International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 1321-1334 www.ijprajournal.com ISSN: 2456-4494

Phytochemicals present in Ayush-Kwath (Ayush-Kadha) for Improving Immunity and Covid-19 Prophylaxis: A Review

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Submitted: 05-04-2022 Accepted: 18-04-2022

ABSTRACT:
Corona virus belongs to genus Betacoronavirus a huge family Coronaviridae which can cause illness in human beings as well as in animals.There are several variants of corona virus that can cause respiratory infections in human. It has long range ailments from simple cold to severe diseases like acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS) and COVID-19.COVID-19 stands for coronavirus disease 2019 caused by SARS-CoV-2.COVID-19 was identified in Wuhan, China in December 2019. It is a new strain of corona virus that can causes respiratory infections in humans and is highly contagious. COVID-19 is containing single-stranded RNA which is in positive-sense associated with a nucleoprotein within a capsid comprised of matrix protein. It is spherical or pleomorphic enveloped particles.
The best ways to prevent COVID-19 infection are breaking the chain by wearing mask, maintaining physical/social distance, avoiding crowd areas, healthy diet etc. Apart from all the above the most important measure to prevent viral attack is to enhance an individual's immunity. The Ministry of AYUSH, Government of India, has recommended the use of AYUSH kwath/kada once or twice a day as immunity booster. AYUSH kwath/kada is a herbal tea /decoction (Kadha) made from Tulsi (Basil:Family-Lamiaceae), Dalchini (Cinnamon: Family-Lauraceae), Kalimirch (Black pepper: Family-Solanaceae), Shunthi (Dry Ginger: Family-Gingiberaceae) and Munakka (Raisin: Family-Vitaceae).Jaggery (natural sugar:Poaceae) and / or fresh lemon (Nimbu: Family-Rutaceae) juice can also be added according to taste. The present paper investigates presence of active phtochemicals in various components of kwath/kada for improving immunity especially against Covid-19. The presence of various phytochemicals in the Ayushkada increases the chances to combat with covid-19.

Keywords: Covid-19, AyushKwath, Phytochemicals, Phytochemicals

I. INTRODUCTION:

The Covid 19 outbreak, suffered the entire mankind across the globe. Many variants like Alpha, Beta, Gamma, Delta, Omicron, Lambda and Mu are found as new one. The main symptoms of viral infection includes Fever , Coughing, Shortness of breath,Trouble breathing,Fatigue,Chills, sometimes with shaking, Body aches, Headache, Sore throat, Congestion/runny nose, Loss of smell or taste, Nausea and Diarrhea. The virus can also lead to pneumonia, respiratory failure, heart problems, liver problems, septic shock, and death.

One can fight with this virus by enhancing the body's natural defence system. Immunity plays an important role in maintaining optimum health. While there is no medicine for COVID-19 as of now, it will be good to take preventive measures which boost our immunity. As we all know that prevention is better than cure so one should give emphasis on prevention.Ayurveda, being the science of life, propagates the gifts of nature in maintaining healthy and happy living. Ayurveda's extensive knowledge base on preventive care derives from the concepts of "Dinacharya" - daily regimes and "Ritucharya" - seasonal regimes to maintain healthy life. It is a plant-based science. The simplicity of awareness about oneself and the harmony each individual can achieve by uplifting and maintaining his or her immunity is emphasized across Ayurveda's classical scriptures.

India predominantly relied on plant-based medications under different domain names like Ayurveda, Siddha, Unani, etc (Parida et al., 2020; Adhikari et al., 2020). Traditional medicines involving plant-based formulations have been proven successful in boosting immunity and providing tolerance to the virus infections (Fakhri et al., 2020; Dave et al., 2020).

Ayurveda has lot of herbs and spices which are known to build immunity. Regular consumption of these would helps us to stay secured and immune from diseases. Kadha is a type of decoction or hot drink made from various herbs

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Volume 7, Issue 2 Mar-Apr 2022, pp: 1321-1334 www.ijprajournal.com ISSN: 2456-4494

and ayurvedic plants/parts which is important for our health as it increases the immunity. It can also give relief from cough, cold and minor infections. Regular use of this kadha can boost the individual's immunity.

According to the Ayush ministry, the decoction/Tea of AyushKwathshould be consumed once or twice daily to strengthen immunity against current pandemic or covid-19. AyushKwath contains Tulsi, Dalchini, Sunthi, Krishna Marich and Munakka which are known for their immunity boosting property and beneficial for our health.Jaggery and lemon can also be added to enhance the taste as well as to boost up the kada properties.These contents have various secondary metabolites and important phytoconstituents which enhance the immunity.

Ginger (Sunthi):

Ginger belongs to the family Zingiberaceae.The rhizome or modified underground stem of ginger is used worldwide as a spice for flavouring a multitude of foods and food products, alcoholic and non-alcoholic beverages, confectionary and prickles as well as in pharmaceutical preparations and traditional medicines (Lawrence, 1984; Selvanet et.al., 2002).

