

प्रयाजेनं चास्य स्वस्थस्य
॥ स्वास्थ्यरक्षणमातुरस्य विकार प्रशमनंच ॥



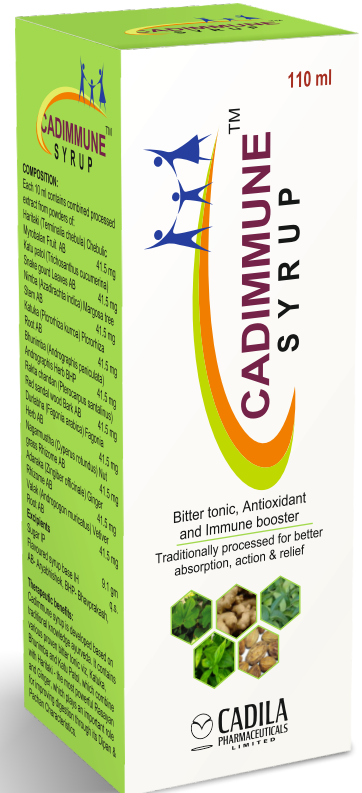
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PRODUCT MONOGRAPH

Win at life



CADIMMUNE™
SYRUP



Product Constituents

Each 10 ml contains combined processed extract from powders of:
CADIMMUNETM syrup is Preservative Free and Alcohol – Free

Name of ingredients	Form of Ingredients	Reference	Part Use	Botanical name	Qty
Active Ingredients					
Haritaki (Chebulic Myrobalan)	Powder	AB	Fruit	Terminalia chebula	41.5 mg
Katu patol (Snake gourd)	Powder	AB	Leaves	Trichosanthus cucumerina	41.5 mg
Nimba (Margosa tree)	Powder	AB	Stem	Azadirachta	41.5 mg
Katuka (Picrorhiza)	Powder	AB	Root	Picrorhiza	41.5 mg
Bhunimba (Andrographis)	Powder	BHP	Herb	Andrographisa paniculat	41.5 mg
Rakta chandan (Red sandal wood)	Powder	AB	Bark	Pterocarpus santalinus	41.5 mg
Durlabha (Fagonia)	Powder	AB	Herb	Fagonia arabica	41.5 mg
Nagarmustha (Nut grass)	Powder	AB	Rhizome	rotundus Cyperus	41.5 mg
Adaraka (Ginger)	Powder	AB	Rhizome	Zingiber officinale	41.5 mg
Valak (Vetiver)	Powder	AB	Root	Andropogon muricatus	41.5 mg
Flavoured syrup base					q.s.

Therapeutic benefits:

Cadimmune Syrup is developed based on Traditional Knowledge of Ayurveda. It contains various proven bitter tonic viz, Katuka, Bhunimba and Katu Patol, which combined with Haritaki - the most powerful Rasayan and Ginger, which plays an important role for improving digestion through its Dipan & Pachan characteristics.

It contains herbs which are known as "Aromatics" (Sugandhit Dravya) viz, Raktachandan, Nagarmoth and Vetiver. Their extraction Process is performed using modern technology so that their Aromatic principles are not lost during process of extraction as aromatic actives play an important role for enhancing the absorption of other herbs processed along with it. The Product developed is preservative and Alcohol free so the complexity of the phyto constituents remain unchanged, thus gives optimum therapeutic benefits. It is filled in amber colored glass bottles so that the efficacy of the product is maintained throughout the shelf life.

Indications:

Prophylaxis-

- To prevent from viral infections e.g. COVID-19, influenza and common cold
- Recurrent attack of viral or bacterial infections

Therapeutic-

- Adjuvant therapy in viral infections, allergic rhinitis, dengue fever
- Oxidative stress

Dosage: 5 to 10 ml 2-3 times a day in empty stomach.

- You may dilute it with equal amount of water.
- Shake well before use.

Storage: Store below 300 C. Protect from Direct Sunlight.

Pack: 110 ml and 220 ml in Amber colour glass bottle

Therapeutic benefits of Ingredients:

Terminalia chebula (Haritaki)

