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Integrated Assesment of Indian Spices as Immunity Boosters

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Abstract

With the outbreak of pandemic immune boosting is very essential for each and every human being. The idea of boosting your immune system is appealing which can only be achieved by intake of essential food ingradients in our daily meals. Functional foods may be designed by supplementation with an active ingredient that is known for its health benefits. The long list of beneficial physiological effects of Indian spices like Turmeric, Ginger, Fennel, Cinnamon suggest that it might be considered as an essential part of human diet and act as potential antioxidant and antiviral agents.

Index terms— immunnity, antiviral, antiinflammatory, antioxident, spices.

1 Introduction

mmune system helps us to defend against the viruses, bacteria and other microorganisms that causes various types of diseases. Therefore a healthy immune system protects us by first developing a carrier that stops those invaders or germs from entering the body. Immune system also produces white blood cells and other chemicals and proteins that attack and destroy these foreign substance and keep our body healthy. So it has become mandatory to keep our immune system strong. The disastrous effect of novel corona virus disease COVID 19 has rapidly spread all over the world as a pandemic, also declared by WHO. Till now no specific drug or vaccine has emerged to control this pandemic. The rising problem of morbidity and mortality justify the search and adoption of new tools and measures to minimise the impact of COVID 19.

The key which can save us from COVID19, is our immunity. If our immune system is strong it can save us to some extent from the attack of virus and to enhance our immunity, the food plays a key role. Food is determining our overall health and immunity. Therefore to enhance the immunity we should take inmmunity boosters. Natural immunity boosters are foods, fruits, vegetables and spices that help us to increase the ability to fight against illness by enhancing our immunity. Ayurvedic system depend upon the natural things since a long time. It has been claimed for their efficacy without side effects, low cost and they have been evaluated boosters to combat current COVID 19 pandemic and is practised all around the globe. In this paper we will discuss some important natural ingradients like Turmeric (Haldi), Ginger (Adrak), Cinnamon (Dalchini), Fennel (Jeera) which are very useful to enhance our immunity.

2 II.

3 Turmeric

Turmeric is known for its healing powers. It contains lipopolysaccharide a substance with antibacterial, antiviral and antifungal properties, that help to stimulate the human immune system .It is also known as Indian saffron due to its brilliant yellow colour. The main constituent responsible is curcumin which is a beta-diketone that is methane in which two of the hydrogens are substituted by feruloyl groups. Commercially available curcumin is a combination of three molecules together called curcuminoids. The percentage of curcuminoids is 60-70% followed by demethoxycurcumin (20-27%) and bisdemethoxycurcumin (10-15%) [1]. Besides curcuminoids the other active components of turmeric include sesquiterpenes, diterpenes, and triterpenoids [2]. The immunomodulary abilities of curcumin arise from its interaction with various immunomodulators including not only cellular components such as dendritic cells, macrophases and both B and T lymphocytes but also molecular components involved in the inflammatory processes such as cytokinines and various transcription factors with their downstream signalling pathways .

4 Structure of Curcumin

The modulatory effects of curcumin on the TLR4/ MyD88/ NF-kB signalling pathway have been reported not onlyin brain injury models but also in experimental colitis [3] , in LPS induced mastitis [4] and in Helicobacter pylori induced gastritis [5] pointing out the importance of this pathway in the development of different diseases. Besides curcumin, the other bioactive components of Curcumalonga have been investigated for their abilities to modulate the immune system are alpha-turmerone and ar-turmerone, these two compounds are isolated from lipophilic fraction and they induce PBMC proliferation and cytokine production [6]. The same effect were also shown by the polar fraction of turmeric hot water extract [7]. Therefore whole C.longa extract is used to enhance the immune stimulant activity in immunosuppressed patients.

5 III.

6 Ginger

Ginger (Zingiberofficinale Roscoe, Zingiberaceae) is one of the most commonly consumed dietary condiments in the world [8]. Its spicy aroma is mainly due to presence of ketones, especially the gingerols, which appear to be the primary component of ginger studied in much of the health-related scientific research. The rhizome, which is the horizontal stem from which the roots grow, is the main portion of ginger that is consumed .The oleoresin (i.e., oily resin) from the rhizomes (i.e., roots) of ginger contains many bioactive components, such as gingerol (1-[4?-hydroxy-3?methoxyphenyl]-5-hydroxy-3-decanone.which is the primary pungent ingredient that is believed to exert a variety of remarkable pharmacological and physiological activities. Gingerol believed to be the most abundant bioactive component of ginger root.