Nutritional value of ginger per 100 gms:

Energy333 kJ (80 kcal), **Carbohydrates**:17.77 g, Sugars 1.7 g, Dietary fiber 2 g

Fat 0.75 g, **Protein**1.82 g

Vitamins: Thiamine (B1)-0.025 mg, Riboflavin (B2)-0.034 mg,Niacin (B3)-0.75 mg, Pantothenic acid (B5)-0.203 mg, Vitamin B6-0.16 mg, Folate (B9)-11 µg,Vitamin C-5 mg,Vitamin E-0.26 mg,

Minerals: Calcium-16 mg,Iron-0.6 mg, Magnesium-43 mg,Manganese-0.229 mg, Phosphorus-34 mg, Potassium-415 mg, Sodium-13 mg, Zinc-0.34 mg.

Other constituents consist of Water-79 g

Chemistry/ phytoconstituents of ginger:

The ginger rhizome contains various biologically active compounds such as gingerol, shogaol, ginger protease, capsaicin and several sesquiterpenes like zingiberol and zingiberenol (Ha et. al.., 2012, Ali et. al.., 2008). Over 50 components of the oil present in ginger are mainly monoterpenoids [b-phellandrene, (+)-camphene, cineole, geraniol etc.] and sesquiterpenoids [a zingiberene (30–70%), b-sesquiphellandrene (15–20%), b-bisabolene (10–15%), (E-E)-a-farnesene, arcurcumene, and zingiberol] (Langner et. al.., 1998; Evans, 2002).The phenolic ketone compounds such as 6-gingerol, 8-gingerol and 10-gingerol are the principle active pungent compounds. Between identified components, 6-gingerol was reported as the most abundant bioactive compound in ginger with various pharmacological effects including antioxidant, analgesic, anti-inflammatory, antipyretic, antidiabetic anticancer, apoptosis in triple-negative breast cancer cells (Wang et. al... 2014, Bernard et. al.. 2017, Samadet. al.., 2017). Besides, gingerols, shogaols and zingerone possess comprehensive medicinal properties such as anti-apoptotic, anti-tumor ,anti-inflammatory, anti-oxidant and anti-emetic anti-migraine,immuno-modulatory and cardiovascular protection The pungency of fresh ginger is primarily due to the gingerols, which are a homologous series of phenols. The pungency of dry ginger mainly results from shogaols which are the dehydrated forms of gingerols. Shogaols are formed from the corresponding gingerol during thermal processing (Wohlmuthet. al.., 2005). It also contains paradols, dihydroparadols, [3]-dihydroshogaols, acetyl derivatives of gingerols, gin- gerdiols, mono- and di-acetyl derivatives of gingerdiols, 1-dehydrogingerdiones, diarylheptanoids, zingiberene, phellandrene and methyl ether derivatives of some of these compounds. In addition to [6]-gingerol, [4]-, [7]-, [8]-, and [10]-gingerol were also identified. In particular, gingerol- related components have been reported to possess anti- microbial and antifungal properties. (Gunathilak&vasantha 2015).

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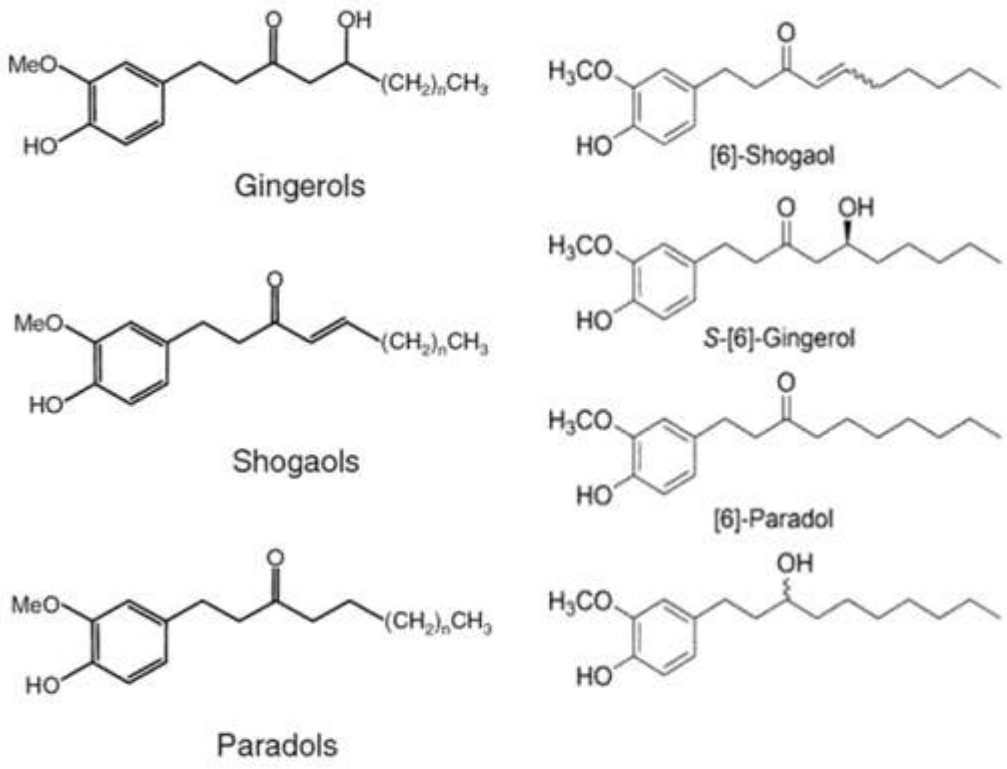