- Haritaki is deeply revered in Ayurveda, also known as “life giving fruit, the medicine that rejects all diseases. It pacify all tri doshas and bringing overall health
 - Fruits of Terminalia chebula Retz. (Combretaceae) are widely used as crude drugs in various traditional medicine systems. Numerous researches conducted on T. chebula have confirmed the presence of wide range of the phytochemicals such as flavonoids, tannins, phenolic acids and other bioactive compounds. T. chebula is also widely studied regarding its pharmacological activities such as antioxidant, hepatoprotective, neuroprotective, cytotoxic, antidiabetic, anti-inflammatory activities among others[1, 2]. T. chebula fruits are widely reported for their high contents of phenolic compounds including phenolic acids, tannins and flavonoids. Fruits are also known for their high content of vitamin C (ascorbic acid).
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- The image shows a close-up of Terminalia chebula (Haritaki) branches. The leaves are large, dark green, and have a prominent central vein. Several small, green, oval-shaped fruits are clustered together on the branches.
- Main compounds among tannins (hydrolysable tannins) are terflavin A, terchebulin, punicalagin, chebulagic acid (CA), chebulinic acid, corilagin[3].
 - Fruits of T. chebula have alternative, astringent, carminative, purgative and stomachic properties.
 - In Ayurveda and Siddha traditional medicines, fruits are used for the treatment of chronic diarrhoea, gastroenteritis, constipation, malabsorption syndrome, asthma, ulcer, dyspnoea, dyspepsia, haemorrhoids, cough, candidiasis, antiparasitic, hepatomegaly, urinary discharge, anti-tumour, skin disease, loss of memory, epilepsy, cardiovascular disease, diabetes, anorexia, homeostatic, and also as diuretic, antitussive and wound healer[4, 5].
 - Researchers have always strived to explore the pathogenicity of chronic conditions to oxidative stress and the impact of antioxidants to serve as adjuvant therapy against inflammatory conditions, diabetes, and exert a cardio-protective effect, as an example.
 - In this context, the methanolic extract of the fruits have shown potent antioxidant activity among the assessment with DPPH assay (IC₅₀ = 2.08 µg/mL). The prevailing antioxidant activity was attributed to the predominant antioxidant components from the methanolic extract of the fruits[6].
 - Among the identified compounds, chebulic ellagitannins was reported as the major compound with a total of 61.8 g/kg dry wt.
 - Some also reported similar results for the methanolic extract of fruits with IC₅₀ value of 5.5 µg/mL. Another study has reported the antioxidant activity of the aqueous methanolic extracts of different morphological parts of T. chebula.
 - The bark showed notable antioxidant activity (85.2 ± 1.1%) in comparison to the leaves and fruits (80.1 ± 0.9% and 79.8 ± 0.5%, respectively), and their antioxidant activities were attributed to the phenolic contents of phenolic compounds.
 - The presence of hydroxycinnamic acid and hydroxybenzoic acid derivatives, flavonol aglycones and their glycosides have been reported as the major phenolic moieties that contributes to its antioxidant profile[7].
 - The antioxidant potential was estimated for the 70% ethanolic fruit extract in terms of assaying the liver lipid peroxidation (LPO) and the in vitro DPPH radical scavenging activity.
 - The extract was potentially active and has shown noticeable reduction in the formation of in vivo thiobarbituric acid reactive substances in carrageenin-induced rat liver (IC₅₀ = 94.96 mg/kg), and also scavenged DPPH free radicals with IC₅₀ value of 42.14 mg/mL[7].
 - The free radical scavenging activity of ethanolic extract of T. chebula fruits was analyzed by the 2,20-azino The free radical scavenging activity of ethanolic extract of T. chebula fruits was analyzed by the 2,20-azinobis(3 ethylbenzothiazoline-6-sulfonic acid) (ABTS), DPPH and nitricoxide (NO) assay. The extract was active and the IC₅₀ values were 2.27, 6.04 and 4.37 µg/mL for the ABTS, DPPH and NO radical scavenging assays, respectively.
 - In an interesting work, delineating the repressive effect of the fruit extracts of T. chebula on the action of digestive enzymes linked to oxidative stress and diabetes, it was found to exhibit potent in vitro radical scavenging action as evident by glutathione S-transferase, superoxide dismutase and induced oxidative stress analyses. Elsewhere, the cardio-protective effect has been attributed to the antioxidant activity reported for the fruits of T. chebula. The study has assessed the capability of the ethanolic extract to alleviate the oxidative stress, induced by isoproterenol, via measuring the levels of serum lipid peroxides, and iron, ascorbic acid, and vitamin E plasma binding capacity. The assessment has gone further to investigate the alteration of the antioxidant enzymes activity as the glutathiones (peroxidase, reductase and S-transferase), superoxide dismutase, and catalase in the heart tissue. The study found that the oral administration of EtOH extract at dose of 500 mg/kg body weight for a month has notably maintained a normal antioxidant status[8].
 - The immunosuppressive response of CA and gallic acid, isolated from T. chebula, were found to block the CTL mediated cytotoxicity via blocking granular exocytosis in response to anti-CD3 stimulation. Other reported that T. chebula alcoholic extract shows immunomodulatory activity on male Wistar rats as evident by increased in neutrophils, lymphocytes and linear time-dependent

significant phagocytic activity with increase in the immunoglobulin level[9].

