Research Journal of Medicinal Plant

ISSN 1819-3455

Academic Journals Inc.

www.academicjournals.com

Research Journal of Medicinal Plant 9 (5): 248-251, 2015
ISSN 1819-3455 / DOI: 10.3923/rjmp.2015.248.251

Investigation of Essential Oil Constituents Isolated from *Trichodesma africanum* (L.) Grow Wild in Egypt

S.S. Ahmed, M.E. Ibrahim and K.A. Khalid
Department of Medicinal and Aromatic Plants, National Research Centre, El Buhouth St., 12622, Dokki, Cairo, Egypt

Corresponding Author: S.S. Ahmed, Department of Medicinal and Aromatic Plants, National Research Centre, El Buhouth St., 12622, Dokki, Cairo, Egypt

ABSTRACT

Chemical composition of Egyptian *Trichodesma africanum* (L) essential oil has a few studies, so, this present investigation was carried out to study the essential oil content and chemical composition of *Trichodesma africanum* (L) plants as a new natural source of essential oil. Plant material was collected from wild plant populations of *Trichodesma africanum* (L) (family Boraginaceae) growing in sandy soils on Gebel Elba region, Egypt. The essential oils obtained by water distillation from aerial parts of *Trichodesma africanum* (L) yielded 0.2%. Seventeen constituents representing 86% of the Egyptian *Trichodesma africanum* (L) essential oil were identified. The major components of Egyptian *Trichodesma africanum* (L) essential are caryophyllene oxide (15.6%), γ-eudesmol (13.7%), α-muurolene (10.5%), elemol (7.0%), carvone (6.8%) and β-caryophyllene (6.6%). Minor component is α-pinene (0.1%). sesquiterpene hydrocarbons reached its highest concentrations (44.6%).

Key words: *Trichodesma africanum* (L), essential oil, caryophyllene oxide

INTRODUCTION

Trichodesma africanum (L) is a member of the family Boraginaceae (Al-Yahya, 1990). Description: An erect annual herb. Stems are slightly woody at the base of the odor plants, dark, green, covered in spines. Leaves are a simple, alternate, old growth is dark green, younger growth is much lighter. Leaves have many glands and also are covered in fine spines. The flower is a small pale /link and on along, thin peduncle. Peduncle and calyx are dark pink to maroon and covered in fine white hair (Boulos, 1997, 2000). Twenty four components were identified using GC/Mass of essential oil extracted from *Trichodesma africanum* (L.) R. Br. Var. *heterotrichum* Bornm and Kneuck, the major constituents were caryophyllene oxide (16.1%), 10-epi-γ-eudesmol (13.0%), cadina-1, 4-diene, β-gurjunene (7.5%), 2-pentadecanone, 6, 10, 14-trimethyl (5.8%) and β-caryophyllene (5.6%) (El-Moaty, 2009). The use of natural products with therapeutic properties is as ancient as human civilization and, for a long time, plant products were the main sources of drugs (De Pasquale, 1984). The World Health Organization estimated that 80% of the populations of developing countries rely on traditional medicines, mostly plant drugs, for their primary health care needs. Also, modern pharmacopoeia still contains at least 25% drugs derived from plants and many others, which are synthetic analogues built on prototype compounds isolated from plants (Bodeker *et al*., 1997).

Chemical composition of *Trichodesma africanum* (L) essential oil has a few studies, so, this present investigation was carried out to study the essential oil content and chemical composition of *Trichodesma africanum* (L) plants as a new natural source of essential oil.

MATERIALS AND METHODS

Plant material: Plant material was collected from wild plant populations of *Trichodesma africanum* (L): Growing in sandy soils on Gebel Elba region approximately 1200 km south of Cairo in March, 2013 identification of the species was achieved by Boulos (1997, 2000), National Research Centre Cairo Egypt Voucher specimens are in the herbarium of NRC, Cairo, Egypt.