(Chemical Structure of Active Secondary Metabolites present in Ginger)

Tulsi:

Ocimum sanctum L. (also known as Ocimumtenuiflorum) belongs to the family Lamiaceae. It has been used for thousands of years in Ayurveda for its diverse healing properties. Tulsi, the Queen of herbs, the legendary 'Incomparable one' of India, is one of the holiest herbs. It is mentioned by Charaka in the CharakaSamhita; an Ayurvedic text that it is anadaptogen, balancing different processes in the body, and helpful for adapting to stress. Marked by its strong aroma and astringent taste, it is regarded in Ayurveda as a kind of 'elixir of life' and believed to promote longevity. Tulsi extracts are used in Ayurvedic remedies for common colds, headaches, stomach disorders, inflammation, heart disease, various forms of poisoning and malaria. Traditionally, O. sanctum L. is taken in many forms, as herbal tea, dried power or fresh leaf (Anbarasu K, Vijayalakshmi 2007)

Nutritional value of Tulsi per 100 g.
Protein: 30 Kcal, 4.2 g
Fat: 0.5 g;
Carbohydrate 2.3 g;
Calcium: 25 mg;
Phosphorus 287 mg;
Iron: 15.1 mg
Vitamin C and A
Minerals: calcium, zinc and iron.

Chemistry/ phytoconstituents of Tulsi:

The chemical composition of Tulsi is highly complex, containing many nutrients and other biologically active compounds. The structuresof biologically active compoundspresent in Tulsi are as following:

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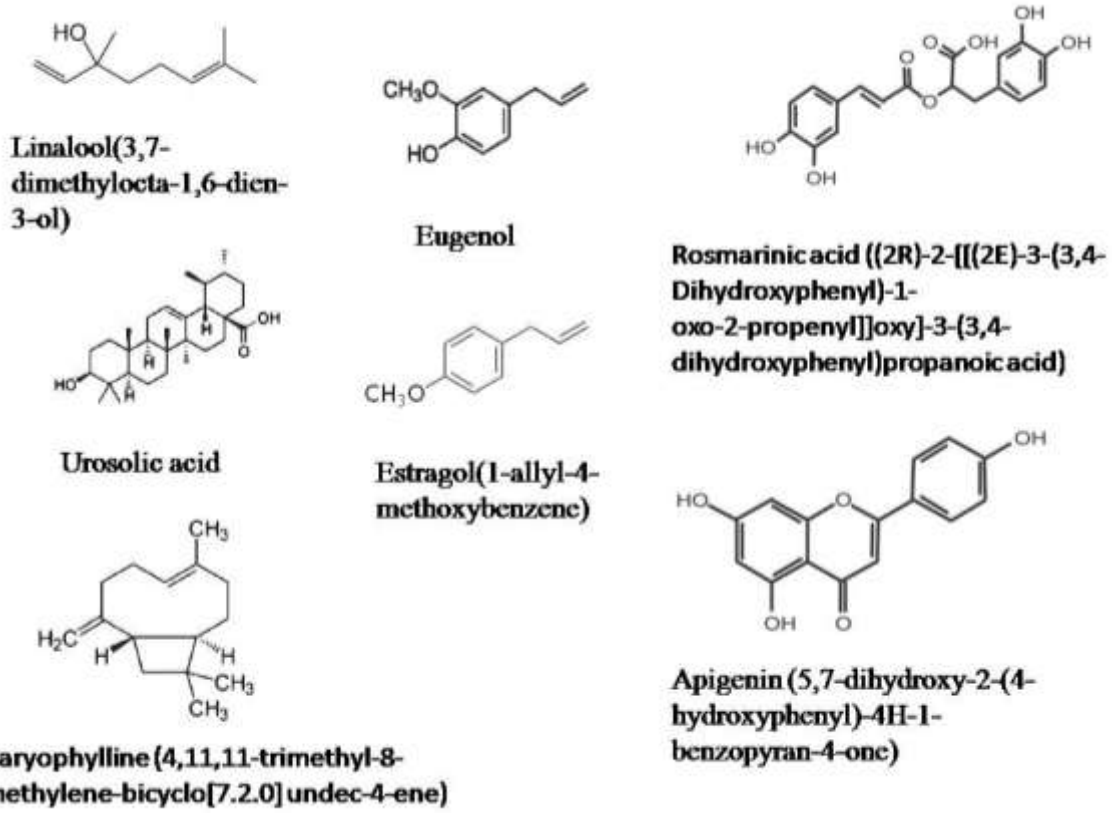

