Chemistry of Natural Compounds, Vol. 46, No. 4, 2010

CHEMICAL CONSTITUENTS OF *Chenopodium ambrosioides* var. *anthelminticum* HERB ESSENTIAL OIL FROM NIGERIA

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UDC 547.913

Chenopodium ambrosioides var. *anthelminticum* A. Gray (Chenopodiaceae) is a small perennial tropical herb with a grooved, multibranched reddish stem and a strong disagreeable scent growing to a height of 1 m [1]. The leaves are oval (up to 4 cm long and 1 cm wide) and sharply toothed. The flowers are small and green, and the seeds are very small and green when fresh and black when dry. It originated in Mexico, and South and Central America, though it is now widespread all over the world. The plant is sometimes cultivated principally for medicinal use in West Africa as a purgative, for treating sores, edema, and for flavoring purposes [1]. The oil of this plant is a popular and highly effective anthelmintic with a long history of usage [2, 3]. Oil of *Chenopodium* species growing in other parts of the world has been studied for its chemical constituents [4–6]. In this study, we investigated the constituents of the Nigerian herb′s essential oil.

From the results of the GC and GC/MS analyses of the herb oil of *C. ambrosioides* var. *ambrosioides* presented in Table 1, 13 constituents amounting to 78% of the total oil were identified. The oil is composed chiefly of monoterpene hydrocarbons (76.8%) with trace amounts of other groups of constituents. α-Terpinene (53.4%) and *p*-cymene (21.1%) are the chief monoterpene hydrocarbons occurring in the oil, while minor hydrocarbons include limonene (1.4%) and γ-terpinene (0.8%). The widely reported anthelmintic component, ascaridole [6], was equally present as a minor component (1.1%) in the oxygenated monoterpene class. Previously, Okelola et al. [7] detected only ascaridole in the leaf oil of the Nigerian plant using the iodometric method.

Chenopodium oil is seldom used for flavoring purposes owing to its reported toxicity [8, 9] at low doses. Toxicity against snails and drug-resistant strains of *Mycobacterium tuberculosis* has also been documented. Nevertheless, it is still used in very small quantities in perfumery [10]. This multipurpose oil is also known for its anticancer and anti-tumor properties *in vitro* [8].

Oil samples from species collected elsewhere in Africa, Madagascar [6], Rwanda [11], and India [12] share similar composition with our oil, but ascaridole and its isomer, isoascaridole, were detected as additional major components in the Madagascar oil. Furthermore, Pino et al. [4] earlier reported α-terpinyl acetate and *p*-cymene as the predominant and minor constituents, respectively, for the Cuban oil, but only *p*-cymene was present as a major constituent in our oil. An earlier sample from Japan obviously belongs to a different chemotype characterized by (–)-pinocarveol [13]. From the various studies on *C. ambrosioides* oil, four chemotypes could be recognized, mainly the Japanese, Madagascar, Cuban, and Indian/Rwandese. The Nigerian oil belongs to the Indian/Rwandese chemotype. However, oil of a related species, *C. botrys,* growing in different locations in Iran was of an entirely different composition [5]. This study reports the overall spectrum of essential oil constituents of *C. ambrosioides* var. *anthelminticum* herb from Nigeria, which is described as a rich source of monoterpene hydrocarbons presumably lacking in the anthelmintic principle characteristic of the oil.

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 0009-3130/10/4604-0654

TABLE 1. Composition of *C. ambrosioides* var. *anthelminticum* Herb Essential Oil, Expressed as %

Compound	RI	%	Compound	RI	%
α-Pinene	898	Tr.	*trans*-Caryophyllene	1434	Tr.
β-Fenchene	954	Tr.	α-Humulene	1471	Tr.
β-Myrcene	958	Tr.	β-Selinene	1507	Tr.
α-Terpinene	982	53.4	α-Selinene	1517	Tr.
p-Cymene	988	21.1	Monoterpene hydrocarbons	–	76.8
Limonene	992	1.4	Oxygenated monoterpenes	–	1.1
γ-Terpinene	1022	0.8	Sesquiterpene hydrocarbons	–	0.1
α-Terpinolene	1058	Tr.	Total identified		78.0
Ascaridole	1248	1.1			

Tr.: trace < 0.5%.

ACKNOWLEDGMENT

The authors gratefully thank Mr. A. T. Oladele, the plant curator at the Department of Pharmacognosy (OAU, Nigeria) herbarium for assistance with plant authentication.

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