- Others has explored the immunomodulatory of the dried ripe fruits of *T. chebula* at cellular level. The immunological effect was examined and the study reported that treatment with *T. chebula* extract has elevated the level of glutathione, superoxide dismutase and catalase (25.36, 252.22 and 273.32 units/mg protein, respectively), while the extract has decreased the level of LPO to 68.01 nmol MDA/g Hb. addition, the extract increased the levels of cytokines expression as IL-2, IL-10 and TNF- mRNA several fold to 7.46-, 73.52- and 6.23-fold, respectively. In an attempt to explore the function of *T. chebula* extract in augmenting the antigen-specific Th1/Th2 immune responses in mice model, it was reported that *T. chebula* enhanced the Ig secretion, increased T-cell proliferation, elevate macrophage mediated phagocytosis and documented an inclination towards Th1-type immunity. These outcomes thus proved *T. chebula* as a stimulator of the humoral, cell-mediated and innate immunity[10].
- *T. chebula* (aqueous and alcoholic extracts) has been reported to intensify the activation of macrophages. The immunostimulatory effect of *T. chebula* in relation to antigenic stimulation was reported previously. The aqueous extract of the fruits (at higher doses of 300, 400 and 500 mg/kg) has produced a noticeable increase in both the humoral antibody titer in a dose-dependent manner, and the delayed-type hypersensitivity in mice.
- Various investigations had displayed the repressive action of *T. chebula* on viral diseases caused by herpes simplex virus-1 (HSV-1), cytomegalovirus (CMV), influenza and human immunodeficiency virus type 1 (HIV-1). The fruits of *T. chebula* were reported to have gallic acid and tannins as human HIV type I integrase inhibitors where galloyl component reportedly perform a pivotal function in hindering the 30-processing of HIV-1 integrase. One author reported that *T. chebula* showed a stronger antiviral activity in conjunction with acyclovir (synthetic analogue of the purine nucleoside) opposed to HSV-1 infection in vivo and in vitro as evident by decrement in the yield of virus in the brain of mice[11].
- Hydrolysable tannins obtained from *T. chebula* (dried fruits), were found to restrain the entry of HSV-1 in human lung cells (A549) via targeting and inactivating HSV-1 viral particles thus averting penetration, binding, cell-to-cell spread and secondary infection as well. In an investigation to explore the *T. chebula*'s effect on CMV using immunosuppressed mice model, it was documented that *T. chebula* notably inhibited the replication process of human CMV in vivo and in vitro (Yukawa et al., 1996). Recently the potential of *T. chebula* was explored for its potential against sexually transmitted herpes simplex virus-2 (HSV-2) infection.
- It was documented that chebulinic and CAs obtained from *T. chebula* extract have remarkably greater direct antiviral activity and efficacy opposed to HSV-2, to impede virus attachment and further penetration to the host cells compared with acyclovir, a standard medication used for the management of HSV infection. The aqueous extract of *T. chebula* was been documented to exhibit the prominent activity against hepatitis B virus (HBV) by decreasing the level of extracellular HBV virion DNA hinting its potential use as an effective anti-HBV drug in future. The antiviral activity of *T. chebula* barks (methanolic extract) was assessed in terms of inhibition of syncytium formation and the effects on cell surface expression of viral glycoprotein of BHK cells infected with the Newcastle disease virus (NDV) virus.
- The methanolic extract has blocks the cell surface expression of NDV-hemagglutininneuramidase (-HN) glycoprotein in a dose-dependent manner.

Trichosanthes cucumerina (Katu patol)

