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Formulation and Evaluation of Herbal Gargle against Throat Irritation, Inflammation and Infection

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Abstract: ***Herbal gargles have gained significant attention as potential alternatives to conventional oral care products due to their perceived natural composition and reported therapeutic benefits. This review aims to provide a comprehensive overview of the efficacy of herbal gargles in promoting oral health and preventing various oral ailments. Our oral cavity is a sweet able place to grow different types of bacterial species either harmless or harmful for human. From ancient age medicinal plants are considered as a store room of different types of biological activity in Ayurveda, Unani and Siddha, and have important role to cleanse tooth and prevent different human pathogens are responsible for unpleasant odour, inflammation of teeth root, dental plaque. The study evaluates a wide range of herbal ingredients commonly found in mouth gargles, including essential oils, plant extracts, and traditional herbal remedies. It explores their antimicrobial properties, antioxidant activity, and potential for reducing plaque formation, gingivitis, and bad breath. Aqueous extract of Tulsi, Turmeric, Clove, Fennel, Betel leaves, Pudina, Ginger, Liquorice shows effective antimicrobial, antifungal activity, anti-inflammatory and anti-plaque properties. In this research work herbal gargle was evaluated depends on various parameter like color, pH, Phase separation , Homogeneity and antibacterial properties. Herbal gargles show potential as adjuncts to conventional oral care, Herbal gargle is suitable for any age group due to less side effect. Healthcare professionals and consumers should approach herbal gargles with caution, taking into consideration individual oral health needs and consulting oral healthcare providers for personalized recommendations.***

Keywords: Herbal Gargle, Formulation, Evaluation, Antimicrobial study, E. Coli

I. INTRODUCTION

The first known references to mouth rinsing are described in Ayurveda and Chinese medicine in 2700 BC. Mouth gargle is a chemotherapeutic agent used as effective home care system by the patient. [1]

In the Greek and Roman periods, mouth rinsing became common among the Hippocrates. They recommended a mixture of salt, alum and vinegar.[1]

Gargles are aqueous solutions used to treat the problem related to pharynx and nasopharynx by pushing air from the lungs through the gargle while it is held in the throat. Often, gargles need to be diluted with water before use. Gargles are used to get the medication onto the mucosal surface of the throat.[2,3] The preparations need to have acceptable organoleptic qualities and be quick-acting.

1) *Natural:* Natural gargles which are also known as herbal gargles. eg: liquorice, clove, ginger, salt water.
2) *Chemical:* Gargles, made from chemical compound. eg,: Methyl salicylate, Saccharine sodium.

Such a variety of health advantages come from gargling and rinsing with salt water. It promotes good oral hygiene and dental health with gargling and it supports the postoperative care process. It aids in the recovery of canker sores. Sometimes pregnancy difficulties may be avoided with its aid.

Gargle can be dangerous for children when used orally they didn't even know how to gargling. Due to oral cavity sometimes, gargle might produce sensation and itching in mouth. [4]

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II. MATERIALS AND METHODS

A. Collection of Plants

Leaves, stem, buds and dried seeds of Tulsi (*Ocimum sanctum)* [5,6], Clove (*Eugenia caryophyllus)*[7,8], Fennel (*Foeniculum valgare)* [9,10], Ginger (*Zingiber officinale)*[11,12], Liquorice (*Glycyrrhiza glabra)*[13,14], Turmeric (*Curcuma longa)*[15,16], Fenugreek (*Trigonella foenum-graceum)*[17,18], Cardamom (*Elettaria cardamomum)*[19,20], Betel Leaves (*Piper betel)*[21,22], Pudina (*Mentha piperita Linn*)[23,24], Coriander (*Coriandrum sativum)*[25,26] were randomly collected from mature plants.

TABLE-1 List Of Ingredients With Their Functions

Sl.No.	***Ingredients***	***Scientific name***	***Chemical constituents***	***Plant part***	***Functions***
1	Tulsi family: *Labiatae* plant part: fresh leaves	*Ocimum sanctum*	Eugenol,Estragole,Camphene		Antibacterial, insecticidal and stimulant
2	Clove family: Myrtaceae Plant part: dried flower buds	*Eugenia caryophyllus*	Eugenol, Caryophylline, Methyl eugenol		Dental analgesic, carminative, stimulant, antioxidant, flavouring agent, an aromatic and antiseptic
3	Fennel family: Umbelliferae Plant part: dried ripe fruit of plant	*Foeniculum valgare*	Fenchone, Anethole, Estragole		Carminative, aromatic, stimulant and flavouring agent
4	Ginger family: Zingiberaceae Plant part: rhizomes	*Zingiber officinale*	Gingerol, Shogaole, Zingiberene		Stomachic, an aromatic, a carminative, stimulant and flavouring agent.

