ISSN No:-2456-2165

Study on Development of Cooking Condiments Based Herbal Remidies to Prevent Viral Disease

Banani R. Chowdhury[1], *Debanjan Mandal[2], Sohom Basak[3], Ranit Roy[4], Progya Majumder[5], Tapajyoti Routh[6]
Department of Biotechnology, Bengal Institute of Technology, Affilated to Maulana Abul Kalam Azad University of Technology, Kolkata, India

Abstract:- In this review work few important natural herbs have been selected which have bioactive components. In this work bioactive components have been obtained from herbs through the methodological process of extraction followed by the process of preparing functional food and the process of encapsulation. In these ways the beneficiary end product may be consumed by human being to fight against viral diseases as antiviral remedies. Cooking condiments like Tulsi, Ginger, Turmeric, Black pepper, Peppermint and Lemon balm have been selected to prevent diseases like (Human influenza, Influenza(flu), Herpes, SARS, SARS-CoV-2, Vesicular stomatitis, HSV-1, HSV-2, Chikungunya).

Keywords:- *Antiviral Activity, Viral Disease, Bioactive Compound, Extraction, Cooking Condiments.*

I. INTRODUCTION

Herbal plants, plant preparations and phytoconstituents have proven helpful in attenuating infectious conditions. Among infectious diseases, infectious agent diseases especially, stay the leading reason behind death in humans globally. a range of phytoconstituents derived from medicative herbs are extensively studied for antiviral activity [1]. Viruses square measure accountable for a variety of human pathogenesis together with cancer. Many hard-to-cure diseases and complicated syndromes together with Alzheimers, kind one polygenic disorder, and carcinoma are related to infectious agent infections [2]. Furthermore, thanks to enhanced world travel and speedy urbanization, epidemic outbreaks caused by rising and re-emerging viruses represent a crucial threat to public health, notably once preventive vaccines and antiviral therapies square measure unprocurable. Examples embody the recent emergence of infectious disease virus, contagion virus, rubeola virus, severe acute metabolic process syndrome (SARS) virus, and West Nile virus outbreaks [3]. Apart from that it's been conjointly found that flavorer medicines also are used for treatment of some diseases. Many aspect effects came from chemical medicine. Use of non-chemical, non-invasive natural remedies don't have any major adverse result as a result of containing naturally active biological elements, so they need paying abundant attention inside recent years. Hence, there's a pressing need to discover novel antivirals that square measure extremely efficacious and efficient for the management and management of infectious agent infections once vaccines and normal therapies square measure are lacking. flavorer medicines and sublimate natural merchandise give an expensive resource for novel medicine development. It's been found that herbs on an individual basis or together show antiviral activities against viruses like madness virus, Human immunological disorder virus, Chandipura virus, Japanese redness Virus, picornavirus, contagion A/H1N1 [4]. During this review work antiviral activities from many change of state condiments like (Tulsi, Ginger, Turmeric, Black pepper, Peppermint and Lemon balm) against some notable infectious agent are summarized.

Table 1:- Bioactive Components of the Selected Herbs

Name of the selective herbs	Scientific name	Bioactive compound
Tulsi	*Ocimum sanctum*	Camphor, Eucalyptol, Eugenol.
Ginger	*Zingiber officinale roscoc*	**Phenolic compound –** shagaol, paradols, quereetin,zingerone **Terpene compounds -** β- bisabolene, α-curcumene, zingiberene α -faranese, β -sesquiphelladrene
Turmeric	*Curcuma lorga*	Calebin A, vanillic acid, vanillin, querectin.
Peppermint	*Mentha piperita*	Limonene, cineole, menthane, menthafuran, isomenthone, menthylacitate, isopulegon, menthol, pulegone, and carvone.
Black pepper	*Piper nigrum*	Piperine is the major bio – active component of pepper, which imparts pungency and biting taste to it.
Lemon Balm	*Melissa officinalis*	Eugenol, Citral, caffine acid derivatives (rosemarinic acid)

ISSN No:-2456-2165

II. EXTRACTION OF BIOACTIVE COMPONENTS OF THE HERBS

A. Extraction of Tulsi

Extraction of Tulsi is generally prepared by a special method that is cold extraction method. To obtain the five different concentration that extract are generally include with dimethyl for mite which is an inert solvent. The concentration of Tulsi give and inhibition zone which is further determined by agar well diffusion method. Tulsi leaves generally separated from the stem and air dried for 7 days. Then by the help of the cold extraction method ethanolic extract was prepared. Generally in this process powder Tulsi are produced for 3 days. Then to the filtration of alcoholic decoction a clear filtrate obtained. In the final step the filtrate is generally reduced to low temperature and the final Tulsi extract each obtained [5].

B. Extraction of Turmeric

The extraction process of turmeric is usually done in two ways: Conventional extraction process each Soxhelt extraction is generally used. Turmeric powder each weighted and put in the Soxhelt apparatus. The apparatus is filled with acetone which is generally used as the extraction solvent. The whole process each carried out at 60° C for 8 hours. The residue which are generally found are dried and weighted which is dissolved in 10 ml methanol for calculation of curcumin content using HPLC. Emerge assisted extraction of curcumin - In this process 1 gram of turmeric powder was weighted in 250 ml flask and mixed with 100 ml water by addition of buffer pH 5. Different concentration of α amylase and amyloglucosidase are added. Cotton and Aluminium foil are generally used to steal the plastic and it is incubated at temperature of 65°C. After enzyme pretreatment the precipitated turmeric was dried and subjected to curcumin extraction [6].