- Katu patol (Parvel) is pitta virechak , laxative. Corrects pitta dosha, it is truptighna, trishna nighraha
- Snake tomato (*Trichosanthes cucumerina*) as it is commonly called or long tomato in some parts of Nigeria is consumed as a vegetable due to its good nutritional value. The plant is a good source of bioactive compounds such as carotenoids, flavonoids, and phenolic acids and this makes it a suitable antioxidant source. Bioactive compounds possess antioxidant properties which are known to neutralize free radical species[12, 13].
- Snake tomato has been found useful as a substitute for common tomato (*Lycopersicon esculentum*) in some parts of the tropics when the common tomatoes are scarce or off-season.
- The snake tomato pulp is thicker, sweeter and less sour compared to the common tomato. Snake tomato juice and leaves are reported to be useful in treating liver disorders and diabetes.
- The plant is commonly called snake gourd, viper gourd, snake tomato, or long tomato in many countries. It is an annual climber belonging to the family Cucurbitaceae and commonly grown in Asian countries including Sri Lanka, India, Malaysia, Peninsula, and Philippines.
- The fruit is usually consumed as a vegetable due to its high nutritional value. The plant is a rich source of functional constituents other than its basic nutrients such as flavonoids, carotenoids, phenolic acids, and soluble and insoluble dietary fibers and essential minerals, which makes the plant pharmacologically and therapeutically active. The plant contains proteins, fat, fiber, carbohydrates, minerals, and vitamin A and E in high levels. The predominant mineral elements are potassium (121.6mg/100 g) and phosphorus (135mg/100 g) and also sodium, magnesium, and zinc are found in fairly high amounts[14].
- In ancient medicine *T. cucumerina* was used for treating headache, alopecia, fever, abdominal tumors, bilious, boils, acute colic diarrhea, haematuria, and skin allergy. It has a prominent place in medicinal systems like Ayurveda and Siddha. The whole plant including roots, leaves, fruits, and seeds is reported to show medicinal properties such as



antidiabetic, antibacterial, anti-inflammatory, anthelmintic, antifebrile, gastroprotective, and antioxidant activity.

- In Sri Lanka, it is the aerial parts of *T. cucumerina* that are used in the traditional medicinal system for treating disease conditions.
- *T. cucumerina* is a fruit that is low in energy value but very rich in crude fibre, which is beneficial to humans as natural laxative. It is also very rich in ascorbic acid and lycopene[15].
- The combined effect of the non-enzymatic and enzymatic antioxidant compounds give *T. cucumerina* the protective support from the ROS generated during the development and ripening stages.

Azadirachta indica (Nimba)

- It is kaphahara, imparts cooling effect to body, helps to balance kapha, according to the Ayurveda it helps to absorb the moisture for intestines, so improves digestion process, helps in infective respiratory problems
- *Azadirachta indica* has been demonstrated to act as a multi-functional medicinal plant for >2,000 years in India, and its neighboring countries. Currently, it is considered a natural resource with great value used in industrial product development and as a medicine for various types of diseases[16].
- Below study investigated the neuroprotective effects of *Azadirachta indica* which improved functional recovery in the 6-hydroxydopamine induced rat Parkinson's disease (PD) model. Catalase, glutathione-peroxidase, tumor necrosis factor- α , interleukin (IL)-1, IL-6, nuclear factor (NF)- κ B p65, inducible nitric oxide synthase (iNOS) and AChE activity levels were analyzed via ELISA[17].
- Western blotting was used to analyze B cell lymphoma-2 associated X protein (Bax), cytochrome c and p53 protein expression. Treatment with *Azadirachta indica* significantly decreased the PD-induced rotational behavior in rats. PD-induced catalase, glutathione-peroxidase, iNOS activity and iNOS protein expression were significantly suppressed by treatment with *Azadirachta indica*. Inflammatory factors, acetylcholinesterase activity and cyclo-oxygenase-2 protein expression levels were additionally significantly suppressed by treatment with *Azadirachta indica*[18].
- The protein expression levels of Bax, cytochrome c and p53 were decreased and caspase-3 and caspase-9 activities diminished, with treatment with *Azadirachta indica*. Therefore, *Azadirachta indica* was demonstrated to exhibit neuroprotective antioxidant and anti-apoptotic effects in Parkinson's disease[17].



Picrorhiza kurroa (Katuka)

- Katuki removes accumulated toxins and promote jathar Agni, this is one of the main content of Arogyavardhani vati which treats many liver diseases and heat imbalance in the body.
- *Picrorhiza kurroa* Royle ex Benth. (Scrophulariaceae), is a small perennial herb found mainly in the Himalayan region growing at an elevation of 3,000-5,000 m. The leaves of the plant are flat, oval and sharply serrated. The leaf, bark and the underground parts of the plant, mainly rhizomes are widely used in the traditional Indian systems of medicine (Ayurved) since ancient times. Although it shows antioxidant, antiinflammatory and immunomodulatory activities, it is most valued for its hepatoprotective effect. *P. kurroa* rhizomes are widely used against indigestion problems since ancient times due to improper digestive secretions[19, 20].
- The major glycoside is 'Kutkin', which is a mixture of (picroside-I and II) and possess significant hepatoprotective action.
- The major uses of the plant are due to its hepatoprotective, anticholestatic, antioxidant, and immunomodulatory activity. Other reported activities in the plant are against leucoderma, antiinflammatory, jaundice, fever and urinary diseases. Reactive oxygen species (ROS), such as hydrogen peroxide (H₂O₂) and free radicals, such as the hydroxyl radical (OH) and superoxide anion (O₂⁻), are produced as normal products of cellular metabolism[21].
- Rapid production of free radicals can act as a precursor for oxidative damage to biomolecules and may cause disorders such as cancer, diabetes, inflammatory disease, asthma, cardiovascular diseases, neurodegenerative diseases, and premature aging[21].
- Antioxidants have also shown their vital role in food industry to prevent deterioration and nutritional losses. Recently, interest has increased considerably in finding naturally occurring antioxidants for use in foods because of their promising activity in health promotion, disease prevention, high safety, and consumer acceptability.
- Previous reports on antioxidant activity of *P. kurroa* shows that root extract scavenges oxygen-free radicals, such as superoxides