. Gingerol Ginger has been used for thousands of years for the treatment of numerous ailments, such as colds, nausea, arthritis, migraines, and hypertension. Ginger is widely used as an antioxidant, anti-inflammatory agent, antinause a compound [9][10][11][12], and anticancer agent as well as the protective effect of ginger against other disease conditions are reviewed. Ginger root contains a very high level (3.85 mmol/100 g) of total antioxidants. One of the many health claims attributed to ginger is its purported ability to decrease inflammation, swelling, and pain. Gingerol, a dried ginger extract, and a dried gingerol-enriched extract were each reported to exhibit analgesic and potent anti-inflammatory effects. The most common and well-established use of ginger throughout history is probably its utilization in alleviating symptoms of nausea and vomiting. The benefits and dangers of herbal treatment of liver and gastrointestinal distress have been reviewed [13].Ginger is also used to treat asthma, diabetes, and other conditions [14].

Asthma is a chronic disease characterized by inflammation and hypersensitivity of airway smooth muscle cells to different substances that induce spasms, and ginger has been used for centuries in treating respiratory illnesses. Components of ginger rhizomes are reported to contain potent compounds capable of suppressing allergic reactions and might be useful for the treatment and prevention of allergic diseases [15]. Ginger is not only an extremely popular dietary condiment used for flavoring food but also an herb that has been used for thousands of years as a medicinal herb to treat a variety of ailments. Chemical and metabolic analyses have revealed that ginger comprises hundreds of compounds and metabolites [16]. The most extensively studied bioactive components include gingerols and shogaols. The content of each component is clearly dependent on the source and preparation of the ginger rhizome.

7 IV.

Fennel Foeniculumvulgare, commonly known as fennel [17], is a flavourful culinary herb and medicinal plant. Fennel plants are green and white, with feathery leaves and yellow flowers. Both the crunchy bulb and the seeds of the fennel plant have a mild, licorice-like flavour. Yet, the flavour of the seeds is more potent due to their powerful essential oil.Its aroma active compounds such as anethole (and its polymers like dianethole and photoanethole) estragole, (+)-Fenchone and p-anisaldehyde.

Aside from its many culinary uses, fennel and its seeds offer a wide array of health benefits and may provide antioxidant, anti-inflammatory, and antibacterial effects [18]. its biologically active molecules possessing oestrogenic, a caricidal and antithrombotic activities. Fresh fennel bulb is a good source of vitamin C [19], a water-soluble vitamin critical for immune health, tissue repair, and collagen synthesis. Both the bulb and seeds contain the mineral Magnese which is important for enzyme activation, metabolism, cellular protection, bone development, blood sugar regulation, and wound healing Aside from manganese, fennel and its seeds contain other minerals vital to bone health, including Potassium, Magnesium, and Calcium [20]. Perhaps the most impressive benefits of fennel and fennel seeds come from the antioxidants and potent plant compounds they contain. Essential oil of the plant has been shown to contain more than 87 volatile compounds, including the polyphenol antioxidants rosmarinic acid, chlorogenic acid, quercetin, and apigenin. Polyphenol antioxidants are potent antiinflammatory agents that have powerful effects on your health. The fennel essential oil has been reported to exhibit antifungal effect [21]. Oral administration (200 mg/kg) of F.vulgare fruit methanolic extract has been reported to show inhibitory effects against acute and subacute inflammatory diseases and type IV allergic reactions [22]Studies suggest that people who follow diets rich in these antioxidants [23] have a lower risk of chronic conditions like heart disease, obesity, cancer, neurological diseases, and type 2 diabetes . Studies

show that fennel extract inhibits the growth of potentially harmful bacteria and yeasts, such as Escherichia coli, Staphylococcus aureus, and Candida albicans [24][25]. F. vulgare is a medicinal and aromatic plant with a diverse pharmacological spectrum and having considerable importance in particular to food industry.

V.

