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A Review on Pharmacological Activity of Vanaoushadhi in Relation with Navadurga

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ABSTRACT

In ancient India, people held the belief that each plant held a distinct power and had a spiritual association with a god or goddess. Ayurveda is a type of knowledge that teaches us how to use plants to cure different illnesses. Most of the Ayurvedic treatment is done using plants. I will try to find out which herbs represent different forms of goddess Durga. As Indians celebrate the festival called 'Navaratri', they honor nine forms of the goddess Durga. These forms are described in the Markandeya purana. The nine avatars have specific herbs chosen for them based on how they look and descriptions of herbs in Ayurvedic books. Here's an attempt to find similarities between herbs and the nine forms of goddess Durga and respective pharmacological action of each herb

Keywords: Navaratri, Navadurga, Divya Vanoushadhi, Markandeya purana, Pharmacology

INTRODUCTION

India is famous for its spiritual beliefs and teachings about how to live a good life. Spirituality means believing in and worshiping a higher power, often called God or goddess, according to various religious beliefs. There are a lot of celebrations that happen all around the world. A festival is a special event where people do religious things like praying, giving things to gods, not eating, doing ceremonies, and more. The festivals are usually held to celebrate events from Hindu stories and sometimes happen at the same time as the seasons change. Navaratri festival is one of them and it happens during the month of Ashwin. Navratri is a festival that lasts for 10 days and nights. It is celebrated by Hindus and Jains in different ways in India and other parts of the world. It always takes place in the Hindu month of Ashwin, which is usually in September or October.

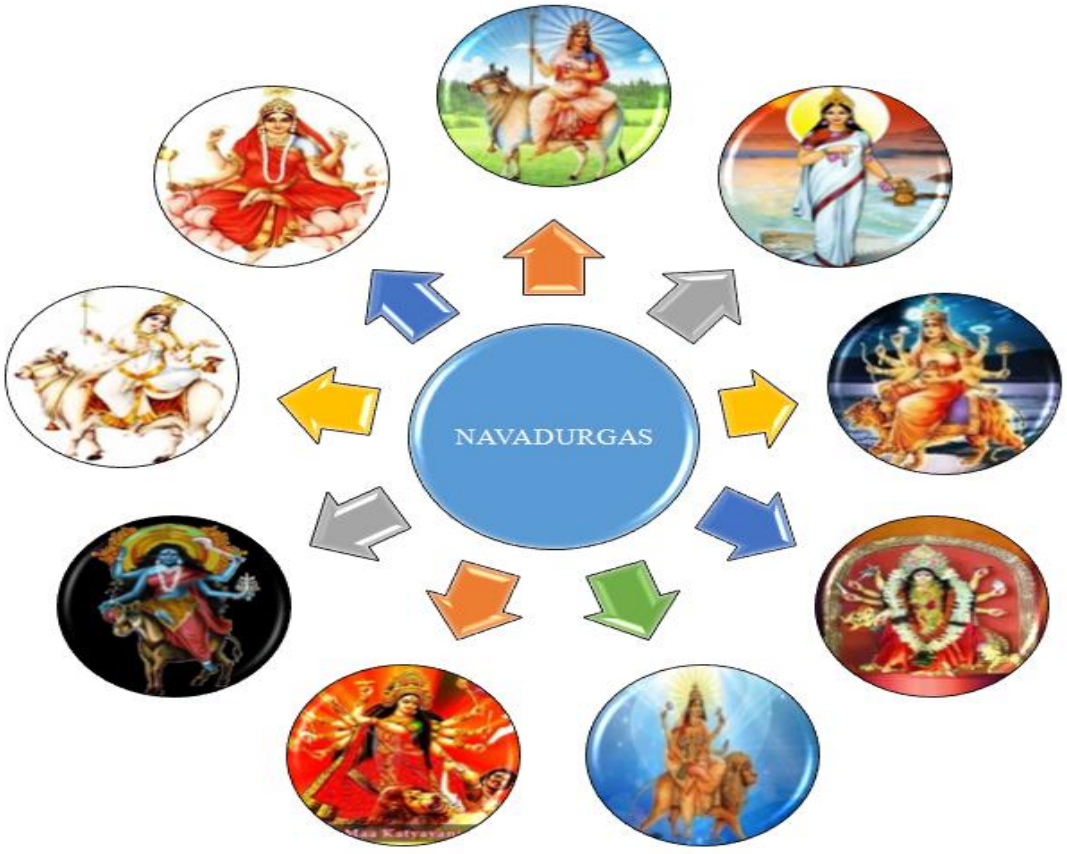
The autumn festival holds significant importance in Hindu culture. It's a time for coming together and feeling refreshed. People fast and then enjoy special traditional food. They also worship during this festival. In some parts of East India (West Bengal, Odisha, Bihar, Jharkhand, Assam, Manipur, and Tripura) and nearby Nepal and Bangladesh, they celebrate a festival called Durga Puja.

During this festival, people worship a goddess named Durga who has ten arms. This worship happens from the 6th to the 10th day of Navratri. The 10th day will be observed as Dussehra. The first 9 days of this festival are known as Gollu, Bommala Koluvu, Gombe Habba, or Gombe Totti. - The 9th day is called Ayudha Puja or Saraswati Puja. - The 10th day is called Vijayadashami or Dusshera. It also marks the start of the festival season in India, which finishes with Diwali one month later.

प्रथमं शलैपत्रीच, द्वितीयंब्रह्मचारिणी। ततृीयं चन्दघण्टेति, कूष्माण्डतेति चतुर्थकम् ।।
पंचमं स्कन्दमातेति, षष्ठंकात्यायनीति च। सप्तमं कालरात्रीति, महागौरीति चाष्टमम्।।
नवमं सिद्धिदात्री, च नवदुर्गाः प्रकीर्तिताः । उक्तान्येतानि नामानि, ब्रह्मणैवमहात्मना।।

In ayurveda already talks about three kinds of treatment i.e. Yuktivyapashraya (using medicines and diet in the right way), daivavyapashraya (seeking god's blessings through rituals and ceremonies), and satvavajaya (using psychotherapy to heal the mind) as explained by acharya charaka. There are some references of god/goddess relation with some herbs in purana, Veda श्वेतार्क – गणपती, अश्वत्थ – श्रीकृष्ण, तुलसी – विष्णुप्रिय, कमल – आसन for लक्ष्मी and ब्रह्म, शमी – शनि and भैरव निवासस्थान.


