Variations of Essential oil composition of Acorus calamus: from Uttarakhand Himalaya.

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ABSTRACT

Sweet flag, Acorus calamus L., is a member of the family of Araceae; various part of specie has Essential oil i.e. Rhizomes, root, leaves and roots. Essential oil from rhizome of Acorus calamus L. (sweet flag) growing wild in different parts of regions essential oil root of the species extracted and analyzed by GC-GC-MS. The yield of calamus oil was in the range of 2.9-4.7% hydro stem distillation process and five components are common in all the region these constituted (93.63-95.89 %) of oil while ß-asarone as major constituents vary among the location ranging 74.36-92.22%.

Key words: Acorus calamus, Rhizomes, GC-GC-MS, ß-asarone, Green pesticides

INTRODUCTION

Acorus calamus (L) family Araceae is well know in India traditional medicinal plants for centuries, it is a perennial, semi-aquatic herbs and smelly plants found in both temperate and sub-temperate zones it grow up to 6 feet tall with soil - shaped leaves, small, yellow, green flowers and branched. The rhizome roots essential oil extracted distilled form these plant parts have been reported to several biological activity including antifungal, 1-3 antibacterial, 4-5 allelopathic, 6 antitumor, and immunosuppressive 7 Essential oil of the species possesses anti-gonadal activity in insects. 8-10 Aromatic oil obtained by Alcoholic extract of the rhizomes is used in pharmaceutical industry and showed antioxidant activity. 11,12 The sweet flag oil present in this plant is a unique source of oxygenated sesquiterpene of great structural variety. 13 Whole plants of A. clamaus essential oil from different parts extensively investigated for its chemical compositions by various workers all over the globe. 14-17 Species also possessed other secondary metabolites like alkaloids, phenolics. 11-18 All most all the biological activity of the essential oils its major constituents ß-asarone are responsible. In view of the above features urgent need to evaluated constituents ß-asarone quantity in specified locations.

Material and Method:

Plant material:

Acorus calamus Rhizomes collected from month of December 2009 five sites namely Gopeshwar, Nagnath Pokhari (Chamoli) Kot (Pauri Garhwal), Bhimtal and Ram Nagar (Nainital) region of Uttarakhand India. Voucher specimens, after identification by Botanical Survey of India northern circle Dehardun Uttarakhand (India), have been kept at the Centre for Aromatic Plants Selaqui, Dehradun, Uttarakhand (India).

Isolation of the Essential oils:

The aerial parts (Leaves, blossoms and very small stalks) were dried and hydro distilled in a Cleverenger apparatus for 6 hours to extract oil. Oil yield, on dry weight basis, ranging between (2.9 - 4.7% v/w). The oil thus obtained were dried over anhydrous sodium sulphate and stored in a refrigerator till samples were analyzed.

Gas Chromatography-Mass Spectrometry:

Analyses by GC were performed by using HP 6890 gas chromatograph equipped with a FID detector and a HP-5 fused silica column (30m X 0.32 mm X 0.25µm film thickness). Nitrogen was used as a carrier gas during analysis. The injector and detector temperature were maintained at 210°C and 230°C respectively. The column oven temperature was programmed from 60°C to 220°C with an increase in rate of 3°C/min. Analysis was carried out on a Perkin Elmer mass spectrometer (Model Claurus 500). Coupled to a Perkin Elmer Claurus 500 gas chromatograph with a 60m x 0.32 mm x 0.25µm film thickness column of rested make (RI-T). Helium was used as the carrier gas (Flow rate 1ml/min). The mass range was scanned from 40-600 Daltons. The oven temperature temperature range was 60°C to 220°C with an increase in rate of 3°C/min. Other conditions were the same as described under GC. The identity of the constituents of the oils was established on the basis of GC retention indices, by comparing their 70 eV mass spectra with those reported in literature, and by computer matching with NIST & WILEY libraries, as well as, Where possible, co-injection with authentic compounds available in our laboratory.