8 Cinnnamon

Cinnamon is a spice that is obtained from the inner bark of trees known as cinnamomum. The common name is Dalchini. Antioxidants protect body from oxidative damage caused by free radicals. Cinnamon is loaded with powerful oxidants such as polyphenols and proanthocyanidins. These compounds give a boost to the immune system. Moreover the antioxidants have anti-inflammatory effects which may help lower the risk of disease [26]. Cinnamon may improve some risk factors for heart disease , 120mg/day cinnamon can reduce level of total cholesterol , bad LDL cholesterol and triglycerides, while good HDL cholesterol remains stable [27]. The polyphenols have been shown to reduce oxidative stress through the inhibition of 5-lipoxygenase. Cinnamaldehyde one of the main active component which inhibits the growth of fungi including yeasts, filamentous molds, dermatophytes and the eggs and the adult of human head lice. 2'hydroxy cinnamaldehyde found in bark can inhibit the production of nitric oxide by altering the activation of the nuclei factor kappa-light chain enhancer of activated B cells. This mechanism reflects that cinnamon have anti-inflammatory activity [28]. Anticancer property of cinnamaldehyde was shown by altering the activity of necrosisfactor kappa betta and the production of tumor necrosisfactor alpha induced interleukin 8 in A375cells. Concentration of triglycerides (TG) level and total cholesterol became significantly lowered after consuming Cinnamon extract 200 mg/kg body weight for 6 weeks [29].

Recent studies showed that essential oil of Cinnamon have antibacterial activity against E,coli, S.aureus, B. Cereus and P. aeruginosa and antifungal activity against Aspergillus and Fusarium and Pencillium species [30][31][32]. The antioxidant capacity of Cinnamon in various test systems indicates that Cinnamon has a large number of pathways for inhibiting oxidation [33]. The understanding of the potential antioxidant activities of Cinnamon in various systems, so it is used in food industry [34]. Phonolic and volatile compounds in Cinnamon play several role in the antioxidant activities [35][36][37]. Vanillicacid, caffeic acid, gallic acid, pcoumaric acid, p-hydroxy benzoic acid, p-hydroxyl benzaldehydeare typical polyphenol [38]. In general the goal of phenolic compounds and antioxidants enrichment in food is to improve the functionality of food and the prevention of various diseases associated with stress and it used as immunity boosters [39, **??**0] VI.

9 Conclusions

A World Health Organisation report 1 indicates an increase in the use of traditional medicines or phytomedicines or herbal medicines globally **??**41] .All the spices mentioned above have a lots of medicinal benefits due to the presence of various bioactive components in them. Their constant use help us in boosting our immunity against COVID 19 without any side effects and also help us in medicating against other diseases also directly or indirectly. Therefore it is preffered and recommended by the medical practitioners for regular use of these condiments in one or the other form.

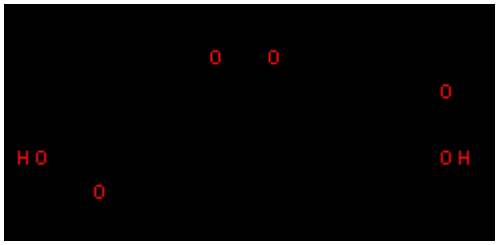

Figure 1:

[Db/Db Mice ()] , Db/Db Mice . *Journal of Ethnopharmacology* 2006. 104 (1) p. .

[Kim et al.] *Anti-Diabetic Effect of Cinnamon Extract on Blood Glucose in*, S H Kim , S H Hyun , S Y Choung .

[Wu et al. ()] 'Antiallergic potential on RBL-2H3 cells of some phenolic constituents of Zingiberofficinale (ginger)'. Chen B H Wu , PY , Chen K M Fu , TF , Wang H M Chen , CY . *J Nat Prod* 2009. 72 p. .

[Goni et al. ()] *Antimicrobial Activity in the Vapour Phase of a Combination of Cinnamon and Clove Essential Oils. Food Chemistry*, P Goni , P López , C Sánchez , R Gómez-Lus , R Becerril , C Nerín . 2009. 116 p. .

[Abdel-Lateef et al. ()] 'Bioactive chemical constituents of Curcuma longa L. rhizomes extract inhibit the growth of human hepatoma cell line (HepG2)'. E Abdel-Lateef , F Mahmoud , O Hammam , E El-Ahwany , E El-Wakil , S Kandil , Abu Taleb , H El-Sayed , M Hassenein , H . *Acta Pharm* 2016. 66 p. .

[Brewer ()] M S Brewer . *Natural Antioxidants: Sources, Compounds, Mechanisms of Action, and Potential Applications. Comprehensive Reviews in Food Science and Food Safety*, 2011. 10 p. .

[Shukla and Singh ()] *Cancer preventive properties of ginger: A brief review. Food ChemToxicol*, Y Shukla , M Singh . 2007. 45 p. .

[Pai et al. ()] 'Chandu Antifungal efficacy of Punicagranatum, Acacia nilotica, Cuminumcyminum and Foeniculumvulgare on Candida albicans: an in vitro study'. M B Pai , G M Prashant , K S Murlikrishna , K M Shivakumar , GN . *Indian J. Dental Res* 2010. 21 (3) p. .