5	Liquorice: family: Leguminoseae Plant part: dried peeled or unpeeled roots and stolons of the plant	*Glycyrrhiza glabra*	Glycyrrhizin, Chalcone, Enoxolone		Demulcent, mild expectorant. sweetening agent, flavouring agent, antitussive, antispasmodic, anti-inflammatory and antiulcer drug
6	Turmeric: family: Zingiberaceae Plant part: dried, as well as fresh rhizomes of plant	*Curcuma longa*	Curcumin, Phellandrene, Curcuminoid		Expectorant, a condiment or spice, colouring agent
7	Fenugreek Family: Fabaceae Plant part: Fresh and dried seeds	*Trigonella foenum-graceum*	Trigonelline, Diogenin, Sotolone		Antioxident, antiulcer, antibacterial, neuroprotective and liver protection propaties
8	Cardamom: Family: Zingiberaceae Plant Part: dried ripe fruits	*Elettaria cardamomum*	Terpineol, Eucalyptol, Sabinene		Aromatic, carminative, stimulant and flavouring agent
9	Betel leaves Family: Piperaceae Plant part: Fresh leaves	*Piper betel*	Arecoline, Methyl euginol, Estragole		Pungent and flavouring agent

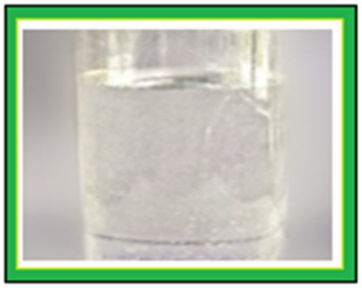
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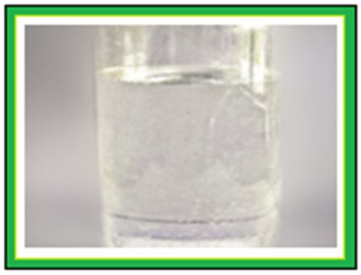
10	Coriander Family: Umelliferae Plant part: fully dried ripe fruits of the plant	*Coriandrum sativum*	Dodecanal, p-Cymene, Borneol		Aromatic, carminative, stimulant and flavouring agent
11	Pudina Family: Labiatae Plant part: Fresh leaves	*Mentha piperita*	Menthol, Menthone, Eucalyptol		Carminative, stimulant, aromatic, counter-irritant flavouring agent and mild antiseptic

B. Collection of Chemicals

In this formulation Sodium Benzoate is used as preservative, Sorbitol is used for soothing & refreshing and Glycerol is used to treat mouth irritation.

TABLE-2 Chemicals Used In The Preparation Of Gargle

Sl. No.	***Ingredients***	***Raw materials***	***Functions***
1	Sodium Benzoate		Anti-corrosive and preservative
2	Sorbitol		Provide a soothing feeling in mouth , mild sweetness and a refreshing. Resistance to dental caries.