C. Extraction of Ginger

Extraction of Ginger mainly occurs by Ginger oil distillation method. In this process the ginger rhizome are generally cut by a knife maintaining a thickness of ± 0.6 cm and then washed to release soil and other impurities attached to its surface. The process generally last for 9 ± 0.25 hr and we generally get Ginger essential oil and spent Ginger as by the product. Another process it spent Ginger extraction where Ginger rhizomes are dried in a cabinet dryer at a temperature of 50 to 60°C. Then using distilled water as a solvent Ginger powder was extracted. This process was conducted in Bontul Indonesia and has a huge significance [7].

D. Extraction of Pepper mint and Lemon Balm

The water extract of plant leaves are generally prepared by a unique procedure. 50 ml of distilled water at room temperature of 22°C are generally added on 2 gram of plant leaves which are further cut into the smaller pieces. The prepared leaves solution are prepared for ultrasonic extraction in which it is generally passed through an ultrasonic bath with a frequency of 35 KHz and power of 140W. During the sonication of the sample the temperature change each measured by infrared thermometer in each 5 minutes interval [8].

E. Extraction of Black pepper

It is generally done by a process known as Soxhelt extraction. Soxhelt apparatus (DBSA) is generally used for this procedure. The advantage of DBS is that it generally helps to increase the extraction cycle which in turn helps to decrease the the extraction time. Through the help of DBS, extraction yield of 3.9 % piperine is obtained in 12 hr with the cycle time of 3 min. In case of Soxhelt extraction methylene chloride is used as a extraction solvent. Apart from soxhlet extraction the other two process helps in the extraction of black people are solvent extraction supercritical CO2 extraction. In solvent extraction pepper is mixed with ethanol followed by sonication for 10 min and then filtration [9].

III. ENCAPSULATION OF THE HERBS

A. Encapsulation of Tulsi

For the encapsulation process of Tulsi generally spray drying technology is used. In the process extract of SC-CO2 Tulsi leaves bay leaves and cardamom seeds are mixed in the ratio of 1:1 :2. For obtaining and encapsulated powder melted extreme are used as well materials at an temperature of 140 degree centigrade. The active compounds have microencapsulation efficiencies and has surfaced binding property within the range of 2.5%. encapsulated extract is generally used in the natural antioxidant in the soybean oil. The the encapsulated SC-CO2 extract has been evaluated and has been found that they have the best antioxidant efficacy [10].

B. Encapsulation of Turmeric

For turmeric generally microencapsulation process is used. In this process 10% maltodextrin extreme is generally used as a microencapsulant. Turmeric concentrate at 300ml is added with maltodextrin. The whole process generally takes place in spray dryer SD basic lab plant [2].

C. Encapsulation of Ginger

The encapsulation process of Ginger is mainly done by mixing chitosan solution, acetic acid, sodium alginate, red ginger oleoserin of amount 2%, 1%, 1% and 8 gm respectively. In this mixture sodium tripolyphosphate is added and the mixture is stirred using a homogenizer with a speed of 22,000 rpm. The emulsion are generally analysed using a nanoparticle analyser. The emulsion formed generally flowed on spray dryer at a inlet temperature of 180°C. By using Scanning Electron Microscopy (SEM) the Powder products were analysed [11].

D. Encapsulation of Peppermint

Tannic acid is commonly used as a hardening agent for pippermint microencapsulation. Various parameters, such as wall material concentration, core material concentration, tannic acid concentration, and Tween 80 content, all play a role in the process. Particle size normally increases when core and wall centration increases, and reduces as tannic acid and Tween 80 concentrations rise. The efficiency is

unchanged by tannic acid or tween 80, and it is generally improved by increasing the core and wall concentrations. Several characteristics are required for maximum efficiency, including 4% wall material, 5% core material, 0.75% tannic acid, and 0.02% tween 80 [12].

E. Encapsulation of Black pepper

The encapsulation process is generally done by using sodium alginate as a crosslinking agent. Generally the whole encapsulation process is done in a lactoferrin/ sodium alginate shell. Using gas chromatography and NMR the chemical composition was identified. Generally the capsules demonstrate low release of essential oil during gastric digestion and higher release in intestinal digestion [13].

F. Encapsulation of Lemon Balm

Modified starch (5g) in deionized water (50 ml) and additional of 1g extract generally used for the preparation of lemon balm extract. The full solution each homogenized at 9500 rpm for 1 min with 7.25 homogenizer. In the whole process the feet solution flow rate is controlled by using a peristaltic pump [14].