[Ladanmoghadam ()] 'Chemical Composition and Antioxidant Activity Cuminum Cyminum L. Essential Oils'. A R ; Ladanmoghadam . *International Journal of Food Properties* 2016. 19 (2) p. .

[Surh ()] 'Chemoprotective properties of somepungent ingredients present in red pepper and ginger'. Y J Surh , LeeE , LeeJ . *Mutat Res* 1998. 402 (1-2) p. .

[Babu et al. ()] 'Ci nnamaldehyde-A Potential Antidiabetic Agent'. P S Babu , S Prabuseenivasan , S Ignacimuthu . *Phytomedicine* 2007. 14 (1) p. .

[Lee et al. ()] 'Cinnamate Supplementation Enhances Hepatic Lipid Metabolism and Antioxidant Defense Systems in High Cholesterol-Fed Rats'. J.-S Lee , S.-M Jeon , E.-M Park , T L Huh , O.-S Kwon , M.-K Lee , M.-S Choi . *Journal of Medicinal Food* 2003. 6 (3) p. .

[Hamidpour et al.] 'Cinnamon from the Selection of Traditional Applications to Its Novel Effects on the Inhibition of Angiogenesis in Cancer Cells and Prevention of Alzheimer's Disease, and a Series of Functions Such as Antioxidant, Anticholesterol, Antidiabetes, Antibacterial, Antifungal, Nematicidal, Acaracidal, and Repellent Activities'. R Hamidpour , M Hamidpour , S Hamidpour , M Sha Hlari . *Journal of Traditional and Complementary Medicine* 2015 (2) p. .

[Faudale et al. ()] 'Cod in a Antioxidant activity and phenolic composition of wild, edible, and medicinal fennel from different mediterranean countries'. M Faudale , F Viladomat , J Bastida , F Poli , C . *J. Agric. Food Chem* 2008. 56 p. .

[Khare et al. ()] *Comparison Study of Chitosan, EDTA, Eugenol and Peppermint Oil for Antioxidant and Antimicrobial Potentials in Chicken Noodles and Their Effect on Colour and Oxidative Stability at Ambient Temperature Storage. LWT -Food Science and Technology*, A K Khare , A K Biswas , J Sahoo . 2014. 55 p. .

[Lubbad et al. ()] 'Curcumin attenuates inflammation through inhibition of TLR-4 receptor in experimental colitis'. A Lubbad , M A Oriowo , I Khan . *Mol. Cell. Biochem* 2009. 322 p. .

[Fu et al. ()] 'Curcumin attenuates inflammatory responses by suppressing TLR4-mediated NF-? Bsignaling pathway in lipopolysaccharide-induced mastitis in mice'. Y Fu , R Gao , Y Cao , M Guo , Z Wei , E Zhou , Y Li , M Yao , Z Yang , N Zhang . *Int. Immunopharmacol* 2014. 20 p. .

[Santos et al. ()] 'Curcumin inhibits gastric inflammation induced by Helicobacter pylori infection in a mouse model'. A M Santos , T Lopes , M Oleastro , I V Gato , P Floch , L Benejat , P Chaves , T Pereira , E Seixas , J Machado . *Nutrients* 2015. 7 p. .

[Momtazi-Borojeni et al. ()] 'Curcumin: A natural modulator of immune cells in systemic lupus erythematosus'. A A Momtazi-Borojeni , S M Haftcheshmeh , S.-A Esmaeili , T P Johnston , E Abdollahi , A Sahebkar . *Autoimmun. Rev* 2018. 17 p. .

[Zhu et al. ()] 'Effect of oral administration of fennel (Foeniculumvulgare) on ciprofloxacin absorption and disposition in the rat'. M Zhu , P Y Wong , R C Li . *J Pharm. Pharmacol* 1999. 51 (12) p. .

[Ernst and Pittler ()] 'Efficacy of ginger for nausea and vomiting: A systematic review of randomized clinical trials'. E Ernst , M H Pittler . *Br J Anaesth* 2000. 84 (3) p. .

[Mohsenzadeh ()] 'Evaluation of antibacterial activity of selected Iranian essential oils against Staphylococcus aureus and Escherichia coli in nutrient broth medium'. M Mohsenzadeh . *Pak. J. Biol. Sci* 2007. 10 p. .