and hydroxyl radicals, and inhibits lipid peroxidation induced by the Fe ascorbate system in rat liver homogenate. Medicinally, in rhizomes extracts of *P. kurroa*, antioxidant and antineoplastic activities have also been reported. Comparative antioxidant activity of two different species i.e., *P. kurroa* and *P. scrophulariiflora* has also been studied. Recently it has reported that the active principles of Kutkin (picroside I and II) are also present in aerial part of the plant. Till date, only roots and rhizomes were explored for their activity; however, presence of picroside I and II in leaves and inflorescence strongly support that the leaves can also be an alternative of the roots and rhizomes[22].

- Scientific data on the biological activities of leaves as compare to roots and rhizomes is limited.
- In the below study the objective was to evaluate antioxidant activity of extract, different fractions and isolated compounds of *P. kurroa* (leaves) by using 2,2'-diphenyl-picrylhydrazyl (DPPH) and 2,2'-azino-bis-(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) assays.
- The present study employed two different (DPPH and ABTS assays) antioxidant testing systems to confirm the antioxidant potentials of the leaves fractions of *P. kurroa*. The ABTS and the DPPH assays are widely used for formation of stable chromogen compounds which depicts the promising antioxidant activity. The isolated compound 1 (luteolin-5-O-glucoside), butanol, ethyl acetate fractions, and ethanol extract were able to scavenge DPPH and ABTS free radicals[22].
- The ethanol extract, however, was less efficient in the scavenging of the radicals as compare to ethyl acetate and butanol fractions. The IC values of isolated compound 1, butanol, ethyl acetate fractions, and ethanol extract showed that isolated compound 1 and butanol fraction were better scavenger of OH radical than ethyl acetate fraction and ethanol extract. Although the chemical assays are commonly used as they are technically simple and give accurate and repeatable results. However, there are limitations on antioxidant activity assessed by chemical assays as few compounds may interfere with free radical scavenger's activity by causing alteration in some parameters such as thermodynamic, absorption spectra and steric accessibility. This study in general conclude the preliminary antioxidant activity of leaves of *P. kurroa*. Currently, a lot off reports on the antioxidant activity of *P. kurroa* rhizomes has been available in the literature. Some paper reported the antioxidant activity (IC) of methanol extract and ethyl acetate extract of *P. kurroa* rhizomes assessed by DPPH method as $47.4 \pm 0.75 \mu\text{g/ml}$ and $44.5 \pm 0.52 \mu\text{g/ml}$, respectively[25]. Another report on antioxidant activity (IC) of ethanol extract of *P. kurroa* rhizomes assessed by nitric oxide scavenging method as $206.69 \mu\text{g/ml}$.
- Comparison of the IC values for DPPH assay for ethanol extract of leaves ($33.74 \mu\text{g/ml}$) and ethyl acetate fraction ($19.79 \mu\text{g/ml}$) with reported literature values for *P. kurroa* rhizome's extract showed that observed antioxidant activity for leaves is better than *P. kurroa* rhizomes antioxidant activity.
- Antioxidant and radical-scavenging activity of parent extract, fractions, and isolated compound of *P. kurroa* leaves indicate its role toward various oxidative stress related diseases, as a food supplement and source of natural antioxidants. This study discloses that the isolated compound 1, butanol, and ethyl acetate fractions found to be promising with antioxidant potential as compared to parent ethanol extract[22].