Table 2:- Prevention of Viral Diseases Usung Herbs

Herbs	Viral Disease	Diseases producing Viruses
Tulsi (Ocimum sanctum)	Human influenza	H9N2 virus
Ginger (Zingiber officinale roscoc)	Influenza(flu), Herpes, SARS, SARS-CoV-2	Influenza A/Aichi/2/68 (Aichi) virus, Herpes simplex virus, severe acute respiratory syndrome coronavirus 2
Turmeric (Curcuma lorga)	AIDS, Hepatitis B, Herpes	Human immunodeficiency virus, Hepatitis B virus, Herpes simplex virus,
Peppermint (Mentha piperita)	HSV-1	Herpes simplex virus type- 1
Black pepper (Piper nigrum)	Vesicular stomatitis, Influenza	Vesicular stomatitis virus, Influenza virus
Lemon Balm (Melissa officinalis)	HSV-1, HSV-2, Influenza	Herpes simplex virus type-1, Herpes simplex virus type -2, Influenza virus

IV. ANTIVIRAL ACTIVITY OF THE HERBS

A. Antiviral activity of Tulsi

All O. sanctum extracts (crude extract, terpenoid, and polyphenol) had substantial virucidal action, while crude extract ocimum and terpenoid ocimum showed a highly significant to significant (p 0.001–0.01) decrease in virus genome copy numbers with the lowest dose tested. In comparison to the viral control, all three extracts of O.sanctum had a therapeutic effect; however, crude extract ocimum and terpenoid ocimum maintained this effect for a longer period of time. The crude extract and terpenoid extracted from O. sanctum leaves have showed antiviral activity against the H9N2 virus [15].

B. Antiviral activity of Ginger

Ginger is high in bioactive chemicals that have therapeutic properties, including as phenolic groups, alkaloids, and steroids. Ginger also contains sub compounds such as 4gingerol, 6gingerol, 8gingerol, 10gingerols, 6shogaols, and 14shogaols in addition to the primary bioactive components. Which aids in antiemetic, antipyretic, analgesic, antiarthritic, and anti-inflammatory activities [16]. The bioactive chemicals in ginger have also been discovered to prevent the spike (S) protein from binding to the ACE2 receptor or to serve as an inhibitor for MPro. The S protein is responsible for SARSCoV2 infection, since it interacts to the host cell's angiotensin converting enzyme 2 (ACE2) receptor to provide a favourable environment for viral replication [17].

Table 3:- Species and Herbs and Their Derivatives Showing Antiviral Properties

Plant parts, extracts and compounds	Virus	Mechanism of action
Zingiberofficinale Rosc (ZOR) induced conditioned medium	Influenza A/Aichi/2/68 (Aichi) virus	Via macrophage activation leading to production of TNF-α.
Ginger essential oil	Herpes simplex virus	Disrupts virus envelope
Aquatic extract of fresh ginger	Human respiratory syncytial virus	Blocking viral attachment and stimulate mucosal cells to secrete IFN-β
Bioactive compounds of ginger (gingerol, geraniol,shogaol, zingiberene, zingiberenol, zingerone)	SARS-CoV-2	Block the S protein from bindingto the ACE2 receptor or act as an inhibitor for MPro
Aquatic extract of ginger	Chikungunya virus	Inhibition of cytopathic effect and cell viability

ISSN No:-2456-2165

C. Antiviral activity of Turmeric

Turmeric (Curcuma longa L.) is a member of the ginger family (Zingiberaceae) that is native to India and Southeast Asia. Curcuminoids, sesquiterpenes, steroids, and polyphenol are some of the key bioactive compounds found in the rhizomes of this plant. Curcumin is a natural polyphenol extracted from turmeric (Curcuma longa) that has been used as a traditional medicine in Asian countries for ages to treat a variety of ailments. Curcumin has been proven in several studies to have anti-inflammatory, anti-angiogenic, and anti-neoplastic activities while being free of toxicity. Curcumin is a potent antiviral that inhibits virus multiplication. Curcumin has been shown to have antiviral effect against a variety of viruses, including hepatitis viruses, SARS coronavirus, influenza viruses, HIV, herpes simplex virus, dengue virus, and chikungunya virus. Curcumin's antiviral properties are also demonstrated by its capacity to modulate a variety of molecular targets involved in cellular events such as transcription regulation and cellular signalling pathway activation. Curcumin's ability to target many cellular pathways, hence limiting virus development and replication, makes it an attractive candidate for use as an antiviral medication. According to a molecular docking research, curcumin binds to and inhibits target receptors implicated in virus infection, including as SARSCoV2 protease, spike glycoprotein RBD, and PDACE2 [18].

D. Antiviral activity of Black Pepper

Piper nigrumin chloroform and methanolic extracts were tested for antiviral activity against vesicular stomatitis virus (an enteric virus) and human parainfluenza virus in human cell lines. The antiviral activity of Piper nigrum has been discovered to be stronger in chloroform extract due to the presence of more alkaloids [18]. Piperine, in comparison to commercial antiviral Ribavirin [19], was found to block methyltransferase of Dengue virus and VP35 interferon inhibitory domain of Ebola virus, according to molecular docking based study. It has been discovered that bioactive chemicals found in black pepper, such as piperdardiine and piperanine, are highly effective against COVID19 and can be further used for its treatment [20].