Plants of
Navadurga[1]


NAVADURGAS

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MATERIALS AND METHODS

Haritaki (Terminalia chebula)	हरस्यभवनेजाताहरिताचस्वभावतः । हरयेत्सर्वरोगांश्चतेनप्रोक्ताह रीतकि ॥[2] Synonyms: हेमवतिपन्चवक्त्ररसांहैमीं सर्वशोकनिवारिणीम्। सर्वशक्तिमयीं वन्दे शिवामभयकारिणीम् ॥ Properties: हरीतकीपन्चरसालवणातुवरापरम्। रूक्षोष्णादीपनीमेध्यास्वादुपाकारसायनी ॥[3]
Brahmi (Bacopa monnieri)	ब्राह्मी कपोतवन्का च सोमवल्लि सरस्वति । मण्डूकपर्णी मण्डूकी त्वाष्ट्री दिव्या महौषधी ॥[4] Properties: ब्राह्मी हिमासरा तिक्ता लघुर्मेध्या च शीतला । कषाया मधुरा स्वादुपाकाऽऽयुष्या रसायनी ॥ स्वर्या स्मृतिप्रदा कुष्टपाण्डुमेहास्त्रकासजित् ।[4]
Chandrashura (Lepidium sativum)	चन्द्रति आह्लादयति लोकान् बलपुष्टिवर्धनद्वारा इति चन्द्रः । शूरयति विक्रमं करोति वातादिरोगेषु इति शूरः ॥चन्द्र ईव शूरो वा चन्द्रशूरः ।[5] श्वेत वर्ण (चन्द्रमा) पुष्प Synonyms: चन्द्रिका चर्महन्ति च पशुमेहनकारिका । नन्दिनि कारवि भद्रा वासपुष्पा सुवासरा ॥[6] Properties: चन्द्रशूरं हितं हिक्कावातश्लेष्मातिसारिणाम् । अस्रग्वातगदद्वेषि बलपुष्टिविवर्धनम् ॥[6] धात्री दुग्धवर्धक
Kushmanda (Benincasa hispida)	Synonyms: पीतपुष्प [7], पुष्पफल, पुष्पसहितम् फलमस्य Nirukti:

	कु नास्ति ऊष्मा अण्डेषु बीजेष्वस्य ।[8] स्थिरफला- स्थिरं द्रुढं Properties: बलदायक निद्राजनक मेधाशक्तिवर्धक शीतवीर्य ।[8] Instead of पशुबलि, कूष्माण्डबलि can be given
Atasi (Linum usitatissimum)	Nirukti: अतति सततं गमयति वातव्याधिप्रतिषेधेन Synonyms: अतसि नीलपुष्पि च पार्वति स्यादुमाक्षुमा ॥[9] उमा - शक्तिशालिनि - Properties: अतसीमधुरातिक्तास्निग्धापाकेकटुर्गुरुः । उष्णाद्रुक्क्षुक्रवातघ्नीकफपित्तविनाशिनी ॥[10]
Ambalika (Hibiscus cannabinus)	Synonyms: माचिका प्रस्थिकाम्बष्ठा तथा चाम्बालिकाम्बिका। मयूरविदलाकेशी सहस्रवातमूलिका ॥[11] Properties: मोचिकोष्णारसेपाकेकषायाशीतलालघु ।पक्वातीसारपित्तास्रकफकण्ठामयापहा ॥[12]
Nagadamani (Crinum asiaticum)	Synonyms: नागदमनि बलामोटा विषापहा ।नागपुष्पि नागपत्रा महायोगेश्वरीति च ।[13] Properties: बलामोटा कतुस्तिक्ता लघुः पित्तकफापहा। मुत्रक्रच्छ्रव्रणान् रक्षो नाशयेज्जलगर्दभम् ॥ सर्वग्रहप्रशमनी निःशेषविषनाशिनि जयं सर्वत्र कुरुते धनदासुमतिप्रदा ॥[13]
Tulasi (Ocimum sanctum)	Synonyms तुलसी सुरसा गौरी भूतघ्नी बह्मन्जरी ।[14] देवदुन्दुभि[15] Properties: तुलसी कटुका तिक्ता हुद्योष्णा दाहपित्तकृत्। दीपनी कुष्ठक्रुच्छास्रपार्श्वरूक्कफवातजित्॥[14]
Haridra (Curcuma longa)	Synonyms हरिद्रा रजनी गौरी रन्जिनी वरवर्णिनी। पिण्डा पीता वर्णवति निशा वर्णा विलासिनी ॥[16] Properties: हरिद्रा कटुका तिक्ता रूक्षोष्णा श्लेष्मपित्तनुत्। वर्ष्या त्वग्दाहमेहास्रशोफपाण्डुव्रणापहा ॥[16]
Shatavari (Asparagus racemosa	Synonyms: शतावरी द्वीपिशत्रुर्दद्वीपिका धरकण्टका। नारायणी शतपदी शतपाद्बहुपत्रिका ।।[17] Properties :शतावरी गुरुः शीता स्वादुः स्निग्धा रसायनी । शुक्रस्तन्यकरा बल्या वातपित्तास्रशोफजित् ॥[17]

Pharmacological activity

Harithaki

Antidiabetic activity

Strong intestinal maltase inhibitory activity of Terminalia chebula fruit extract in rats did not affect intestinal sucrase or isomaltase activity, but its inhibitory effect on -glucosidase indicates that it may be effective for treating type 2 diabetes[18].In both short- and long-term experiments, T. chebula fruit and seeds reduced blood glucose levels in streptozotocin induced diabetic rats in a dose-dependent manner. They also displayed Reno protective behavior[19, 20]

