaceae	*Pinus halepensis* Mill.	Kherbit qeis	Yes	No	N.T	Yes	

Table. 20: DNA barcoding results of the matching specimens in the data-set and NCBI data base, Abundance: CC = Very Common, C = Common, RP= Potentially Rare, R = Rare, RR= Very Rare (1 to 30 sites), Endemism: P= Historic Palestine, N.T= not tested

3.3 Herbarium:

All the herbarium samples produced in this work are collected preserved in both of Alquds and TUSCIA universities, to be considered as documentation of some Palestinian plant samples, the herbarium samples contributed to prepare the initial checklist of the selected sites and describe the habitate, the ecosystem and the plant community is growing in the same area, In addition, the correct and standard scientific names were checked and fixed, in those instances where some plants species names used by botanists in Palestine are considered synonym: *Papaver syriacum* Boiss. & C. I. Blanche (= *Papaver umbonatum* Boiss.), *Quercus calliprinos* Webb (= of *Quercus coccifera* L.), *Anthemis palaestina* (Kotschy) Boiss. (= *Cota palaestina* Kotschy), *Crataegus aronia* (L.) DC. (= *Crataegus azarolus* L.), and many others . Table 21.

Scientific Name	Family	Synonym	arabic name	common name	Locality	District	Date	Identifier	Collector
Anagallis arvensis L.	*Primulaceae*	*Anagallis latifolia* L.	Ein alqut عين القط	Poor man's weatherglass	Wadi Qana	Selfit	22/05/2014	Dr. Khaled Swallha	Nisreen Al-Qaddi
Anagallis arvensis L.	*Primulaceae*	*Anagallis latifolia* L.	Ein alqut عين القط	Poor man's weatherglass	Atara	Jenin	23/04/2015	DNA barcode	Dr.Khaled Swalha
Arbutus andrachne L.	*Ericaceae*		Qaiqab القيقب	Strawberry tree sp.	Wadi Al-Quf	Hebron	04/06/2014	Michela Celestini	Nisreen Al-Qaddi
Arbutus andrachne L.	*Ericaceae*		Qaiqab القيقب	Strawberry tree sp.	Kherbit Qeis	Selfit	04/06/2014	Michela Celestini	Nisreen Al-Qaddi
Arum palaestinum Boiss.	*Araceae*	Arum magdalenae Sprenger, Arum sanctum Dammer	Allouf Alflastini اللوف الفلسطيني	Palestine Arum	Wadi Qana	Selfit	10/05/2014	Michela Celestini	Nisreen Al-Qaddi
Asparagus aphyllus L.	*Asparagaceae*		Heleewen Al-Harsh الهلوين	Prickly asparagus	Wadi Al-Quf	Hebron	21/05/2014	Michela Celestini	Nisreen Al-Qaddi
Asparagus aphyllus L.	*Asparagaceae*		Heleewen Al-Harsh الهلوين	Prickly asparagus	Wadi Al-Quf	Hebron	13/09/2014	Michela Celestini	Nisreen Al-Qaddi
Atriplex halimus L.	*Chenopodiaceae*	*Atriplex halimoides* Tineo	Qataf القطف	tall shrubby orache	Jordan valley		23/05/2014	Michela Celestini	Michela Celestini
Ballota saxatilis Sieber ex C. Presl	*Lamiaceae*		Dana sakhrie دانه صخريه	rock horehound	Wadi Qana	Selfit	10/05/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Ballota undulata (Sieber ex Fresen.) Benth.	*Lamiaceae*	*Marrubium undulatum* Sieber ex Fresen., Marrubium crispum Sieber ex Boiss.	Rasa or Asghan رسا او أسغان	Black Horehound	Bani Naim	Hebron	21/05/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Carlina hispanica Lam.	*Compositae*	*Carlina corymbosa* subsp. *hispanica* (Lam.) O. Bolòs & Vigo	Sak al'rous or zand al'bd ساق العروس او زند العبد	Corymbed Carline Thistle	Em Al-tut	Jenin	04/06/2014	Michela Celestini	Nisreen Al-Qaddi
Centaurea iberica Spreng.	*Compositae*		Murar sha'e مرار شائع	Iberian centaury	Siris	Jenin	22/05/2014	Michela Celestini	Nisreen Al-Qaddi
Ceratonia siliqua L.	*Fabaceae*		kharrub خروب	carob, St. John's-Bread	Siris	Jenin	14/06/2014	Michela Celestini	Nisreen Al-Qaddi
Ceratonia siliqua L.	*Fabaceae*		kharrub خروب	carob, St. John's-Bread	Em Al-tut	Jenin	04/06/2014	Michela Celestini	Nisreen Al-Qaddi
Cistus creticus (L.)	*Cistaceae*	*Cistus incanus* L., *Cistus villosus* L.	Lubad ahmar لباد أحمر	soft-hairy rockrose, pink rockrose	Wadi Al-Quf	Hebron	02/06/2014	Michela Celestini	Nisreen Al-Qaddi
Cupressus sempervirens L.	*Cupressaceae*	*Cupressus sempervirens* var. *horizontalis* (Mill.) Loudon, *Cupressus sempervirens* var. *pyramidalis* (O. Targ. Tozz.) Nyman	Sarw سرو	Mediterranean cypress	Bani Naim	Hebron	17/04/2014	Michela Celestini	Nisreen Al-Qaddi
Cupressus sempervirens L.	*Cupressaceae*	*Cupressus sempervirens* var. *horizontalis* (Mill.) Loudon, *Cupressus sempervirens* var. *pyramidalis* (O. Targ. Tozz.) Nyman	Sarw سرو	Mediterranean cypress	Wadi Al-Quf	Hebron	21/05/2014	Michela Celestini	Nisreen Al-Qaddi
Cupressus sempervirens L.	*Cupressaceae*	*Cupressus sempervirens* var. *horizontalis* (Mill.) Loudon, *Cupressus sempervirens* var. *pyramidalis* (O. Targ. Tozz.) Nyman	Sarw سرو	Mediterranean cypress	Kherbit Qeis	Selfit	04/06/2014	Michela Celestini	Nisreen Al-Qaddi
Cyclamen persicum Miller.	*Primulaceae*	*Cyclamen latifolium* Sibth. & Sm., *Cyclamen vernale* Mill.	Karn Alghazal قرن الغزال	Persian Cyclamen	Wadi Al-Quf	Hebron	17/04/2014	Michela Celestini	Nisreen Al-Qaddi
Cyperus distachyos All.	*Cyperaceae*	*Cyperus laevigatus* subsp. *distachyos* (All.) Ball	Alsa'd السعد		Qana		22/05/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Cyperus fuscus L.	*Cyperaceae*	*Cyperus mucronatus* Rottb.	Alsa'd Alboni	brown galingale	Wadi Qana	Selfit	15/09/2014	Dr.	Nisreen

			السعد البني					Ghadeer Omar	Al-Qaddi
Daucus carota L.	*Apiaceae*	Daucus gingidium L.	Jazar bari جزر بري	Wild carrot, Bird's nest	Kherbit Qeis	Selfit	10/05/2014	Michela Celestini	Nisreen Al-Qaddi
Diplotaxis viminea (L.) DC.	*Brassicaceae*	*Sisymbrium vimineum* L., *Arabis longistyla* Rech. f., *Diplotaxis prolongoi* Boiss., Diplotaxis viminea var. integrifolia Guss.		Vineyard Wall-rocket	Wadi Al-Quf	Hebron	24/05/2014	Michela Celestini	Nisreen Al-Qaddi
Ecballium elaterium (L.) A. Richard	*Cucurbitaceae*		Faquos Alhameer فقوس الحمير	Squirting cucumber,Exploding cucumber	Bani Naim	Hebron	04/08/2014	Dr. Khaled Swallha	Nisreen Al-Qaddi
Helichrysum sanguineum (L.) Kosel.	*Compositae*	*Gnaphalium sanguineum* L.	dam al-Massiah دم المسيح	Red Everlasting, Red cudweed	Em Al-tut	Jenin	22/05/2014	Michela Celestini	Nisreen Al-Qaddi
Helichrysum sanguineum (L.) Kosel.	*Compositae*	*Gnaphalium sanguineum* L.	dam al-Massiah دم المسيح	Red Everlasting, Red cudweed	Kherbit Qeis	Selfit	04/06/2014	Michela Celestini	Nisreen Al-Qaddi
Lonicera etrusca G. Santi	*Caprifoliaceae*		Abhar Asal عبهر عسل	Etruscan Honeysuckle	Bani Naim	Hebron	03/08/2014	Dr. Khaled Swallha	Nisreen Al-Qaddi
Malcolmia chia (L.) DC.	*Cruciferae (Brassicaceae)*	*Cheiranthus lyratus* Sm., *Malcolmia lyrata* (Sm.) Sm., *Malcolmia micrantha* Boiss. & Reut., *Wilckia chia* (L.) Halácsy		Chian Stock, Chian Malcolmia	Wadi Al-Quf	Hebron	21/05/2014	Michela Celestini	Nisreen Al-Qaddi
Papaver umbonatum Boiss.	*Papaveraceae*	*Papaver subpiriforme* Fedde, *Papaver syriacum* Boiss. & C. I. Blanche, *Papaver stylatum* subsp. *platylophum Bornm.*	Aldahnoon الدحنون	Corn poppy	Wadi Qana	Selfit	22/05/2014	Michela Celestini	Nisreen Al-Qaddi
Phagnalon rupestre (L.) DC.	*Compositae*	*Conyza rupestris* L., *Phagnalon spathulatum* Cass., nom. illeg.	Hadak الحدق	African fleabane	Wadi Al-Quf	Hebron	02/06/2014	Michela Celestini	Nisreen Al-Qaddi
Phillyrea latifolia L.	*Oleaceae*	*Olea latifolia* (L.) Salisb, *Olea latifolia* (L.) Salisb and other	alfarze الفرزه	Green Olive Tree	Siris	Jenin	27/09/2014	Michela Celestini	Nisreen Al-Qaddi
Pinus halepensis Miller	*Pinaceae*	*Pinus ceciliae* Llorens & L. Llorens, *Pinus maritima* Mill.	Al-Sanawbar el hhalab الصنوبر الحلبي	Aleppo pine	Wadi Al-Quf	Hebron	21/05/2014	Michela Celestini	Nisreen Al-Qaddi
Pinus halepensis Miller	*Pinaceae*	*Pinus ceciliae* Llorens & L. Llorens, *Pinus maritima* Mill.	Al-Sanawbar el hhalab الصنوبر الحلبي	Aleppo pine	Em Al-tut	Jenin	14/06/2014	Michela Celestini	Nisreen Al-Qaddi
Pinus halepensis Miller	*Pinaceae*	*Pinus ceciliae* Llorens & L. Llorens, *Pinus maritima* Mill.	Al-Sanawbar el hhalab الصنوبر الحلبي	Aleppo pine	Em Al-tut	Jenin	04/06/2014	Michela Celestini	Nisreen Al-Qaddi
Pinus halepensis Miller	*Pinaceae*	*Pinus ceciliae* Llorens & L. Llorens, *Pinus maritima* Mill.	Al-Sanawbar el hhalab الصنوبر الحلبي	Aleppo pine	Kherbit Qeis	Selfit	04/06/2014	Michela Celestini	Nisreen Al-Qaddi
Pinus halepensis Miller	*Pinaceae*	*Pinus ceciliae* Llorens & L. Llorens, *Pinus maritima* Mill.	Al-Sanawbar el hhalab الصنوبر الحلبي	Aleppo pine	Kherbit Qeis	Selfit	12/05/2014	Michela Celestini	Nisreen Al-Qaddi
Pistacia lentiscus L.	*Anacardiaceae*		Botom mistiki بطم مستكي	Mastic tree, Lentisc	Siris	Jenin	14/06/2014	Michela Celestini	Nisreen Al-Qaddi
Pistacia lentiscus L.	*Anacardiaceae*		Botom mistiki بطم مستكي	Mastic tree, Lentisc	Em Al-tut	Jenin	04/06/2014	Michela Celestini	Nisreen Al-Qaddi
Pistacia palestina	*Anacardiaceae*		Botom Falastini بطم فلسطيني	Palestine pitachio	Wadi Al-Quf	Hebron	02/06/2014	Michela Celestini	Nisreen Al-Qaddi