(Chemical Structure of Active Secondary Metabolites present in Tulsi)

Table no. -1: Types of Tulsi, their Medicinal uses and Secondary Metabolites

S.No.	Botanical name	Local name	Family	Medicinal uses	Secondary metabolites	Reference
1.	Ocimumbasillicum	GulalTulsi	Lamiaceae	Bactericidal, Anti-Gonorrhoea, Dysentery, Antiviral, Antimicrobial, Treating cancer, Diabetes, Asthama	Linalool,Methyl Chavicol, 1,8-Cineole, Alpha Terpinene, Ethyl-2-methyl-butyrate	Damiret. al..,2015; Chiang et. al.., 2005; De-Almeida et. al..,2007; Tohtiet. al..,2006; Mansosroiet. al.., 2006; Dube 1989;
2.	Ocimumcitriodorum	Nimbutulsi	Lamiaceae	Antimicrobial, Antibacterial, Antioxident	Eugenol, β-Caryophyllene Linalool, Methyl chavicol, Eugenol, 1,8-cineole,	Carovi et. al.., 2010 Kashyap et. al.., 2011 Abhay et. al., 2014; Hakkim et. al.., 2008

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 1321-1334 www.ijprajournal.com ISSN: 2456-4494

					Geranial , Neral Limonene 1,8-Cineol Citronellal Alfa-pinen	Martin et. al.., 2014
3	Ocimum sanctum (Greenleaved Tulsi)	Green/ Shree Tulsi	Lamiaceae	Bronchitis, Malaria, Diarrhea, Dysentery, skin disease, arthritis, Eye diseases, Insect bites, Anticancer, Antidiabetic, Antifungal, Antimicrobial, Cardioprotective,	Eugenol, urosolic acid, limatrol, caryophyllene , methyl carvicol , Linalool	Priyabrataet . al.., 2010; Shishodiaet. al.., 2003
6.	Ocimumtenuiflorum (Purple leaved)	Shyam/Krishna Tulsi	Lamiaceae	Anticancer Radioprotective, Anticarcinogenic Antioxidant Chemo-preventive Immuno-therapeutic, Antimicrobial ,	α-Pinene Camphor, Citral, Geraniol, β-Pinene Citronellal Eugenol,Vanillin, Linalool	Soumenet. al..,2013 Awasthi& Dixit, 2007 Khan et. al., 2010 Kathiresanet. al.., 1999; Devi, 2001, Joshi, 2013; Prasharet. al.., 1994; Mukherjee et. al..,2005 Singh et. al..,2005; Joshi, 2013; Godhwani, &Vyas, 1987; Singh &Majumdar, 1997; Godhwani et al., 1987

Black Pepper:

Black Pepper scientific nameis Piper nigrum L. (black pepper), which is considered as "King of Spices" and is commonly used as a condiment around the world. It is alsoapplied in traditional medicine in several countries, mainly in Asia, Africa and SouthAmerica (Senet al., 2016; Grineviciuset al., 2017). Black pepper is an aromatic plant usually known for the application of its flavoring agents in the reduction of muscle pain, feverish conditions, diarrhea, gastric conditions and cholesterol. The metabolites acting as an anti-

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inflammatory, antioxidant, antimicrobial, and repellent agent (Bagheri et al., 2014; Swathy et al., 2018; Duangjai et al., 2013; Aziz et al., 2015).