3	Glycerol		Treating sore throat pain, mouth pain and minor mouth irritation

C. *Aqueous Extraction Process of Plant parts-*

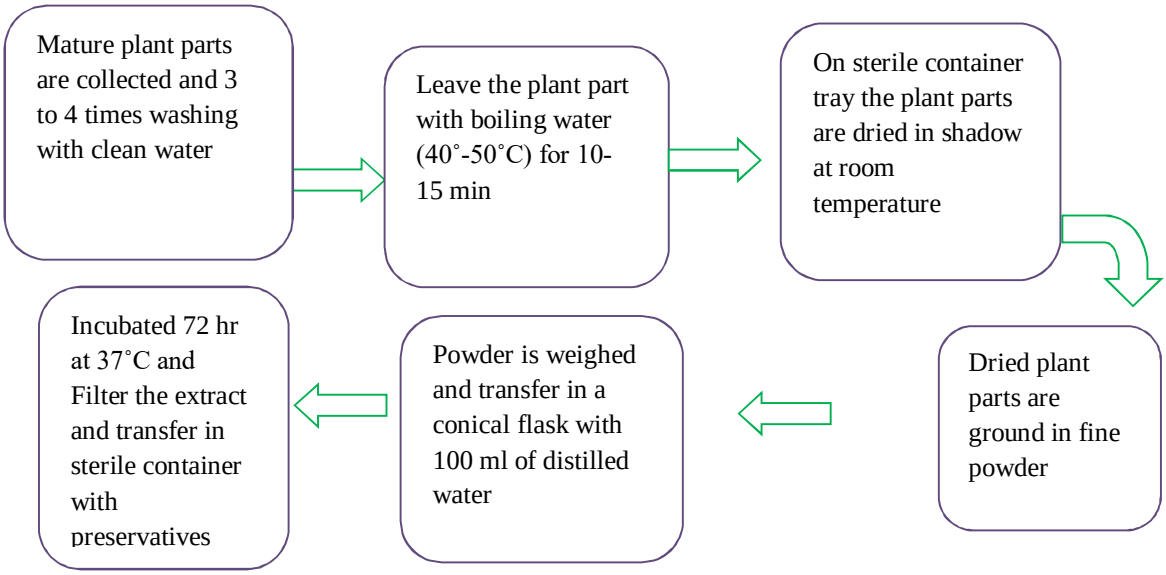


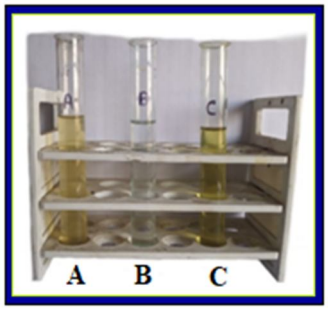
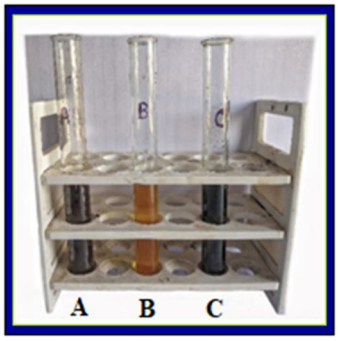
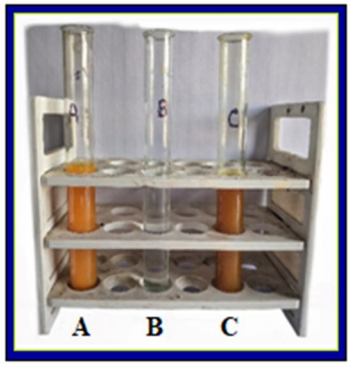
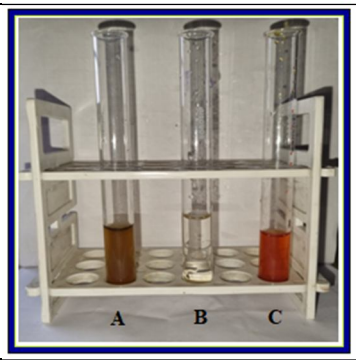
TABLE-3 : Water Soluble Extracts

