Vetiver Oil and Its Sedative Effect

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Abstract : The essential oil obtained by steam distillation from the roots of *Vetiveria zizanioides* (L.) Nash was investigated for their chemical constituents by GC and GC/MS. The major volatile components belong to the sesquiterpene group such as khusimol, □-vetivone, and □-vetivone. The sedative effect of vetiver oil upon inhalation in rats was studied by observing the number of crossing and rearing motilities. The results showed that vetiver oil decreased rearing motility when compared to the control group.
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1 INTRODUCTION

The essential oil of vetiver, *Vetiveria zizanioides* (L.) Nash is one of the most important raw materials in perfumery both as a fixative and in its own right as a fragrance ingredient. It has extensive applications in toiletries and cosmetic industries and vetiver root is also important in traditional medicine as a carminative, stimulant and diaphoretic.

Vetiver oil possesses sedative property and has been traditionally used in aromatherapy for relieving stress, anxiety, nervous tension and insomnia for a long time (Fischer-Rizzi, 1990). However, there is a lack of scientific experiment to prove these effects by way of inhalation. The aim of this study was to investigate the oil yield and chemical composition from the roots of vetiver cultivated in Thailand and to determine the sedative effect of vetiver oil upon inhalation in rats.

2 MATERIALS AND METHODS

2.1 Plant Material

Vetiver, 'Sri Lanka' ecotype was cultivated by the Agricultural Technology Department, TISTR, at Lam Takhong Research Station, Nakhon Ratchasima Province, in the Northeast of Thailand.

2.2 Isolation of the Essential Oil

The dried roots were subjected to steam distillation for 14 hours. The isolated oil was dehydrated by addition of anhydrous sodium sulfate and kept in an amber-colored glass bottle. The oil yield was calculated relative to the dry matter.

2.3 Analysis

Vetiver oil was investigated using capillary Gas Chromatography (GC) and Gas Chromatography/Mass Spectrometry (GC/MS).

GC analysis was performed using a Fisons gas chromatograph model 8000 series equipped with a FID detector and a DB-5 capillary column (30 m □ 0.25 □m; film thickness 0.25 □m). The operating

conditions were as follows; carrier gas: helium with a flow rate of 2 ml / min; column temperature: 50 - 220 ^{o}C at 4 ^{o}C / min : injector and detector temperatures: 230 ^{o}C.

GC/MS analysis was performed on a VG Quattro mass spectrometer operating at 70 eV ionization energy, equipped with a DB-wax column (60 m x 0.3 mm x 0.25 μm). The oven temperature was programmed from 35 ^{o}C (5 min) to 220 ^{o}C (45 min) at 3 ^{o}C/min, with helium as carrier gas. The identification of the oil components was accomplished by comparing their GC retention indices as well as their mass spectra with corresponding data of authentic compounds or published spectra (Heller and Milne, 1978,1980,1983; Adams, 2001).

2.4 Animal Study

Male Wistar rats with mean body weights of 124 g were divided into 3 groups (7 rats/group) and kept under conventional conditions at room temperature of 24 ^{o}C. The first group was used for testing with vetiver oil (5 % w/w) and the others with lavender oil (5 % w/w) and distilled water as a positive control and control group, respectively. The cage for inhalation (14 L) contained a perforated plastic, which was partitioned into two sections. One part contained soda lime (14 g) to absorb CO_2 and the other one contained calcium chloride (14 g) to remove humidity. After each group of animal was put into the cage, it was made airtight with a transparent plastic seal with 2 small openings. One was connected to a spirometer for O_2 admission. The second was fitted with a folded 8x10 cm filter paper, which was used to add the volatile oil.

The open-field test was modified from Brotto and Kovacs (Brotto, *et al*., 2000, Kovacs, *et a.l.*, 1999). After the animals inhaled the essential oils for 1 hour, they were rested for 30 minutes. Rats were placed individually in the center of a square measuring 10 x 10 cm each. The standard source of illumination was 60 W bulb from 80 cm. The activity was assessed during 5 minutes and recorded on a ceiling mounted video camera. Videotapes were later scored and measured for the number of segments crossed by the animal (defined as at least three paws in a quadrant) and the number of rears (defined as the animal standing upright on its hind legs).

3 RESULTS AND DISCUSSION

The steam distillation of dried roots of *Vetiveria zizanioides* (L.) Nash gave viscous light-brown oil in about 0.3 - 1.0 % v/w yield with balsamic earthy and sweet woody odor. The complex mixture of vetiver oil was identified and summarized in Table 1. From the results, it can be seen that sesquiterpenes constitute the predominant class of compounds, with khusimol(12.7%), longipinene (4.2 %), valerenol (3.9 %), epizizanal (3.3 %), β-vetivone (2.0 %) and α-vetivone (1.62 %) being the major ones. Khusimol is a sesquiterpene alcohol which was found to inhibit the binding of vasopressin to rat liver.(Rao, 1994). Furthermore, khusimol, epizizanal, β-vetivone, and α-vetivone were found to possess insect repellent properties (Jain *et al.*, 1982)

Table 1 Composition of vetiver oil ('Sri Lanka' ecotype)

Compound	Percentage
terpinen-4-ol	3.75
5-epiprezizane	0.71
khusimene	0.66
α-muurolene	1.14
khusimone	1.49
calacorene	0.94
α-humulene	2.37
β-longipinene	4.20
β-selinene	4.13
α-selinene	1.63
δ-cadinene	1.72
valencene	2.30
calarene,-gurjunene	9.84
γ-amorphene	2.07
epizizanal	3.33
3-epizizanol	2.97
khusimol	12.71
Iso-khusimol	0.57
Valerenol	3.93
β-vetivone	1.62
α-vetivone	2.02

Table 2 Effect of vetiver oil administration on crossing and rearing behaviors in the open-field test in rats

Group	No.	Number of Crossing		Number of Rearing	
		Mean	% Motility	Mean	% Motility
Vetiver oil	7	117.3	4.2	24.7	-20.1
Lavender oil	7	81.3	-27.8	27.6	-10.7
Control	7	112.6	-	30.9	-

The animal study explored the effect of vetiver oil on the motility of rats using inhalation procedure. The influence on motility is calculated to demonstrate sedative effect after aromatherapeutical application of the essential oils. In this study we used lavender oil, known to have potent sedative effect, as a positive control. (Buchbauer *et al.*, 1993). After the one-hour inhalation period, vetiver oil led to the most decrease in rearing motility compared to the control group and lavender oil but a small increase in crossing motility. These data showed that vetiver oil possesses sedation effect in agreement with traditional use. In order to understand the effect of every major component of vetiver oil, it may be necessary to study their activities individually on the animals further.

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