Nutritional value of Tulsi per 100 g

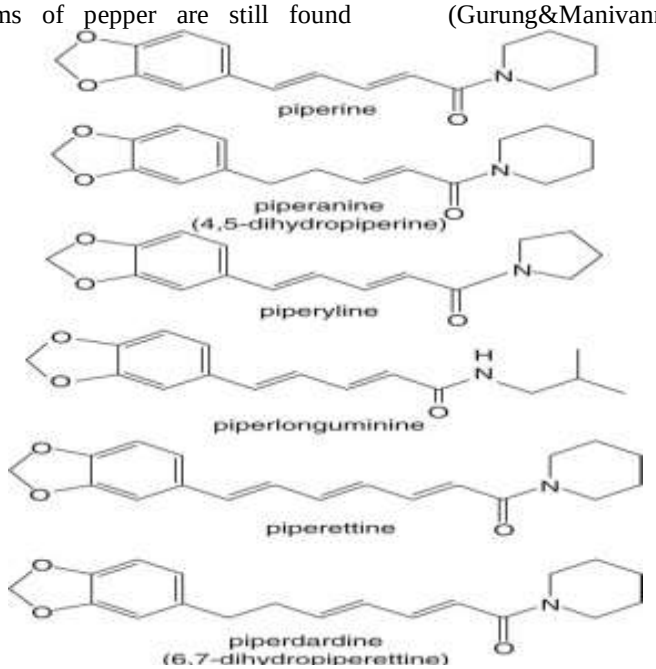
Moisture 13.2%
Protein 11.5%
Fat 6.8%
Fiber 14.9%
Carbohydrates 49.2%
Mineral matter 4.4%
Calcium 460 mg/100 g
Phosphorus 198 mg/100 g
Phytin phosphorus 115 mg/100 g
Iron 16.8 mg/100 g.
Vitamin A value 1,800 I.U/100 g.
Oxalic acid (00.4-3.4%)
Starch 34.1%

Black pepper (Piper nigrum) is a perennial trailing plant used as spices and in medicine.It is belongs to the family Piperaceae (Bentham et al. 1980). The genus Piper is distributed in tropical and subtropical regions of the world (Treleaseet al. 1950). Wild forms of pepper are still found growing in the rich, moist and humus soils of sub mountainous tract of this region (Gurung&Manivannan, 2020).

Chemistry/ phytoconstituents of Black Pepper:

The alkaloid piperine (C_{17} H_{19} O_3 N,) is considered to be the major constituent responsible for the bitter taste of black pepper. Other pungent alkaloids, occurring in pepper in smaller quantity, are chavicine, piperidine, and piperettine. Oil of the pepper is an almost colorless to slightly greenish liquid with a characteristic odor of pepper and also of phellandrene (Aziz et al., 2015).

Active compound of black pepper is piperine (1-piperoylpiperidine). The phytoconstituents of P. nigrumfruits include other minor alkaloids such as piplartin, piperlogumine, piperidine, starch and resin. Piperine is an alkaloid found in the fruits and roots of piper species of piperaceae family. Piperine along with chavicine an isomer of piperine is responsible for the pungency of P. nigrum. Piperine is the main phytochemical responsible for analgesic action of pepper. It has anti-inflammatory and antioxidant property (Gurung&Manivannan, 2020).



(Chemical Structure of Active Secondary Metabolites present in Black pepper)

Cinnamon:

Cinnamon or Dalchini (Cinnamomum zeylanicum) is an aromatic spice obtained from the bark of several trees of the Cinnamon genus. Approximately 250 species have been identified among the cinnamon genus, with trees being scattered all over the world. Cinnamon is mainly used in the aroma and essence industries due to its fragrance, which can be incorporated into different varieties of foodstuffs, perfumes and medicinal products. Additionally, Cinnamon is a highly beneficial supplement for the skin, hair and offers a wide range of health benefits. It helps to maintain the blood sugar level, control vomiting, reduces breathlessness, strengthens heart muscles and more. The bark of various cinnamon species is one of the

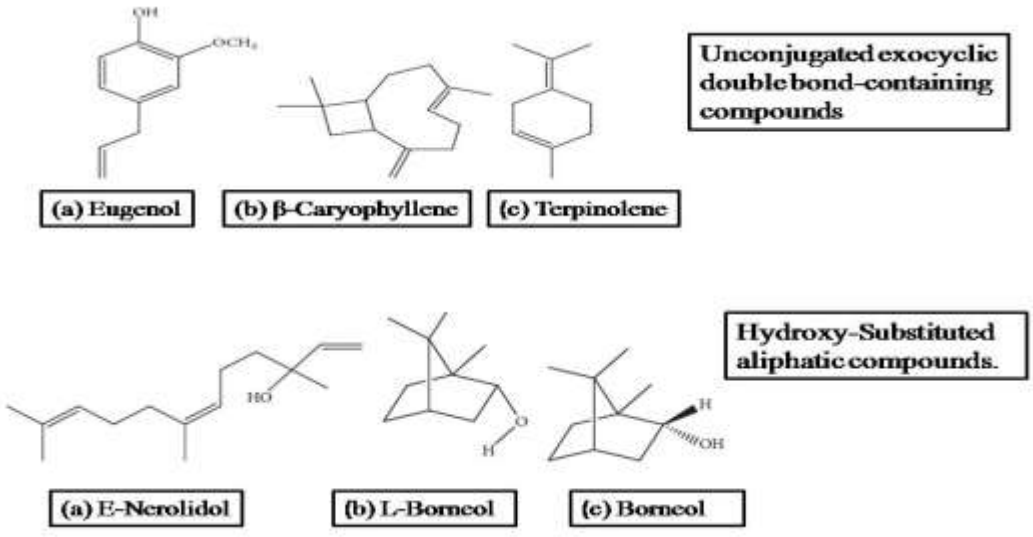
International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 1321-1334 www.ijprajournal.com ISSN: 2456-4494

most important and popular spices used worldwide not only for cooking but also in traditional and modern medicines. The most important constituents of cinnamon are cinnamaldehyde and trans-cinnamaldehyde (Cin), which are present in the essential oil, thus contributing to the fragrance and to the various biological activities observed with cinnamon. Cinnamon bark contains procyanidins and catechins (Chang et al., 2008; Marongiuet al., 2007). The components of procyanidins include both procyanidin A-type and B-type linkages. These procyanidins extracted from cinnamon and berries also possess antioxidant activities (Huang et al., 2007; Yehet al., 2013).