Andrographis paniculata (Bhunimba)

- In Ayurveda it is known as Kalmegh or Bhunimba means "neem of the earth," and its common name is "king of the bitters." keep us in balance with innumerable health benefits e.g supporting the immune system,
- Kalmegh is helpful for more than just immune support. The dry and penetrating qualities of the herb help to cut through thick phlegm caused by increased kapha, and it also reduces pitta and kapha in the head and chest, helping to maintain a normal body temperature. Additionally, it supports a healthy respiratory tract, sinuses, and throat, and can even be used externally to help balance excess pitta in the skin. Due to kalmegh's bitter and cooling qualities, it helps to balance elevated pitta in the blood and stagnant pitta in the liver (ranjaka pitta), enhancing liver function, and stimulating the production of bile. And if all of that isn't enough, kalmegh can also burn and eliminate ama, helping to kindle agni, improve the appetite, and support comfortable digestion.
- Dengue virus is a leading cause of illness and death in the tropics and subtropics. As many as 400 million people are infected yearly. Dengue is caused by any one of four related viruses transmitted by mosquitoes. Currently, there is no vaccine to prevent infection with dengue virus and the most effective protective measures are those that avoid mosquito bites. When infected, early recognition and prompt supportive treatment can substantially lower the risk of medical complications and death. Nowadays, the search for natural plant products to fight against viral diseases has been increasing [23, 24].
- Objective was to test the anti-dengue viral activity of both ethanolic & aqueous extract of *Andrographis paniculata*.
- In vitro antiviral activity were performed against dengue virus by the 3-(4, 5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) method and SYBR green quantitative real-time polymerase chain reaction (PCR) method. Cytotoxicity was also evaluated by MTT. The dengue viral load (VL) inhibition in plant extracts was characterized by reverse transcription PCR (RT-PCR) analysis.



- In below study, the maximum nontoxic dose (MNTD) of *A. paniculata* plant was determined by testing the ethanolic extracts against Vero cells in vitro. Antiviral assay based on cytopathic effects denoted by degree of inhibition upon treating DENV 1–4-infected Vero cells with MNTD of *A. paniculata* has the most antiviral inhibitory effects. These results were further verified with an in vitro inhibition assay using MTT and RT-PCR, in which 55%–97% of cell viability were recorded in DENV-1–4-infected cells in different duration.
 - Ethanolic extracts treated with dengue VLs also showed a significant changes which were reflected in RT PCR assay[23].

Pterocarpus santalinus (Rakta chandan)

- In Ayurveda Shastra, Rakta Chnadan is mentioned as Sheetla , rooksha, tiktabaha and rakshoghna, which is useful in psychological imbalancing and disorders indicated in shrama bhranti and daha etc
- *Pterocarpus santalinus*, a traditional medicinal plant has shown protective mechanisms against various complications.
- The aim of the below study is to evaluate therapeutic efficacy of *P. santalinus* heartwood methanolic extract (PSE) against alcohol-induced oxidative/nitrosative stress leading to hepatotoxicity. In-vitro studies revealed that PSE possess strong DPPH (1,1-diphenyl-2-picryl hydrazyl) and nitric oxide radical scavenging activity. For in vivo studies male albino Wistar rats were treated with 20% alcohol (5 g/ kg b.wt/day) and PSE (250 mg/kg b.wt/day) for 60 days[25].
- Results showed that alcohol administration significantly altered plasma lipid profile with marked increase in the levels of plasma transaminases (ALT and AST), alkaline phosphatase (ALP), lactate dehydrogenase (LDH) and gamma glutamyl transferase (gGT). Moreover, lipid peroxides, nitric oxide (NOx) levels in plasma and liver were increased with increased iNOS protein expression in liver was noticed in alcohol administered rats and these levels were significantly brought back close to normal level by PSE administration except iNOS protein expression.
- Alcohol administration also decreased the content of reduced glutathione (GSH) and activities of glutathione peroxidase (Gpx), glutathione-s transferase (GST), glutathione reductase (GR), superoxide dismutase (SOD) and catalase (CAT) in liver, which were significantly enhanced by administration of PSE. The active compounds pterostilbene, lignan and lupeols present in PSE might have shown protection against alcohol-induced hepatic damage by possibly reducing the rate of lipid peroxidation, NOx levels and increasing the antioxidant defence mechanism in alcohol administered rats[25].
- Both biochemical and histopathological results in the alcohol-induced liver damage model emphasize beneficial action of PSE as a hepatoprotective agent.
- Alcohol-induced fatty liver can progresses into advanced stages of ALD i.e., steatohepatitis, fibrosis, cirrhosis and even hepatocellular carcinoma. In below study liver histopathological changes in alcohol administered rats showed tissue congestion, necrotic changes and vacuolization in hepatocytes. Alcohol-induced liver damage by ROS/RNS was evidenced from the spill of liver marker enzymes and hyper-lipidemia which was further confirmed by the histopathological changes.
- Administration of PSE to alcohol administered rats showed near to normal hepatic architecture.
- Phenolic compounds reported to reduce the formation of hepatic stellate cells and fibrous connective tissue. Based on studies they concluded that PSE has shown strong therapeutic potential against alcohol-induced hepatic damage by reducing the formation of ROS/RNS followed by enhancing antioxidant status of the liver. Therapeutic properties of phyto-compounds present in PSE have probably shown a concerted mode of action and conferred protection against alcohol-induced damage[25].