Anticarcinogenic activity

When the phenolics of Terminalia chebula fruit were studied, chebulinic acid, tannic acid, and ellagic acid were shown to have the highest growth-inhibitory effects on cancer cell proliferation[21] .Chebulinic acid, tannic acid, and ellagic acid were discovered to be the greatest cancer cell growth-inhibitory phenolics in T. chebula, according to a team of researchers that examined the fruit's phenolics' effects on the growth of the diseasecausing cells[21] .The T. chebula fruit's ethanol extract was found to have effects on human (MCF-7) and mouse (S115) breast cancer cell lines, human osteosarcoma cell line (HOS-1), human prostate cancer cell (PC-3) and a non-tumorigenic immortalised human prostate cell[22]

Antiviral activity

Additionally, it has been noted that T.chebula shows modest effectiveness against HSV-1, HIV-1, and CMV[23].The T. chebula extract displayed strong anti-HSV- 1 efficacy when coupled with acyclovir. It raised the mean survival times of

infected mice and decreased the occurrence of skin lesions at doses suitable for human use when compared to acyclovir and mice treated only with the herbal extract (p0.01 and p0.05)[24].Fruits from Terminalia chebula contained gallic acid, three galloyglucoses, and four HIV-1 integration inhibitors. Significantly inhibiting the compounds' 3'-processing of HIV-1 integrase is their galloylmoiety[25].The fruits of T. chebula provided three galloyl glucoses and GA (I), four HIV-1 integrase inhibitors (II-IV). Their galloyl moiety significantly contributes to the compounds' suppression of HIV-1 integrase's 3'-processing[26] .The retroviral reverse transcriptase inhibitory activity of T. chebula is also present[27] .Haritaki (T. chebula) in vitro study against SARSCoV2 may require screening[28].Biomolecules from some Terminalia chebula plant species have already been shown to have antiviral properties. Chebulagic and chebulinic acids exhibit superior direct antiviral action against HSV-2 compared to acyclovir and are more successful at preventing virus attachment and penetration to the host cells. In order to prevent sexually transmitted HSV-2 infection, it may therefore be a good candidate for alternative therapy[29] .IAV (the influenza A virus) replication can be efficiently stopped by chelating acids chebulinic and chebulagic. These substances exhibit antiviral effectiveness against both oseltamivir-resistant and wild-type IAV strains by acting as neuraminidase inhibitors[30] .In vitro influenza is inhibited by chebulagic acid and/or its hydrolysis products as a novel drug that recovers M2 (S31N)-expressing yeast development.Without reference to the M2[31]

Cardiotonic & cardioprotective activity

Several extracts made from the Terminalia chebula fruit rind have demonstrated cardiotonic action when tested on healthy and hypodynamic isolated frog hearts. Without altering heart rate, the extracts increased cardiac output and force of contraction[32].Pretreatment with T. chebula extract was observed to reduce the impact of the medication on the production of lipid peroxide and maintain the activity of the diagnostic marker enzymes in rats with isoproterenol-induced heart injury[33].In an isolated frog heart model, its pericap has also been shown to have cardioprotective effects[32]
Anti-bacterial activity

A variety of bacterial species were resistant to Terminalia chebula antimicrobial properties[34].One team of researchers discovered that it is efficient in preventing Helicobactorpyroli (H.pyroli), a common bacteria linked to the emergence of gastritis, ulcers, and stomach malignancies, from producing urease[35].Its antimicrobial properties include those against bacteria, fungi, protozoa, anthelmintics, and salmonella[36,37].evaluated the antimicrobial efficacy of acetone, ethanol, methanol, hot aqueous and cold aqueous extracts of fruits of T.chebula against ear pathogens i.e. S.aureus, Acinetobacter sp., P.aeruginosa, P.mirabilis, E.coli and C.albicansand found that all extracts were effective against pathogens causing ear infections[38] .the therapeutic effect of ethyl acetate, acetone, methanol and water extracts of fruits of T.chebula against several human pathogens (S.auerus, S.mutans, S.pyrogens, S.pneumonia and S.aeruginosa) have been known. The aqueous extract of T.chebula Retz. Fruit also showed inhibitory effect against B.subtilis, S.aureus, S.epidermis, E.coli, P.aeruginosa and Staphylococcus flexineria[19,39] .Studied the antibacterial activity of hydro-alcohalic fruit extract of T.chebula against microorganisms. B.subtilis, B.cereus, S.aureus, S.epidermis, E.coli, P.aeruginosa, S.flexineria and found that extract was effective against all test organisms. It is well known that tannins have antibacterial properties and can stop the growth of many bacterium, yeast, and fungal virus strains. The fruit of the Terminalia Chebula has shown antibacterial effectiveness against specific clinical strains of pathogens[40] .By combining methanolic, aqueous, and ethyl acetate extracts with a variety of standard antibiotics, the potential of T. chebula fruit extract was examined. The extracts demonstrated significant antibacterial action against the bacterial causes of all autoimmune inflammatory disorders[41]

Antifungal activity

Aqueous Terminalia chebula extract shown antifungal efficacy against several yeasts and dermatophytes. The alcoholic ethyle acetate extract shows the activity against Aspergillus niger, aspergillus flavus, alternate. 70% of methanol ethylacetate, hexane, chloroform extract shows activity against Fusarium oxysporum, Phytopthoracapsici, Fusarium solanietc[42,43].It is effective against the Dermatophytes, Epidermophyton floccosum, Microsporum gypseum, and Trichophyton rubrum as well as the pathogenic yeast Candida albicans[44].Additionally, its inhibition of three yeasts (Candida spp.) and three dermatophytes (Trichophyton spp.)[43].Three yeasts (Candida spp.) and three dermatophytes (Trichophyton spp.) were inhibited by an aqueous preparation of T. chebula galls[44] .T. chebula methanol extract demonstrated in vitro anti-candidal action against Candida albicans that were resistant to clotrimazole[45] .A seed extract was effective against the fungus Trichophyton glabrata[44]