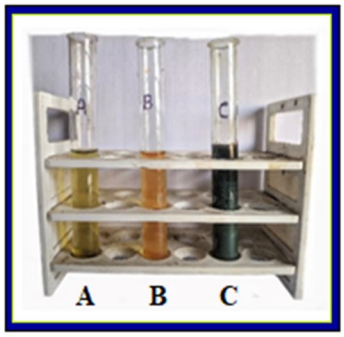
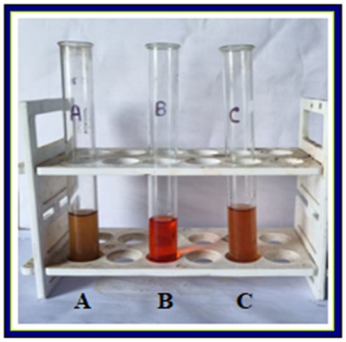
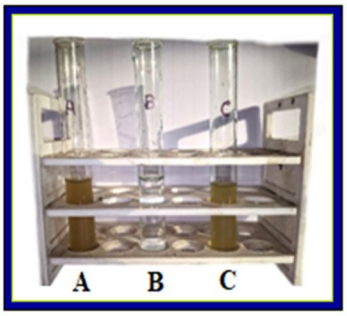
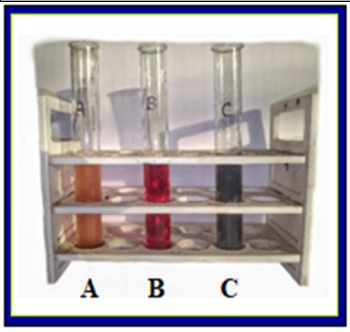
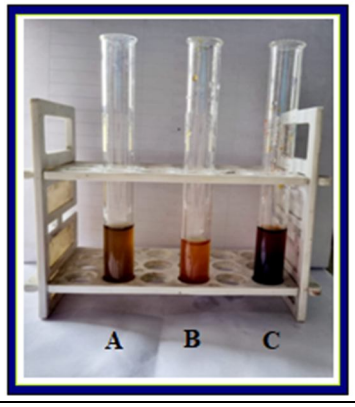
Ingredients	Amount taken in gm	Water quantity (ml)	Extract (gm)	Percentage (%)
Tulsi	1.02	50	0.144	14.4
Clove	1.01	50	0.2	20
Fennel	1.02	50	0.219	21.9
Turmeric	1.03	50	0.267	26.7
Ginger	1.01	50	0.224	22.4
Liquorice	1.02	50	0.28	28
Coriander	1.03	50	0.209	20.9
Cardamom	1.01	50	0.216	21.6
Betel leaves	1.03	50	0.186	18.6
Fenugreek	1.04	50	0.236	23.6
Mint	1.02	50	0.193	19.3

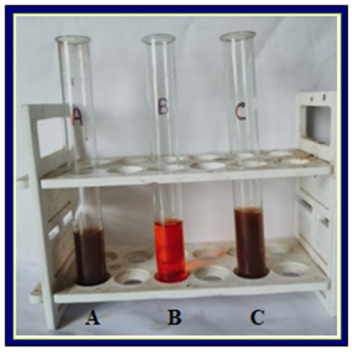
D. Phytochemical Screening

The chemical, identification tests of different herbal extract are given in the following

TABLE-4 Chemical Test Of Plant Extracts

Sr. No.	Name of herbs	Tests	Observation	Images
1	Tulsi	0.5 ml of crude extract was mixed with 2ml of glacial acetic acid containing 2-3 drops of 2% solution of FeCl3. Then 2ml of concentrated H2SO4 was poured into the mixture.	A brown ring at the interface indicated the presence of cardiac glycosides	
2	Clove	Aq. Extract + ferric chloride 5% solution	the cloves extract and eugenol standard turned light green	
3	Turmeric	1 or 2 ml of extract added with Wagner's reagent (dissolving 2gm of iodine and 6 gm of potassium iodine in 100ml of distilled water)	Reddish brown precipitate shows for the alkaloids	
4	Liquorice	Moistened with 80% H2SO4	Orange yellow is observed for transformation of flavone glycoside Liquiritin to chalcone glycoside isoliquiritin	

5	Pudina	1ml of Aqueous extract and 2 drops of Ferric chloride(FeCl3) added with the extract	Green – blackish colour indicate presence of catechol tannins	
6	Cardamom	Aqueous extract of Eletteria cardamomum + volatile oil + Sudan III	Red colour due to volatile oil	
7	Fennel	2ml extract + 1ml Mayer's reagent (1.36gm mercuric chloride + 5gm potassium iodide in 100ml water)	Light green precipitate indicating presence of alkaloids	
8	Ginger	Aq. Extract of ginger + few drops of Wagner's reagent (dissolving 2gm of iodine and 6 gm of potassium iodine in 100ml of distilled water)	Reddish brown precipitation due to alkaloids	
9	Betel leaves	1 gm Powder form of Piper betel + 10 ml distilled water (5 min boil) + 2 drop 5% Fecl3	Greenish black Precipitation due to tannin	

10	Fenugreek	4ml of aqueous extract + few drops of Wagner's reagent	Green precipitate confirms the present of alkaloids	
11	Coriander	Aq. Extract of *Coriandrum sativum* +Violet oil + Sudan III	Red colour due to volatile oil	

