Composition of Coriander Essential Oil from Brazil

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Abstract

Coriander (*Coriandrum sativum* L.) is an annual and herbaceous plant, belonging to the Apiaceae family. Native of southern Europe and western Mediterranean region, this herb is cultivated world widely. This species, rich in linalool, has potential using as source of essential oil and as a medicinal plant. It has been used as analgesic, carminative, digestive, depurative, anti-rheumatic and antispasmodic agent. Its fruits (commonly called "seeds") are used for flavoring candies, in cookery, perfumery, beverage and in tobacco industry. The aim of this study was to analyze the chemical composition of the seed essential oil of this species grown in Botucatu, São Paulo, Brazil. The experiment was carried out in Lageado Experimental Farm, Department of Plant Production, Agronomical Sciences College, São Paulo State University. The fruits were harvest 108 days after sowing. The essential oils were extracted by hydro distillation, in Clevenger apparatus. 50 g of fruits were used in each extraction. Three extractions were performed during three hours. The essential oils were analyzed in Gas Chromatography Mass Spectrometer (CG-MS, Shimadzu, QP-5000), equipped with DB-5 capillary column (30 m x 0,25 mm x 0,25 mm), split 1/20, injector for 240 C^{o}, detector for 230 C^{o}, dragged by gas He (1,7 mL/min), with programmed temperature for 40 C° (5 min)-150 C°, 4 C°/min; 150 C°-280 C°, 8 C°/min. The identification of the compounds was made by comparison of their spectra of masses with data from CG-MS (Nist 62 lib), literature references and retention index of Kovats. The 18 most important components were identified and quantified. The main components of the oil were linalool (77.48 %), γ-terpinene (4.64 %), α-pinene (3.97 %), limonene (1.28 %), geraniol (0.64 %) and 2-decenal (0.16 %).

INTRODUCTION

The Apiaceae family consists of 3000 species and around 400 genera distributed mainly over temperate regions of the northern hemisphere where a high number of endemism has been presented (Barroso, 1991). Coriander (*Coriandrum sativum* L.) is an annual herbaceous plant originally from southern Europe, Asia and Caucasus. Being known as aromatic, medicinal and condimental plant, the whole aerial part of coriander, specially the leaves, present essential oil with an unpleasant odour; while the dry fruit and seeds are rich in essential oil and have both odour and taste very pleasant. So, they have been widely used in food industry to prepare liqueur, sweets and condiment as well as perfume and cosmetics (Pola, 1996). The essential oil of seeds is rich in linalool and it is used in pharmaceutical production to improve flavour and aroma of some medicines. In Brazil ripe fruits of coriander are widely and popularly used in infusion preparation as analgesic, antispasmodic, febrifuge, carminative and diuretic agent. There are also reports on its home using against several respiratory and digestive affections. (Martins et al., 1994). Coriander crop even playing an important role in regions of its growing, it has only

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recently been the aim of scientific studies mainly through the work of Putievky (1980).

This work aimed to evaluate chemical composition of coriander seeds (*Coriandrum sativum* L.) grown in Botucatu city-SP-Brazil.

MATERIAL AND METHODS

The study was done in the experimental field of Plant Production Department - Horticulture of the Agricultural Science College of UNESP - Campus of Botucatu. The experiment was set up in the field in a randomized block design with four replications. Plots were 2.80 x 2.40 m, 40 cm apart within rows and 10 cm apart among rows. Commercial seeds of Português cv have been used for sowing. Harvest was held 108 days after sowing. Hydrodistillation in Clevenger apparatus has been used for essential oil extraction. About 100 g seeds of each treatment were set in flat bottom flask with distillated water enough to cover the vegetable material. The process of hydrodistillation lasted 3 consecutive hours. The seed essential oil was analyzed through a gas chromatograph connected to the mass spectrometer (CG-EM, Shimadzu, QP-5000), equipped with DB-5 capillary column (30 m x 0.25 um x 0.25 um), split 1/20, injector at 240 C°, detector at 230 C°, He as carrier gas (1.7 ml/min), with the temperature program: 40 C° (5 min.) - 150 C°, 4 C°/ min.; 150 C° - 280 C°, 8 C°/min. The compound identification was based on comparison of their mass spectra with data of CG-EM (Nist 62 lib.), literature reference (Mclafferty & Stauffer,1989) and retention index of Kovats (Adams, 1995).