Antioxidant activity

Antioxidants are substances that stop oxidative chain reactions from spreading, hence preventing the oxidation of vital biomolecules[46] .Rats can benefit from the radioprotective and antioxidant characteristics of Terminalia chebula fruits. In cultured rat primary hepatocytes and rat liver, tert-butyl hydroperoxide (t-BHP)-induced oxidative damage has also been shown.It has been demonstrated that a fruit extract from Terminalia chebula possesses preventive properties[47] .The fruit of the Terminalia chebula showed antioxidant activity in six extracts and four compounds, all too varying degrees[48] .Its fruit has anti-inflammatory and radioprotective effects on rats[47].Furthermore, the protective effects of the

Terminalia chebula fruit extract against tertbutyl hydroperoxide (t-BHP)-induced oxidative injury on cultured rat primary hepatocytes and rat liver have been linked[49,50]

Gastro-intestinal motility improving and antiulcerogenic activity

Although T. chebula fruit has a long history of usage as a laxative, studies have shown that it can speed up stomach emptying[51] .As Brunner's gland's secretory state improved, it emerged that this action was counterbalanced by a protective impact on the gastrointestinal mucosa, which plays a role in the prevention of duodenal ulcers[52]

PHARMACOLOGICAL ACTIVITIES OF BHRAMI

Anti-Asthmatic Activity

B. Monnieri extract is reported to possess relaxant property in the tracheal muscle. It is also helpful in producing bronco dilation. The bronchodilator property of this plant may be reflected by the antagonism of carbachol-induced effects on inspiratory and expiratory stress[53, 54, 55, 56]

Anti-allergy

It has been reported that the methanolic extract of B. Monnieri possesses an intense mast cell stabilizer, showing the possible use of B. Monnieri leaves in allergic conditions[57]

Anti- cancer activity

Bacoside A and B present in the ethanolic extract of B. monnieri plant possess anti-tumour property. Cucurbitacins component present in this plan were reported for their strong anti-tumorigenic and anti-proliferative activity[58, 59, 60]

Anticonvulsive

In various scientific studies, it was reported that crude water extract of B. Monnieri controls epilepsy. The plant extract produces a sedative. Those substances which stimulates neurotransmitter GABA are known to possess anticonvulsant, pain-relieving and sedative effects.[60, 61, 62]

Antidepressant

Bacopa monneri is mainly known as a brain stabilizing agent. Methanolic extract of this plant possesses anti-depressant properties[63]

Anti-inflammatory

Bacopa monneri can release proinflammatory mediators through modulation. The triterpenoids and bacosides extract give effectiveness in the healing of various inflammatory conditions[64, 65, 66]

Anti-nociceptive activity

The aqueous extract of the plant shows pain-relieving activity through various pathways, for example, β1-adrenergic, α2- adrenergic receptors and 5-HT receptors[67]

Antioxidant activity

The anti-oxidant properties present in the alcoholic and hexane constituents of B. monnieri inhibit the lipid peroxidation effect.[68] other scientific studies also showed the antioxidant effect of B. monnieri by other mechanisms. i.e., by inhibition of superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase (GPX) activities.[69,70]The methanolic extract can restrain the superoxide anion concentration because of the decreased nitric oxide (NO which are used in various diseases like AD, ischemia.[71,72]

PHARMACOLOGICAL ACTIVITIES OF CHANDRASOORA

Antibacterial activity
L. sativum extracts are effective against various bacteria used in this study. According to the results of this study show that the methanol extract revealed prominent antibacterial activity on Staphylococcus aureus (22 mm), Bacillus cereus

(16 mm), Escherichia coli (14 mm), Pseudomonas aeruginosa (14 mm), Micrococcus luteus (16 mm), and Salmonella typhi (13 mm), respectively, in terms of zone of inhibition, while the ethyl acetate extract exhibited moderate effect and the other two extracts showed weak inhibition on the growth of the organisms. The zone of inhibition being prominent in methanol extract; therefore, the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) studies of extract were carried out. The results showed that S. aureus had the highest MIC (1.56 mg/ml) and MBC (6.52 mg/ml), while the lowest MIC of 25 mg/ml was shown by S. typhi [73]

Antifungal activity

The antifungal potential of the methanolic extract of L. sativum seeds against the tested fungi at different concentrations. It is revealed that the methanolic extract at a concentration of 30mg/ml completely inhibited the growth of Aspergillus flavus. Toward the end of the incubation period, Rhizopus sp. showed slow and weak growth on 30 mg/ml and 60 mg/ml slant and was completely inhibited at 90 mg/ml. At a concentration of 90 mg/ml, the fungi Aspergillus fumigatus, Candida albicans, Fusarium sp., Microsporum sp., Penicillium sp., and Penicillium marneffi were completely inhibited[74]

Antioxidant activity

Extraction of powdered parts (shoot, seed, stem, and leaves) of L. sativum was carried out with ethanol using Soxhlet extraction equipment. Then under reduced pressure and controlled temperature, the ethanolic extracts were dried. The crude dried powdered materials which are ethanol free, were used for experiments. The extracts were individually dissolved in dimethyl sulfoxide and used for particular assays. L. sativum ethanolic extract (LSEE) was also analyzed for free radical scavenging and antioxidant activities using 2,2-diphenyl-1-picrylhydrazyl-hydrate assay, glutathione S-transferase activity and quantify in reduced glutathione content. The results show that the extracts contain high antioxidant activities and thus form a potential source of natural antioxidant compounds[75]

Cytotoxic activity

L. sativum seeds and leaves which contain flavonoids were investigated for their cytotoxic activities toward HEp2 cells. The results obtained in this study showed that ethyl acetate extract (O-glycosides) of L. sativum seeds had the best cytotoxic effect toward HEp2 cells followed by butanol seed extract. This study reports the first study on flavonoids of L. sativum leaves, this conclude that all extracts have a good cytotoxic activity[76]