In addition to being used as a spice and flavoring agent, cinnamon is also added to flavor chewing gums due to its mouth refreshing effects and ability to remove bad breath (Jakhetiaet al., 2010). Cinnamon can also improve the health of the colon, thereby reducing the risk of colon cancer (Wondraket al., 2010). Cinnamon is a coagulant and prevents bleeding (Hossein et al., 2013). Cinnamon also increases the blood circulation in the uterus and advances tissue regeneration (Minich and Msom, 2008). This plant plays a vital role as spices. it contain essential oils and other constituents also have important activities, including antimicrobial (Chang et al., 2001; Gendeet al., 2008; Wang et al., 2005), antifungal , antioxidant (Mancini-Filho et al., 1998), and antidiabetic (Kim et al., 2006). Cinnamon has been used as anti-inflammatory, antitermitic, nematicidal, mosquito larvicidal, insecticidal, antimycotic and anticancer agent. Cinnamon has also been traditionally used as tooth powder and to treat toothaches, dental problems, oral microbiota, and bad breath (Lu et al., 2010; Kwon et al., 2009).

Chemistry/ phytoconstituents of Cinnamon:

Cinnamon consists of a variety of resinous compounds, including cinnamaldehyde, cinnamate, cinnamic acid, and numerous essential oils (Senanayakeet al., 1978). Spicy taste and fragrance of Cinnamon are due to absorption of oxygen by cinnamaldehyde (Singh et al., 2011). As cinnamon ages, it darkens in color, improving the resinous compounds (Singh et al., 2007). Sangal reported various physiochemical such as trans-cinnamaldehyde, cinnamyl acetate, eugenol, L-borneol, caryophyllene oxide, b-caryophyllene, L-bornyl acetate, E-nerolidol, α-cubebene, α-terpineol, terpinolene, and α-thujene (Tung et al., 2008; Tung et al., 2010).



(Chemical Structure of Active Secondary Metabolites present in Cinnamon)

Table no. 2-Chemical Constituents of different part of Cinnamon (Vangalapati et al., 2012)

Part of the plant	Compound	Effective Concentration
Leaves	Cinnamaldehyde	1.00 to 5.00%
	Eugenol	70.00 to 95.00%

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 1321-1334 www.ijprajournal.com ISSN: 2456-4494

Bark	Cinnamaldehyde	65.00 to 80.00%
	Eugenol	5.00 to 10.00%
Root bark	Camphor	60.00%
Fruit	trans-Cinnamyl acetate	42.00 to 54.00%
	Caryophyllene	9.00 to 14.00%
C. zeylanicumbuds	Terpene hydrocarbons	78.00%
	alpha-Bergamotene	27.38%
	alpha-Copaene	23.05%
	Oxygenated terpenoids	9.00%
C. zeylanicumflowers	(E)-Cinnamyl acetate	41.98%
	trans-alpha-Bergamotene	7.97%
	Caryophyllene oxide	7.20%

Munakka:

Vernacular names of Draksha in Hindi is- Angoor, Dakh, Munakkain English it is the dry grapes, raisins commongrape-vine

It is diuretic, used in skin disease, splenomegaly etc. Ash of the stem is best for arthralgia, haemorrhoids and vesicle calculi. Flowers are expectorant, hematinic are useful in anaemia, amenorrhoea and dysmenorrhoea

Vitisvinifera has shown presence of Antioxidant, Antifungal, Antiulcer, Hepato - Protective, Wound Healing, Anti Mutagenic, Anti Herpetic, Cardio Protective, Breast Cancer Suppressor, Angiotensin-Converting EC Enzyme (ACE), and Antibacterial Activity.