Here, A= Plant Extract, B= Reagent, C= Final Product

E. Formulation of herbal gargle

The herbal Mouth-gargle was prepared by the formula given in Table – 5

TABLE-5 Formulation Table

Ingredients	Function	Each 5 ml contains
Tulsi	Antibacterial	20%
Ginger	Stomachic	5%
Clove	Dental analgesic	10%
Liquorice	Sweetening agent	5%

Cardamom	Aromatic	3%
Turmeric	Expectorant	5%
Fenugreek	Antioxidant	5%
Fennel	Carminative	10%
Betel leaves	Pungent	3%
Pudina	Cooling agent	10%
Coriander	Carminative	3%
Sorbitol	Sweetening agent	10%
Glycerol	Co surfactant	5%
Sodium benzoate	Preservatives	1.25%
Water	Diluent	q.s

III. EVALUATION

1) *Colour*- Dark Brownish
2) *Odour*- Characteristics
3) *pH*- pH of prepared herbal gargle was measured by using Digital pH meter. The pH meter was previously calibrated using standard buffer solution. Collect about 1 ml of gargle and dissolved in 50 ml of distilled water and it's pH was found 5.84 at room temperature.
4) *Weight per ml:*

Table – 6: Weight per ml test

Sample quantity	Weight of empty volumetric flask	Weight of volumetric flask with formulation	Result (wt/ml)
25ml	42.21 gm	67.53 gm	1.01gm/ml

5) *Test for Microbiological growth*

The formulated mouth gargle was inoculated in the plates of agar media by streak plate method and a control was prepared. The plates were kept at 37˚C for 24 hours in the incubator. After the incubation period plates were taken out and checked for microbial growth.

6) Stability studies

Stability test aims to ensure that the gargle formulations are usable and can maintain the same characteristics in the long term basis, before undergoing antibacterial assay

The formulation and preparation of a pharmaceutical product is incomplete without proper stability studies of the prepared product. This is done in order to determine the physical and chemical stability of the prepared product and thus determine the safety of the product at (30 ± 2˚C, RH- 65±5˚C)

TABLE-7 : Stability Studies Of Formulated Herbal Gargle

Sl. No.	Parameters	Observations			
		Initial	10 days	20 days	30 days
1	Colour	Dark brown	Dark brown	Dark brown	Dark brown
2	Odour	Characteristics	Characteristics	Characteristics	Characteristics
3	Consistency	Stable	Stable	Stable	Stable
4	Phase separation	Nil	Nil	Nil	Nil
5	pH	5.83	5.82	5.84	5.85
6	Homogeneity	Good	Good	Good	Good
7	Weight /ml	1.01 gm/ml	1.03 gm/ml	1.01 gm/ml	1.02 gm/ml

IV. RESULT & DISCUSSION

The look of gargle retained its colour and homogeneity after a one-month examination. The gargle's formulation showed no signs of phase separation. Gargle has maintained its pH and has a mildly acidic character. The specially prepared gargle proved active against a variety of human pathogens, including S. aureus (+ve) and E. coli (-ve).