Diuretic activity

A dose-dependent increased in urine excretion showed by L. sativum. With the aqueous extract, the maximum increase in urinary excretion was produced at 100 mg/kg with a value of 49.89% compared while the methanol extract (100 mg/kg) showed an increase of 41.05% grouping urine volume. The specific conductivity was increased in a dose-dependent manner in all the extract-treated groups which are an indirect measure of the ionic content of the urine. Thus, the diuretic effect of aqueous and methanol extract is indicated by an increase in both water excretion and excretion of sodium and potassium. The active principles responsible for the diuretic effects of the extracts of this plant have not yet been confirmed, but the preliminary phytochemical study of the extracts revealed the presence of polar compounds such as flavonoids and steroids[77]

Hepatoprotective activity

LSEE is effective in the prevention of d-galactosamine/lipopolysaccharides (D-GalN/LPS)-induced hepatic damage in rats. The pretreatment with LSEE considerably prevented the D-GalN/LPS induced upsurge in liver functional enzymes (aspartate transaminase, alanine aminotransferase, Gamma-glutamyltransferase, alkaline phosphatase (ALP), total bilirubin, lactate dehydrogenase, and total protein). Thus, significantly alleviate the reduction of lipid peroxidation and restored the antioxidant enzymes and total protein to normal levels. LSEE decreases hepatic injuries and structural damage through the decline of oxidative stress, inflammation, and apoptosis in the liver[78]

Hypoglycemic activity

This study intended at the investigation of antidiabetic efficacy of L. sativum seed total alkaloid (LSTA). The main ingredients of this alkaloid fraction are lepidine and semilepidine, a rare group of imidazole alkaloid. Hypoglycemic profile of LSTA (50, 150, and 250 mg/kg, i.p.) was examined on alloxan-induced diabetic rats on 21 days continuous treatment.

Biochemical parameters such as glucose, total cholesterol, triglycerides, low-density lipoprotein, high-density lipoprotein, urea, and creatinine were determined along with body wt. and relative organ weight. LTSA at 250 mg/kg showed 1.94% body wt. gain on the 21st day relative to 6.14 and 8.94% of control and diabetic group. LSTA considerably ($p<0.001$) suppressed blood glucose, cholesterol, triglyceride, and urea level in diabetic rats at 250 mg/kg dose. According to the above results, LSTA at dose 250 mg/kg is showed potent hypoglycemic activity. The L. sativum alkaloid shows that hypoglycemic activity against alloxan-induced diabetes may be by reducing oxidative damage and

modulating antioxidant enzymes. It is assumed that the mechanism by which LSTA brings about its hypoglycemic activity is potentiation of pancreatic secretion of insulin from the remaining β cells[79]

PHARMACOLOGICAL ACTIVITIES OF KUSHMANDA

Anti-Ulcer:
Extracts of Kushmanda prevent development of experimental ulcers. In Ayurveda a study showed extracts of Kushmanda may be a natural drug with anti-ulcer activity[80]

Anti-angiogenic Effect:
Study showed the seed extract of Kushmanda decreased bFGF-induced endothelial cell proliferation and tube formation in a dose-dependent manner. It showed no cytotoxicity and showed potent inhibitory effect on bFGF-induced angiogenesis in vivo. Seed extract of Kushmanda supports its anti- angiogenic property through inhibition of endothelial cell proliferation[80]

Gastroprotective / Anti-Ulcer / Antioxidant:
(1) Study results were comparable with the omeprazole treated group. Study suggested Kushmanda possesses significant antiulcer as well as antioxidant property. (2) Study showed decrease in ulcer index in animals treated with fruit extract of Kushmanda, contains active principles - Terpenes, Flavanoid C. glycosides and sterols which have antioxidant effects, probably helping to inhibit gastric mucosal damage by scavenging free radicals and repressing production of superoxide dismutase[80]

Bronchodilator Effect:
Effect of methanolic extract of Benincasa hispida against histamine and acetylcholine induced bronchospasm in guinea pigs: The ME of BH showed excellent protection against histamine-induced bronchospasm probably through an antihistamine activity (H1 receptor-antagonism) [80]

Opioid Withdrawal Benefit
Study showed the juice of Kushmanda showed significant activity against symptoms of morphine withdrawal. Results suggest a potential for Kushmanda in preventing the development of morphine addiction and suppression of Opioid withdrawal in animals[80]

Antipyretic
Study results indicate that the ethanol extract of Kushmanda possesses potent antipyretic effects and pharmacologically justifies its folkloric use for fever and pain conditions[80]

Anti-diarrheal
Study showed the methanol extract of fruit of Kushmanda showed significant inhibitory activity against castor oil-induced diarrhea and inhibited PGE2 induced enteric pooling in rats. Results establish its efficacy as an anti-diarrheal agent[80].

PHARMACOLOGICAL ACTIVITIES OF ATASI

Laxative

Linseed have good dietary fiber content. It is reported that flaxseeds produce laxative effects by increasing fecal volume and fecal weight. It stimulates peristalsis due to stretch reflexes. Thus, used as laxative[83]

Antioxidant

The antioxidant activity of ethanolic extract of Linum usitatissimum in vitro model has been evaluated.

