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Basil Oil As A Potential Natural Preservative In Personal Care Domain

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ABSTRACT:-
In the recent years the personal care industry is witnessing green consumerism. Apart from traditional use, Indian herbs find utility in personal care industry. Sweet Basil (*Ocimum basilicum*) is native of tropics and widely cultivated in India. From ancient times, essential oil extracted from Basil has played an important role in traditional Ayurvedic medicines. The present study aims to evaluate the chemical constituents and antimicrobial activity of *Ocimum basilicum* oil. Basil oil was extracted by steam distillation and characterized using GC-MS, which showed the presence of ocimene (78%), linalool (50%) and terpineol cis-Beta (38%). Antimicrobial activity of basil oil was tested against *B. cereus, P. aeruginosa* and *C. albicans* and compared with methyl and propyl parabens. Minimum Inhibitory concentration was determined using agar well diffusion method. The results showed that all the three microorganisms were susceptible to basil oil with varied degree of inhibition for *B. cereus (0.1mg/ml), P. aeruginosa (0.15mg/ml)* and *C. albicans (0.25mg/ml).* The susceptibility was comparable to synthetic preservatives parabens.
Keywords:- green consumerism, ocimene, parabens, linalool, terpineol

INTRODUCTION:-

Personal care products become easily contaminated by bacteria and fungi as they are rich in water, oil, peptides and carbohydrate content. It provides a very good medium for growth of microbes. But microbial safety of cosmetics has been always a issue of special concern as microbial spoilage leads to product degradation and risk to consumer well being. Preservatives are chemical biocides employed to prevent microbial growth, contamination and deterioration of product. They are potent antimicrobial which prevent personal care products from spoiling and helps to increase its shelf life substantially along with its efficacy. Preservatives are meant to prevent and control microbial contamination during manufacturing and storage till consumer use. [1]

A range of synthetic preservatives are currently being used which operates on broad spectrum of bacteria and fungi. However, safety of chemical preservative has been questioned owing to their adverse effects such as skin irritation and allergic reactions especially in stay-on personal care products.[2] Wash off personal care products also contribute to environmental pollution on long term use due to bioaccumulation. [3] Moreover, bacterial strains have developed resistance against conventional preservatives. [4]

Parabens are the choice of preservatives by personal care industry due to its broad spectrum antimicrobial activity, easy availability and cost effectiveness. But parabens are reported to be the cause of contact dermatitis and responsible for weak endocrine disruption. [5]

An idea of using naturally derived chemical compounds as preservative seems to be very promising. Personal care industry is witnessing green consumerism which provides expanding opportunity for traditionally used herbs. *Ocimum basillicum* is widely cultivated in India and there has been much research into the health benefits conferred by essential oil found in Basil. Scientific studies in-vitro has established that compounds in basil oil have potent antioxidant antiviral and antimicrobial properties. [6] Thus Basil oil offers eco-friendly and effective alternative to synthetic antimicrobial preservatives.

The aim of present work was to study antimicrobial efficacy of *Ocimum basillicum* oil against *B. cereus, P. aeruginosa* and *C. albicans* and compare its efficacy with popular synthetic preservative parabens.

MATERIAL AND METHODS:-

Plant Material

Sweet basil chosen for the present study was collected from the garden and was authenticated by Department of Botany, RTMNU as *Ocimum basillicum* belonging to family *Lamiaceae*.

Extraction of Basil Oil

50 g of fresh leaves of *O. basilicum* were taken and steam distilled for 3 hours. The distillate was extracted with hexane. The organic solvent was dried and basil oil was obtained. [7]

Synthetic Preservative

Methyl paraben (GRM1291) and propyl paraben (GRM1900) used in this study were of AR grade and obtained from HIMEDIA.

Characterization of Constituents of Basil Oil

Basil oil was analyzed using Perkin Elmer 680 GC system, for MS detection and an electron ionization mode with ionization energy of

70 electron volt injector and MS transfer line temperature 22° C to 290° C was used. Various chemical constituents present in basil oil were indentified.

Microbial Strains

To test the efficacy of basil oil against gram +ve, gram-ve and fungi, pure strains of *B. cereus, P. aeruginosa* and *C. albicans* were obtained from Rajiv Gandhi Biotechnology Centre, RTM Nagpur University, Nagpur.