Boiss.									
Pistacia palestina Boiss.	*Anacardiaceae*		Botom Falastini بطم فلسطيني	Palestine pitachio	Kherbit Qeis	Selfit	04/06/2014	Michela Celestini	Nisreen Al-Qaddi
Plantago lagopus L.	*Plantaginaceae*	*Plantago eriostachya* Ten., *Plantago lusitanica* L., *Plantago lagopus* subsp. *cylindrica* (Boiss.) Franco	Lisan alhamal al'rnabi لسان الحمل الأرنبي	Round-headed plantain, Mediterranean	Wadi Qana	Selfit	22/05/2014	Michela Celestini	Nisreen Al-Qaddi
Pyrus syriaca Boiss.	*Rosaceae*	*Pyrus glabra* Boiss., *Pyrus nobilis* Kotschy, *Pyrus syriaca* subsp. *glabra* (Boiss.) Browicz	Ajas bari أجاص بري	Syrian Pear	Wadi Al-Quf	Hebron	17/04/2014	Michela Celestini	Nisreen Al-Qaddi
Quercus coccifera L.	*Fagaceae*	*Quercus calliprinos* Webb, *Quercus aquifolia* Kotschy ex A. DC. And others	Balout, sindyan (evregreen) بلوط أو سنديان دائم الخضره	kermes Oak, Palestine oak	Kherbit Qeis	Selfit	04/06/2014	Michela Celestini	Nisreen Al-Qaddi
Quercus coccifera L.	*Fagaceae*	*Quercus calliprinos* Webb, *Quercus aquifolia* Kotschy ex A. DC. And others	Balout, sindyan (evregreen) بلوط أو سنديان دائم الخضره	kermes Oak, Palestine oak	Siris	Jenin	04/06/2014	Michela Celestini	Nisreen Al-Qaddi
Quercus coccifera L.	*Fagaceae*	*Quercus calliprinos* Webb, *Quercus aquifolia* Kotschy ex A. DC. And others	Balout, sindyan (evregreen) بلوط أو سنديان دائم الخضره	kermes Oak, Palestine oak	Wadi Al-Quf	Hebron	02/06/2014	Michela Celestini	Nisreen Al-Qaddi
Quercus coccifera L.	*Fagaceae*	*Quercus calliprinos* Webb, Quercus *aquifolia Kotschy* ex A. DC. And others	Balout, sindyan (evregreen) بلوط أو سنديان دائم الخضره	kermes Oak, Palestine oak	Bani Naim	Hebron	21/05/2014	Michela Celestini	Nisreen Al-Qaddi
Quercus coccifera L.	*Fagaceae*	*Quercus calliprinos* Webb, *Quercus aquifolia* Kotschy ex A. DC. And others	Balout, sindyan (evregreen) ب بلوط أو سنديان دائم الخضره	kermes Oak, Palestine oak	Wadi Al-Quf	Hebron	17/04/2014	Michela Celestini	Nisreen Al-Qaddi
Quercus coccifera L.	*Fagaceae*	*Quercus calliprinos* Webb, *Quercus aquifolia* Kotschy ex A. DC. And others	Balout, sindyan (evregreen) بلوط أو سنديان دائم الخضره	kermes Oak, Palestine oak	Bani Naim	Hebron	21/05/2014	Michela Celestini	Nisreen Al-Qaddi
Quercus coccifera L.	*Fagaceae*	*Quercus calliprinos* Webb, *Quercus aquifolia* Kotschy ex A. DC. And other	Balout, sindyan (evregreen) بلوط أو سنديان دائم الخضره	kermes Oak, Palestine oak	Siris	Selfit	22/05/2014	Michela Celestini	Nisreen Al-Qaddi
Quercus coccifera L.	*Fagaceae*	*Quercus calliprinos* Webb, *Quercus aquifolia* Kotschy ex A. DC. And other	Balout, sindyan (evregreen) بلوط أو سنديان دائم الخضره	kermes Oak, Palestine oak	Em Al-tut	Jenin	22/05/2014	Michela Celestini	Nisreen Al-Qaddi
Quercus coccifera L.	*Fagaceae*	*Quercus calliprinos* Webb, *Quercus aquifolia* Kotschy ex A. DC. And other	Balout, sindyan (evregreen) بلوط أو سنديان دائم الخضره	kermes Oak, Palestine oak	Siris	Selfit	14/06/2014	Michela Celestini	Nisreen Al-Qaddi
Quercus coccifera L.	*Fagaceae*	*Quercus calliprinos* Webb, *Quercus aquifolia* Kotschy ex A. DC. And other	Balout, sindyan (evregreen) بلوط أو سنديان دائم الخضره	kermes Oak, Palestine oak	Wadi Al-Quf	Hebron	02/06/2014	Michela Celestini	Nisreen Al-Qaddi

Quercus coccifera L.	*Fagaceae*	*Quercus calliprinos* Webb, *Quercus aquifolia* Kotschy ex A. DC. And other	Balout, sindyan (evregreen) بلوط أو سنديان دائم الخضره	kermes Oak, Palestine oak	Kherbit Qeis	Selfit	14/06/2014	Michela Celestini	Nisreen Al-Qaddi
Retama raetam (Forssk.) Webb	*Fabaceae*	*Retama duriaei* (Spach) Webb	Qosab, ratam almkanis قصاب أو رتم المكانس	White Broom	Wadi Al-Quf	Hebron	02/06/2014	DNA barcode	Nisreen Al-Qaddi
Rhamnus lycioides L.	*Rhamnaceae*	Rhamnus palaestinus Boiss.	Alsweed Alflastini السويد الفلسطيني	Palestine Buckthorn	Siris	Selfit	14/06/2014	Michela Celestini	Nisreen Al-Qaddi
Rhamnus lycioides L.	*Rhamnaceae*	*Rhamnus palaestinus* Boiss.	Alsweed Alflastini السويد الفلسطيني	Palestine Buckthorn	Bani Naim	Hebron	21/05/2014	Michela Celestini	Nisreen Al-Qaddi
Ricinus communis L.	*Euphorbiaceae*	*Cataputia major* Ludw., *Ricinus africanus* Mill. And other	Kharwa' خروع	Castor Bean, Palma Christi. Gourd	Wadi Al-Quf	Hebron	13/09/2014	Michela Celestini	Nisreen Al-Qaddi
Salvia fruticosa Mill.	*Lamiaceae*	*Salvia triloba* L.f., *Salvia clusii* Jacq. And other	Maariamie مرميه او مريميه	three-leafed sage, trilobasage	Kherbit Qeis	Selfit	04/06/2014	Dr. Khaled Swallha	Nisreen Al-Qaddi
Salvia officinalis L.	*Lamiaceae*		Mariamie bladie مرميهه او ميميه بلديه	Common sage, Garden sage, Kitchen sage	Kherbit Qeis	Selfit	12/04/2014	Dr. Khaled Swallha	Nisreen Al-Qaddi
Salvia judaica Boiss.	*Lamiaceae*		Qas'ein hkalili قصعين خليلي	Judean sage	Kherbit Qeis	Selfit	12/05/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Sarcopoterium spinosum (L.) Spach	*Rosaceae*	*Poterium spinosum* L., *Sanguisorba spinosa* (L.) Bertol., *Pimpinella spinosa* Gaertn.	Natsh نتش	Thorny burnet, Pricky Burnet	Bani Naim	Hebron	21/05/2014	Michela Celestini	Nisreen Al-Qaddi
Satureja thymbra L.	*Lamiaceae*	*Clinopodium thymbra* (L.) Kuntze, *Micromeria thymbra* (L.) Kostel., *Thymbra hirsuta* Pers., and other	Nadgh Albsatin, Krenei نداغ البساتين أو كرينه	Thyme-leaved savory, Pink savory	Kherbit Qeis	Selfit	14/06/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Silene aegyptiaca (L.) L.	*Caryophyllaceae*	*Cucubalus aegyptiacus* L., *Silene atocioides* Boiss., Silene atocion Jacq.	Ahlwan أحلوان	Egyptian Campion	Wadi Al-Quf	Hebron	17/04/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Smilax aspera L.	*Smilacaceae*		Oleak عليق	Common Smilax, Rough Smilax	Wadi Qana	Selfit	22/05/2014	Michela Celestini	Nisreen Al-Qaddi
Smilax aspera L.	*Smilacaceae,*		Oleak عليق	Common Smilax, Rough Smilax	Wadi Al-Quf	Hebron	02/06/2014	Michela Celestini	Nisreen Al-Qaddi
Styrax officinalis L.	*Styracaceae*		umaima, Abhar اميمه أو عبهر	Official Storax	Siris	Selfit	14/06/2014	Michela Celestini	Nisreen Al-Qaddi
Teucrium divaricatum Sieber ex Heldr.	*Lamiaceae*		Jaada mosharafe جعده مشرفه		Wadi Al-Quf	Hebron	02/06/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Teucrium polium L.	*Lamiaceae*	*Chamaedrys polium* (L.) Raf.	Jaada bladia جعده بلديه	Cat-thyme Germander, Felty Germander	Siris	Jenin	14/06/2014	Michela Celestini	Nisreen Al-Qaddi
Teucrium polium L.	*Lamiaceae*	*Chamaedrys polium* (L.) Raf.	Jaada bladia جعده بلديه	Cat-thyme Germander, Felty Germander	Kherbit Qeis	Selfit	14/06/2014	Michela Celestini	Nisreen Al-Qaddi
Thymelaea hirsuta (L.) Endl.	*Thymelaeaceae*	*Daphne hirsuta* (L.) Samp., *Passerina hirsuta* L.	Mithnan مثنان	Yitran, Shaggy Sparrow-Wort	Bani Naim	Hebron	21/05/2014	Michela Celestini	Nisreen Al-Qaddi

Trifolium tomentosum L.	*Fabaceae*	*Amoria tomentosa* (L.) Roskov, *Galearia tomentosa* (L.) C. Presl, *Trifolium curvisepalum* Täckh.	Kreashet Alra'e كريشة الراعي	Woolly Trefoil	Wadi Al-Quf	Hebron	21/05/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Ziziphus spina-christi (L.) Desf.	*Rhamnaceae*	*Rhamnus spina-christi* L.	Sider, Nabak, Doom سدر ـو دوم أو نبق		Siris	Jenin	22/05/2014	Michela Celestini	Nisreen Al-Qaddi
Medicago orbicularis (L.) Bartal.	*Fabaceae*	*Medicago polymorpha* var. *orbicularis* L., *Medicago applanata* Hornem., and other	Alnafl or Alfasa alzria النفل أو الفصه الزرعيه	blackdisk medick, button clover,round-fruited medick	Sanour	Jenin	23/4/2015	DNA barcode	Dr.Khaled Swalha
Cota palaestina Kotschy	*Compositae*	*Anthemis palaestina* (Kotschy) Boiss., *Anthemis syriaca* Bornm., and other	Uqhwan flastini أقحوان فلسطيني	Israel's Chamomile	Atara	Jenin	23/4/2015	Dr.Khaled Swalha	Dr.Khaled Swalha
Calicotome villosa (Poir.) Link	*Fabaceae*		Kandoul قندول	thorny broom, spiny broom	Atara	Jenin	23/4/2015	Dr.Khaled Swalha	Dr.Khaled Swalha
Medicago scutellata (L.) Mill.	*Fabaceae*	*Medicago polymorpha* var. *scutellata* L.	Alfasa Alhurshfia الفصه الحرشفيه	snail medick	Sanour	Jenin	23/4/2015	DNA barcode	Dr.Khaled Swalha
Anchusa azurea Mill.	*Boraginaceae*	*Anchusa italica* Retz., *Buglossum italicum* (Retz.) Tausch, and other			Atara	Jenin	23/4/2015	DNA barcode	Dr.Khaled Swalha
Astoma seselifolium DC.	*Apiaceae*	*Astomaea seselifolia* (DC.) Rauschert			Wadi Al-quf	Hebron	12/10/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Rubia tenuifolia d'Urv.	*Rubiaceae*	*Rubia olivieri* A. Rich.	Alfuwa الفوه	Narrow-leaved Madder	Wadi Al-quf	Hebron	12/10/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Erodium gruinum (L.) L'Hér.	*Geraniaceae*	*Geranium gruinum* L., *Erodium telavivense* Eig	kaff el 'arus, Ibrit Al'guz كف العروس او ابرة العجوز	stork's bill	Wadi Al-quf	Hebron	12/10/2014	Dr.Khaled Swalha	Nisreen Al-Qaddi
Lythrum hyssopifolia L.	*Lythraceae*		Khuthri zofi خثري زوفي	hyssop loosestrife, grass-poly	Wadi qana	Selfit	22/5/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Paronychia sinaica Fresen.	*Caryophyllaceae*	*Paronychia flavescens* Boiss.	Rigl Alhmame Alghzawie رجل الحمامه الغزاويه	Algerian tea, Whitlow-Wort	Wadi Al-quf	Hebron	21/5/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Paronychia argentea Lam.	*Caryophyllaceae*	*Illecebrum paronychia* L., *Paronychia mauritanica* (Schult.) Rothm. & P. Silva, *Plottzia paronychia* (L.) Samp.	Rigl Alhmame , Shwesht Alra'I رجل الحمامه أو شويشة الراعي	Silver nailroot, Silvery Whitlow Wort	Wadi Qana	Selfit	22/5/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Berula erecta (Huds.) Coville.	*Apiaceae*	*Berula angustifolia* Mert. & W. D. J. Koch, *Siella erecta* (Huds.) Pimenov, *Sium angustifolium* L., nom. illeg., *Sium erectum* Huds.	Berula muntasiba البيروله المنتصبه	lesser water-parsnip	Wadi qana	Selfit	22/5/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Alcea acaulis (Cav.) Alef.	*Malvaceae*	*Althaea acaulis* Cav.	alkhutmie Alzahfa الختميه الزاحفه	Stemless Hollyhock	Kherbit Qeis	Selfit	05/10/2014	Dr.Khaled Swalha	Nisreen Al-Qaddi
Anchusa aegyptiaca (L.) DC.	*Boraginaceae*	*Lycopsis aegyptiaca* L.	hemhem masri, dabun حمحم مصري أو دبون	Egyptian Alkanet	Wadi Qana	Selfit	22/5/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Vitex agnus-castus L.	*Lamiaceae*	*Agnus-castus robusta* (Lebas) Carrière, *Vitex agnus* Stokes, and others	Habb al-faqd, shajar alefe	Lilac chastetree, Chasteberry	Kherbit Qeis	Selfit	06/04/2014	Dr. Ghadeer	Nisreen Al-Qaddi