The result indicated significant dose dependent inhibition against reducing power, superoxide anion radical scavenging, hydroxyl radical scavenging, metal chelating and hydrogen peroxide scavenging[81]

Anti bacterial activity

Flaxseed protein extract showed an antibacterial activity against the most test microorganisms especially gram negative bacteria[82]

Anti ulcer

In a study flaxseeds oil and flaxseed mucilage showed significant protective activity against gastric ulcers. [Reduces length and number of gastric ulcers induced by ethanol[81]

Atherosclerosis

Linseed is effective in reducing hypercholesterolemic atherosclerosis by reducing oxidative stress and lowering serum levels of HDL-C in the early stage. Thus, it reduces the relative risk of coronary artery disease. Due to the presence of Lignans, flaxseed shows favorable effect on atherosclerotic plague[81]

Cardiovascular diseases

Due to the presence of alpha linolenic acid in flaxseed oil, it has protective effects against cardiovascular diseases and have ability to decrease the tendency of platelets to aggregate[83]

PHARMACOLOGICAL ACTIVITIES OF AMBALIKA

Cytotoxic effect:

Hibiscus cannabinus seed oil [KSO] from supercritical carbon dioxide extraction fluid [SFE]. Was screened for cytotoxicity towards human colorectal cancer cell lines [HT29] and mouse embryonic fibroblast [NIH/3T3] cell lines using MTS assay. KSO-SFE showed the strongest cytotoxicity towards HT29 with IC50 of 200 μg/ml. Cell cycle analysis showed a significant increase in the accumulation of KSO-SFE-treated cells at sub-G1 phase, indicating the induction of apoptosis by KSO-SFE[84].The cytotoxic activities of six lignans isolated from the core and bark acetone extracts of Hibiscus cannabinus were investigated in vitro. Two compounds showed strong cytotoxic activity against HeLa, Hep-2 and A-549 cell lines while one compound showed moderate activity on HeLa cells when they were in advanced stage of cellular division[85]

Anthelmintic activity:

The anthelmintic activity of Hibiscus cannabinus leaf extract was investigated against adult earthworm, Pheritima posthuma. The methanolic extract of the crude Hibiscus cannabinus leaf at concentrations of 10, 20, 30 and 40mg/ml were tested by the determination of paralysis time and death time. Methanolic extract of the Hibiscus cannabinus leaves showed good anthelminthic activity in comparison with albendazole[86]

Antibacterial Effect:

The antibacterial effects of aqueous and ethanol extracts of Hibiscus cannabinus leaves [120000-12 µg/10ml] were studied against Salmonella typhimurium. The extracts showed different activity, the growth inhibition zones ranged between 12.67±1.52 to 6.67±1.15mm for the aqueous extract and 12.33±2.08 to 6.33±0.58mm for the ethanol extract[87].In studying the antibacterial activity of Hibiscus cannabinus leaves extracts, acetone extract exerted antibacterial activity against Klebsiella Sp. [9mm at concentration of 10 µl]. Chloroform extract showed antibacterial activity against E. coli [10, 8 and 10 mm at concentration of 10, 20 and 30 µl], against Klebsiella Sp. [12mm at concentration of 10 and 30 µl], against Pseudomonas Sp. [14 and 12 mm at concentration of 20 and 30 µl] and against Staphylococcus Sp [11mm at concentration of 30 µl] [88]

Antiulcer Effect:

The antiulcer properties and percentage protection of Hibiscus cannabinus seed oil were evaluated towards many ulcer-inducing models in rats. Hibiscus cannabinus seed oil showed an ulcer protective effect towards ethanol, non-steroidal anti-inflammatory drugs [NSAIDs] and cold restrain stress induced ulcers. Hibiscus cannabinus seed extract [HSSE] exhibited an exceptionally high ulcer protection of 74.98 ± 0.78% against NSAIDs induced ulcer. The gastric lesions were controlled primarily by both mucosal protection and acid inhibition of the oil[89]

Antidiabetic Effect:

The antidiabetic activity of methanolic extract of Hibiscus cannabinus leaves was evaluated in streptozotocin induced diabetic rats. The alcoholic extract was orally administered at a dose of 400mg/kg bw for 15 days. The result showed that the alcoholic extract of Hibiscus cannabinus leaves significantly lowered the blood glucose in hyperglycemic rats[90]

Pharmacological activities of Nagadamani [91]

a. Antimicrobial (Antibacterial, Antifungal).
b. Analgesic, Antioxidant.
c. Antiviral, Antitumor.
d. Antiemetic, Anthelmintic.
e. Haemogogue, Analgesic.
f. The bulbs of this species are laxative.
g. Its seeds are used as purgative and diuretic.
h. Its leaves are applied in skin infections, and also as expectorant.
i. Inflammation
j. Wound healing, Purgative, Bleeding control,
k. Tonics, Urine problem,
l. Boil, Tonsils

PHARMACOLOGICAL ACTIVITIES OF TULASI

Anticancer activity:

The anticancer activity of OS has been proved and cited by several investigators[92].The alcoholic extract (AlE) of leaves of OS has a modulatory influence on carcinogen metabolizing enzymes such as cytochrome P 450, cytochrome b5, aryl hydrocarbon hydroxylase and glutathione S-transferase (GST), which are important in detoxification of carcinogens and mutagens[93-96].The anticancer activity of OS has been reported against human fibrosarcoma cells culture, wherein AlE of this drug induced cytotoxicity @ 50g/ml and above. Morphologically, the cells showed shrunken cytoplasm and condensed nuclei. The DNA was found to be fragmented on observation in agarose gel electrophorosis[97].OS significantly decreased the incidence of benzo(a)pyrine induced neoplasia of forestomach of mice and 3'-methyl-4-dimethylaminoazobenzene induced hepatomas in rats[98].The AlE of the leaves of OS was shown to have an inhibitory effect on chemically induced skin papillomas in mice[99].Topical treatment of Tulsi leaf extract in 7,12-dimethylbenz(a)anthracene (DMBA) induced papillomagenesis significantly reduced the tumour incidence, average number of papillomas/mouse and cumulative number of papillomas in mice. Topical application of the extract significantly elevated reduced GSH content and GST activities[100].A similar activity was observed for eugenol, a flavonoid present in many plants, including Tulsi[101].Oral treatment of fresh leaves paste of Tulsi may have the ability to prevent the early events of DMBA induced buccal pouch carcinogenesis[102].Leaf extract of OS blocks or suppresses the events associated with chemical carcinogenesis by inhibiting metabolic activation of the carcinogen[103].The anticancer activity of OS was observed in Swiss albino mice bearing Ehrlich ascites carcinoma (EAC) and S 180 tumours[104]

Chemopreventive activity:

The chemopreventive effect of OS leaf extract is probably through the induction of Hepatic/extrahepatic GST in mice. Elevated levels of reduced GSH in liver, lung and stomach tissues in OS extract supplemented mice were also found[105].

