

Volatile compounds from leaves and flowers of *Bituminaria bituminosa* (L.) Stirt. (Fabaceae) from Italy

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ABSTRACT: The volatile fraction of *Bituminaria bituminosa* (L.) Stirt. was isolated by steam distillation from fresh aerial tissues and analysed by GC and GC–MS. Leaves from six accessions collected in central and south Italy and flowers from a single accession were used in this investigation. The yield in essential oil from the leaves and flowers was 0.1–0.3% and 0.2% of fresh material, respectively. A wide range in volatile quantitative composition was detected. Alcohols and sesquiterpenes were identified as the major compounds in both types of tissue samples. The former constituted 36.6–62.3% of the total leaf oil and 53.0% of the flower oil; the latter, 18.1–31.5% of the leaf oil and 13.7% of the flower oil. Hydrocarbons (4.3–9.1% in leaves, 7.6% in flowers), phenolics (4.3–7.8% in leaves, 2.6% in flowers), furanocoumarins (3.0–4.7% in leaves, 4.9% in flowers) and monoterpenes (1.4–2.9% in leaves, 1.9% in flowers) were also detected. Aldehydes, sulphurated compounds, esters, acids and miscellaneous compounds, together constituting 1.1–5.1% in the leaves and 4.7% in the flowers, were also identified and quantified in lower amount. The presence of furanocoumarins, phenol derivatives and sulphurated compounds were detected for the first time in the volatile oil from this species. A possible relationship between volatile chemical composition and the characteristic, strong ‘oil’ odour of this species is discussed. Copyright © 2007 John Wiley & Sons, Ltd.

KEY WORDS: *Bituminaria bituminosa* (L.) Stirt; Fabaceae; essential oil; chemical composition; sesquiterpenes; phenolic compounds; furanocoumarins

Introduction

Bituminaria bituminosa (L.) Stirt. (syn. *Psoralea bituminosa* L.) is a perennial legume species widely distributed in the Mediterranean basin and adapted to its climatic conditions.^{1,2} Good biomass production and forage quality have been reported in this species,³ which is locally exploited for feeding animals, either under grazing or as hay.⁴ However, the presence of toxic compounds in this plant, such as psoralen and angelicin, can limit its use.⁵ In addition, *B. bituminosa* is usually considered of low palatability because of the strong smell that can be emitted by oil glands located on its foliage. Nonetheless, variation in palatability does exist within the species and, for instance, the ‘tedera’ ecotype from Canary Islands is reported to be of good palatability.⁶

The composition of the volatile oil was investigated in two other species of the genus *Psoralea* (*P. drupacea*

Bge. and *P. corylifolia* L.) and the presence of bakuchiol, a meroterpene C₁₈H₂₄O, angelicin, α -pinene and limonene was documented.⁷ The essential oil of the same species was also examined for its antimicrobial activities.^{8,9} Recently, the volatile composition of *B. bituminosa* was also assessed in samples of leaves, flowers and seeds.¹⁰

Preliminary investigations performed on Italian *B. bituminosa* germplasm¹¹ have demonstrated the good nutritional value of this plant, which represents an unexplored species for forage use in Italy. To complement our study on *B. bituminosa* germplasm collected in Italy, this investigation focused on the volatile composition of fresh leaves and flowers, to obtain further information on the compounds present in the aroma of this species.

Material and Methods

Plant material

Six accessions of *B. bituminosa* were collected in different Mediterranean areas of Italy and grown *ex situ* at the experimental field of the University of Tuscia, Viterbo. Three year-old plants were sampled at full

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