			حب الفقد أو شجرة العفه					Omar	
Chiliadenus iphionoides (Boiss. & C. I. Blanche) Brullo	*Compositae*	Varthemia iphionoides Boiss. & C. I. Blanche, Jasonia iphionoides (Boiss. & C. I. Blanche) Botsch.	Katleea كتيله	Goldy-Locks	Em Al-tut	Jenin	06/02/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Thymbra capitata (L.) Cav.	*Lamiaceae*	*Coridothymus capitatus* (L.) Rchb. f., *Satureja capitata* L., *Thymus capitatus* (L.) Hoffmanns. & Link, *Origanum capitatum* (L.) Kuntze	Za'tar bari زعتر بري	Conehead thyme, Persian-hyssop	Wadi Al-quf	Hebron	06/02/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Micromeria nervosa (Desf.) Benth.	*Lamiaceae*	*Clinopodium nervosum* (Desf.) Kuntze, *Satureja nervosa* Desf., *Micromeria hirsuta* Mazziari ex Nyman, and others			Wadi Al-quf	Hebron	21/5/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Clinopodium serpyllifolium subsp. fruticosum (L.) Bräuchler	*Lamiaceae*	*Micromeria fruticosa* (L.) Druce, Satureja *fruticosa* (L.) Briq, *Melissa fruticosa* L., and other	ashab a-shai, عشب الشاي	White micromeria, White savory and Tea Hyssop	Wadi Al-quf	Hebron	21/5/2015	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Rubus sanctus Schreb.	*Rosaceae*	*Rubus ulmifolius* subsp. *sanctus* (Schreb.) Sudre, nom. illeg., *Rubus sanguineus* Friv., and other		Holy Bramble, Blackberry	Wadi Qana	Selfit	22/5/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Echium judaeum Lacaita	*Boraginaceae*		hemhim Alghour حمحم الغور	Judean Viper's-bugloss	Wadi Al-quf	Hebron	21/5/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Rosmarinus spp.					Wadi Al-quf	Hebron	06/02/2014	DNA barcode	Nisreen Al-Qaddi
Moluccella spinosa L.	*Lamiaceae*	Molucca spinosa (L.) Moench,Chasmonia incisa C. Presl, Moluccella armata Sieber ex Benth.		Spiny molucca	Wadi Al-quf	Hebron	05/10/2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Crataegus azarolus L.	*Rosaceae*	*Crataegus aronia* (L.) DC., *Pyrus azarolus* (L.) Scop., *Oxyacantha azarolus* (L.) Bubani, and others	Za'rur زعرور	Spiny Hawthorn, Neapolitan medlar	Kherbit Qeis	Selfit		Dr. Khaled Swallha	Nisreen Al-Qaddi
Anthemis cotula L.	*Compositae*	*Maruta cotula* (L.) DC., *Anthemis psorosperma* Ten, *Anthemis ramosa* Spreng., *Anthemis cotula* subsp. *psorosperma* (Ten.) Arcang.	Aluqhwan saghir alka's الاقحوان صغير الكأس	Mayweed chamomile	aljdayde	Jenin	23.4.2015	DNa barcode	Dr. Khaled Swallha
Dittrichia viscosa (L.) Greuter	*Compositae*	*Inula viscosa* (L.) Aiton, *Cupularia viscosa* (L.) Godr. & Gren., *Erigeron viscosus* L., *Jacobaea viscosa* (L.) Merino	altayoun الطيون	False yellowhead, Strong-Smelling Inula					
Thymbra spicata L.	*Lamiaceae*		Zaitar زعتر		Kherbit Qeis	Selfit	10.5.2014	Dr. Ghadeer Omar	Nisreen Al-Qaddi
Polygonum arenarium Waldst. & Kit.	*Polygonaceae*				aljdayde	Jenin	23.4.2014	DNA barcode	Dr. Khaled Swallha

Table. 21: Current botanical checklist of all samples were collected from the selected sites, shows the scientific name, family, synonyms, Arabic and English names, all the species with highlighted with red colors are old named resolved names and they are not exist on the official site (http://www.emplantbase.org), the species highlighted with blue color were confirmed by DNA barcode as another species.

The IUCN Red List of Threatened Species provides taxonomic, conservation status and distribution information on plants, fungi and animals that have been globally evaluated using the IUCN Red List Categories and Criteria, This system is designed to determine the relative risk of extinction, and the main purpose of the IUCN Red List is to catalogue and highlight those plants and animals that are facing a higher risk of global extinction (i.e. those listed as Critically Endangered, Endangered and Vulnerable). The IUCN Red List also includes information on plants, fungi and animals that are categorized as Extinct or Extinct in the Wild; on taxa that cannot be evaluated because of insufficient information (i.e., are Data Deficient); and on plants, fungi and animals that are either close to meeting the threatened thresholds or that would be threatened were it not for an ongoing taxon-specific conservation programme (i.e.,are Near Threatened) (http://www.iucnredlist.org).

Biodiversity and Enivronmental Research Center (BERC) prepared in 2002 the Red List of Threatened Plants"of the West Bank and Gaza (Table. 22), that is leading study has attempted to identify the threatened plant species in the West Bank and Gaza based on the available information on these species including their taxonomy, species range, population trends, main habitats, major threats and conservation status. This "Red List" "provides the basic knowledge about the status of biodiversity that can be used by conservation planners and decision-makers to determine priorities and take the necessary conservation actions''. (BERC; 2003), and provides a list of threatened species to be intended as the most complete check-list of the Palestinian menaced flora. This result has been achieved taking into account the taxonomy, conservation status, population trends, main habitats, major threats and distribution of those species. Since this data presently represents the most update survey about the Palestinian flora, it has been considered as reference point to develop and implement the following protocols for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions (DEBPAL2).

Latin Name	Geographical Regions	Abundance	Endemism	Attractivity	Habitat Vulnerability	Dynamics	Blooming Time	English Name
Faidherbia albida (Delile) A. Chev.	HM NN DSA LJV SWB	RP	-	1	-	D	3-4,8-9	White acacia
Acacia farnesiana (L.) Willd.	HM LJV	RP	-	-	-	D	5-9	Acacia
Acacia laeta Benth.	JD HM DSA LJV	RP	-	-	-	ND	4-5, 8-11	Acacia
*Acacia saligna (*Labill.) H. L. Wendl.	JD NM GS	RP	-	-	-	ND	4-5	Acacia
Acacia tortilis (Forssk.) Hayne	JD DSA	RP	-	-	-	ND	6-9	Acacia
Acer obtusifolium Sm.	HM	RP	PSL	1	-	ND	3-5	Maple
Prunus arabica (Olivier) Meikle	JD	RR	-	-	-	ND	1-2	Broom almond
Prunus dulcis (Mill.) D. A. Webb.	NN	RR	P	-	-	ND	1-3	Wild almond
Arbutus andrachne L.	HM NM DSA	RP	-	2	-	D	3-5	Oriental strawberry tree
Balanites aegyptiaca Delile	JD DSA LJV NDT	RP	-	-	-	ND	6-8	Zachum oiltree
Calotropis procera (Aiton) W. T. Aiton	JD DSA LJV NDT	RP	-	-	-	D	3-8	Sedom-apple
Casuarina cunninghamian	NM NDT JD SWB HM LJV GS NN	RP	-	-	-	ND	-	Casuarina
Celtis australis L.	JD HM NM	R	-	-	-	D		European nettle tree
Ceratonia siliqua L.	SWB	RP	-	-	-	ND		Carob tree
Cercis siliquastrum L.	HM NM	RP	-	2	-	D	2-3	Judas tree, redbud
Cordia sinensis Lam.	JD DSA	RR	-	-	-	ND	4-8	Cordia
Crataegus azarolus L.	JD HM NM DSA NDT	RR	-	1	-	D	3-5	Hawthorn, azarole
Crataegus azarolus L.	HM NM	RR	-	1	-	D	3-4	Hawthorn
Cupressus sempervirens L.	HM	RR	-	-	-	ND	3-5	Cypress
Elaeagnus angustifolia L.	HM	RR	-	1	V	ND	4-8	Narrow-leaved

								oleaster
Malus trilobata (Poir.) C. K. Schneid.	NM	RP				ND	3-5	Mountain ash
Eucalyptus camaldulensis Dehnh.	NM HM NN GS	RP	-	-	-	ND	4, 9-10	Gum tree
Ficus bengalensis		R	-	-	-	D	-	Ficus
Ficus carica L.	JD HM NM DSA NDT GS	R	-	-	-	D	-	Fig
Ficus nipeda		R	-	-	-	D	-	Ficus
Ficus pseudo sycomorus	DSA LJV	R	-	-	-	D	4	False Sycamore
Ficus religiosa		R	-	-	-	D		Ficus
Ficus sycomorus L.	NM LJV GS	R	-	-	-	D	6-8	Sycamore
*Fraxinus angustifolia subsp. syriaca (*Boiss.) Yalt.	HM	R	-	-	-	D	3-4	Syrian ash
Haloxylon persicum Bunge	DSA	RP	-	-	-	ND	3-4	Haloxylon, white saxaul
Laurus nobilis	HM NM	RP	-	-	-	D	3-5	Laurel, sweet bay
Maerua crassifolia Forssk.	JD DSA	RR	-	-	-	ND	4-5	Maru
*Moringa peregrina (*Forssk.) Fiori	JD NN DSA	RR	-	1	-	ND	3-5	Moringa
Myrtus communis L.	HM NM	RP	-	1	-	D	6-8	Myrtle
Paliurus spina-christi	HM NM	RR	-	1	-	D	4-6	Jerusalem thorn, Christ's Thorn
Phillyrea latifolia L.	HM NM NDT	RP	-	-	-	D	3-5	Lance-leaved phillyrea
Phoenix dactylifera L.	JD NM DSA LJV GS	RP	-	-	-	ND	3-5	Date palm
Pinus brutia Ten.	HM	RP	-	-	-	ND	4-5	Brutian pine
Pinus halepensis Mill.	HM NM	RP	-	-	-	ND	3-4	Aleppo Pine
Pinus pinea L.	HM NM	RP	-	-	-	ND	3-4	Stone pine
Pistacia atlantica Desf.	JD HM NM DSA NDT	RP	-	-	-	D	2-4	Atlantic pistachio