Antimicrobial activity:

AqE of OS showed growth inhibition for Klesbiella, E. coli, Proteus and Staphylococcus aureus; while AlE of OS showed growth inhibition for Vibrio cholerae[106].The AlE of OS was also found to be active against multidrug-resistant strains of S. aureus that are also resistant to common beta lactam antibiotics[17].

Antiinflammatory activity:

Methanolic extract (500 mg/kg) and aqueous suspension of OS showed analgesic, antipyretic and antiinflammatory effects in acute (carrageenan-induced pedal oedema) and chronic (croton oil induced granuloma and exudate formation) inflammations in rats[108]

Analgesic activity:

The OS oil was found to be devoid of analgesic activity in experimental pain models (tail flick, tail clip and tail immersion methods).

However, it was effective against acetic acid induced writhing method in mice in a dose dependent manner. The writhing inhibiting activity of the oil is suggested to be peripherally mediated due to combined inhibitory effects of prostaglandins, histamine and acetylcholine[109].

Antipyretic Activity:

The antipyretic activity of OS fixed oil was evaluated by testing it against typhoid-paratyphoid A/B vaccine-induced pyrexia in rats. The oil on ip administration considerably reduced the febrile response indicating its antipyretic activity. At a dose of 3 ml/kg, the antipyretic activity of the oil was comparable to aspirin. Further, the fixed oil possessed prostaglandin inhibitory activity and the same could explain its antipyretic activity[110].

PHARMACOLOGICAL ACTIVITIES OF HARIDRA

Anti-diabetic, Hypolipidemic, Anti-inflammatory, Anti-diarrhoeal, Hepatoprotective, Anti-asthmatic and Anti-cancerous drug[111-114].

Gastrointestinal disorders

The fresh juice of Haridra is considered to be anthelmintic[115]. The Curcumin acts through nuclear factor (NF)-κB inhibition and it reduces the production of adhesion molecules and inflammatory cytokines, resulting in the amelioration of gastric injury in NSAIDs-induced gastropathy in rats. It also improves gastric mucosal damage and decreases in leukocyte adhesions, and intercellular adhesion molecule 1 and tumor necrosis factor (TNF)-α production after curcumin administration[116].

Respiratory disorders:

The fresh juice of rhizome is given in bronchitis. In rhinitis and cough boil Haridra in milk and mixed with jiggery given internally. In catarrhal cough, sore throat, and throat infection the decoction of rhizome is used for gargle and also the piece of rhizome is slightly burnt and given for chewing[117]. In asthma and congestion, fumes of Haridradi dhumvarti (fumes wick) is given.

Inflammatory disorders:

Curcumin has been shown to inhibit a number of different molecules involved in inflammation including phospholipase, lipooxygenase, COX-2, leukotrienes, thromboxane, prostaglandins, nitric oxide, collagenase, elastase, hyaluronidase, MCP-1, interferon-inducible protein, tumor necrosis factor, and interleukin-12[118].

Diabetes mellitus:

Turmeric rhizome powder is very useful with Amla juice and Honey in Madhumeha (diabetes mellitus) [119]. The ingestion of 6 g Curcuma longa increased postprandial serum insulin levels, but did not seem to affect plasma glucose levels or GI, in healthy subjects. The results indicate that Curcuma longa may have an effect on insulin secretion[119].

Cardiovascular disorders:

The antioxidants in turmeric also prevent damage to cholesterol, thereby helping to protect against atherosclerosis. In fact, the ability of the antioxidants in turmeric to decrease free radicals is similar to that in vitamins C and E. Since the antioxidant activities of turmeric are not degraded by heat (unlike most vitamins), even using the spice in cooking provides benefits. Animal studies show that curcumin lowers cholesterol and triglycerides, another fat that circulates in the blood stream and is a risk factor for cardiovascular disease. In a recent study of atherosclerosis, mice were fed a standard American diet, rich in refined carbohydrates and saturated fat, but low in fiber. Some of the mice, however, received this diet plus turmeric mixed in with their food. After four months on these diets, the mice that consumed the turmeric with their food had 20 percent less blockage of the arteries than the mice fed the diet without the turmeric[120].

Hepatoprotective:

Curcumin, the most common antioxidant constituent of Curcuma longa rhizome extract, was reported to enhance apoptosis of damaged hepatocytes which might be the protective mechanism whereby curcumin down-regulated inflammatory effects and fibrogenesis of the liver. The ethanolic extract of Curcuma Longa rhizomes showed a significant hepatoprotective effect when orally administrated in doses of 250 mg/kg and 500 mg/kg, and the protective effect was dosedependent. The main constituents of Curcuma longa rhizome ethanolic extract are the flavonoid curcumin and various volatile oils, including tumerone, atlantone, and zingiberene. The hepatoprotective effects of turmeric and curcumin might be due to direct antioxidant and free radical scavenging mechanisms, as well as the ability to indirectly augment glutathione levels, thereby aiding in hepatic detoxification. The volatile oils and curcumin of Curcuma longa exhibit potent anti-inflammatory effects[121].

Anti cancer activity:

Curcumin as a natural phytochemicals could communicate with these novel targets and show synergism to chemotherapy. Additionally, curcumin is well tolerated in humans. Therefore, EGFR- miRNA- autophagy and cancer stem cell-based therapy in the presence of curcumin might be promising mechanisms and targets in the therapeutic strategy of lung cancer[122].