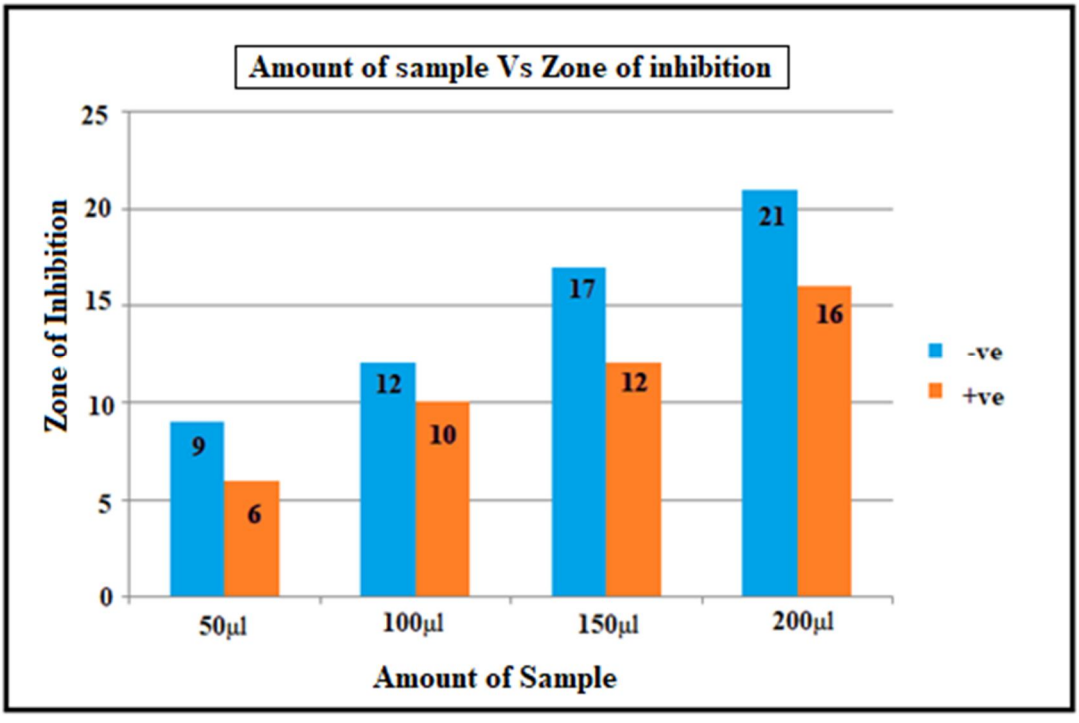
The formulation was useful against various microorganisms and shows good stability during various physicochemical test and mostly effective against gram negative bacteria instead of gram positive bacteria. This mouth-gargle entirely prepared from plants parts and safe for health.

TABLE-8 : Zone Of Inhibition

ORGANISM	ZONE OF INHIBITION (nm)			
	50 µl	100 µl	150 µl	200 µl
E. coli(-ve)	9 nm	12 nm	17 nm	21 nm
S. aureus(+ve).	6 nm	10 nm	12 nm	16 nm

For various gargle concentrations amount, the agar diffusion method was used to determine their antibacterial activity. For E. coli (-ve), the zone of inhibition was found to be 9 mm for 50 µl, 12 mm for 100 µl, 17 mm for 150 µl, and 21 mm for 200 µl, respectively. For S. aureus, the zone of inhibition was found to be 6 mm for 50 µl, 10 mm for 100 µl, 12 mm for 150 µl, and 16 mm for 200 µl, respectively. These findings demonstrated the significant antibacterial activity of the herbal mouthwash and the capability of the current product to prevent bacterial growth in the oral cavity.

TABLE- 9 ANTI-BACTERIAL ACTIVITY



V. CONCLUSION

The present liquid herbal gargle can work in long way to help people to cure the various throat disorder . Present herbal formulation is acceptable for a long period.

Furthermore the prepared herbal gargle were standardized by various physicochemical studies like pH, appearance of solution, consistency, phase separation and microbial study and all test results are in limit. So the prepared herbal formulation is very good and safe for any age group.