Table 4:- Antiviral Properties and Mechanism of Action of Curcumin (Bioactive Compound from Turmeric)

Virus	**Mechanism of action**
SARS coronavirus	Replication and protease activity inhibitor
Herpes virus	Gene expression inhibitior
Hepatitis B virus	Replication inhibitor, cccDNA inhibitor
Human immunodeficiency virus	Protease inhibitor, Integrase inhibitor, Tat protein inhibitor
Influenza A virus	Inhibitor of virus uptake, replication and particle production

E. Antiviral activity of Peppermint

The essential oil of Mentha suaveolens (EOMS) and its active ingredient piperitenone oxide (PEO) have been shown to have antiviral properties against HSV-1. These chemicals (EOMS & PEO) have been reported to have antiviral effect against the virus prior to adsorption but not after penetration into the host cell [21]. By interfering with a late step in the HSV-1 life cycle, PEO had a considerable inhibitory effect. HSV-1 infection is known to cause a pro-oxidative state in the cell due to the depletion of glutathione, the main intracellular antioxidant, and this redox shift is necessary for viral reproduction. PEO treatment reduced this deficiency, implying that the molecule may interfere with some redox-sensitive cellular mechanisms involved in viral replication. Overall, our findings imply that both EOMS and PEO could be promising candidates for new anti-HSV-1 therapies [22]. Peppermint oil in higher doses lowered viral titers of both herpesviruses by more than 90%. Peppermint has been shown to have a direct antiviral effect on HSV. It has been shown to be effective against an HSV-1 strain that is resistant to acyclovir (HSV-1-ACVres) [21].

F. Antiviral activity of Lemon Balm

In medicinal research, Lemon Balm L. (Lamiaceae) has been employed in a range of practical purposes. In cell culture, it was tested for antiviral activity against the herpes simplex virus type 1 (HSV-1). In Vero cells, a hydroalcoholic extract of lemon balm suppressed H5V-1 proliferation and development in a dose-dependent manner. Lemon Balm L.extract also found to inhibit the growth and development of HSV-1 in cells in vitro. On Vero cells [23], lemon balm was found to lessen the cytopathic effect of HSV-2. The viral binding experiment revealed that the extract does not prevent HSV-2 from entering the cells, implying a method of action after the virus has penetrated the cell [24]. Apart from that, it has been discovered that Lemon balm derivatives will become a novelty as a natural and strong therapy for the treatment of influenza viruses that are becoming increasingly resistant to conventional antivirals. Lemon balm essential oil been found to inhibit influenza virus reproduction at several stages of the replication cycle, particularly during direct engagement with virus particles, according to a study [25].

ISSN No:-2456-2165

Fig 1:- Common spices and herbs with antiviral properties

V. USES OF HERBS AS DUNCTINAL FOOD

A. Tulsi as a functional food

- *Preparation of Tulsi juice*

Tulsi leaves were separated and properly washed with potable water, and juice was made by boiling Tulsi at 650°C for 5 minutes in 1:4 water [26]. To form a fine paste, the heat-treated Tulsi was crushed in the juice maker with the water. Tulsi juice was obtained by filtering it through a clean, sanitised fine double-layered muslin cloth and storing it at room temperature until needed [27]. Aside from that, fruit yoghurt with tulsi boosts nutritional content and meets expanding consumer demand for healthy foods. The herbal fruit yoghurt was made using three different concentrations of TLE (0.5%, 1%, and 1.5%); as well as apple pulp (10%). Dahi, Tulsi, and a fruit combination are regarded devotional foods and are referred to as Panchamrite, which provides several health benefits. Tulsi and apple pulp were used to create a high-quality yoghurt [28].

- *Yoghurt preparation using Tulsi leaves*

The apple and TLE were added to the milk, which was heated to 85°C for 15 minutes before chilling to 43°C. The STLB mixed yoghurt culture was then added at a rate of 20 mg/l of milk and thoroughly stirred to ensure that the culture was evenly distributed. The samples were placed in polystyrene containers and incubated for 3.5 hours at 43 °C. Yogurt was chilled to 4°C and stored under refrigeration conditions (4-7°C) after forming a hard coagulum [29].

B. *Ginger as a functional food*

- *Preparation of ginger juice*

To prepare the juice, ginger rhizomes were cleaned under running water, peeled, and then shredded. A two-fold muslin cloth was used to filter the juice [26]. Aromatic ginger (Kaempferia galanga L.) extracts can be utilised as a functional food in addition to juice preparation [30]. Soft cheese enriched with ginger extract has been tested as a functional dairy product. Ginger extract supplementation increased cheese proteolysis and TFVAs while lowering pH and oxidative rancidity. When compared to control cheese, ginger extract-fortified cheese promotes the growth of L. lactis ssp. lactis and L. lactis ssp. cremoris. In both pickled and unpickled cheese, ginger extract-fortified cheese received the highest evaluations for flavour, texture, and overall acceptability, and became more palatable to panellists than control cheese throughout storage [31].