Pistacia lentiscus L.	HM NM DSA LJV NDT	RP	-	-	-	ND	3-5	Lentisk, mastic tree
Pistacia palaestina Boiss	JD HM NM DSA NDT	RP	-	-	-	D	3-5	Palestinian pistachio, terebinth
Platanus orientalis L.	HM	R	-	-	-	D	4-5	Oriental plane tree
Populus alba L.		RP				ND	2-4	Poplar
Populus euphratica	JD NM NN DSA LJV	R	-	-	-	ND	2-4	Euphrates poplar
Populus nigra L.	NM NDT LJV JD SWB GS HM NN	RP				ND	2-4	Poplar
Prunus cocomilia Ten.	HM	RP	-	1	-	ND	4-5	Bear plum
Pyrus syriaca Boiss.	JD HM NM NDT	RP	-	-	-	D	3-4	Syrian pear
Quercus infectoria subsp. veneris (A. Kern.) Meikle	HM NM	C	-	-	-	D	3-4	Cyprus oak
Quercus coccifera L.	JD HM NM DSA NDT	CC	-	-	-	D	3-4	Kermes oak
Quercus ithaburensis Decne.	HM NM	C	-	-	-	D	2-4	Mt. Tabor oak
Salix acmophylla Boiss.	JD HM NM DSA LJV NDT	RR				D	3-5	Willow
Salvadora persica	JD DSA LJV	RR	-	-	-	ND	1-4	Persian salvadora
Sambucus nigra	HM SWB	RR	-	1	-	D	4	Black-berried elder, common elder
Styrax officinalis L.	HM NM NDT	C	-	1	-	D	4-6	Snowbell, storax
Tamarix amplexicaulis	DSA	RP	-	-	-	ND	3-9	Tamarisk
Tamarix aphylla	JD HM DSA NDT	C	-	-	-	D	8-9	Athel, jointed tamarisk
Tamarix hampeana	GS	RP	-	-	-	D	4-5	Tamarisk
Tamarix jordanis	JD DSA LJV	RP	-	-	-	ND	3-8	Tamarisk

Tamarix nilotica	JD HM NM DSA LJV GS	CC	-	-	-	D	3-9	The Nile tamarisk
Tamarix palaestina	DSA LJV	RP	-	-	-	ND	2-4	Tamarisk
Tamarix parviflora	DSA	RP	-	-	-	ND	3-6	Tamarisk
Tamarix passerinoides	DSA	RP	-	-	-	ND	4-9	Tamarisk
Tamarix tetragyna	JD NM DSA LJV NDT	C	-	-	-	D	1-4	Desert tamarisk
Ulmus minor subsp. canescens (Melville) Browicz & Ziel.	HM NM	RR	-	-	-	D	2-3	Hairy elm
Viburnum tinus	HM	RP	-	-	-	ND	3-4	Viburnum, arrow-wood, laurestinus
Ziziphus spina-christi (L.) Desf.	JD HM NM DSA LJV NDT GS	RP	-	-	-	D	1-5	Christ's thorn, jujube

Table.22: Checklist of forest species included in the Red List of Flora of Palestine (According to BERC – Biodiversity & Environmental Research Center, 2002).

*Abbreviations of the Table

Geographical Regions: NM = Nablus Mountains, NDT = Nablus Desert, LJV = Lower Jordan Valley, JD = Jerusalem Desert, SWB = South west of West Bank, HM = Hebron Mountains, DSA = Dead Sea Area, NN = Northern & W. Negev, GS = Gaza Strip

Abundance: CC = Very Common, C = Common, RP= Potentially Rare, R = Rare, RR= Very Rare (1 to 30 sites), Endemism: P= Historic Palestine, PSL= Palestine + Syria (+ Lebanon), Attractivity: 1 = Attractive, 2 = Very Attractive, Habitat Vulnerability: V = Vulnerable to destruction, VV = Very Vulnerable, Dynamics: D = No. of sites have declined at least 30 % for the last 35 years, ND = No. of sites have not declined for the last 35 years

There is only national list of threatened species available for Palestinian flora and there is no national list for Palestinian threatened fauna due to lack of comprehensive surveys of fauna species. There are two published lists of threatened plants: one Israeli and one Palestinian, there is no plant recorded in the IUCN Red List website although there are two published lists of threatened plants as indicated earlier (EQA; 2015).

Based on IUCN global Red List criteria and guidelines there is no plant species were listed as globally threatened in state of Palestine (SP) till 2105, however the lowest number of listed threatened species are not because SP do not hav threatened species but because there is need to conduct a comprehensive study to conclude SP species status based on the IUCN criteria. In addition, capacity building for human resources is needed in this field) (EQA; 2015). As in Table. 23 shows the comaprasion between the Red list supplied by the Palestinians (BERC 2002) and the IUCN red list plant species have been assessed until now in SP all of them listed as Least Concern (LC).

spp	spp. Name by BERC	IUCN	BERC
*Faidherbia albida (*Delile) A. Chev.	*Acacia albida* Delile	no	RP
Acacia farnesiana (L.) Willd.		no	RP
Acacia laeta Benth.		no	RP
Acacia saligna (Labill.) H. L. Wendl.		no	RP
Acacia tortilis (Forssk.) Hayne		no	RP
Acer obtusifolium Sm.			RP
Prunus arabica (Olivier) Meikle	*Amygdalus arabica* Olivier	no	RR
Prunus dulcis (Mill.) D. A. Webb	*Amygdalus ramonensis* Danin	no	RR
Arbutus andrachne L.		no	RP
Balanites aegyptiaca Delile		no	RP
Calotropis procera (Aiton) W. T. Aiton		no	RP
Casuarina cunninghamian			RP
Celtis australis L.		no	R
Ceratonia siliqua L.		no	RP
Cercis siliquastrum L.		no	RP
Cordia sinensis Lam.		no	RR
Crataegus azarolus L.	*Crataegus aronia* (L.) DC.	Lower Risk	RR
Cupressus sempervirens L.		Least Concern	RR
Elaeagnus angustifolia L.			RR
Malus trilobata (Poir.) C. K. Schneid.	*Eriolobus trilobata* (Poir.) M. Roem.	no	RP
Eucalyptus camaldulensis Dehnh.		no	RP
Ficus bengalensis			R
Ficus carica L.		Least Concern	R
Ficus nipeda			R
Ficus pseudo sycomorus			R
Ficus religiosa			R
Ficus sycomorus L.		no	R

Fraxinus angustifolia subsp. syriaca (Boiss.) Yalt.	*Fraxinus syriaca* Boiss.	no	R
Haloxylon persicum Bunge		no	RP
Laurus nobilis			RP
Maerua crassifolia Forssk.		no	RR
Moringa peregrina (Forssk.) Fiori		no	RR
Myrtus communis L.		no	RP
Paliurus spina-christi			RR
Phillyrea latifolia L.		no	RP
Phoenix dactylifera L.		no	RP
Pinus brutia Ten.		Least Concern	RP
Pinus halepensis Mill.		no	RP
Pinus pinea L.		no	RP
Pistacia atlantica Desf.			RP
Pistacia palaestina Boiss.			RP
Pistacia lentiscus L.			RP
Platanus orientalis L.		Lower Risk/least concern	R
Populus alba L.		no	RP
Populus euphratica Olivier		no	RP
Populus nigra L.		Least Concern	RP
Prunus cocomilia Ten.	*Prunus ursina* Kotschy	Lower Risk/least concern	RP
Pyrus syriaca Boiss.		no	RP
Quercus infectoria subsp. *veneris (A. Kern.) Meikle*	*Quercus boissieri* Reut.	no	C
Quercus coccifera L.	*Quercus calliprinos* Webb.	no	CC
Quercus ithaburensis Decne.		no	C
Salix acmophylla Boiss.		Least Concern	RR
Salvadora persica L.		no	RR
Sambucus nigra		no	RR
Styrax officinalis L.		no	C
Tamarix amplexicaulis		no	RP
Tamarix aphylla		no	C
Tamarix hampeana		no	RP
Tamarix jordanis		no	RP
Tamarix nilotica		Least Concern	CC
Tamarix palaestina		no	RP
Tamarix parviflora		Least Concern	RP
Tamarix passerinoides		no	RP
Tamarix tetragyna		Least Concern	C
Ulmus minor subsp. canescens (Melville)	*Ulmus canescens* Melville	no	RR

Browicz & Ziel.			
Viburnum tinus L.		no	RP
Ziziphus spina-christi (L.) Desf.		no	RP

Table. 23: the comparasion between the IUCN red list and Palestinian red list prepared by BERC in 2002. Abundance: CC = Very Common, C = Common, RP= Potentially Rare, R = Rare, RR= Very Rare (1 to 30 sites), Endemism: P= Historic Palestine., all species highlighted with red color are not exist on the official sites, so these names are not acceptable

3.4 The integration between herbarium and DNA barcode:

Identification of plants is important step to know its uses or value as it relates to our goals, but in many cases, I faced difficulties in identifying the plant samples; because the samples are often incomplete or were dried badly preventing to identify them accurately. The opportunity of assigning a link between the morphological identification of plant samples and DNA s is therefore of great importance to make sure that the results of genetic analysis are correct, Table. 24.

Species	**Family**	**Morpholofical identification**	**Barcoding identification**	**Note**
Ballota saxatilis Sieber ex C. Presl	Lamiaceae	Ballota saxatilis	has been confirmed at the level of the Genus	this species (saxatilis is not analyzed before)
Anagallis arvensis L.	Primulaceae	Anagallis arvensis	has been confirmed at the level of the Genus and species	with both of markers (rbcL and trnH)
Centaurea iberica Spreng.	Compositae	Centaurea iberica	has been confirmed at the level of the Genus and species	with rbcL at the level of species, while by matK at the level of the genus
Ecballium elaterium (L.) A. Richard	Cucurbitaceae	Ecballium elaterium	has been confirmed at the level of the Genus and species	with both of markers (rbcL and trnH)
Helichrysum sanguineum (L.) Kosel.	Compositae	Helichrysum sanguineum	has been confirmed at the level of the Genus	with both of markers (rbcL and trnH)
Lonicera etrusca G. Santi	Caprifoliaceae	Lonicera etrusca	has been confirmed at the level of the Genus	with both of markers (rbcL and trnH)
Phagnalon rupestre (L.) DC.	Compositae	Phagnalon rupestre	has been confirmed at the level of the Genus and family	with rbcL at the level of genus, while by matK at the level of the family
Pyrus syriaca Boiss.	Rosaceae	Pyrus syriaca Boiss.	has been confirmed at the level of the Genus and species	with rbcL at the level of epscies, while with trnH at the level of the genus
Cyclamen persicum Miller.	Primulaceae	Cyclamen persicum	Has been confirmed just by rbcL	
Sarcopoterium spinosum (L.) Spach	Rosaceae	Sarcopoterium spinosum	has been confirmed at the level of the Genus	with both of markers (rbcL and matK)

Rhamnus lycioides L.	Rhamnaceae	Rhamnus lycioides	has been confirmed at the species and genus level	by matK has been confirmed at the level of genus
Salvia dominica L.	Lamiaceae	?	has been confirmed at the level of the genus	with both of markers (rbcL and trnH)
Salvia judaica Boiss.	Lamiaceae	Salvia judaica	has been confirmed at the level of the genus	with both of markers (rbcL and trnH)
Ephedra spp.	Fabaceae	*Ephedra spp*	Has been confirmed at genus level	rbcL and trnH
Teucrium divaricatum Sieber ex Heldr.	Lamiaceae			
Ziziphus spina-christi (L.) Desf.	Rhamnaceae	Ziziphus spina-christi	has been confirmed	with both of markers (rbcL and matK)
Styrax officinalis L.	Styracaceae	Styrax officinalis	has been confirmed at the species and genus level	by trnH has been confirmed at the level of genus
Crataegus azarolus L.	Rosaceae	Crataegus azarolus	has been confirmed at the level of the Genus and species	with rbcL at the level of species, while by matK at the level of the genus
Pistacia lentiscus L.	Anacardiaceae	Pistacia lentiscus	has been confirmed at the species and genus level	with rbcL at the level of genus, while by trnH at the level of the species
Pistacia palestina Boiss.	Anacardiaceae	Pistacia palestina	has been confirmed at the level of the genus	with both of markers (rbcL and trnH)
Ballota undulata (Sieber ex Fresen.) Benth.	Lamiaceae	Ballota undulata	has been confirmed at the level of the genus	with both of markers (rbcL and trnH)
Asparagus aphyllus L.	Asparagaceae	Asparagus aphyllus	has been confirmed at the level of the genus	with both of markers (rbcL and trnH)
Carlina hispanica Lam.	Compositae	Carlina hispanica	has been confirmed at the level of the family	with both of markers (rbcL and matK)
Smilax aspera L.	Smilacaceae	Smilax aspera	Has confirmed at species level	with both of markers (rbcL and trnH)
Salvia fruticosa Mill.	Lamiaceae	Salvia fruticosa	has confirmed at the level of species	with both of markers (rbcL and matK)
Astoma seselifolium DC.	Apiaceae	Astoma seselifolium	has been confirmed at the level of family	with both of markers (rbcL and trnH)
Berula erecta (Huds.) Coville.	Apiaceae	Berula erecta	has been confirmed at the species and family level	trnH could identify it hust at family level.
Chiliadenus iphionoides (Boiss. & C. I. Blanche) Brullo	Compositae	Chiliadenus iphionoides	has been confirmed at the level of family	with both of markers(rbcL and trnH)
Echium judaeum Lacaita	Boraginaceae	Echium judaeum	has been confirmed at the level of the genus	with both of markers(rbcL and trnH)
Thymbra capitata (L.) Cav.	Lamiaceae	Thymbra capitata	has confirmed at the level of species	with both of markers(rbcL and trnH
Erodium gruinum (L.) L'Hér.	Geraniaceae	Erodium gruinum	has been confirmed at the level of the species	with both of markers (rbcL and trnH)
Dittrichia viscosa (L.) Greuter	Compositae	Dittrichia viscosa	has been confirmed at the level of the species	with both of markers (rbcL and trnH)
Lythrum hyssopifolia L.	Lythraceae	Lythrum hyssopifolia	has been confirmed at the level of species and the genus	with both of markers (rbcL and trnH)
Clinopodium serpyllifolium subsp. fruticosum (L.)	Lamiaceae	Clinopodium serpyllifolium subsp. fruticosum	has been confirmed at the level of family and the genus	with both of markers (rbcL and trnH)