Essential oil isolation: Dried herbs [divided into small pieces (0.5-1 cm)] were collected then 500 g from each replicate (three replicates) of all treatments was subjected to hydro-distillation for 3 h using a Clevenger-type apparatus (Clevenger, 1928). The essential oil content was calculated as a relative percentage (v/w). The samples of essential oils were dried over anhydrous sodium sulphate to identify the chemical constituents of the essential oil.

Gas chromatography: The GC analyses were performed using a Shimadzu GC-9A gas chromatograph equipped with a DB5 fused silica column (30 m×0.25 mm i.d., film thickness 0.25 μm). Oven temperature was held at 40°C for 5 min and then programmed until 250°C at a rate of 4°C min^{-1}. Injector and detector (FID) temperature were 260°C, helium was used as carrier gas with a linear velocity of 32 cm sec^{-1}.

Gas chromatography-Mass spectrometry: The GC-MS analyses were carried out on a Varian 3400 system equipped with a DB-5 fused silica column (30 m×0.25 mm i.d.), Oven temperature was 40-240°C at a rate of 4°C min^{-1}, transfer line temperature 260°C, injector temperature 250°C, carrier gas helium with a linear velocity of 31.5 cm sec^{-1}, split ratio 1/60, flow rate 1.1 mL min^{-1}, Ionization energy 70 eV; scan time 1 sec, mass range 40-350 amu. The components of the oils were identified by comparison of their mass-spectra with those of a computer library or with authentic compounds and confirmed by comparison of their retention indices either with those of authentic compounds. Kovat's indices (Kovats, 1958) were determined by co-injection of the sample with a solution containing a homologous series of n-hydrocarbons in a temperature run identical to that described above (Adams, 1995).

Qualitative and quantitative analyses: Identifications were made by library searches Adams (1995) combining MS and retention data of authentic compounds by comparison of their GC Retention Indices (RI) with those of the literature or with those of standards available in our laboratories. The retention indices were determined in relation to a homologous series of n-alkanes (C_8-C_{22}) under the same operating conditions. Further identification was made by comparison of their mass spectra on both columns with those stored in NIST 98 and Wiley 5 Libraries or with mass spectra from literature. Component relative concentrations were calculated based on GC peak areas without using correction factors.

RESULTS AND DISCUSSION

The essential oils obtained by water distillation from aerial parts of *Trichodesma africanum* (L) yielded 0.2% v/w on a dry weight. Seventeen constituents representing 86% of the Egyptian *Trichodesma africanum* (L) essential oil were identified (Table 1). The major components of Egyptian *Trichodesma africanum* (L) essential are caryophyllene oxide (15.6%), γ-eudesmol (13.7%), α-muurolene (10.5%), elemol (7.0%), carvone (6.8%) and β-caryophyllene (6.6%). Minor component is α-pinene (0.1%). Previously, twenty four components were identified using GC/Mass of essential

Table 1: Chemical constituents of essential oil extracted from *Trichodesma africanum* (L)

Components	KI	Class	IM	Peak area (%)
α-pinene	939	MH	RI, MS	0.1
Sabinene	976	MH	RI, MS	0.2
Linalool	1098	OM	RI, MS	1.8
ß-sesquiphellandrene	1140	SH	RI, MS	4.0
Carvone	1242	OM	RI, MS	6.8
Geraniol	1255	OM	RI, MS	3.5
α-longipinene	1351	SH	RI, MS	4.5
Neryl acetate	1365	OM	RI, MS	2.5
α-cedrene	1409	SH	RI, MS	4.3
ß-caryophyllene	1418	SH	RI, MS	6.6
α-muurolene	1480	SH	RI, MS	10.5
α-zingiberene	1495	SH	RI, MS	2.0
ß-bisabolene	1509	SH	RI, MS	3.0
Δ-cadinene	1524	SH	RI, MS	2.0
Elemol	1547	SH	RI, MS	7.7
Caryophyllene oxide	1581	OS	RI, MS	15.6
γ-eudesmol	1630	OS	RI, MS	13.7
		MH		0.3
		OM		14.6
		SH		44.6
		OS		29.3
Total identified				88.8