C. Turmeric as a functional food

Turmeric flowers, which have a long history of culinary use, were employed to create new cookie formulations. Fresh turmeric flower aqueous extracts were employed as a supplementary component in cookies. The results revealed that the proximate composition of all the formulated cookies differed significantly. Cookies with a higher extraction amount of turmeric flowers (20%) had lower antioxidant activity. This can be related to the baking process's destruction of heat-sensitive antioxidant molecules. According to the texture investigation, cookies with a higher quantity of turmeric flower extracts required

the least amount of compression force. Furthermore, the sensory quality evaluation found that control cookies had the highest overall acceptability score (5.70), followed by 10% (5.13) and 5%. (5.07). Because the consumers (panellists) are more accustomed to the flavour of regular cookies, they may have been less willing to accept unique cookies made with turmeric flower extracts. Overall, no microbiological contamination was discovered in any of the formulated cookies. Turmeric blossoms have been shown in studies to give value to functional food ingredients in cookies and other baked products [32]. Turmeric powder can also be used with tulsi and ginger to make herbal milk [26].

- *Preparation of herbal milk*

Tulsi juice (25%), ginger juice (3%), turmeric powder (0.1%), sugar (7%), and stabiliser were used to make the herbal milk (carrageenan, 0.025%). The following is a flow chart for making herbal milk with Tulsi juice, ginger juice, and turmeric powder. The control was made using the same process but with the addition of sugar. The flow diagram for making herbal milk with Tulsi juice, ginger juice, and turmeric powder [26].

D. Peppermint as a functional food

In herbal teas, peppermint and green cardamom are commonly added with basil [33]. Peppermint tea is commonly used to calm the stomach and improve digestion, and it may be beneficial in the treatment of stomach disorders and digestive issues. The herb Mentha sp. (Lamiaceae family) is extracted in heated water and used as a flavouring ingredient or as a herbal drink. Peppermint leaves and stems are frequently utilised in popular beverages because of its refreshing flavour and distinct perfume [34].

- *Formulation of herbal tea using peppermint leaves*

The following ingredients (0.3 g crumbled Basil leaves, 0.1 g crumbled Peppermint leaves, and 0.05 g powdered green cardamom) are heated. The concoction was poured into a sealed empty tea bag. To prepare infusion, this tea bag is dunked in 200 mL hot nestle water. The antioxidant component of herbal tea was detected using standard phytochemical analytical methods [33].

E. Black pepper as a functional food

The Indian Spices Board has recognised 52 spices that have been utilised as traditional medicine throughout history. Among these, black pepper is useful in the manufacture of functional foods. Pepper is prized for its pungency, which comes from the alkaloid piperine, as well as its flavour, which comes from the volatile oil. Black pepper can be employed in industrial processes despite these quality concerns [35]. It has a wide range of culinary and therapeutic applications, including flavouring and preserving processed goods. Black pepper is an important component of Indian medicinal systems — Ayurveda, Sidha and Unani [36]. It can be taken alone or in combination with other herbs such as dried long pepper (Piper longum) and dried ginger (Zingiber officinale). Black pepper is used in cooking for a variety of functions, including flavouring, masking/deodorizing, pungency, and coloration. Pepper is appropriate for recipes including meat, seafood, milk, eggs, grains, vegetables, fruit, beans and seeds, and beverages because it prevents or delays oxidative deterioration, so adding greatly to food preservation [35].

