Fumigation activity of Essential Oil extracted from Mentha Spicata L.

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*Abstract:*The present studied has been undertaken to study the pharmalogical activity and Industrial potentiality to use the oil of M. spicata ,it is essential to check chemical variation in the essential oil of ***Mentha spicata L***. in different climatic habitats Plant material collected from the different natural habitats of Kumaun Garhwal Refion in the following places (1)Khatima (2) Rishikesh (3) Almora (4)Tankpur(5)Kashipur (6)Nainital(7)Champawat (8)Pithorogarh(9)Haldwani(10)Harinagar and to study their fumigation effect of essential oils on the sprouting behavior of potato **(*Salanum tuberosum L).*** In the present study the sprout suppressant activity of two chemotype of ***Mentha spicata*** essential oils from Champawat and Tanakpur of uttarakhand were investigated.As the major constituent in Champawat collection (site-7) were ***carvone*** (68.5%) ***limonene*****(**14.0%) and Tanakpur collection (site-4) the major constituent was ***pipertenone oxide***(79.2%) .These comounds could responsible for sprout suppression in potato tuber the standard in the study were CIPC and Iodine which are responsible for maximum sprout inhibition.

1: INTRODUCTION:

Terpenoids constitute the most abundant and structurally diverse group of plant secondary metabolites and normally produced in vegetable tissues, flowers and roots. They play an important role in plant–insect, plant-pathogen, and plant-plant interaction [(1).]Terpenoides are commonly present in higher plants and more than 23000 individual structures have been identified [(2).]Fruit and Vegetables contain an abundance of Phenolic substances ,terpenoids and other natural antioxidants that have been association .with protection from and treatment of chronic diseases such as heart disease or cancer .The terpeoids beneficial to maintain and improve health are monoterpenes (like limonene ,carvone or carveol),diterpenes (include all different carotenoids like αand β-carotene ,lutein ,lycopene and cryptoxanthine)[(3).]Terpenes are derived biosysthetically from units of isoprene,which has the molecular formula C_5H_8. The isoprene units may be linked together “head to tail”to from linear chains or they may be arranged to from rings[(4)].

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Family Lamiaceae of a rich source of terpenoids consists of 264 genera and 6990 species distributed world over[(5).]The Indian sub-continents represents 72 genera and 435 species [(6).]Indian Himalayan region is a big repository of

the family Lamiaceae.Western Himalaya represents 60 genera and 225 species [6].Himanchal Pradesh represent 42 genera and 111 species[7].While uttarakhand region contributes 49 genera and 151 species of Lamiaceae[8].Out of total species reported in India .Hence Uttarakhand.**:** Himalayan provides potential to develop database on Family Lamiaceae.

Plant of family lamiaceae are distinctive in being herbs or shrubs ,often aromatic with ethereal oils,with usually 4-sided steams,opposite leaves,with usually 4-sided stems ,opposite leaves,a verticillaster or thyrse in florescence,and zygomorphic .[4]

Potato is the most important agricultural case crop but for a long term storage of potatoes requires, effective sprouting inhibition. Sprouting in potatoes cause increased in weight loss reduced tuber quality and impedes air passage through the potato pile which ultimately cause potato malformation and make them unacceptable for marketing. The primary method to control sprouting for long term, storage of potato is the post harvest application of ***Isopropyl-N-chlorophenyl carbamate (chlorpropham;CIPC).***CIPC suppress sprout development by interfering with cell division. However, a recent Environmental Protection Agency (EPA) mandate from the requirements of the food quality protection act (FQPA)of 1996,resulted a reduction in permissible CIPC residue on fresh potatoes in United states between50-30 ppm. The other obstruction for use of CIPC is other the application of CIPC as emusifiable concentration (EC) at commercial level requires years of experiences using specialized equipment as well as similarity with storage and acerosols [9].