IM: Identification method, KI: Confirmed by comparison with Kovats index on DB5 column (Adams, 1995), MH: Monoterpene hydrocarbons, OM: Oxygenated monoterpene, SH: Sesquiterpene hydrocarbons, OS: Oxygenated sesquiterpene

oil extracted from *Trichodesma africanum* (L.) R. Br. Var. heterotrichum Bornm and Kneuck, the major constituents were caryophyllene oxide (16.1%), 10-epi-γ- eudesmol (13.0%), cadina-1, 4-diene, β-gurjunene (7.5%), 2-pentadecanone, 6, 10, 14-trimethyl (5.8%) and β-caryophyllene (5.6%) (El-Moaty, 2009).

Table 1 represents the obtained compounds from *Trichodesma africanum* (L) essential oil under Egyptian conditions grouped into four classes, which are Monoterpene Hydrocarbons (MH), Oxygenated Monoterpene (OM), Sesquiterpene Hydrocarbons (SH) and Oxygenated Sesquiterpene (OS). From the same Table 1 it is evident that the SH reached its highest concentrations (44.6%), followed by OS (29.3%) in essential oil compared with the other chemical classes MH (0.3) and OM (14.6%). The SH included the components of β-sesquiphellandrene, α-longipinene, α-cedrene, β-caryophyllene, α-muurolene, α-zingiberene, β-bisabolene, cadinene and elemol caryophyllene oxide is the major constituents of the SH of *Trichodesma africanum* (L) essential oil.

Our results indicate that caryophyllene oxide of *Trichodesma africanum* (L) essential oil grown in Egypt belongs to the caryophyllene oxide chemotype. This compound represents 15.6% (area percent) of the total oil. Caryophyllene oxide, an oxygenated terpenoid, well known as preservative in food, drugs and cosmetics, has been tested in vitro as an antifungal against dermatophytes. Its antifungal activity has been compared to cyclopiroxolamine and sulconazole (Yang *et al*., 1999).

CONCLUSION

It may be concluded that the essential oils obtained from aerial parts of *Trichodesma africanum* (L) yielded 0.2%.v/w. *Trichodesma africanum* (L) essential oil grown in Egypt belongs to the caryophyllene oxide chemo-type.

REFERENCES

Adams, R.P., 1995. Identification of Essential Oil Components by Gas Chromatography/Mass Spectrometry. 4th Edn., Allured Publishing Corp., Carol Stream, Illinois.

Al-Yahya, M.A., 1990. Saudi Plants: A Phytochemical and Biological Approach. King Saud University Press, Riyadh, Saudi Arabia, Pages: 524.

Bodeker, G., K.K.S. Bhat, J. Burley and P. Vantomme, 1997. Medicinal Plants for Forest Conservation and Health Care. Vol. 92, Food and Agriculture Organization of the United Nations, Rome, ISBN-13: 9789251040638, Pages: 158.

Boulos, L., 1997. Flora of Egypt. Checklist Hadara Publishing Cairo, Egypt.

Boulos, L., 2000. Flora of Egypt. Al Hadara Publishing Cairo, Egypt.

Clevenger, J.F., 1928. Apparatus for the determination of volatile oil. J. Am. Pharma. Assoc., 17: 346-349.

De Pasquale, A., 1984. Pharmacognosy: The oldest modern science. J. Ethnopharmacol., 11: 1-16.

El-Moaty, H.I.A., 2009. Active constituents and antimicrobial activity of *Trichodesma africanum* (L.) R.Br. var. *heterotrichum* Bornm. and Kneuck. Bull. Faculty Agric. Cairo Univ., 60: 357-365.

Kovats, E., 1958. [Characterization of organic compounds by gas chromatography. Part 1. Retention indices of aliphatic halides, alcohols, aldehydes and ketones]. Helvetica Chimica Acta, 41: 1915-1932, (In German).

Yang, D., L. Michel, J.P. Chaumont and J. Millet-Clerc, 1999. Use of caryophyllene oxide as an antifungal agent in an *in vitro* experimental model of onychomycosis. Mycopathologia, 148: 79-82.