Chemistry/ phytoconstituents of Munakka:

Chemical composition of Munakka contains catechin, epicatechin, beta-sitosterol, ergosterol, jasmonicacid, glucose, fructose, galactose, mannose, arabinose, rhamnose, tannic acid and mallic acids. Therapeutic constituents: The main basic element of grape is manganese. It also contains vitamin B6, thiamine, riboflavin, vitamin C and potassium. Many studies demonstrated that it also contains a chemical substance i.e, resveratrol, a polyphenol which has antioxidant properties. Arginine is a semi-essential amino acid. It is involved in many metabolic processes and important in the treatment of heart diseases and high blood pressure. Alanine is a non-essential amino acid found in it. Amino acids are the building blocks of protein which helps in building strong and healthy muscles. It also process vitamin B especially vitamin B5 and B6 during metabolic pathways (DeepashriSuchetha 2017)

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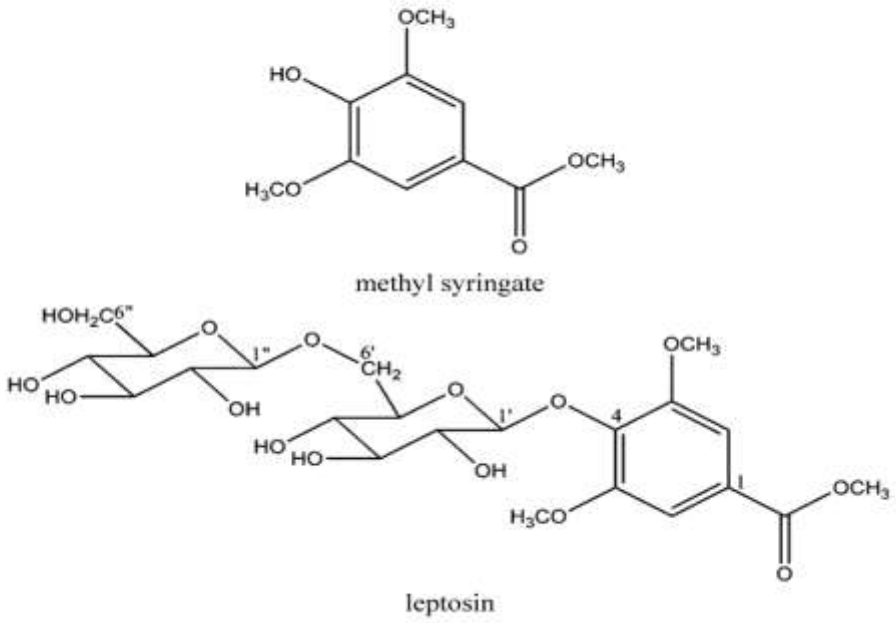

(Chemical Structure of Active Secondary Metabolites present in Munakka)

The other main compounds found in cinnamon includes propanoic acid, 1,4-pentadiene-3-ol, methyl-cycolhexane, 1,1,2,2-tetramethyl-cyclopropane, butyl methyl ketone, methyl isobutyl ketone, myrcene, 2,2-dimethyl-pentanal, 3-heptanol, 2-azetidinone, 3-hexane2-one, oxapane, 2,2,3-trimethyl, 3-petanol- 2-methyl, tripropionin, 2,3-heptanedione. These compounds are volatile flavoring compounds and have associated medicinal benefits as well (Lorenzetti et.al. 1991).

Jaggery:

Jaggery is a common product in Asia and Africa. It is made from the juices of palm trees (Date palm, palmyra palm and coconut) or sugarcane and is growing in popularity as a replacement for white sugar. It is a staple in India, where people call it gur. Jaggery is slightly more nutritious than refined white sugar (Shiralkaret al., 2014). It is the superfood, because it has more vitamins, minerals and lower sucrose content than white sugar. Jaggery is an unrefined natural sweetener. Jaggery is golden yellow in color and has a sweet, winy fragrance and taste similar to brown sugar or molasses. According to India's Ministry of Commerce and Industry, more than 70% of the world's jaggery comes from India, where people refer as "medicinal sugar." Practitioners of Indian Ayurvedic medicine have been using jaggery for thousands of years. Good quality of jaggery contains around 70% sucrose (Kumar et al., 2020).

Nutritional value of Jaggery per 100 g

- Sucrose: 65–85 g
- Fructose and glucose: 10–15 g
- Protein: 280 milligrams (mg), or 5.6% daily value (DV)
- Potassium: 1056mg, or 22.5% DV
- Magnesium: 70–90 mg, or approximately 19% DV
- Calcium: 40–100 mg, or approximately 5% DV
- Manganese: 0.2–0.5 mg, or approximately 15% DV
- Phosphorus: 20-90 mg, or approximately 5% DV
- Iron: 11 mg, or 61% DV
- vitamin A: 3.8 mg, or 422% DV
- vitamin C: 7.0 mg, or 7.8% DV
- vitamin E: 111.30 mg, or 740% DV

Jaggery is chemically morecomplex than sugar, it consists of longer chains of sucrose. It takes longer to digest and does not release energy as quickly as refined sugar (Nath et al., 2015).