Minimum Inhibitory Concentration

MIC of basil oil against *B. cereus, P. aeruginosa* and *C. albicans* was carried out using agar well diffusion method**.** [8] Nutrient agar was poured in a sterile glass petri dish and allowed to solidify. After solidification of agar, the agar surface was streaked with 1ml of bacterial cultures of *B. cereus*, *P. aeruginosa* and *C. albicans*. Methyl paraben and propyl paraben were used as positive reference control. Bore of 1 cm was prepared by a sterile cock borer. In each bore, 100µl of basil oil, methyl paraben and propyl paraben at different concentration were poured. The plates were allowed to stand for 1hour and then incubated at 37° for 48 hours.

RESULT AND DISCUSSION:-

Analysis of Basil Oil

The basil oil yield in %w/w was 0.12. Adilson Sartoratto et al reported the yield of basil oil by steam distillation using Clevenger system as 0.10%w/w.[9] Basil oil was analyzed for sp. Gravity and refractive index. (Table No. 1)

Chemical Constituents of Basil Oil

Basil oil was analyzed for its chemical constituents by GCMS method. Its contents are tabulated in Table No.2.

A total of 18 compounds were identified. High levels of monoterpenes hydrocarbons were found. The analysis showed presence of ocimene (78%), linalool (50%) and terpineol cis-Beta (38%) Fig.1. The chemical constituents of basil oil showed similar chemical constituents as investigated by Hussain Abdullah Ijaz et al**.** [11] These chemical constituents are mainly responsible for its antimicrobial activity. [12] Dalia Waleed Al Abbasy et al reported the chemical constituents of Ocimum basilicum oil with major constituent as linalool (69.7%) while the present investigation revealed ocimene as major constituent (78%). [13]

Table No.1- Analysis of extracted Basil oil.

Parameter	**Specification**[10]	**Result**
Appearance	Yellow to Pale Yellow colour. Clear fluid liquid.	Complies
Specific Gravity At 25° C	0.905to 0.962 g/cc	0.939 g/cc
Refractive Index At 25° C	1.458 to 1.540	1.507

Table No.2- Chemical composition of Basil oil

RI	Compound Name	M.W	Formula
0.67	**Terpineol, cis-Beta**	154	$C_{10}H_{18}O$
0.76	3-methyl-cis-3A,4,7,7a Tetrahydroindan	136	$C_{10}H_{16}$
0.81	Isocyclocitral	152	$C_{10}H_{16}O$
0.85	**Linalool**	168	$C_{11}H_{20}O$
1.143	**Ocimene**	136	$C_{10}H_{16}$
1.21	Beta-myrcene	136	$C_{10}H_{16}$
1.39	Terpin hydrate	172	$C_{10}H_{20}O_2$
1.63	Fenchyl acetate	196	$C_{12}H_{20}O_2$
1.67	Copaene	204	$C_{15}H_{24}$
2.22	Alpha-Caryophylene	204	$C_{15}H_{25}$
2.86	Napthalene,l,2,3,4,4A,5,6,8AOctahydro-7-methyl-4-methylene-l-(l)	204	$C_{15}H_{24}$
3.61	Caryophyllene oxide	220	$C_{15}H_{24}O$
3.70	Alpha-Famesene	204	$C_{15}H_{24}$
4.80	Alpha-cadinol	222	$C_{15}H_{26}O$
5.386	Alpha-Bisabolol	222	$C_{15}H_{26}O$
6.281	Methyl tetradecanoate	242	$C_{15}H_{30}O_2$
8.700	Isopropyl myristate	270	$C_{17}H_{43}O_2$
29.885	Nonanoic acid, 9(-3-Hexeylidenecyalopropylidene)-2-Hydroxyl- 1	350	$C_{21}H_{36}O_4$

Table no.3:- Protocol for evaluation of Zone of Inhibition

Sr. No.	Name of organism	Name of active	Concentration of active (mg/ml)	Zone of Inhibition (mm)
1	*B.cereus*	Basil oil	0.1	8 mm
		Methyl paraben	0.001	7mm
		Propyl paraben	0.001	8mm
2	*P.aeruginosa*	Basil oil	0.15	7mm
		Methyl paraben	0.001	7mm
		Propyl paraben	0.001	9mm
3	*C.albicans*	Basil oil	0.25	6mm
		Methyl paraben	0.001	6mm
		Propyl paraben	0.001	9mm