RESULTS AND DISCUSSION

Results of chemical composition of coriander essential oil (*Coriandrum sativum*) are shown on Table 1. Twenty nine compounds have been found (Fig. 1), 18 of them identified and the major ones were as follows: linalool (77.48 %), γ-terpinene (4.64 %), α-pinene (3.97 %), limonene (1.28 %), geraniol (0.64 %) and α-decenal (0.16 %).

Pino et al. (1996) studying the chemical composition of essential oil from Cuba, identified 35 compounds and have found different percentage for linalool (54.57 %), α-pinene (1.14 %), geraniol (6.97 %), γ-terpinene (4.08 %) and limonene (1.55 %) when compared to the results from this work.

Pino & Borges (1993, 1999) have also studied the content and chemical composition of coriander essential oil grown in different geographic regions in Russia, Italy, Albania and India. They have found different percentage for content and chemical composition of the oil for each studied region. The major compounds were linalool, γ-terpinene, camphor and α-pinene, and the highest percentages were found in Russia and Albania.

In studies carried out to evaluate chemical composition of coriander essential oil produced in Russia and Bulgaria, Derbesy & Uzio (1993) and Frank et al. (1995) have found very close values for its major compounds: linalool (65.0 % and 68.4 %), α-pinene (3.0 % and 2.5 %) and limonene (2.0 % and 1.3 %).

The results obtained by several authors compared to the ones from this work, show that these compounds present variation, which may be related to climate and soil condition, harvest season and plant development.

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Tables

Table 1. Chemical compounds identified in essential oil of coriander seeds (*Coriandrum sativum* L.).

Peak[a]	Compound	%[b]
1	Heptanal	2,06
2	α-pinene	3,97
3	Camphene	0,33
4	Sabinene	0,26
5	β-pinene	0,38
6	Myrcene	0,77
7	ρ-cymene	2,16
8	Limonene	1,28
9	γ-terpinene	4,64
10	Linalool	77,48
11	Camphor	2,60
12	Borneol	0,18
13	Terpine-4-ol	0,17
14	Decanal	0,46
15	Geraniol	0,64
16	2-decenal	0,16
17	Geranyl-acetate	1,06
18	Tetradecane	0,05

a. Numbers in the compounds correspond to peaks in Figure 1.
b. Total percentage

Figures

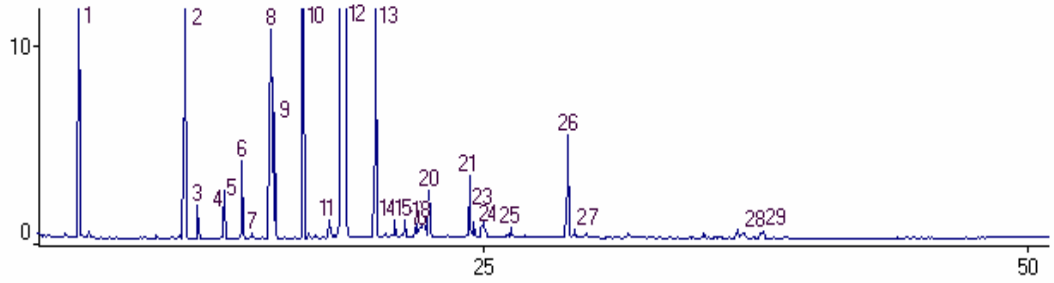

Fig. 1. Gas chromatogram of essential oil of coriander from Brazil.