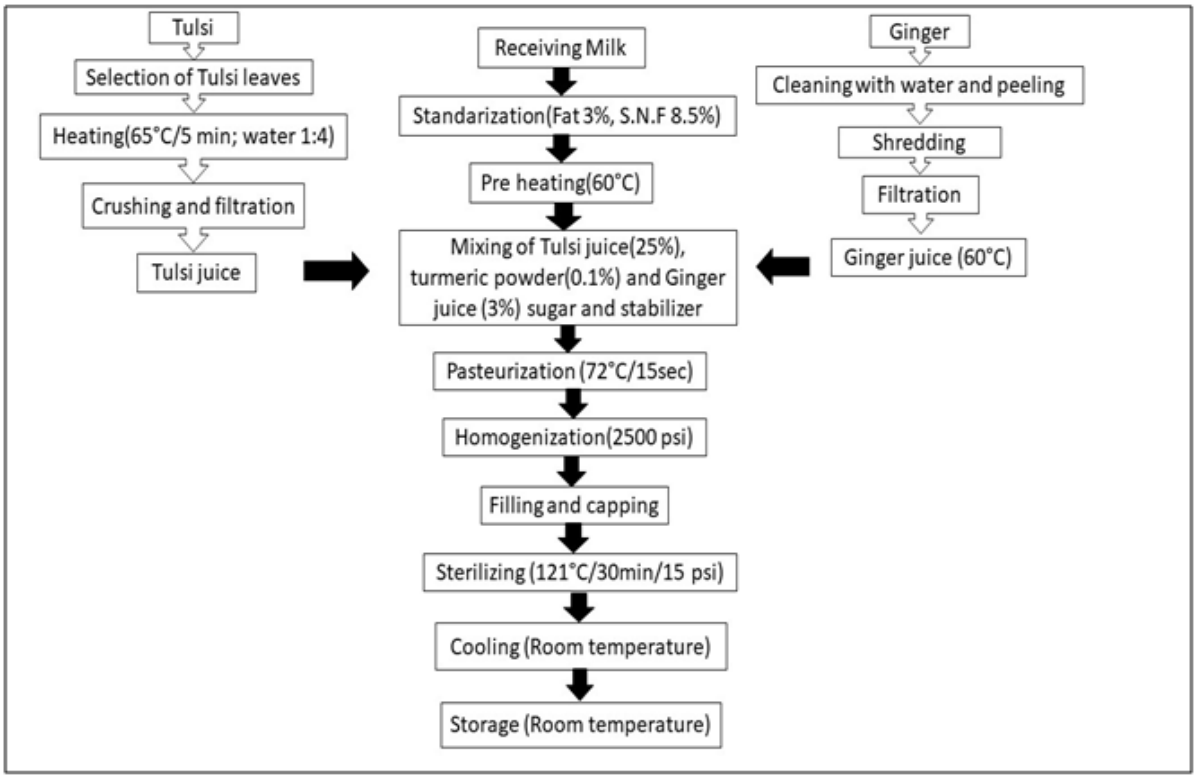

Fig 2:- Flow chart for preparation of herbal milk using Tulsi, turmeric and ginger

ISSN No:-2456-2165

F. Lemon Balm as a functional food

Lemon balm (Melissa officinalis) has been utilised as a mood and cognitive function modulator in the past and present, having anxiolytic effects when taken as capsules, coated pills, or applied topically [37]. Until now, research into the psychogenic effects of M. officinalis has been limited to extracts taken as capsules, coated tablets, or applied topically [38], [39], [40]. According to the findings, M. officinalis administered as a beverage or yoghurt drink has an anti-stress and cognitive benefit [37]. Cakes, biscuits, and cookies are bakery products that are loved and enjoyed by people all over the world because of their low cost, vast variety of flavours and textures, and long shelf life [41], [42], [43]. Lemon balm extract, which is high in rosmarinic acid, can help baked items perform better. Synthetic additives were commonly employed in bread items in the past. Natural additives, such as rosameric acid, have been proven to have higher bioactivity in terms of preserving and functionalizing a specific food product [41]. The binary effect of natural chemicals like rosameric acid, or their enriched extracts, has previously been investigated in a variety of foodstuffs such yoghurts, cottage cheese, biscuits, and bread [16]. The aqueous extract of M. officinalis (lemon balm), previously known to possess significant quantities of rosmarinic acid, was used as a natural preserver/functionalizing agent in cupcake formulations because of this high beneficial action [41].

VI. CONCLUSION

Precautions and strengthening immunity are two of the most important ways to avoid viral infections like the current COVID-19 pandemic in the present pandemic scenario. According to our study, the usage of herbs may have a significant role in the prevention of viral infections. Tulsi, Ginger, Turmeric, Black pepper, Peppermint, and Lemon Balm have been shown to be effective against SARS-CoV-2 (COVID-19) as well as other viral infections such as Influenza, Herpes, and AIDS, according to research. Herbs have been used in India since ancient times for their flavour, antiviral, and immunity-boosting effects. Since ancient times, Indians have used these natural compounds, which have given immunity in the Indian people, which is likely the main reason for India's low mortality rate. Excessive use of spices and herbs, on the other hand, can result in stomach acidity, heartburn, constipation, diarrhoea ulcers in the mouth, high blood pressure, and other problems. As a result, more research into the bioactive components found in common Indian herbs, as well as their efficiency and method of action against fatal viruses, is needed.

REFERENCES

[1]. Gaurav Kumar Gaur, Rekha Rani, Chetan N Dharaiya and Khushal Solanki; Development of herbal milk using tulsi juice, ginger juice and turmeric powder; International Journal of Chemical Studies 2019; 7(2): pp 1150-1157

[2]. Liang-Tzung Lin et al. - Antiviral Natural Products and Herbal Medicines, J Tradit Complement Med. 2014 Jan-Mar; 4(1): pp 24–35.

[3]. Christou L. The global burden of bacterial and viral zoonotic infections. Clin Microbiol Infect. Volume 17, Issue 3, March 2011, Pages 326-330.

[4]. Rajesh Kumar Ganjhu, Piya Paul Mudgal, Hindol Maity, Deepu Dowarha, Santhosha, Devadiga, Snehlata Nag & Govindakarnavar Arunkumar; Herbal plants and plant preparations as remedial approach for viral diseases; 03 September 2015

[5]. Sajjanshetty Mallikarjun, Ashwini Rao, Gururaghavendran Rajesh, Ramya Shenoy, and Mithun Pai, Antimicrobial efficacy of Tulsi leaf (Ocimum sanctum) extract on periodontal pathogens: An in vitro study, J Indian Soc Periodontol. 2016 Mar-Apr; 20(2): 145–150.

[6]. E. M. Tanvir et al, Antioxidant Properties of Popular Turmeric (Curcuma longa) Varieties from Bangladesh, Journal of Food Quality Volume 2017, Article ID 8471785, 8 pages.