[Yue et al. ()] 'Evaluation of in vitro anti-proliferative and immunomodulatory activities of compounds isolated from Curcuma longa'. G G L Yue , B C L Chan , P.-M Hon , M Y H Lee , K.-P Fung , P.-C Leung , C B Lau . *Food Chem. Toxicol* 2010. 48 p. .

198 [Reginster et al. ()] 'Evidence of nutriceutical effectiveness in the treatment of osteoarthritis'. J Y Reginster , V
199 Gillot , O Bruyere , Y Henrotin . *CurrRheumatol Rep* 2000. 2 (6) p. .

200 [Dadalioglu ()] 'Evrendilek Chemical compositions and antibacterial effects of essential oils of Turkish oregano
201 (Origanumminutiflorum), bay laurel (Laurusnobilis)'. I Dadalioglu , GA . *J. Agric. Food Chem* 2004. 52 p. .
202 (Spanish lavender (Lavandulastoechas L.), and fennel (Foeniculumvulgare) on common food borne pathogens)

203 [Ferguson] L R Ferguson . *Antimutagens as Cancer Chemopreventive Agents in the Diet. Mutation*,

204 [Ghayur and Janssen ()] 'Ginger attenuates acetylcholine-induced contraction and Ca2 + signalling in murine
205 airway smooth muscle cells'. M N Ghayur , Gilani A H Janssen , LJ . *Can J PhysiolPharmacol* 2008. 86 (5)
206 p. .

207 [Brinker ()] *Herb Contraindications and Drug Interactions*, F Brinker . 1998. 2 p. nd.

208 [Choi ()] *Hwang Anti-inflammatory, analgesic and antioxidant activities of the fruit of Foeniculumvulgare
209 Fitoterapia*, E M Choi , JK . 2004. 2004. 75 p. .

210 [Yue et al. ()] 'Immunostimulatory activities of polysaccharide extract isolated from Curcuma longa'. G G L Yue
211 , B C L Chan , P.-M Hon , E J Kennelly , S K Yeung , B R Cassileth , K.-P Fung , P.-C Leung , C B Lau .
212 *Int. J. Biol. Macromol* 2010. 47 p. .

213 [Sheng and Zhu ()] 'Inhibitory Effect of Cinnamomum Cassia Oil on non-O157 Shiga Toxin-Producing Es-
214 cherichia Coli'. L Sheng , M.-J Zhu . *Food Control* 2014. 46 p. .

215 [Muhammad et al. ()] 'Interaction between Natural Antioxidants Derived from Cinnamon and Cocoa in Binary
216 and Complex Mixtures'. D R A Muhammad , D Praseptiangga , D Van De Walle , K Dewettinck . *Food
217 Chemistry* 2017. 231 p. .

218 [Surh ()] 'Molecular mechanisms of chemopreventive effects of selected dietary and medicinal phenolic sub-
219 stances'. Y J Surh . *Mutat Res* 1999. 428 (1-2) p. .

220 [Eliopoulos and Ginger ()] 'More than a great spice'. C Eliopoulos , Ginger . *Director* 2007. 15 (1) p. .

221 [Crowe and Francis ()] 'Position of the Academy of Nutrition and Dietetics: Functional Foods'. K M Crowe , C
222 Francis . *Journal of the Academy of Nutrition and Dietetics* 2013. 113 (8) p. .

223 [Langmead and Rampton ()] 'Review article: Herbal treatment in gastrointestinal and liver diseasebenefits and
224 dangers'. L Langmead , D S Rampton . *Aliment PharmacolTher* 2001. 15 (9) p. .

225 [Diaaz-Maroto et al. ()] 'Sanz Comparison of the volatile composition of wild fennel samples (Foeniculumvulgare
226 Mill.) from Central Spain'. M C Diaaz-Maroto , M S Pearez-Coello , J Esteban , J . *J. Agric. Food Chem*
227 2006. 54 p. .

228 [Torres et al. ()] 'Spice Use in Food: Properties and Benefits'. De La Torre Torres , J E Gassara , F Kouassi ,
229 A P Brar , S K Belkacemi , K . doi:10.1080/ 10408398.2013.858235. *Critical Reviews in Food Science and
230 Nutrition* 2015.

231 [Bacanl? et al. ()] 'The Antioxidant and Antigenotoxic Properties of Citrus Phenolics Limonene and Naringin'.
232 M Bacanl? , A A Ba?aran , N Ba?aran . *Food and Chemical Toxicology* 2015. 81 p. .

233 [Blumenthal ()] *The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines*, M
234 Blumenthal . 1998.