RESULTS AND DISCUSSION:

Present study revealed that essential oil yield vary among the location where sample collected the ranges vary 2.9-4.7%. Results of present study shown (Table-1) and Resemble with previous reports analyzed root samples/ possessed ß-asarone as major constituents, maximum sample collected from Kot Puri Garhwal i.e. 92.22% and sample collected from Gopeshwar regions district Chamoli found minimum content of ß-asarone (74.36%). Other components in oil shoyobuone, also vary ranging (0.20-1.53 %) ß-asarone vary (1.57-17.25 %). It is also observed that only Gopeshwar sample higher amount of ß-asarone, another minor components like cis-cisocimene, linalool, methyl, isoeugenol quantity depends on location specific. A lot of work done in chemical composition of essential oil of A. calamus various authors analyzed essential oil sample from different parts of Uttarakhand Himalaya. 18 Study stated that quantity of ß-asarone is found very high quantity as compared to previous reports from all over India and outside of India. In this context ß-asarone reported the variability in the composition of A. calamus has been explained to the existence of four chemo-types with different ploidy. The biploid grown in northern American no contents of ß-asarone, European triploid cytotypes contents 5-20% ß-asarone, tetraploid present in east Asia, Japan, ß-asarone content upto 70. Hexaploid cytotypes grown in Jammu Kashmir region with ß-asarone content of 5%. According to Mazza 19 Indian calamus, oil contained high amount of ß-asarone (77.7%) and 6.8% a-asarone, but in European calamus oil acoerenone (81%), isohyobubone (6.3%), B-gurjumene (6.7%), calamendiol (5.2%) and B-asarone (5.2%) were found to be major compo
Study conducted by as per health authority centre for drugs information HS V-11 Feb 2001 guideline for health supplement *calamus* is prohibited(http://functionalfood.moeaidb.gov.tw/law/HSGuidelinesFeb04r.pdf accessed on 15/06/20001).According to this potential of species harassed in manufacturing herbal/ green pesticides from Himalayan origin. It is well established and reported biological activity of essential oil due to presence of β-asarone. Its Our dataset indicated found very high amount of such responsible compounds it’s also concluded that need to isolated β-asarone which place quantity is very high and further truly investigation elite source genetic map for conservation and sustainable harvesting through mass multiplications of such region/ area planting materials.

**Table-1 Chemical composition of Acorus calamus**

<table>
<thead>
<tr>
<th>Chemical Composition</th>
<th>RI (%)</th>
<th>Bhimtal (%)</th>
<th>Gopeshwar (%)</th>
<th>Nag Nath Pokhari (%)</th>
<th>Ramnagar (%)</th>
<th>Pauri Garhwal (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cis- Ocimene</td>
<td>1252</td>
<td>0.62</td>
<td>0.15</td>
<td>0.79</td>
<td>0.19</td>
<td>0.15</td>
</tr>
<tr>
<td>Shyobunone</td>
<td>1506</td>
<td>1.48</td>
<td>1.53</td>
<td>1.06</td>
<td>1.01</td>
<td>0.20</td>
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<tr>
<td>Linalool</td>
<td>1553</td>
<td>0.17</td>
<td>0.16</td>
<td>0.17</td>
<td>0.11</td>
<td>-</td>
</tr>
<tr>
<td>Methyl isoeugenol</td>
<td>2099</td>
<td>0.11</td>
<td>0.18</td>
<td>1.05</td>
<td>1.59</td>
<td>1.16</td>
</tr>
<tr>
<td>α-asarone</td>
<td>2186</td>
<td>2.10</td>
<td>17.25</td>
<td>1.71</td>
<td>3.05</td>
<td>1.57</td>
</tr>
<tr>
<td>β-asarone</td>
<td>2252</td>
<td>90.42</td>
<td>74.36</td>
<td>91.11</td>
<td>89.64</td>
<td>92.22</td>
</tr>
<tr>
<td>Total</td>
<td>94.9</td>
<td>93.63</td>
<td>95.89</td>
<td>95.59</td>
<td>95.30</td>
<td></td>
</tr>
</tbody>
</table>

RI* = Retention index relative to C5 – C28 n- Alkenes calculated on non polar Rtx 5 Capillary Column

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