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Benefits of Jaggery

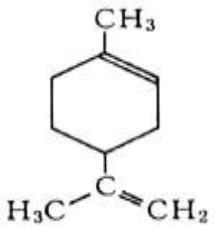
Researchers believe that the magnesium present in jaggery boosts nervous system function and that jaggery's high iron content may protect against anemia. Jaggery has antitoxicity and cytoprotective effects, as well as anticariogenic effects (Singh et al., 2013). It also notes that consuming jaggery may strengthen the immune system and lower the risk of diabetes and hypertension.

Other beneficial effects of Jaggery:

- Prevents constipation: Jaggery activates the digestive enzymes and stimulates bowel movements.
- Detoxes the liver: Jaggery flushing out harmful toxins from the body.
- Treats flu-like symptoms: Jaggery commonly added in kada to cure cold and cough.
- Blood purifier: Jaggery has an ability to purify the blood.
- Boosts immunity: Jaggery is loaded with antioxidants and minerals such as zinc and selenium, which in turn help prevent free-radical damage and also boost resistance against infections.
- Jaggery also helps increase the total count of haemoglobin in the blood.

Lemon:

Lemons (Citrus limon) are among the world's most popular citrus fruits. They grow on lemon trees and are a hybrid of the original citron and lime. Citrus fruits are cultivated worldwide and recognized as one of the most high-consumption fruits in terms of energy, nutrients and health supplements (Qudah et al., 2018). Secondary metabolites of Citrus have chemotherapeutic effect or complementary medicine in recent decades. Citrus-derived secondary metabolites such as flavonoids, alkaloids, limonoids, coumarins, carotenoids, phenolic acids and essential oils are of vital importance to human health due to their active properties (Erdogan et al., 2004). These characteristics include anti-oxidative, anti-inflammatory, neuroprotective, anti-cancer as well as cardiovascular protective effects etc.Flavanones, synephrine, auraptene and limonin are the most dominants among the flavonoids, alkaloids, coumarins and limonoids groups, respectively. A great source of vitamin C and fiber, lemons contain many plant compounds, minerals, and essential oils. Lemons may lower the risk of heart disease, cancer and kidney stones (Vekiari et al., 2002; Vekiari et al., 2002).



Limonene

(Chemical Structure of Active Secondary Metabolites present in Lemon)

Nutritional value of 1/2 cup lemon Juice:

- **Calories:** 29
- **Water:** 89%
- **Protein:** 1.1 grams
- **Carbs:** 9.3 grams
- **Sugar:** 2.5 grams
- **Fiber:** 2.8 grams
- **Fat:** 0.3 grams

Other natural bioactive substances found in lemon juice, some of which have powerful health benefits against cancer, cardiovascular disease, and inflammation (Tandoğan and Ulusu, 2005). These are the main compounds in lemon:

- **Citric acid.** The most abundant organic acid in lemons, citric acid may help prevent the formation of kidney stones.
- **Hesperidin.** This antioxidant may strengthen your blood vessels and prevent atherosclerosis — the buildup of fatty deposits (plaque) inside your arteries.
- **Diosmin.** An antioxidant used in some drugs that affect the circulatory system, diosmin improves muscle tone and reduces chronic inflammation in your blood vessels.
- **Eriocitrin.** This antioxidant is found in lemon peel and juice.

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 1321-1334 www.ijprajournal.com ISSN: 2456-4494

- **D-limonene.** Found primarily in the peel, d-limonene is the main component of lemon essential oils and responsible lemons' distinct aroma. It can relieve heartburn and stomach reflux.

II. CONCLUSIONS

The COVID-19 pandemic is a serious threat to humankind. As of 27 July 2020, COVID-19 has led to more than 650,000 deaths worldwide. Due to the absence of approved therapeutics or vaccines against SARS-CoV-2, several countries have been forced to implement partial or complete lockdown measures to restrict infection spread, however, such measures have in turn resulted in an economic catastrophe. Consequently, there is an urgent need to develop antiviral booster/vaccine/dose and to enhance the individuals immunity against SARS-CoV-2 to protect humankind.

Since early civilization, humans have used medicinal plants in different systems of traditional medicine to treat various ailments. Specifically, traditional systems of Indian medicine including Ayurveda, Siddha and Unani have over centuries acquired invaluable knowledge on medicinal plants spanning the rich biodiversity of the subcontinent for treating various ailments including viral infections. As plant-based natural products have been an indomitable source of lead molecules in the course of modern drug discovery, it is worthwhile to search for potential anti-COVID drugs among phytochemicals of Indian medicinal plants.

In conclusion, we expect the natural product inhibitors present in selected plants Tulsi (Basil), Dalchini (Cinnamon), Kalimirch (Black pepper), Shunthi (Dry Ginger) and Munakka (Raisin), Jaggery (natural sugar) and fresh lemon (Nimbu) for making Ayush Kwath will definitely help future research toward natural product-based anti-COVID therapeutics.

Acknowledgement: Authors are highly thankful to Ministry of Education, Govt. of India and SPD-RUSA, Rajasthan for the financial support received under RUSA-2.0.

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