VI. ACKNOWLEDGEMENT

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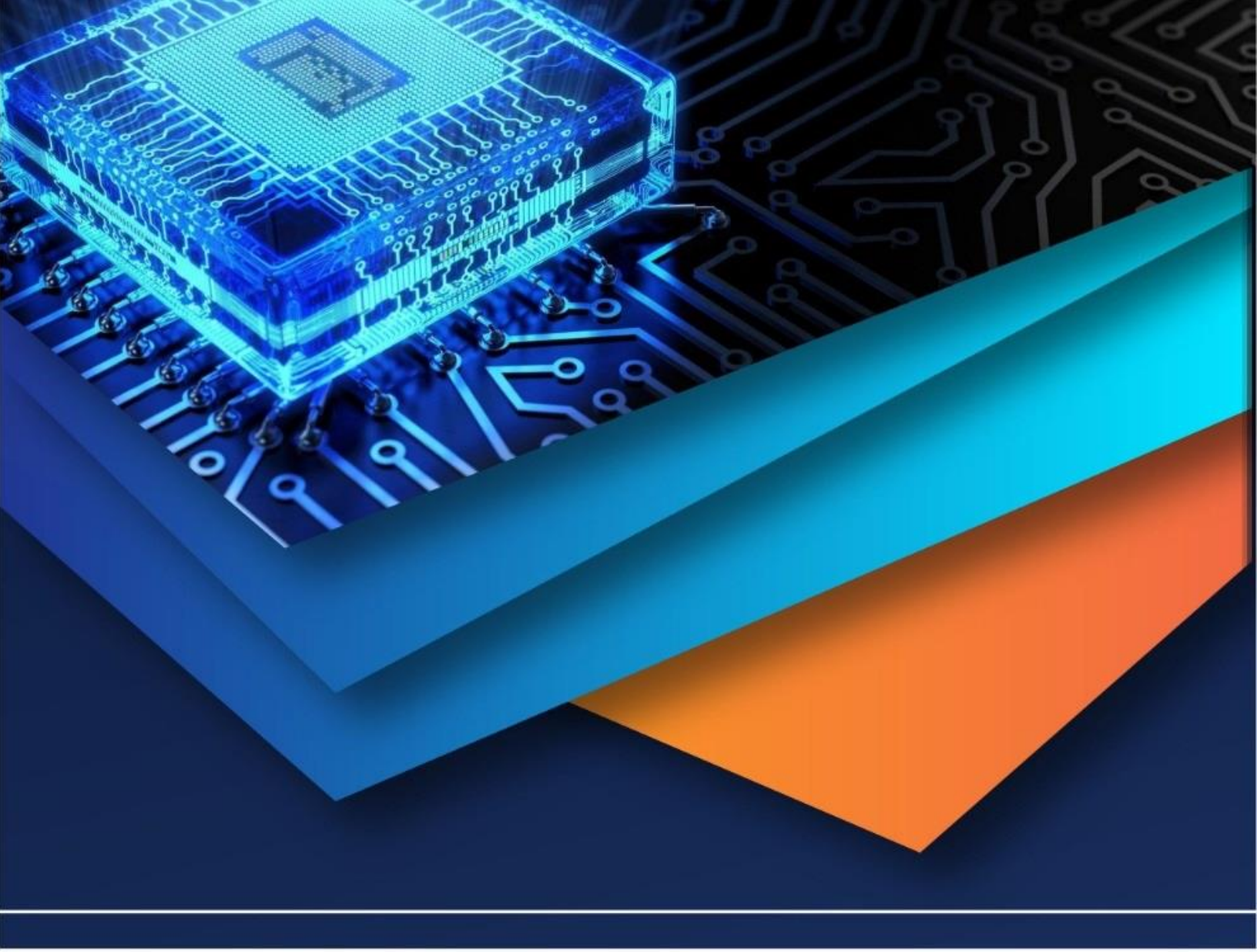
VII. CONFLICT OF INTEREST

The authors declare that there is no conflict of interest to reveal.