Fagonia arabica (Durlabha)

- It is also known as Dhamar , vata pitta shamak useful in medahara, visarpa, it is one of the major content of Sariva kalpa, punarnavasava etc
- Fagonia arabica (Zygophyllaceae) is an important Ayurvedic herb, grows throughout arid regions of India, has been widely used as a folk remedy by the indigenous people for its anti-inflammatory, analgesic and antipyretic effects.
- In below study, antioxidant potential of F. arabica and the associated mechanism of antioxidant defence in rat pheochromocytoma (PC12) cells subjected to chemical ischemia was studied. Effect of total extract of F. arabica was studied for its antioxidant potential on the chemical ischemia induced PC12 cells. Alterations in the activities of cellular antioxidant enzymes (SOD, CAT, GSH-Px and GSH-R) were measured. Antioxidant potential of herb (ABTS), extent of lipid peroxidation (MDA and 4-HAE), total antioxidant status (TAS) and total glutathione (reduced, oxidized and their ratio) were evaluated[26].
- F. arabica scavenges the free radicals (ABTS+), and showed a concentration dependent antioxidant activity, highest being at 1000 lg/ml. Its treatment with ischemic cells ameliorates the GSH and TAS levels and also helps the cells to restore the activities of the cellular antioxidative enzymes and also reduced the degree of lipid peroxidation. F. arabica scavenges the free radicals and attenuates oxidative stress mediated cell injury during ischemia.
- The imbalance between pro-oxidants and anti-oxidants leads to generation of oxygen/nitrogen free radicals which are implicated in several neurodegenerative diseases.
- Fagonia arabica is an ethno-pharmacologically important Ayurvedic herb known to have many medicinal properties like anti-inflammatory, analgesic and antipyretic effects. However, its antioxidant potential has not been investigated so far. The below study was designed to investigate the antioxidant potential of F. arabica and its neuroprotective effect on chemical ischemia induced in PC12 cells[26].
- Chemical ischemia was induced through exposing the cells to uncoupler of oxidative phosphorylation sodium azide (5.0 mM) and competitive inhibitor of glycolysis 2-deoxy-glucose (2.0 mM) for 2 h followed by 24 h reperfusion with normal culture medium. Total polyphenolic content (TPC) and antioxidant potential of the herb was measured using DPPH and ABTS•+ scavenging and ferric ion reducing antioxidant potential (FRAP) assays; its effect on neuroprotection and energy metabolism was also studied[26].
- The ischemic injury was characterized by impaired energy status as indicated by decreased ATP levels in the cells, accompanied by increased lactic acid content. Both the changes favourably responded to F. arabica and offered considerable neuroprotection from ischemia and helped to maintain the cellular viability and mitochondrial integrity of the cells[26].
- F. arabica showed considerable amount of TPC and antioxidant activity. So, the study reveals the antioxidant potential of F. arabica and its protective efficacy against ischemia/reperfusion mediated cell death.



Cyperus rotundus (Nagarmustha)

- In Ayurveda it is known as Nagarmotha, It prevents cell damage caused by free radicals and protects the body from certain diseases. It improve digestive fire and correct the digestion because of its Deepan (Appetizer) and Pachan (digestive) properties. It mproves the Jathar Agni (digestive fire) and digests the food easily.
- Nagarmotha helps to reduce Ama by improving digestion, absorption of food and reduces the fat deposition in the body.
- Cyperus rotundus (C. rotundus) Linn, a sedge of the Cyperaceae family, is widely scattered in the Mediterranean basin areas. This plant, which grows naturally in tropical, sub-tropical and temperate regions, is widespread in the north-east, Center and south Tunisia[27, 28].
- C. rotundus is a traditional medicinal plant appearing among Indian, Chinese and Japanese natural drugs used against spasms, stomach disorders, and inflammatory bowel diseases[29].
- Although it has already been demonstrated that aerial parts of C. rotundus contain phenolic compounds, little is known about their antioxidant and antigenotoxic potentials[30].
- This evaluated in vitro antioxidant and apoptotic activities of Cyperus rotundus (C.rotundus).