[7]. G J Manuhara, G P Mentari, L U Khasanah , R Utami, Aqueous Extract Composition of Spent Ginger (Zingiber officinale var. Amarum) from Essential Oil Distillation, IOP Conf. Series: Materials Science and Engineering 333 (2018) 012069

[8]. Jana Šic Žlabur, Sandra Voća*, Nadica Dobričević, Stjepan Pliestić, Ante Galić, Ana Boričević et al., Ultrasound-assisted extraction of bioactive compounds from lemon balm and peppermint leaves, Int. Agrophys., 2016, 30, 95-104

[9]. Leila Gorgani ,Maedeh Mohammadi ,Ghasem D. Najafpour ,Maryam Nikzad, Piperine—The Bioactive Compound of Black Pepper: From Isolation to Medicinal Formulations, 22 November 2016, Volume16, Issue1,, Pages 124-140

[10]. Sudip Ghosh, Dipan Chatterjee, Subhankar Mishra, Paramita Bhattacharjee; Food application of an encapsulated phytochemically rich SC-CO_2 extract of a polyherbal mix of tulsi, bay and cardamom: Shelf-life and frying stability of soybean oil; Journal of Food Engineering Volume 171, February 2016, Pages 194-199.

[11]. Jayanudin, Rochmadi, Wiratni, Meri Yulvianti, Dhena Ria Barleany, Widya Ernayati , Encapsulation Red Ginger Oleoresin (Zingiber officinale var. Rubrum) With Chitosan-alginate as Wall Material Using Spray Drying, Research Journal of Applied Sciences, Engineering and Technology 10(12): 1370-1378, 2015
[12]. H. Pakzad, I. Alemzadeh, A. Kazemi; Encapsulation of Peppermint Oil with Arabic Gum-gelatin by Complex Coacervation Method; IJE TRANSACTIONS B: Application Vol. 26, No. 8, (August 2013) 807-814
[13]. Lívia Pinto Heckert Bastosa, Carlos Henrique Corrêa dos Santosb , Mario Geraldo de Carvalhob , Edwin Elard Garcia-Rojas, Encapsulation of the black pepper (Piper nigrum L.) essential oil by lactoferrin-sodium alginate complex coacervates: Structural characterization and simulated gastrointestinal conditions, Food Chemistry 316 (2020)
[14]. Samira Najafi-Soulari, Hajar Shekarchizadeh &Mahdi Kadivar; Encapsulation optimization of lemon balm antioxidants in calcium alginate hydrogels Journal of Biomaterials Science, Polymer Edition Volume 27, 2016 - Issue 16
[15]. S. S. Ghoke, R. Sood et al. - Evaluation of antiviral activity of Ocimum sanctum and Acacia arabica leaves extracts against H9N2 virus using embryonated chicken egg model, June 2018
[16]. Singh, N., Jha, A., Chaudhary, A., & Upadhyay, A. (2012). Enhancement of the functionality of bread by incorporation of Shatavari (Asparagus racemosus). Journal of Food Science and Technology, 51, 2038–2045.
[17]. Walls, A. C., Park, Y.-J., Tortorici, M. A., Wall, A., McGuire, A. T., & Veesler, D. (2020). Structure, function, and antigenicity of the SARS-CoV-2 spike glycoprotein. Cell, 181(2), 281–292.
[18]. Namita Ashish Singh, Pradeep Kumar, Jyoti, Naresh Kumar. Spices and herbs: Potential antiviral preventives and immunity boosters during COVID-19. 29 January 2021
[19]. Anish Nag , Rajshree Roy Chowdhury ; Piperine, an alkaloid of black pepper seeds can effectively inhibit the antiviral enzymes of Dengue and Ebola viruses, an in silico molecular docking study, VirusDis 2020 Sep;31(3):308-315.
[20]. Rajagopal, K., Byran, G., Jupudi, S., & Vadivelan, R. (2020). Activity of phytochemicalconstituents of black pepper, ginger, and garlic againstcoronavirus (COVID-19): An in silico approach. International Journal of Health and Allied Sciences, 9, S43–S50.
[21]. A.Schuhmacher, J.Reichling, P.Schnitzler. Virucidal effect of peppermint oil on the enveloped viruses herpes simplex virus type 1 and type 2 in vitro. Phytomedicine Volume 10, Issues 6–7, 2003, Pages 504-51
[22]. Livia Civitelli, Simona Panella, Maria Elena Marcocci, Alberto De Petris, Stefania Garzoli, Federico Pepi et al., In vitro inhibition of herpes simplex virus type 1 replication by Mentha suaveolens essential oil and its main component piperitenone oxide. Phytomedicine Volume 21, Issue 6, 15 May 2014, Pages 857-865.
[23]. Vahabpour Roudsari R.A, Shamsi Shahrabadi M., Monavari S.H.R., Sajadi E.E., Sajadi N. Evaluation of potential antiviral activity of the hydroalcoholic extract of lemon balm l. against Herpes Simplex Virus type-1.Iranian Journal of Virology December 2007, volume 1, number 2; Page(s) 28 To 32.
[24]. G. Mazzanti , L. Battinelli, C. Pompeo, A.M. Serrilli, R. Rossi, I. Sauzullo, et al. Inhibitory activity of Melissa officinalis L. extract on Herpes simplex virus type 2 replication. Formerly Natural Product Letters Volume 22,2008 – Issue 16
[25]. Gholamhosein Pourghanbari, Hasan Nili, Afagh Moattari, Ali Mohammadi & Aida Iraji. Antiviral activity of the oseltamivir and Melissa officinalis L. essential oil against avian influenza A virus (H9N2). 21 May 2016. VirusDisease volume 27, pages170–178(2016)
[26]. Gaurav Kumar Gaur, Rekha Rani, Chetan N Dharaiya and Khushal Solanki; Development of herbal milk using tulsi juice, ginger juice and turmeric powder; International Journal of Chemical Studies 2019; 7(2): 1150-1157
[27]. Trivedi VB, Prajapati JP, Pinto SV, Darji VB. Use of Basil (Tulsi) As Flavouring Ingredient in the Manufacture of Ice Cream. American International Journal of Contemporary Scientific Research. 2014; 1(3):28-43.
[28]. Mohit Mittal, Ankush Thakur, Ravinder Kaushik, Prince Chawla ; Physicochemical properties of Ocimum sanctum enriched herbal fruit yoghurt; Journal of Food Processing and Preservation Volume44, Issue12 December 2020, e14976
[29]. Wong, S., Wicklund, R., Bridges, J., Whaley, J., & Koh. Y. B. (2020). Starch swelling behavior and texture development in stirred yoghurt. Food Hydrocolloids, 98, 105274
[30]. Nupur Srivastava, Ranjana, Shilpi Singh, Amit Chand Gupta, Karuna Shanker, Dnyaneshwar U.Bawankule et al. ; Aromatic ginger (Kaempferia galanga L.) extracts with ameliorative and protective potential as a functional food, beyond its flavor and nutritional benefits; Toxicology Reports Volume 6, 2019, Pages 521-528
[31]. El-Aziz M. A. , Mohamed S. H. S. , Seleet F. L. ; Production and evaluation of soft cheese fortified with ginger extract as a functional dairy food ; Polish Journal of Food and Nutrition Sciences 2012 | 62 | 2 |
[32]. Azmi, Nur Syakila; Bhat, Rajeev; Yeoh, T. K.; Quality evaluation of novel cookies prepared by supplementing with fresh turmeric flower (Curcuma longa L.) extracts as a value added functional ingredient. International Food Research Journal 2016, Vol. 23 Issue 4, p1514-1522. 9p.
[33]. Afshan Saleem, Arjumand Iqbal Durrani, Fatima Batool Awan, Amina Irfan, Misbah Noreen, M Ali Kamran et al.; Preparation of Marketable Functional Food to Control Hypertension using Basil (ocimum basillium) and Peppermint (mentha piperita); International Journal of Innovations in Science and Technology, Vol 01 Issue 01: pp 15-32, 2019