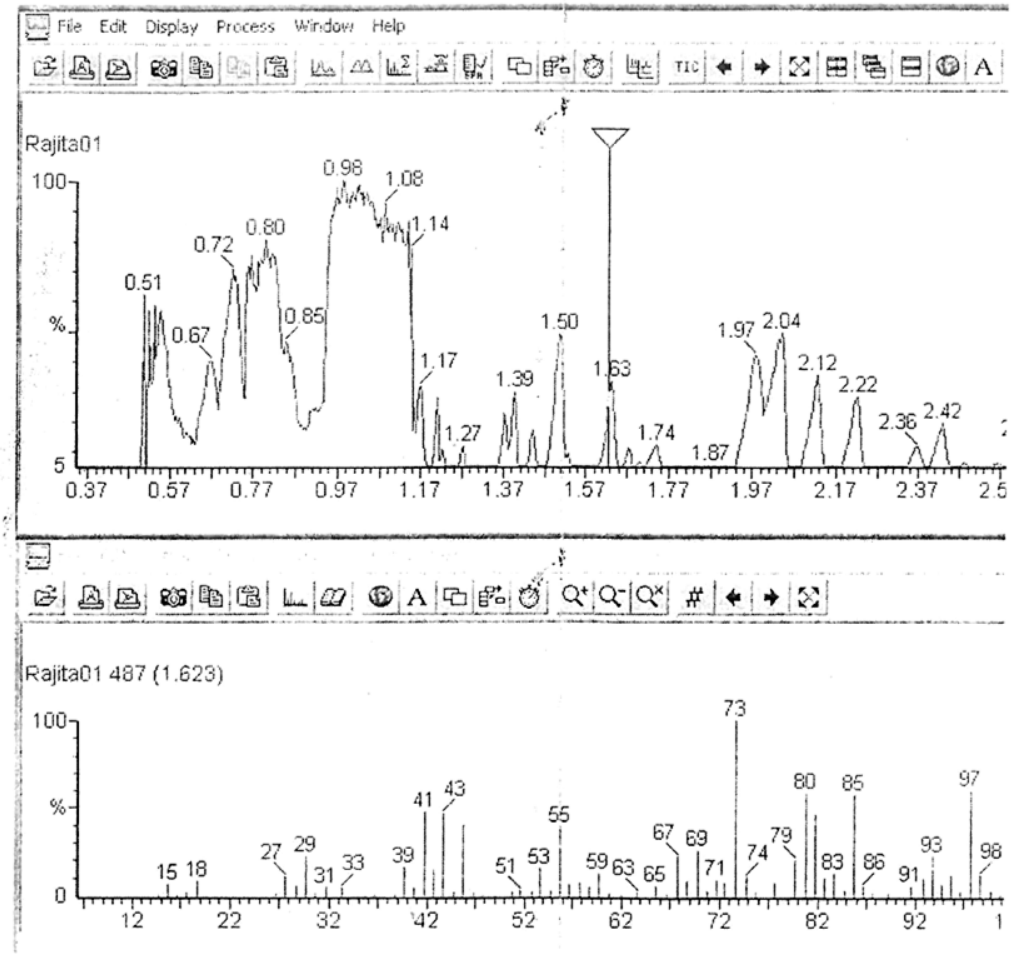

Figure 1: Graph for Gas Chromatography/ Mass Spectrometry of Basil Oil

Determination of Antimicrobial Activity

In the present study antimicrobial activity of basil oil was evaluated and compared with methyl and propyl parabens. The inhibition zone diameter (in mm) was used as a measure of the antimicrobial activity of basil oil.