Bräuchler				
Moluccella spinosa L.	Lamiaceae	Moluccella spinosa	has been confirmed at the level of family	with both of markers (rbcL and trnH)
Phillyrea latifolia L.	Oleaceae	Phillyrea latifolia	Has been confirmed by trnH	With rbcL just at genus level
Teucrium parviflorum Schreb.	Lamiaceae	Teucrium parviflorum	Fas been confirmed	By trnH and rbcL
Rubus sanctus Schreb.	Rosaceae	Rubus sanctus	has been confirmed at the levl of the genus	with both of markers (rbcL and trnH)
Rubia tenuifolia d'Urv.	Rubiaceae	Rubia tenuifolia	has been confirmed at the levl of the genus	with both of markers (rbcL and trnH)
Salvia officinalis L.	Lamiaceae	Salvia officinalis	has been confirmed at the levl of the species	with both of markers (rbcL and trnH)
Satureja thymbra L.	Lamiaceae	Satureja thymbra	has been confirmed at the genus and family level	With trnH just at family level
Thymbra spicata L.	Lamiaceae	Thymbra spicata	has been confirmed at level of family and genus	with both of markers (rbcL and trnH)
Thymelaea hirsuta (L.) Endl.	Thymeleaceae	Thymelaea hirsuta	has been confirmed at the level of the species and the family	with both of markers (rbcL and trnH)
Vitex agnus-castus L.	Lamiaceae	Vitex agnus-castus	has been confirmed at the level of the species and the genus	with both of markers (rbcL and trnH)
Cota palaestina Kotschy	Compositae	Cota palaestina	has been confirmed at the level of the the genus	with both of msrkers (rbcL and trnH)
Polygonum arenarium Waldst. & Kit.	Polygonaceae	Polygonum arenarium	has been confirmed at the level of the genus	with both of msrkers (rbcL and trnH)
Medicago orbicularis (L.) Bartal.	Fabaceae	Medicago orbicularis	has been confirmed at the level of the family	with both of markers (rbcL and trnH)
Ficus sycumrous L.	Moraceae	there is no herbarium sample	has been confirmed at the level of the species	with both of markers (rbcL and trnH)
Anthemis spp.	Compositae	Anthemis cotula L.	has been confirmed at the level of the spp	with both of markers (rbcL and trnH)
Calicotome villosa (Poir.) Link	Fabaceae	Calicotome villosa	has been confirmed at the level of the family	with both of markers (rbcL and trnH)
Anchusa azurea Mill.	Boraginaceae	Anchusa azurea Mill.	Has been confirmed at soecies level	With rbcL and trnH
Medicago scutellata (L.) Mill.	Fabaceae	Medicago scutellata	has been confirmed at the level of the species	with both of markers (rbcL and trnH)
Cupressus sempervirens L.	Cupressaceae	Cupressus sempervirens	has been confirmed at the level of the species	with trnH
Pinus halepensis Miller	Pinaceae	Pinus halepensis	has been confirmed at the level of the species	with trnH

Table.24: the integration between herbarium and DNA barcode.

Samples that could not be been identified through the herbarium samples and have been identified by using genetic analyses are: *Medicago scutellata* (L.) Mill., *Medicago orbicularis* (L.) Bartal., *Polygonum arenarium* Waldst. & Kit., *Anchusa azurea* Mill., and *Anthemis cotula* L. ; in addition, in many case DNA barcoding allowed the identification of the genus, the species could be easily identified.

For instance, in the case of *Rosmarinus* spp, it was identified by Dr.Khaled Sawalha s but the DNA barcoding gave the highest match with *Teucrium parviflorum* Schreb.(the same family) which has high morphological similarity (Fig. 44 a). similarity, *Retama raetam* (Forssk.) Webb & Berthel., identified in the field. Gave highest match with *Ephedra* spp.(Fig.44 b). The two species are similar and grow in the same habitat but the herbarium sample was unable to differentiate them.

Fig. 44 a: the two species were compared with the herbarium sample.

Rosmarinus officinalis L. *Teucrium parviflorum* Schreb. *Herbarium sample*

ref.: www.flowersinisrael.com *ref.:* www.flora.org.il

Fig.44 b: the two species were compared with the herbarium sample.

*Retama raetam (*Forssk.) Webb *Ephedra aphylla* Forssk. *Herbarium sample*

Ref.: www.flora.org.il *ref.: www.flora.org.il*

3.5 Geographical Information Systems (GIS):

GIS is a computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface. GIS can show many different kinds of data on one map. This enables people to more easily see, analyze, and understand spatial patterns and relationships.

As the application of choice, GIS has a central role in analyzing the geographic distribution of endangered species, in measuring and monitoring biodiversity, and in identifying priorities for conservation management. It has become so widely established in plant conservation in particular, that habitat evaluation and monitoring is now be carried out with a high degree of accuracy and even rare, endemic species with highly limited habitats can be accurately monitored and assessed for conservation (Krigas *et al*.; 2012).

3.5.1 Prediction result of potential distributions:

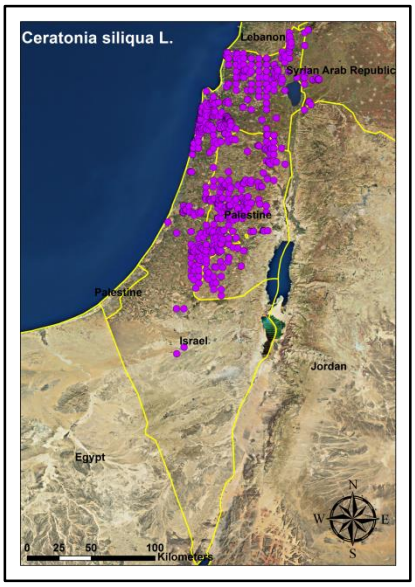
We used a geographical information system (GIS)-based approach to investigate and characterize the geographic distributions of some native (fig.45) and protected (fig.46)trees and shrubs at the level of historical Palestine, by producing maps showing the distribution of each species as a shape file format, where each point represents one record. Species distributions were predicted for both native and protected populations using the locality data have been taken from the Israeli BioGis project website (http://www.biogis.huji.ac.il). This database represents the actual knowledge about this species'ranges. It includes only natural species, "i.e it does not show the distribution of implanted species in case of *Cupressus sempervirens L*. (Fig.43 b) that appears as absent in West Bank, while it has been planted abundantly during the British mandate. All native and protected plant species were characterized show in Table. 25

Native species	Protected species
*Acacia tortilis subsp. raddiana (*Savi) Brenan	*Cercis siliquastrum* L.
Acacia tortilis (Forssk.) Hayne	*Origanum syriacum* L.
Arbutus andrachne L.	*Moringa peregrina* (Forssk.) Fiori
Ceratonia siliqua L.	*Phoenix dactylifera* L.
Cupressus sempervirens L.	*Saccharum spontaneum* L.
Faidherbia albida (Delile) A. Chev.	*Salvadora persica* L.
Laurus nobilis L.	*Salvia fruticosa* Mill.
Pinus halepensis Mill.	*Salvia indica* L.
Pinus pinea L.	*Spartium junceum* L.
Pistacia atlantica Desf.	*Ficus sycomorus* L.
Pistacia lentiscus L.	*Calotropis procera* (Aiton) W. T. Aiton
Pistacia palaestina Boiss.	*Balanites aegyptiaca* Delile
Pistacia saportae Burnat	
Populus euphratica Olivier	
Quercus infectoria subsp. veneris (A. Kern.) Meikle	
Quercus coccifera L.	
Quercus ithaburensis Decne.	
Tamarix amplexicaulis Ehrenb.	
Tamarix aphylla (L.) Karsten	
Tamarix aravensis Zohary	
Tamarix parviflora DC.	
Tamarix tetragyna Ehrenb.	

Ziziphus spina-christi (L.) Desf.	
Ziziphus lotus (L.) Lam.	

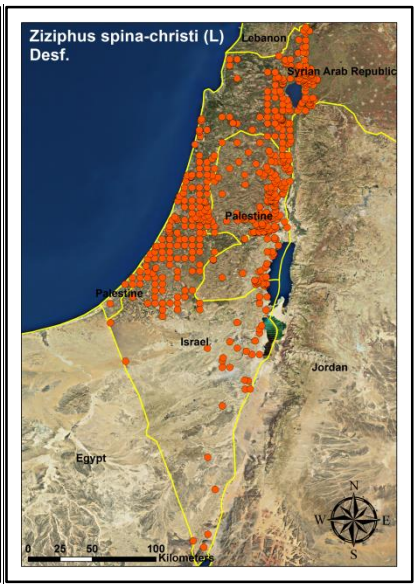
Table.25: Native and protected species retrived and analyzed by GIS

The main advantage of such information is that we can use as a base predicting how would be the species distribution in the coming years.

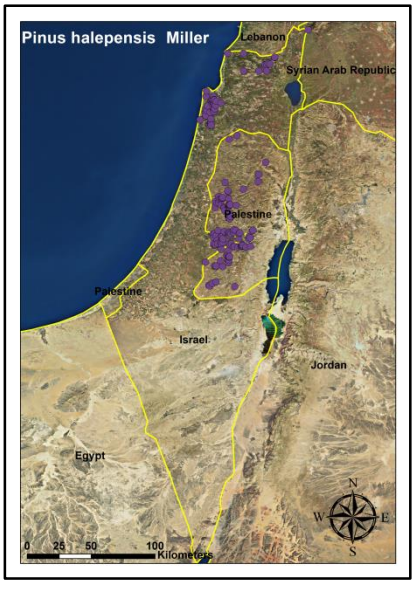


45.a

45.b

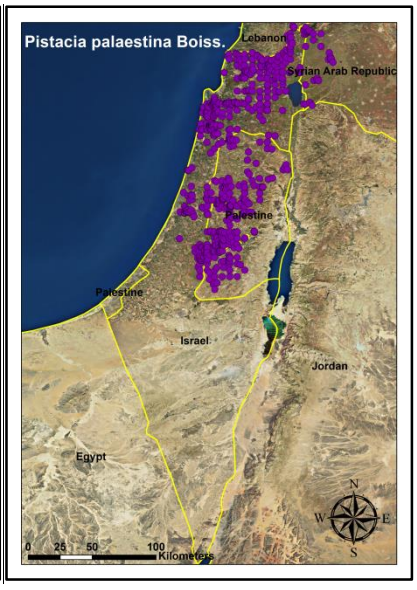


45.c



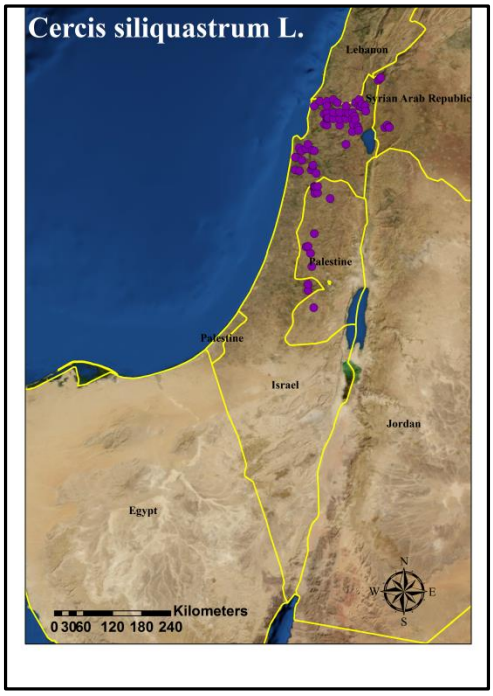
45. d

45.e



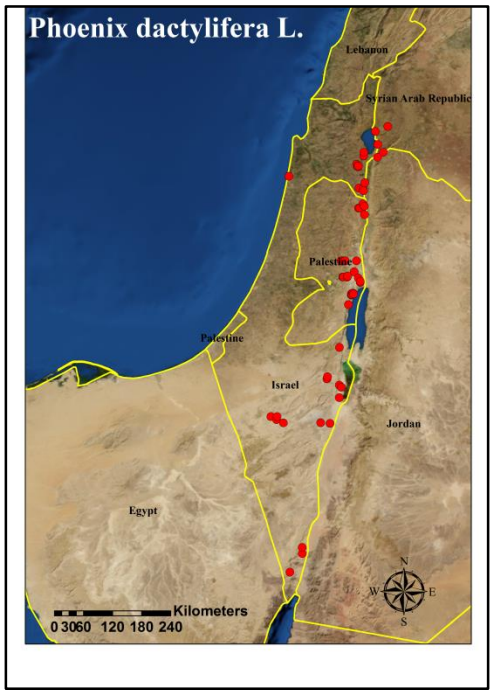
45. f

Fig. 45: Distribution map of native trees/shrubs generated from the database of resource survey. The colored dots show species actual distribution in the historical Palestine.