[34]. Xiaoyan Xia, Zhenchuan Lin, Keping Shao, Xude Wang, Jing Xu, Hang Zhai, et al. ; Combination of white tea and peppermint demonstrated synergistic antibacterial and anti-inflammatory activities ; Journal of the science of food and agriculture Volume101, Issue6 April 2021 Pages 2500-2510
[35]. P.N.Ravindran, J.A.Kallupurackal. ; 6 - Black pepper; Handbook of Herbs and Spices (Second edition) Volume 1 Woodhead Publishing Series in Food Science, Technology and Nutrition 2012, Pages 86-115
[36]. P.N.Ravindran, J.A.Kallupurackal, 6 - Black pepper Handbook of Herbs and Spices (Second edition) Volume 1; 2012, Pages 86-115
[37]. Andrew Scholey, Amy Gibbs, Chris Neale, Naomi Perry, Anastasia Ossoukhova, Vanessa Bilog et al.; Anti-Stress Effects of Lemon Balm-Containing Foods; Nutrients. 2014 Nov; 6(11): 4805–4821. 2014 Oct 30
[38]. Kennedy D., Wake G., Savelev S., Tildesley N., Perry E., Wesnes K. et al. Modulation of mood and cognitive performance following acute administration of single doses of Melissa officinalis (lemon balm) with human CNS nicotinic and muscarinic receptor-binding properties. Neuropsychopharmacology. 2003; 28:1871–1881
[39]. Kennedy D.O., Little W., Scholey A.B. Attenuation of laboratory-induced stress in humans after acute administration of Melissa officinalis (lemon Balm) Psychosom. Med. 2004; 66:607–613
[40]. Ballard C.G., O'Brien J.T., Reichelt K., Perry E.K. Aromatherapy as a safe and effective treatment for the management of agitation in severe dementia: The results of a double-blind, placebo-controlled trial with Melissa. J. Clin. Psychiatry. 2002; 63:553–558
[41]. Cristina Caleja, Lillian Barros, João C.M. Barreira, Ana Ciric, Marina Sokovic, Ricardo C. Calhelha et al.; Suitability of lemon balm (Melissa officinalis L.) extract rich in rosmarinic acid as a potential enhancer of functional properties in cupcakes; 3 January 2018; Food Chemistry S0308-8146(18)30043-8
[42]. Gandhi, A. P., Kotawaliwale, N., Kawalkar, J., Srivastava, D. C., Parihar, V. S., & Raghu Nadh, P. (2001). Effect of incorporation of defatted soy flour on the quality of sweet biscuits. Journal of Food Science and Technology, 38(502–503), 7
[43]. Jeddou, K.B., Bouaziz, F., Zouari-Ellouzi, S., Chaari, F., Ellouz-Chaabouni, S., Ellouz Ghorbel, R. et al. (2017). Improvement of texture and sensory properties of cakes by addition of potato peel powder with high level of dietary fiber and protein. Food Chemistry, 217, 668–677