The results showed that all the three microorganisms were susceptible to basil oil with varied degree of inhibition. Minimum inhibitory concentration was found to be, *B. cereus* (0.1mg/ml), *P. aeruginosa* (0.15mg/ml) and *C. albicans* (0.25mg/ml). Essential oil extracted from basil showed maximum activity for *B. cereus* and *P. aeruginosa* at a lower concentration. The Zone of inhibition for 0.1mg/ml of basil oil for *B. cereus* was found to be 8mm which is comparable with 0.001mg/ml of methy and propyl paraben. (Table No.3) Eriotou E. et al reported the lowest MIC value (0.039 ml/100 ml) for the small-leaved basil EO against B. cereus. [14] Amir Mohammad et al stated good inhibitory activity against gram-ve bacteria with MIC of 9µg/ml.(6)

Phytochemicals derived from plant products serve as a prototype to develop less toxic and effective medicines in controlling the growth of microorganism.[15]

CONCLUSION:-

Results revealed that basil oil has a potent antimicrobial activity against B.cereus, P.aeruginosa, C.albicans although the degree of inhibition varied amongst the microbes and thus can serve as a promising candidate in personal care industry as a natural preservative.

REFERENCES:-

1. Mariola Dreger, Krolina Wielgus; (2013); "Application of essential oils as natural cosmetic preservatives"; Herba Polonica; 59(4); 142-153.
2. Svedman C, Andersen KE, Brandao FM, Bruynzeel DP, Diepgen TL, Frosch PJ, Rustemyer T, Gimenez Arnau A, Goncalo M, Goossens A et al; (2012); "Follow-up of the monitored levels of preservative sensitivity in Europe;Overview of the years 2001-2008"; Contact Dermat.;67; 312-314.
3. Claudia Juliano and Giovanni Magrini; (2017); "Cosmetic ingredients as emerging pollutants of environmental and health concern. A Mini-Review"; Cosmetics; 4,11.
4. Pilar Orus, Laura Gomez-Perez, Sonia Leranoz, Mercedes Berlanga; (2015); "Increasing antibiotic resistance in preservative-tolerant bacterial strains isolated from cosmetic product"; Int. Microbiol; 18(1); 51-59.
5. Lemini C, Jaimez R, Avyila ME, Franco Y, Larrea, Lemus AE; (2003); "In vivo and in vitro estrogen bioactivities of alkyl parabens"; Toxicol Ind Health; 2-6; 69-79.
6. Amir Mohammad Danehian Moghaddam, Jalal Shayegh, Peyman Mikaili and Jalil Dolghari Sharaf; (2011); "Antimicrobial activity of essential oil extract of Ocimum basilicum L. leaves on variety of pathogenic bacteria"; Journal of Medicinal Plants Research; 5(15); 3453-3456.
7. Aswati Mindaryani and Suprihastuti Sri Rahayu; (2007); "Essential oil from Extraction and steam distillation of Ocimum basilicum"; In proceedings of World Congress on Engineering and Computer Science, WCECS, Oct 24-26, Sanfransisco, US.
8. Antara Sen and Amla Batra; (2012); 'Evaluation of antimicrobial activity of different solvent extracts of medicinal plant: Melia Azedarach L."; Int. Journal of Current Pharmaceutical Research; 4(2),67-73.
9. A Sartoratto, ALM Machado, C Delarmelina, GM Figueira, MCT Duarte; (2004); "Composition and antimicrobial activity of essential oils from aromatic plants used in Brazil"; Brazilian Journal of Microbiology 35 (4), 275-280
10. Indian Standard: Oil of Basil Methylchavicol type: IS-15136:2002
11. Hussain Abdullah Ijaz et al; (2008); "Chemical composition , antioxidant and antimicrobial activities of basil (*Ocimum basilicum)*essential oil depends on seasonal variations."; Food chemistry; June,108; 986-995.
12. Herman A and Tambor K; (2016); "Linalool affects the antimicrobial efficacy of essential oils"; Curr. Microbiol; Feb,72(2); 165-172.
13. Dalia Waleed Al Abbasy, Nirmal Pathare, Jamal Nasser Al-Sabahi, Shah Alam Khan; (2015); "Chemical composition and antibacterial activity of essential oil isolated from Omani basil (*Ocimum basilicum Linn*)"; Asian Pacific Journal of Tropical Disease; August, 5(8); 645-649.
14. Eriotou E1, Anastasiadou K1, Nikolopoulos D2* and Koulougliotis D3; (2015); "Antimicrobial and Free Radical Scavenging Activities of Basil (Ocimum basilicum) Essential Oil Isolated from Five Plant Varieties Growing in Greece"; 5(3);1-9.
15. Kelmanson JE, Jager AK and Vaan Staden J.;(2000); " Zulu medicinal plants with antibacterial activity"; J. Ethanopharmacol.;69: 241-246.