In the present study the sprout suppressant activity of two chemotype of ***Mentha spicata*** essential oils from Champawat and Tanakpur of uttarakhand were investigated.The germination was retarded in all the tested concentration after seven days the final sprouting percentage and weight loss of the most concentrated oils signicantly reduced by both the oils in comparison with control in a dose dependant manner (table 1, Fig 1-3)

1.1Chemical Investigation;

Survey of literature lot of variation in chemistry of essential oil of *M.spicata* collected from different geographical regions. Pinene(2.38%), limonene (22.92%) .isomenthone(0.51%),menthone(5.22%).isobornylacetate(1.05%),pulegone(3.53%).neryl acetate(2.70%) carvone (60.54%), and geraniol(1.27%) were reported as main constituent in essential oil of *M.spicata* growing in Argentina[10].[11] reported that at early stage of growth of plant ,the main component was (+) di-hydrocarvone(87%).In flowering stage 14 compounds were identified which include (+) di-hydrocarvone (55%),isohydorcarvone (7.5%) ,piperitone oxide (3.5%) limonene (2.4%) ,a-pinene (1.5%), ß-pinene (1.2%) and caryophyllene (7.8%).

(-)-carvone,(+)-dihydrocarvone,(-)-dihydro carveol,(-)-dihydrocarvyl acetate,(+)-neodihydrocarveol and (-)- cis-carvyl acetate were the major components of the essential oil of spearmint oil growing in Japan[12.13] reported that (-)-carvone (60.6-62.5%),(-)-limonene (5.9-9.6%),1,8-cineole(8.2-10.2%) and (+)-dihydrocarvone (3.7-9.0%) from flowers of *Mentha Spicata* collected from Japan.

[14]reported that carvone, pulegone and borneol were found to be effective for the control of sprouting in potatoes. When potato were kept in closed bins and treated with 1,8-cineole the volatile monoterpene inhibited sprouting growth on stored potato.

[15]have reported that essential oil of caraway showed ant sprouting activity for stored potatoes.Carvone was used as sprouting suppressant for stored potatoes.Commerically (+)- carvone is more effective than (-) -carvone,which does not give an unpleasant taste after treatment.

[16]observed inhibition of sprout growth in stored potatoes by the use of R-carvone and S-carvone.But due to faster uptake of S-carvone,it inhibited elongation of sprouts in potatoes more efficiently as compared to R-carvone.It has also

been reported that the essential oils of peppermint ,
ajowan .basil and spearmint were most effective for controlling sprouting in potatoes up to twelve weeks.

2: EXPERIMENTAL

2.1 SOURCE OF PLANT MATERIAL

Plant material (Whole hurb) was collected from the different natural habitates of the Kumaun and Garhwal region,in the month of August,September and was identified by Dr. D.S. Rawat (Asstt. Professor & Taxonomist),Depatrment of Biological Science,G.B.P.U.A. &T.Pantnagar.

2.2 CHEMICALS AND GLASSWARE

The solvents and chemicals used for the present study were of Laboratory and Analytical grade and were procured form BDH and E.Merck. The solvents were distilled prior to use.Glassware used during the study were either Corning or Borosil make.

2.3 SOURCE OF POTATO

Fully mature and healthy potato of uniform size and shape were collected from vegetable Research centre (V.R.C),G.B pant University of Agri.and Tech.,Pantnagar (U.S.Nagar),by courtesy of Dr.J.P.singh,Joint-Director of V.R.C,G.B pant university of Agri.and tech.,Pantnagar.

2.4 STORAG OF CLAY POT

Clay pots of capacity 300 gm were purchased from local market. The clay pots were properly washed with distilled water and dried in sun light before using in experiment.

2.5 EXPERIMENT

Potato sprout growth inhibition activity by the fumigation of essential oils was performed according to the method reported earlier[10]. 100gm (10-15 tuber/treatment) were taken in clay pots with air tight condition. Various amounts of essential oils (100µL,200 µL and 300 µL in triplicate) in a glass vials without lid were placed inside the clay pots for fumigation.Sprout growth during the experiment was the primary measured effect. The fumigation of test essential oil were allowed to the tuber as vapour for five weeks (35 days) at room temperature (35^0c)and the sprouting growth inhibition activity was monitored at the interval of seven days (seven days ,fourteen days, twenty one days, twenty eight days and thirty five days) by counting the number of sprout and weight loss of the tubers per clay pot.Chlorpropham(CIPC/Isopropyl-N-chlorophenyl carbamate) the synthetic sprout inhibitor and Iodine balls were used as standard and the clay pot without essential oil was used as control.

