

# Chemical Composition of the Stem Oil of *Aristolochia indica* L.

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## Abstract

Essential oil from dry matured stem of *Aristolochia indica* Linn. family Aristolochiaceae was investigated by GC and GC/MS. A total of 15 compounds were identified, representing 91.2% of the total oil. The major constituents of oil were *trans*-pinocarveol (24.2%),  $\alpha$ -pinene (16.4%) and pinocarvone (14.2%).

## Key Word Index

*Aristolochia indica*, Aristolochiaceae, essential oil composition, *trans*-pinocarveol,  $\alpha$ -pinene, pinocarvone.

## Introduction

*Aristolochia indica* L is one of the 300 species belonging to the family Aristolochiaceae, found in low hills and plains of India from Nepal and lower Bengal to Chittagong in Bangladesh and Coromondal Coast (1–4).

*Aristolochia indica* is a shrubby or herbaceous vine with a woody root stock and the plant is used in indigenous system of medicine. Leaves of this plant are used to treat cholera, fever and bowel troubles (5). Roots are bitter, acrid digestive and also useful in ulcers, leprosy and all types of poisonous bites (3). The essential oil composition of the root and aerial parts of this plant has been studied by Krishna Rao et al. (6), Rao and Mulhara (7), and Jirovetz et al. (8). A fresh cutting of stem as such has no aroma, but when air-dried, it produces an aroma which has led us to investigate the constituents of the essential oil from the dry stem, which has not been previously studied.

## Experimental

**Plant material:** *Aristolochia indica* is collected from foot hills of Arunachal Pradesh and planted in experimental farm in Regional Research Laboratory, Jorhat, Assam. The species was identified in Botanical survey of India (BSI) Shillong, Meghalaya, India and voucher specimens have been deposited at RRL Herbarium and also in NBPGR Herbarium, New Delhi. Two year old vines/stems without leaves were uprooted from

experimental farm of RRL, Jorhat and dried in room temperature. The stems were cut into small pieces and subjected to water distillation.

**Isolation of volatile components:** The air dried stems (400 g) of *Aristolochia indica* were subjected to hydrodistillation in a Clevenger-type apparatus for 4 h. The yield of oil was 0.5–0.6% on a dry weight basis. The oil were dried over anhydrous sodium sulphate and stored in sealed vials under refrigeration prior to analysis. The oil was analyzed by GC and GC/MS.

## Gas Chromatography/Mass Spectroscopy

Analysis of the oil was done by a combination of capillary GC and GC/MS using Shimadazu GC-17A and GC-MS QP5000 instruments. The GC columns used for both GC and GC/MS analysis was a CP-sil 5CB fused GC columns 25 m x 0.25 mm, film thickness 0.25  $\mu$ m. The initial oven temperature was held at 35°C for 25 min then programmed at 5°C/min to 280°C; split ratio 50:1; carrier gas He at a flow rate of 30 cm<sup>3</sup>/s. The injector and detector (FID) temperatures were maintained at 280°C.

For GC/MS analysis, a quadrupole mass analyzer with an electron ionization (EI = 70 eV) system was used. The column and conditions of a GC were as above. The mass spectra acquired was in the range 10–400 Da with a scanning rate of four spectra/s. The transfer line temperature was kept at 280°C and the He flow rate was 40 cm<sup>3</sup>/s.

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The percentage composition of the oil was calculated from electronic integration measurement using FID detection without response factor correction. Linear retention indices of the components were determined relative to n-alkane. The constituents of the oil were identified by matching their mass spectra and retention indices using NIST library search facility available with the instrument.

## Results and Discussion

Analysis of the essential oil resulted in the identification of 15 components comprising 91.2% of the total volatiles (Table I). The major components were *trans*-pinocarveol (24.2%),  $\alpha$ -pinene (16.9%) and pinocarvone (14.2%) followed by  $\beta$ -pinene (7.1%), limonene (6.9%) and myrtenol (6.4%). The oil was characterized by the predominance of monoterpenes (88%) to sesquiterpene (3.2%) compounds. The constituents of the oil under investigation were quite different than the oil reported by Jirovetz et al. (8), which contained  $\beta$ -caryophyllene,  $\alpha$ -humulene, ishwarone, caryophyllene oxide, ishwarol, ishwarane and aristolochene as well as linalool and terpinolene. Krishna Rao et al. (6) and Rao and Mulhara (7) also observed that few similar compounds like ishwarol, ishwarane, iswarone in the root oil of this species. As a result, this study reveals that the composition of the oil of the matured dried stem is uniquely different from either the aerial parts or the root oil of *Aristolochia indica*.

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## References

1. Anonymous, *Indian Medicinal Plants; a compendium of 500 species*. Vol. 1, p. 81, Orient Longman Ltd., Madras, India (1993).
2. Anonymous, *The Wealth of India, Raw Materials*. Vol. 1, *A Dictionary of Indian Raw Materials and Industrial Products*. p. 117, CSIR, New Delhi, India (1948).
3. R.N. Chopra, S.L. Nayar, and I.C. Chopra, *Glossary of Indian Medicinal Plants*. p. 24, CSIR, New Delhi, India (1956).

**Table I. Percentage composition of dried stem oil of *Aristolochia indica***

Compound	RI	%
$\alpha$ -pinene	941	16.9
camphene	956	4.5
$\beta$ -pinene	982	7.1
p-cymene	1027	t
limonene	1032	6.9
<i>trans</i> -pinocarveol	1142	24.2
pinocarvone	1168	14.2
terpinen-4-ol	1180	t
myrtenol	1199	6.4
myrtenal	1199	2.1
carvone	1246	t
$\alpha$ -terpinyl acetate	1352	2.1
aromadendrene	1444	1.5
(E)- $\beta$ -ionone	1493	3.6
$\alpha$ -cadinol	1657	1.7
Total		91.2%

t = trace (< 0.1%).

4. U.N. Kanjilal, P.C. Kanjilal, R.N. Dey and A. Das, *Flora of Assam*. Vol. IV, p. 26, R. Kumar, Omsons Publications T-7, New Delhi, India (1997).
5. A. Chatterjee and S.C. Pakrashi, *The Treatise on Indian Medicinal Plants*. Vol. 1, p. 63, Publications and Information Directorate (CSIR), New Delhi, India (1991).
6. U.S. Krishna Rao, B.L. Manjurath and K.N. Menon, *Essential Oil from the Roots of Aristolochia indica*. *J. Ind. Chem. Soc.*, **12**, 494–498 (1935).
7. A. Samesekhran Rao and M.S. Mulhara, *Preliminary Studies on the Essential Oil from Aristolochia indica*. *J. Ind. Inst. Sci.*, **37A**, 266–271 (1955).
8. L. Jirovetz, G. Buchbauer, C. Puschmann, W. Fleischhacker, P.M. Shafi and M.K. Rosamma, *Analysis of the Essential Oil of the Aerial Parts of the Medicinal Plants Aristolochia indica Linn. (Aristolochiaceae) from South India*. *Sci. Pharm.*, **68**, 309–316 (2000).