46.a

46.b



46.c

46.d

Fig. 46: Distribution map of protected trees/shrubs generated from the database of resource survey. The colored dots show species' occurrence at the level of historical Palestine.

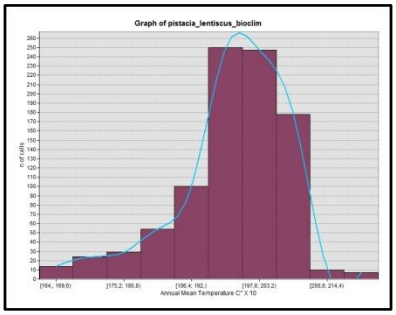
3.5.2 Topographic and climatic description:

Topography and climate are critical factors in determining the spatial and temporal variation of species' distribution. They play an integral role in affecting the species growth. Topography is the description of the physical features of a place which describes the configuration of the ground, its altitude, slope, aspect, etc, and affects vegetation through climate, soil formation processes, soil moisture, soil nutrients.

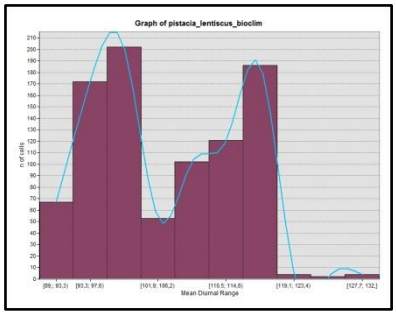
The goal of studying the topographic and climatic description is to understand climate and topography effects on tree and shrubs growth and to understand the potentialresponse of tree and shrubs growth to future climate.

In this work , 19 GIS data layers were retrived from the WorldClim Global Climate GIS database. These included topographic and bioclimatic variables representing elevation (m), annual mean temperature (˚C), mean diurnal temperature range (˚C), isothermality, temperature seasonality (˚C), maximum temperature of warmest month (˚C), minimum temperature of coldest month (˚C), temperature annual range (˚C), mean temperature of wettest quarter (˚C), mean temperature of driest quarter (˚C), mean temperature of warmest quarter (˚C), mean temperature of coldest quarter (˚C), annual precipitation (mm), precipitation seasonality (mm), precipitation of wettest quarter (mm), precipitation of driest quarter (mm), precipitation of warmest quarter (mm), and precipitation of coldest quarter (mm), elevation, slope and aspect have been studied together. Histograms (fig. 47) and summary tables list averages and maximum and minimum values of these variables (Table. 26) for each species (native and protected trees and shrubs) have been then computed to give an idea of the climatic factors affecting the species growth.

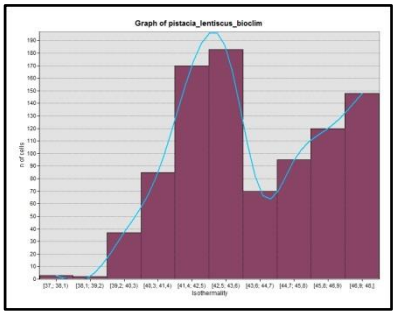
(a)



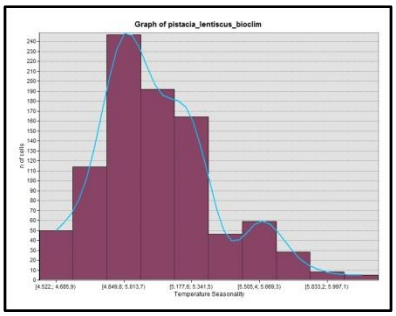
(b)



(c)



(d)



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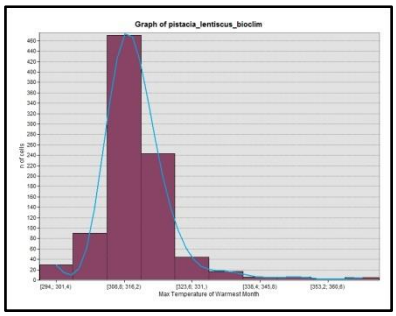
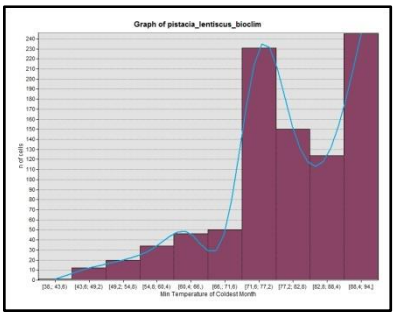
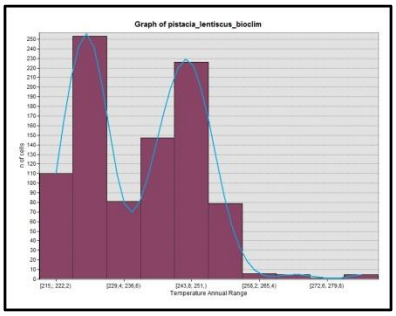


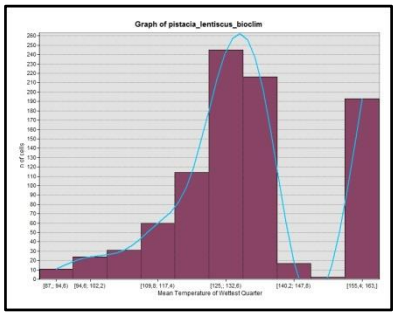
(f)



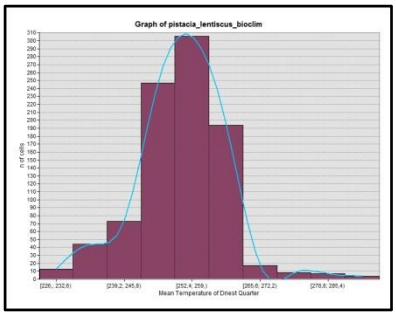
(g)



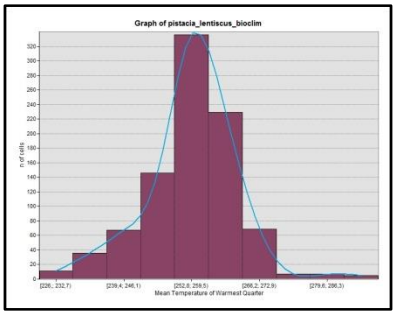
(h)



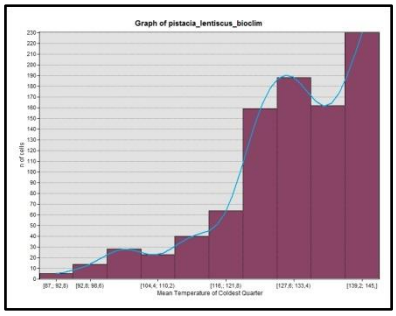
(i)



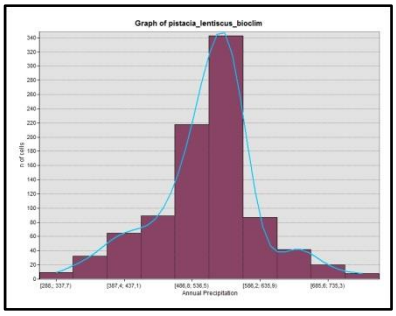
(j)



(k)



(l)



(m)

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(o)

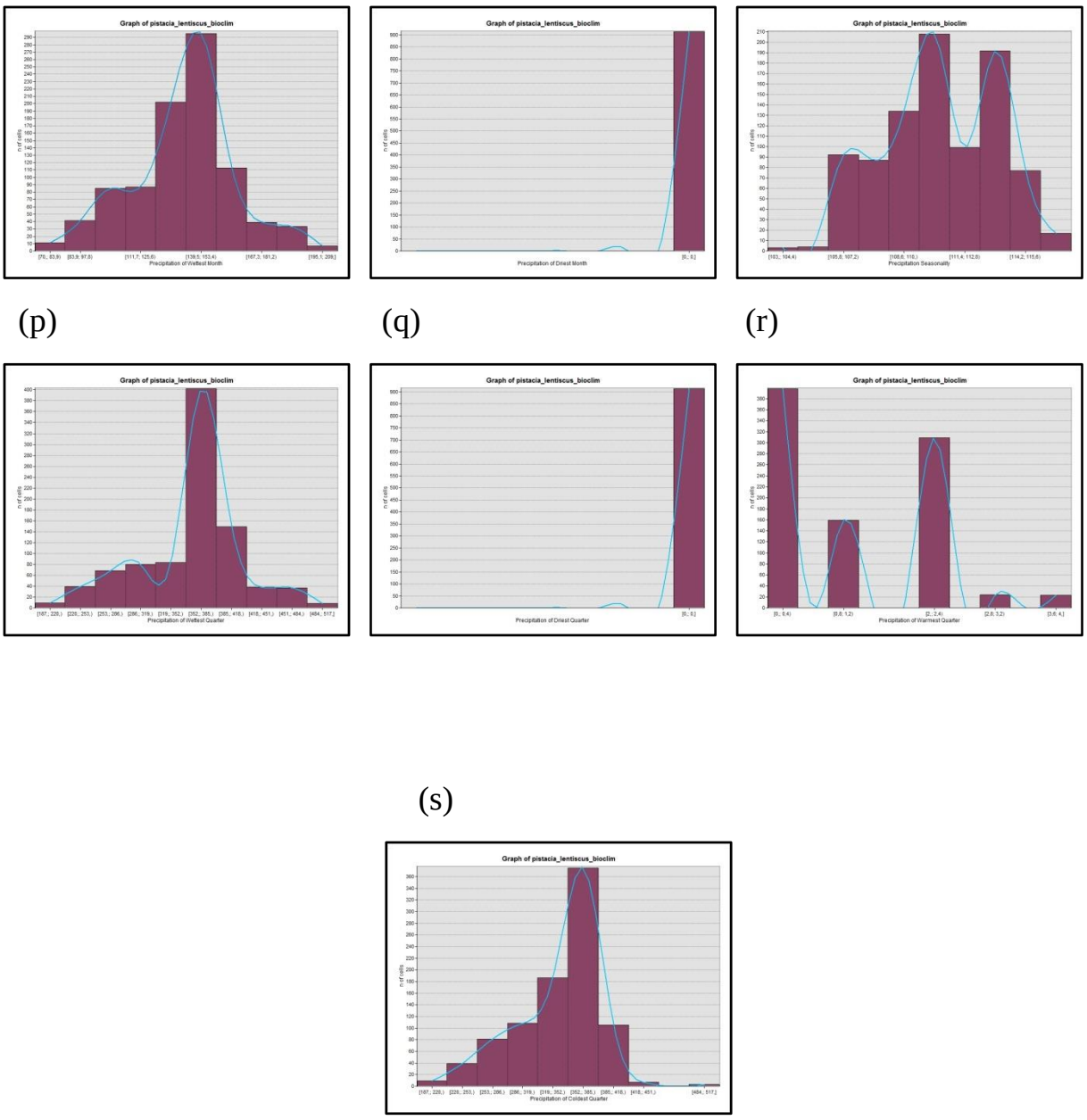


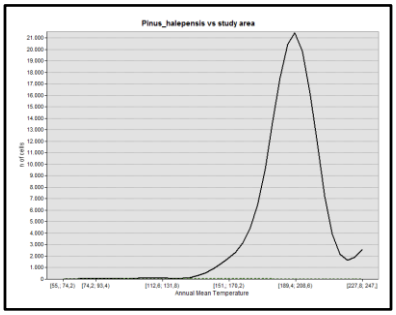
Fig. 47: Frequency histograms of Pistacia lentiscus L. *for (a) annual mean temperature, (b) mean diurnal range, (c) isothermality, (d) tempretaure seasonality, (e) max tempreture of the warmest month, (f) min tempreture ig of coldest month, (g) tempreture annual range, (h) mean tempreture of wettest quarter, (i) mean tempreture of driest quarter, (j) mean tempreture of warmest quarter, (k) mean tempreture of coldest quarter, (l) annual precipitation, (m) precipitation of wettest month, (n) precipitation of driest month, (o) precipitation seasonality, (p) precipitation of wettest quarter, (q) precipitation of driest quarter, (r) precipitation of warmest quarter, (s)precipitation of coldest quarter, (t) altitude***.***

bioclimatic factors	Count	Minimum	maximum	mean	SD
Bio1	481	157	213	190,47	10,98
Bio2		84	119	105,65	9,96
bio3		35	48	43,57	2,70
bio4		4575	5924	5163,95	225,74
bio5		284	349	313,10	8,23
bio6		42	94	73,69	12,57
bio7		215	260	239.409	11,09
bio8		79	163	124,42	16,24
bio9		225	280	248,88	9,32
bio10		225	282	251,36	10,32
bio11		79	145	122,97	13,78
bio12		363	814	559,85	84847
bio13		86	209	143,65	25.65
bio14		0	0	0	0
bio15		103	115	109,90	2,01
bio16		229	535	370,20	59,90
bio17		0	1	0.002	0,04
bio18		0	4	0,91	1,17
bio19		229	535	349,3	50,53

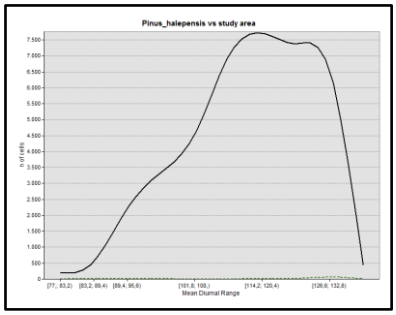
Table. 26: lists averages and maximum and minimum values of 19 variables from the WorldClim Global Climate GIS database, for all historical Palestine for Salvia fruticosa Mill.