3: RESULT:-

The herbs of plant were collected from the ten different natural habitats and were extracted by the hydor distillation using clavenger's type apparatus.The essential oil was varies from 0.57% -1.4%.The oil also differed in their qualitative and quantitative make up on the basis of GC and GC MS analysis.All the collection are dominated by the mono terpenoids contributing 80.6%,89.4%,50.6%,88.4%,78.9% ,92.0%,90.2%,89.4% 85.4% and 89.8% of the total oil respectively.Carvone and pipertone oxide has been identified as the major constituents in the essential oils and varied from 15.3-68.5% and 24.4-79.2% respectively.

GC Analysis:-G C analysis of the essential oils performed in Nucon –GC 5765 system.
Following conditions were used for GC analysis.

Column:	DB-5 Non-polar silica capillary column (30 mx0. 32mm i.d.)
Carrier gas :	Nitrogen
Flow Rate:	50 Kg/cm^2
Detector Temperature	210^0c
Intial temperature	60^0C
Sample Injection	0.1 µL
Split Ratio	1:48
Sensitivity	X1000
Attenuation	X4

GC-MS Analysis

The GC-Ms data of the essential oils were obtained on Thermo Quest ,Trace 200,GC coupled with Finnigan Mat Polaris Q MS with following conditions

Column DB-5 Non –polar silica capillary Column (30m X0.32 mm i.d)
Carrier gas Helium
Flow rate : 1ml/min
Split Ratio: 40:1
Ion Source temperature: 200^{0}C
Mode: EI (70 eV)
Initial Temperature: 60^{0}C
Temperature Programme: 3^{0}C/min upto 210^{0}C and finally isotherm for 10 min.

The compound were identified by matching their mass spectra and GC retention indices with those in NIST –MS Wiley Library comparing with literature reports and published data (Adams,1995)

The result showed that oils collected from the collection site (7) and (4) are responsible for sprout suppression in potato tuber the standard in the present study were CIPC and Iodine which are responsible for maximum sprout inhibition.

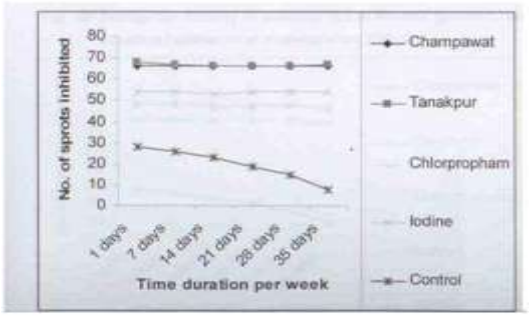

Fig. 1 Fumigation effect of essential oils of Mentha spicata on sprouting behaviour of potato (Solenum tuberosum L.)

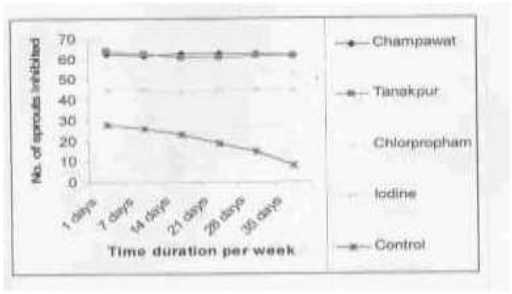

Fig.2 Fumigation activity of essential oils of Mentha spicata L. on Solenum tuberosum at concentration 200 µL

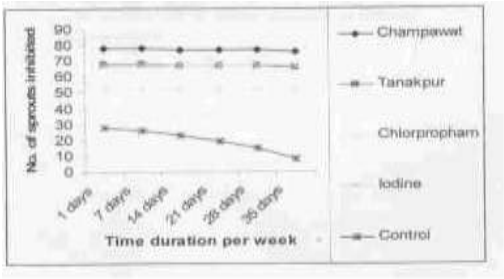

Fig. 3 Fumigation activity of essential oils of Mentha spicata L. on solenum tuberosum at concentration 300 µL

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