Anti allergic activity:

Curcumin suppressed compound 48/80-induced rat peritoneal mast cell (RPMC) degranulation and histamine release from RPMCs. Curcumin inhibited compound 48/80-induced systemic anaphylaxis in vitro and anti-DNP immunoglobulin E (IgE) mediated passive cutaneous anaphylactoid response in vivo. Curcumin has an ability to inhibit nonspecific and specific mast cell-dependent allergic reactions[123].
Shatavari

Gastrointestinal effects

The powdered dried roots of Asparagus racemosus promote gastric emptying in healthy volunteers and its action comparable with that of the synthetic dopamine antagonist metoclopramide[124].It has been reported that A. racemosus along with Terminalia chebulaprotect gastric mucosa against pentagastrin and carbachol induced ulcers, by significantly reducing both severity of ulceration and ulcer index[125].Shatavari is primarily known to ease the pain and burning sensation as well as other dyspeptic symptoms due to the ulcers. Since it does not have any antacids or anti-secretory properties, the observed mild acid secretion can be ascribable to the changes in gastric mucosa[126].

Galactagogue effect

Alcoholic extract of Asparagus racemosus have a significant effect on lactating mother to increase milk production and have been observed along with increased growth of the mammary gland alveolar tissue and acini. The growth of lobuloavelar tissue and milk secretion in the estrogenic primed rats was thought to be due to the action of released corticoids or prolactin[127]The galactagogue effect has also been studied in buffalo as described by Patel et al [128]As described by Akansha Singh et al., the effect was evaluated in 60 lactating mothers by measuring the change in the prolactin hormone level. The study shows that the oral administration of A. racemosus led to thrice increase the level of prolactin than that of the control group. [129]

Immunomodulatory activities

The use of Asparagus racemosus dried root powder modulates the action of the immune system. That in turn, decreases the inflammatory response. It induces the immune system to fight against immune deficiencies (like AIDS), infections and cancer. It may be helpful in obtaining higher protective antibody against different vaccinations including more effective cell mediated immune response for protection against various bacterial, viral, and other diseases. Several workers has studied the effect of Asparagus racemosus root extract in augmentation of humoral and cell mediated immune response providing better protection level against infections[130]

Anticancer activity

Natural products have long been used for treatment against cancer. There are at least 10000 species of plants, documented to have anti-cancerous properties. As described by Shankar et.al the isolated shatavarin IV along with AR-2B containing 5.05% shatavarin IV showed potent cytotoxicity. It showed increase in non-viable cell count when compared to untreated mice of group in the study . Hence from various in vitro and in vivo models it can be concluded that the root extract of the plant which contains shatavari IV fraction exhibits significant activity against cancer cells. [131]

Cardiovascular effects

Increase in serum lipid levels especially cholesterol along with the generation of reactive oxygen species are the major reasons for development of coronary artery disease and atherosclerosis Abana‘ a herbo-mineral formulation containing 10mg Asparagus racemosus extract per tablet, as found to have significant hypocholerolacemic effect in rats and therefore established a potential for use as a cardio-protective agent. The Asparagus racemosus root powder supplements decreased lipid peroxidation and causes a dose-dependent reduction in lipid profiles. The total lipids, total lipids, total cholesterol and triglycerides in plasma and liver as well as plasma LDL (low density lipoprotein) and VLDL (very low density lipoprotein) cholesterol decrease. Through it can be hypothesized that the hypocholesteremia is alleviated by decreasing and increasing conversion of endogenous cholesterol to bile acid[132].

Immunological activity

The use of Asparagus racemosus dried root powder modulates the activity of immune system. That in turn, decreases the inflammatory response. It induces the immune system to fight against immune deficiencies (like AIDS), infections and cancer.

It may be helpful in obtaining higher protective antibody against different vaccinations including more effective cell mediated immune response for protection against various bacterial, viral, and other diseases. Several workers has studied the effect of Asparagus racemosus root extract in augmentation of humoral and cell mediated immune response providing better protection level against infections[133]

Antidiabetic effect

Diabetes mellitus (DM) is a major reason of disability and hospitalization that parents a substantial burden on companies worldwide. In such circumstances, herbal medicines for the treatment of diabetes become significant. Asparagus racemosus roots have been reported to reduce blood glucose level in rats, and rabbits. Asparagus racemosus root extract causes a wide ranging stimulatory effect on physiological insulinotropic pathways [134]

Antioxidant action

Antioxidants are the moieties which are involved in the prevention of cell damage, common pathway for many diseases. As given by Aarati K the Methanolic extract of the root possess significant anti-oxidant properties when administered through the oral method. The levels of enzymes like superoxidase dismutase, catalase and ascorbic acid increase with significant reduction in the lipid peroxidation. The antioxidant properties were mainly exhibited due to the presence of Isoflavons[135]

Antiulcer effect

Ulcer is one of the burning problems in developing and even developed countries. It is induced due to imbalance among aggressive factors, especially gastric acid and pepsin, and protecting factors including gastric mucosa, bicarbonate and prostaglandin.

Asparagus racemosus is an effective antiulcerogeneric agent whose activity can easily be compared with that of ranitidine hydrochloride Asparagus racemosus causes an inhibitory effect on release of gastric hydrochloric acid, and protects gastric mucosal damage. Hence the roots of the Shatavari plant in the form of powder can be administered to chronic ulcer patients along with other patients[136]

Antidiarrhoeal effect

Diarrhoea can be classified as one of the major problems faced mainly in the developing countries with an estimated death rate of 2.2 million people globally, mainly in the developing countries.

The fatal cases can be mainly seen in the children with the 5 years of age[137].The ethanol and aqueous extracts of roots of A. racemosus exhibited a significant anti-diarrhoeal activity against the castor oil induced diarrhoea in the rats as described by the Venkatesan et al., (2005). [138]Studies have shown that the action of ―prostaglandin E‖ caused the diarrhoea in the test subjects, hence it can be said that the action of this can be to prevent the biosynthesis of prostaglandin which in turn inhibits the diarrhoeal effect.

Aphrodisiac activity

Lyophilized aqueous extracts roots of Asparagus racemosus have sexual behavioral effect in male albino rats. Administration of the aqueous extracts has pronounced anabolic effect in treated animals as evidenced by weight gains in body and reproductive organs.

There was a significant variation in the sexual behaviour of animals as reflected by reduction of mount latency ejaculation latency, post ejaculatory latency, intromission latency[139]

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