Moreover, the same description was assessed for historical Palestine and comparisons with ecological species range have been made by overlapping the results, in order to show where each species is located within the environmental range of Palestine (Fig. 48). This last might provide preliminary informations about the threatens of a species with respect to the factors affecting its occurrence in Palestine, also taking into account the current predictions on the future climate change.

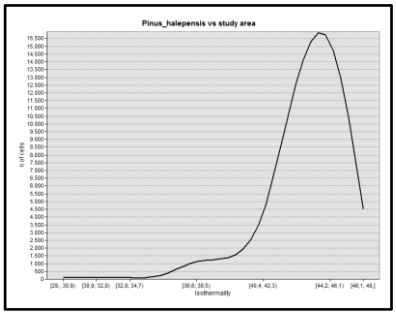
(a)



(b)



(c)



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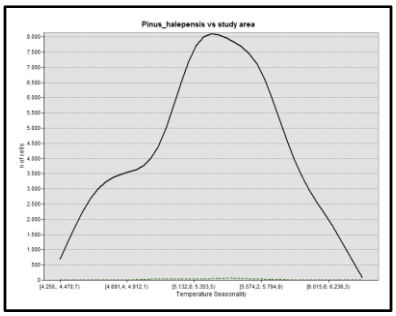
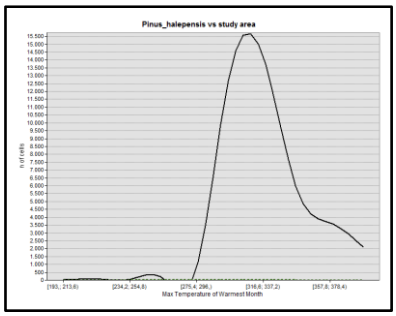
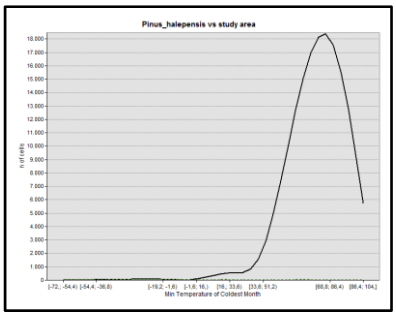


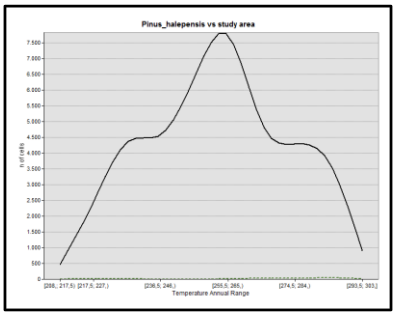
(e)



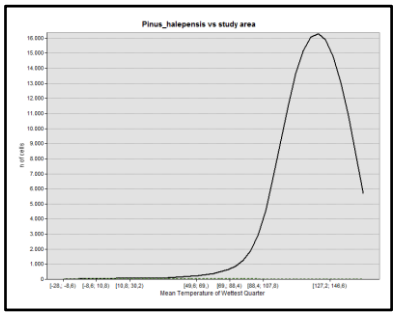
(f)



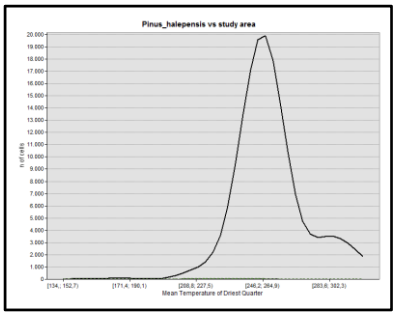
(g)



(h)



(i)



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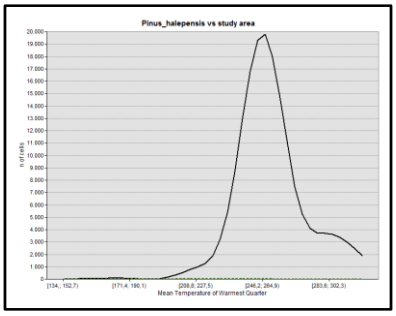
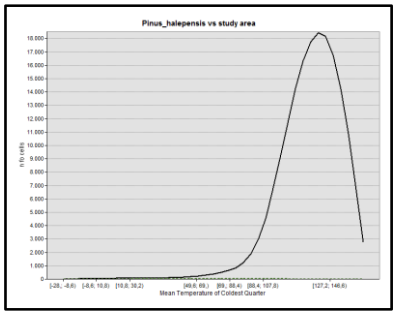
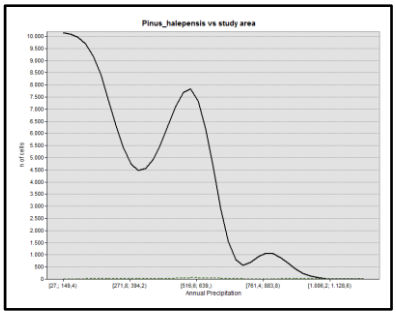


(k)



(l)



(m)

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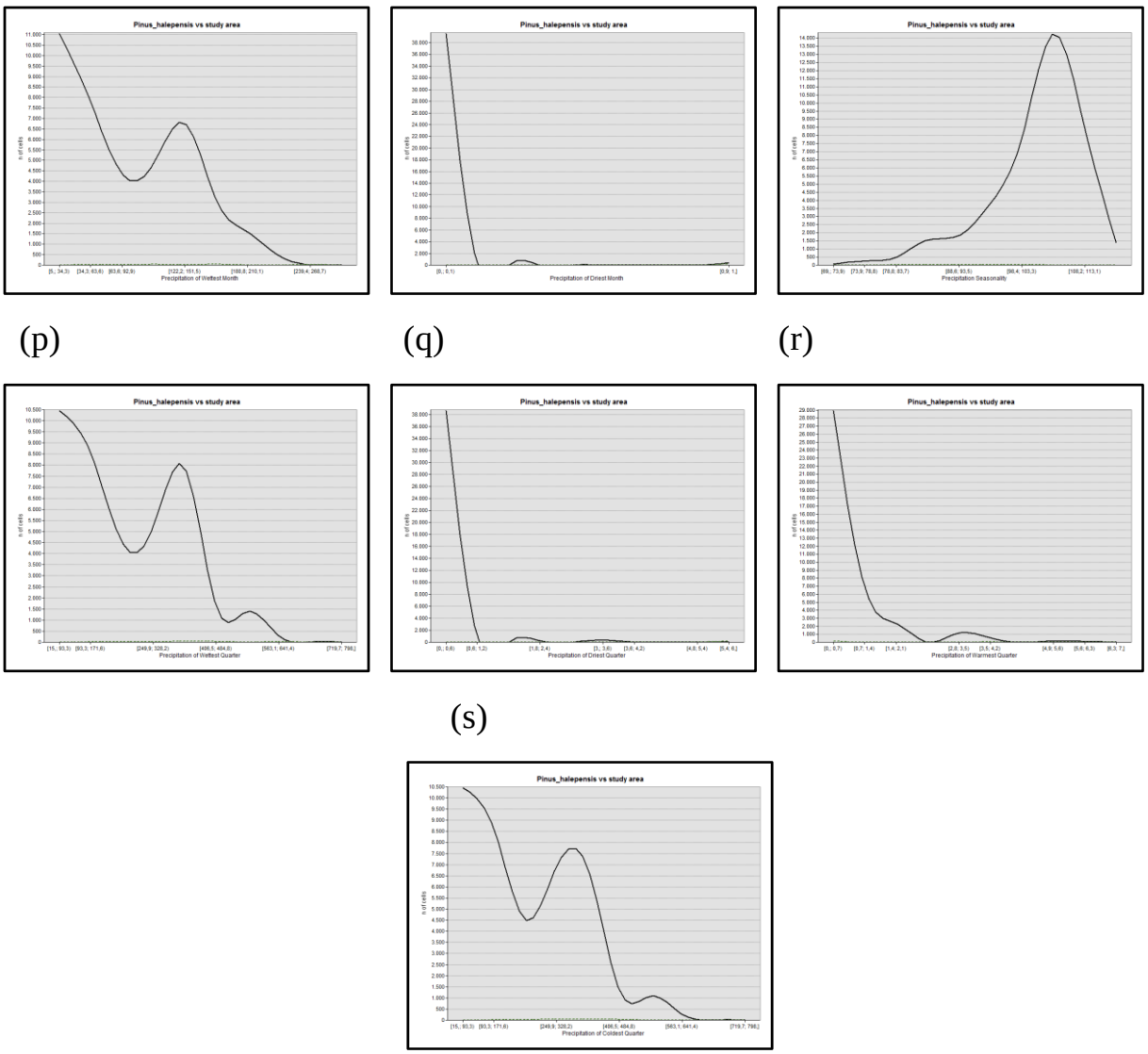

Fig. 48: the bioclimatic variables qualitatively examined the overlap with historical Palestine, for Pinus halepensis Miller.

Mapping and analysing plant populations and communities at greatest environmental risk and identifying those that display remarkable resilience and persistence to environmental perturbations is of paramount importance to identify and understand potential opportunities and threats to the vast natural capital provided by plants.

3.6 Seedsbank:

The storage of material in the form of seeds is one of the most widespread and valuable ex situ approaches to conservation, seed banking has considerable advantages over other methods of ex situ conservation such as ease of storage under cold and dry conditions, economy of space, relatively low labour demands and consequently, the capacity to maintain large samples at an economically viable cost.

Seed banks take up little space, but can be expensive to run, both because of the need to maintain low temperatures and the necessity for germination tests, growth trials and regeneration.