REFERENCES

[1] International journal of science and research ISSN:2319-7064 Index Copernicus Value (2015):78.96
[2] Biosaintifika Journal of Biology and Biology Education 12 (3) (2020): 288-296
[3] World Journal of Pharmacy and Pharmaceutical Sciences Vol 7, Issue 9, 436-445
[4] Ahmad L. Impact of gargling on respiratory infections. All Life. 2021;14(1): 147-158
[5] Mahajan N, Rawal S, Verma M, Poddar M, Alok S. A phytopharmacological overview on Ocimum species with special emphasis on Ocimum sanctum. Biomed Prev Nutr. 2013;3:185–92.
[6] Reshma K, Rao AV, Dinesh M, Vasudevan DM. Radioprotective effects of ocimum flavonoids on leukocyte oxidants and antioxidants in oral cancer. Indian J Clin Biochem. 2008;23:171–5.
[7] Jirovetz L, Buchbauer G, Stoilova I, Stoyanova A, Krastanov A, Schmidt E. Chemical composition and antioxidant properties of clove leaf essential oil. J Agric Food Chem. 2006;54(17):6303–6307.
[8] Pérez-Jiménez J, Neveu V, Vos F, Scalbert A. Identification of the 100 richest dietary sources of polyphenols: an application of the phenol-explorer database. Eur J Clin Nutr. 2010;64(Suppl 3):S112–S120.
[9] Anubhuti P, Rahul S, Kant KC. Standardization of fennel (Foeniculum vulgare), its oleoresin and marketed ayurvedic dosage forms. *Int J Pharm Sci Drug Res*. 2011;3:265–269.
[10] Rasul A, Akhtar N, Khan BA, Mahmood T, Uz Zaman S, Shoaib Khan HM. Formulation development of a cream containing fennel extract: in vivo evaluation for anti-aging effects. Pharmazie. 2012;67(1):54–58.
[11] Kulkarni R.A., Deshpande A.R. Anti-inflammatory and antioxidant effect of ginger in tuberculosis. J. Complement. Integr. Med. 2016;13:201–206. doi: 10.1515/jcim-2015-0032.
[12] Al-Amin Z. M, Thomson M, Al-Qattan K. K, Peltonen-Shalaby R, Ali M. Anti-diabetic and hypo- lipidaemic properties of ginger (Zingiber officinale) in streptozotocin-induced diabetic rats. Br J Nutr. 2006;96(4):660–6.
[13] Asha, M. K. , Debraj, D. , Prashanth, D. , Edwin, J. R. , Srikanth, H. S. , Murugananthan, N. , … Agarwal, A. (2013). In vitro anti-*Helicobacter pylori* activity of a flavonoid rich extract of *Glycyrrhiza glabra* and its probable mechanisms of action. *Journal of Ethnopharmacology*, 145(2), 581–586.
[14] Saumendu, D. R. , Raj, K. P. , Suvakanta, D. , Jashabir, C. , & Biswajit, D. (2014); Hair growth stimulating effect and phytochemical evaluation of hydro-alcoholic extract of *Glycyrrhiza glabra* . *Global Journal of Research on Medicinal Plants & Indigenous Medicine*, 3(2), 40–47.
[15] Jyotirmayee B and Gyanranjan M: A Review On Selected Pharmacological Activities Of Curcuma longa L. International Journal of Food Properties, 2022(25):1377-98
[16] Priyadarsini K.I. The chemistry of curcumin: From extraction to therapeutic agent. *Molecules*. 2014;19:20091–20112. doi: 10.3390/molecules191220091.
[17] Altuntas E., Ozgoz E., Taser O.F. Some physical properties of fenugreek (Trigonella foenum-graceum L.) seeds. J. Food Eng. 2005;71:37–43.
[18] Khole S., Chatterjee S., Variyar P., Sharma A., Devasagayam T.P.A., Ghaskadbi S. Bioactive constituents of germinated fenugreek seeds with strong antioxidant potential. J. Funct. Foods. 2014;6:270–279.
[19] Souissi M., Azelmat J., Chaieb K., Grenier D. Antibacterial and anti-inflammatory activities of cardamom (*Elettaria cardamomum*) extracts: Potential therapeutic benefits for periodontal infections. *Anaerobe*. 2020;61:102089. doi: 10.1016/j.anaerobe.2019.102089.
[20] Masoumi-Ardakani Y., Mandegary A., Esmaeilpour K., Najafipour H., Sharififar F., Pakravanan M., Ghazvini H. Chemical composition, anticonvulsant activity, and toxicity of essential oil and methanolic extract of Elettaria cardamomum. *Planta Med*. 2016;82:1482–1486. doi: 10.1055/s-0042-106971.
[21] Bhide SV, Shivapurkar NM, Gothoskar SV, Ranadive KJ. Carcinogenicity of betel quid ingredients: Feeding mice with aqueous extract and the polyphenol fraction of betel nut. Br J Cancer. 1979;40:922–6..
[22] Toprani. R, Patel.D, ;Betel leaves: Revisiting the benefits of an ancient Indian herb; South Asian J Cancer; 2013;2(3); P-140-141.
[23] Della Loggia R, Tubaro A, Lunder T. Evaluation of some pharmacological activities of a peppermint extract. *Fitoterapia*. 1990;61:15–221.

[24] Saller R. Peppermint (Mentha x piperita), medicinal plant of the year 2004. Forsch Komplementarmed Klass Naturheilkd 2004; 11(1): 6-7
[25] Sobhani. Z, Mohtashami L; Mohammad S.A, Ramezani M, Ahmed S.E, Gandara J.S; Ethnobotanical and Polychemical aspects of the edible herb *Coriandrum sativum L*; Journal of Food Science; 2022; 87(4); p-1386-1422
[26] Rehman N., Jahan N., ul-Rahman K., Khan K.M., Zafar F. Anti-arrhythmic potential of Coriandrum sativum seeds in salt induced arrhythmic rats. *Pak. Vet. J*. 2016;36:465–471.



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