In this study we focus on seed banks as tools for the conservation of native trees species, it was the first step in order to establish seed bank in Alqauds University, wheraese; the availability of plant germplasm in seed banks facilitates scientific study that could provide helpful information for conserving the remaining plant species in West Bank, table. 27 shows the trees species that were collected seeds from at and were conserved in Al- Quds University.

species	collection date	location	elevation	coordinates	notes
Cupressus sempervirens L.	13.9.2014	Wadi Al-quf	553m	(SW) 31˚34’50” N 35˚02’10”E	
Pistacia atlantica Desf.	13.9.2014	Wadi Al-quf		(W) 31˚34’50”N 35˚02’09”E	
Pistacia lentiscus L.	13.9.2014	Wadi Al-quf	560m	(W) 31˚34’50”N 35˚02’09”E	
Pistacia palaestina Boiss.	13.9.2014	Wadi Al-quf	595m	(SE) 31˚34’44”N 35˚02’12”E	
Quercus coccifera L.	13.9.2014	Wadi Al-quf	549m	(SE) 31˚34’49”N 35˚02’10”E	
Quercus coccifera L.	13.9.2014	Wadi Al-quf	571m	(E) 31˚34’48”N 35˚02’10”E	
Quercus coccifera L.	13.9.2014	Wadi Al-quf	597m	(SW)31˚34’46”N 35˚02’10”E	
Pinus halepensis Mill.	13.9.2014	Wadi AL-quf	578m	(NE) 31˚34’48”N 35˚02’20”E	

Ceratonia siliqua L.	15.9.2014	Wadi Qana	238m	(SW) 32˚09’32”N 35˚ 06’53”E	
Pistacia lentiscus L.	15.9.2014	Wadi Qana	238m	(NE) 32˚09’31”N 35˚07’04”E	
Pistacia palaestina Boiss.	15.9.2014	Wadi Qana	251m	32˚09’32”N 35˚06’51”E	
Pistacia atlantica Desf.	15.9.2014	Wadi Qana	251m	32˚09’32”N 35˚06’51”E	
Quercus coccifera L.	15.9.2014	Wadi Qana	252m	(N) 32˚09’25”N 35˚06’50”E	
Quercus coccifera L.	15.9.2014	Wadi Qana	282m	(N) 32˚09’25”N 35˚06’49”E	Mature
Crataegus azarolus L.	15.9.2014	Kherbit Quies	397m	(E) 32˚03’53”N 35˚10’56”E	
Quercus coccifera L.	15.9.2014	Kherbit Quies	369m	(N) 32˚04’03”N 35˚11’03”E	
Pistacia lentiscus L.	15.9.2014	Kherbit Quies	376m	(N) 32˚04’03”N 35˚11’03”E	
Pistacia lentiscus L.	15.9.2014	Kherbit Quies	379m	(N) 32˚04’00”N 35˚11’04”E	
Pistacia palaestina Boiss.	15.9.2014	Kherbit Quies	370m	(NW)32˚04’05”N 35˚11’07”E	
Pistacia palaestina Boiss.	15.9.2014	Kherbit Quies	376m	(NE) 32˚04’04”N 35˚11’03”E	
Pistacia lentiscus L.	27.9.2014	Em Al-Tut	264m	(N) 32˚26’03”N 35˚20’07”E	
Quercus coccifera L.	27.9.2014	Em Al-Tut	276m	(N) 32˚26’03”N 35˚20’10”E	
Ceratonia siliqua L.	27.9.2014	Siris	457m	(NE) 32˚18’53”N 35˚18’25”E	
Quercus coccifera L.	27.9.2014	Siris	455m	(N) 32˚18’53”N 35˚18’28”E	
Quercus coccifera L.	27.9.2014	Siris	456m	(N) 32˚18’53”N 35˚18’23”E	
Ziziphus spina-christi (L.) Desf.	27.9.2014	Siris	544m	(NW) 32˚19’01”N 35˚18’15”E	

Crataegus azarolus L.	27.9.2014	Siris	453m	(N) 32˚18’53”N 35˚18’23”E	
Styrax officinalis L.	27.9.2014	Siris	444m	(NE) 32˚18’53”N 35˚18’02”E	

Table.27: seeds collected from selected sites

In siris and Um altut there are no fruits of P.palestina and P.atlantica. Pistacia atlantica was more productivity than P.palaestina in Wadi Qana

Chapter four: Discussion

Biodiversity includes various forms of life existing with an emphasis on the diversity of their form and function. Historical Palestine has a rich biodiversity and unique ecosystems due to its location as a significant conjunction bridge between Europe, Asia and Africa; it contains about 51,000 living species, constituting approximately 3% of global biodiversity (EQA; 2015). Palestine hosts a large variety of plant, which is ranging from dense forests to thin patches of desert herbs, passing through different forms of woodland, such as maquis, garrigue; due to the diversity of climatic and environmental conditions in which, and the diversity of topography and soil, and they constitute Forum for several plant different from each other in the climate and the types of plants.

Globally, there are many endangered plants species due to a shift habitats, excessive consumption, invasive alien species, pollution and climate change, which now threatened with extinction. This raises the vital and massive quantities of biological diversity and the disappearance of one of the biggest challenges facing the global community.

There are efforts by the concerned government ministries and local institutionsins in Palestine to follow techniques (in situ and ex situ) and scientific methods to keep the Palestinian biodiversity, and to stop the destruction of plant diversity which is an essential tool to meet human needs in the present and in the future. It is therefore important to develope processes to manage and protect the biodiversity generally and the plant diversity specially, in order to save the endangered species. In situ conservation is involving the designation, management and

monitoring of biodiversity in the same area where it is encountered, as :1) protect them in specific geographical areas (natural reserves) by imposing special protection under the laws from human encroachment and harmful environmental changes. The main goals of the establishment of natural reserves is the conservation of biological diversity and its components of living organisms and protect it from the impact of extinction, the survival of protected species as live models similar are existent wildly in the mother nature and maintained them properly, monitor all the vital content naturally in their native habitat.This gives us real information about the behavior of those species, and allow to preserve the genetic diversity of the species. By managing these protected area we have to expand the currently existing protected areas, so that it encompasses ecosystem types and biodiversity components, and for the non-protected areas, which contain a rich diversity that are exposed to the drain, and abuse, which threatens biodiversity and the alarming disappearance plant species, during this research that I have done i found many Palestinian's preference studies in the field of study of the Palestinian biodiversity and taken into consideration by the relevant government ministries for the administration to natural reserves in accordance with the National Biodiversity Strategy and Action Plan of Palestine goals to contribute to the conservation and sustainable development of Palestine's biodiversity and to chart a course for strengthening human capacity for this task(PEnA; 1999).

2) Establish botanic gardens dedicated to the collection, cultivation and display of a wide range of plants labelled with their botanical names. In 2003, BERC established the BERC-Til Botanic Gardens as the first in addition to the botanical garden owned by the municipality of Bani Nai'm established in 2002-2003, and the Baotanical Garden of Al-Quds University. A recent policy pursued by the Ministry of Agriculture is to create parks on the specific area of the forest (25% of the total area of the forests) as part of the Ministry of Agriculture standards in cooperation with the local municipalities, the establishment of botanical gardens is a good example of environmental management, sustainable development, environmental rehabilitation, and involvement pf the local communities in the process of sustainable development initiative, it is also a site for studies and environmental research.

Proceeding from the goals of this research for the conservation and management of plant diversity in West Bank taking into account the efforts done by the Palestinians, representative by governmental ministries (The Palestinian Ministry of Agriculture, Environment Quality

Authority (EQA), Palestinian Environmental Authority (PEnA) and Ministry of Environmental Affairs (MEnA), and the private local institutions concerned with the health of the Palestinian environment through as (National Agricultural Research Center (NARC)), the Applied Research Institute of Jerusalem (ARIJ), the Biodiversity and Enviromental Research Center BERC, Palestinian Agricultural Releif center (PARC), Union of Agricultural Working Committes(UAWC) and others, there is the need to assemble these efforts and work together to create one national data base of the biodiversity in the Occupied Palestinian Territories.

There are different tools and techniques (In situ) that can help to understand and manage the plant diversity; they are standard techniques.

The creation of a herbarium is a key point of reference for studing and evaluating the plant resources and the geographical, environmental distribution in all Occupied Palestinian Territories. Certainly, setting up an herbarium according to the standard steps of other official herbaria in rhe world (e.g. Kew Gardens Herbarium), is not a new technique in Palestine, where there are many herbaria as in National Agricultural Research Center (NARC), ARIJ, Al-Najah university and others. At Al-Quds university, a scientific herbarium is currently not available, and the only existing one collects samples older than 15 years, with a sensible lack of full scientific classification, with some samples documented only at the genus or family level. In this study, all the necessary techniques to establish a new herbarium by following the scientific and official procedure were acquired and applied on a set of important species. In addition, the need to equip a specific place with special conservation lockers was highlighted, and guidelines to re-arrange the available herbarium samples safekeeping according to the scientific ways were produced., Sorting the samples by families and provide taxonomic services to some scholars, updating the printed names of families and genera of the collected plant species, since a herbarium is a special information tool. It is therefore necessary to keep pace with development and technological progress to produce an electronic herbarium, i.e. to transfer each plant information into digital format as a data base including the description, classification, photos in the field, and the main chemical components., In this way, the data of Palestinian flora will be saved indefinitely, making it easier to read and interpret in the future and providing the plant classification services for students and graduate researchers from various universities. Record it within the international herbarium lawns to give it the universal official adjective. In addition by

herbarium samples a correct and accurate list of accepted names and synonyms of known plant species will be assessed, as an essential element for the management of biodiversity; this is the process of inventory resources and the best way of organizing information in a logical way and to manage data retrieval. The compiled data, taken from herbarium specimens and available literature, are combined to provide seed collecting guides for partner organizations, increasing the efficiency and effectiveness of targeted seed collecting work. In this study, seeds collection was also as initial step for establishing a seed bank at the Al- Quds University, whereas there are many seeds were collected from previous years but they were conserved without exposing them for treatment process before.

As the herbarium is a key point for the conservation and record the plant species, it is important to document the scientific names of the species, this requires good experience and knowledge to identify them. A globally accepted, quick and easy system of identification is the DNA barcoding methodology. This method is an efficient and powerful tool for identification of unknown plant specimens by using DNA-based markers, and it has been applied in many countries as USA, Italy, China, Uk, South Africa…etc. In this study, three DNA barcoding candidate sequences (rbcL, trnH-psbA and matK) were used to identify 55 plant samples The results of this part of the research proved that the highest amplification and sequecing rate was observed with trnH-psbA and rbcL, compared with matK, as demonstrated in many previous studies (e.g. Lahaye et al.; 2008; Song et al.; 2009; Ferri et al.; 2015) In agreement with our results, all previous studies have concluded that rbcL offers high universality and good, but not outstanding discriminating power, whereas matK and trnH–psbA offer higher species resolution, (Hollingsworth et al.; 2009), but matK is more difficult to analyze. All the specimens investigated in the dataset showed to be present in the GenBak at the genus or species level for both rbcL and trnH-psbA, allowing a good comparison with the produced sequences relatively to each marker. All the samples were correctly identified, except a few specimens that require a deeper attention and further studies (*Teucrium parviflorum* Schreb., *Ephedra* spp.). The DNA barcoding methodology thus demonstrated to be an efficient and modern tool to assist plant identification in the field and to implement the knowledge of poorly known floras in order to allow their management and protection.

It is very important also to document the trees and plant species and geographical distribution of forests in the West Bank with the help of the application of geographic information systems (GIS) in the field to analyzing and identifing the situation of the forests and the distribution of the trees. The records of GIS collected from herbarium samples or from surveys carried out by academic institutions, individual scientists, government authorities, and non-governmental organizations; the goal is to document the information in the form of a programmed database includes Vital and environmental information of all forests in Palestine, to become an electronic data base can be accessed by the authorities concerned to learn about the plants and the environment of Palestinian forests.

All characterizing and distribution maps in this study have produced by data have been taken from the Israeli BioGis project website, but we need to prepare Palestinian data base querying, analyzing, modeling, and visualizing patterns of species distribution in Palestine.

For this at the end of my research i concluded that there are great efforts in the field of biodiversity in general and plant diversity particularly, whereas there are many experts and persones are interested in this area, there are many Palestinian researches prepared by Palestinian researchers, but we need to assemble all these efforts together to create a national database of the flora and fauna of Palestine, set up a special research center biodiversity includes all the experts in this field in one place in cooperation with the concerned government ministries to become a reference for all basic researchers and students.

Conclusion

The fundamental goal of this study was to setup a wide framework of activities to be inserted as starting point of Guide Lines and best practices to be performed for Biodiversity by applying some teaching that will link between reality and science, this study includes six areas in West Bank, but all the steps and techniques used where applicable to other areas by understanding of the realities and challenges of west Bank forests to conserve the core of biodiversity there, in order to reach this goal different tools and techniques (In situ) have been applied in this study.

I faced difficulties during my study: 1) to find the exact number of plant species to the difference of a refrence to another, 2) not use a unified name (correct name) of the plant, 3) there are some incorrect scientific names that need auditing and auditor, 4) there is no reference or official site gives the current distribution of plants in West Bank, 5) there is no Palestinian Palnt checklist, 6) we do not have national herbarium of flora in West Bank as a refrence. So as Palestinian we need a database documenting all palnt species with correct and acceptable names, their correct number, threaten species, their distribution, their situation and other important information to document all plant species in West Bank.

I would like to highlighting the role of DNA barcode in plant diversity, which showed its effectiveness in identifying the plant species, specially since the setup a list of plant species is an essential element for the management of biodiversity. Since the scientific name is the only acceptable symbol to identify the plant species, whereas without it is impossible to find the necessary information for planning and management of plant conservation and the sustainable use, so should prepare a list of sciebtific and acceptable names with their synonems as a certified reference, this contributes significantly to conserve the endangered plant species.

At the end of this study, i appeal to assemble all efforts in this field to preserve our environmental heritage, and I hope that the decision makers make the biodiversity conservation of their properties.

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