- The phytochemical study and the antioxidant activities of both methanol and aqueous extracts from *C. rotundus* aerial part were determined. In addition, these extracts were also investigated for their cytotoxic and apoptotic activities. The major compound of the methanol extract was isolated. Both methanol and aqueous extracts (300, 150, and 50 µg/mL) were evaluated for their antioxidant activity by the xanthine/xanthine oxidase assay system[31, 32].
- However, 16, 8, and 4 mg/mL of each extract were tested to investigate their OH. formation scavenging potential. Aqueous extract (800, 400, and 200 µg/mL) and methanol extract (350, 175, and 88 µg/mL) were tested against lipid peroxidation, induced by 75 µM H₂O₂[32].
- The cytotoxicity (by MTT assay) and cell DNA fragmentation of both extracts were evaluated towards K562 and L1210 cell lines. The major compound was obtained from the butanol fraction of methanol extract and its structure was determined by RMN spectroscopic analysis.
- The methanol and aqueous extracts showed respectively, 88% and 19% inhibition of xanthine oxidase activity. Yet, the same extracts inhibited lipid peroxidation by 61.5% and 42.0%, respectively. Both extracts inhibited OH. formation by 27.1% and 25.3%, respectively. Only methanol extract induced DNA degradation. Orientin was determined as the major compound isolated from the butanol fraction of methanol extract[32].

Protective effect of *C. rotundus* extracts against lipid peroxidation induced by H₂O₂ (75 µ M) in K562 cells.

Extract	Concentration (µ g/mL)	% inhibition ^a
Aqueous extract	200	24.7 ± 1.0
	400	29.0 ± 0.9*
	800	42.0 ± 1.0*
Methanol extract	88	57.3 ± 1.0*
	175	60.0 ± 0.8*
	350	61.5 ± 0.6*

^a Results are means ± standard deviation of duplicate analysis of three replications. *: *P*<0.05 as compared with the control group.

- It appears that *C. rotundus* extracts exhibit a potential use as a natural antioxidant and an apoptosis inducer.
- Further, *Cyperus rotundus* L. (Cyperaceae) is a medicinal herb traditionally used to treat various clinical conditions at home. In below study, chemical composition of *Cyperus rotundus* rhizomes essential oil, and in vitro antioxidant, DNA damage protective and cytotoxic activities as well as antibacterial activity against foodborne pathogens were investigated. Results showed that -cyperone (38.46%), cyperene (12.84%) and -selinene (11.66%) were the major components of the essential oil[32].
- The essential oil had an excellent antioxidant activity, the protective effect against DNA damage, and cytotoxic effects on the human neuroblastoma SH-SY5Y cell, as well as antibacterial activity against several foodborne pathogens. These biological activities were dose-dependent, increasing with higher dosage in a certain concentration range.
- The antibacterial effects of essential oil were greater against Gram-positive bacteria as compared to Gram-negative bacteria, and the antibacterial effects were significantly influenced by incubation time and concentration. These results may provide biological evidence for the practical application of the *C. rotundus* rhizomes essential oil in food and pharmaceutical industries[33].

Zingiber officinale (Adaraka)

- Ayurveda recognizes ginger as sattvic, means a state of mind, ginger is as a The Digestive Fire-Keeper, By supporting agni, ginger sets off an entire domino effect of benefits. With healthy, happy digestion, you will burn through any ama buildup, and you will help prevent any new accumulation of ama.
- According to the Ayurvedic concept, strong digestion also leads to a stronger immune system. A healthier immune system means more ojas, and vice versa. This means more energy, vigor, strength, joy, and juiciness to live your life!
- Plus, ginger has an affinity for the lungs, meaning ginger's support of the immune system goes even deeper than as a welcome by product of great digestion. Ginger supports healthy expectoration and comfortable breathing, and it can help clear excess kapha and vata from the lungs. You probably won't be surprised to find that ginger is included in most of Ayurvedic immune products
- Essential oil is the concentrate and hydrophobic liquid of volatile aromatic compounds, such as phenolics and polyphenols, terpenoids, saponins, quinone, esters, flavone, flavonoids, tannins, alkaloids, and nonvolatiles residues[34].
- These molecules have many properties including antimicrobial, stimulating animal digestive system, antioxidants, antifungal, antiparasitic, and anti-inflammatory. These properties can reduce loss of energy and improved nutrients absorption for better growth and reproductive performances in animals[35].
- Among the aromatic plants containing essential oil is classified the ginger (*Zingiber officinale*).The ginger, especially the rhizome, contains several biologically active compounds such as gingerol, shogaols, gingerdiol, and gingerdione. These compounds confer to ginger various activities such as antioxidants, antibacterial, anti-inflammatory, antiseptic, antiparasitic, and immunomodulatory properties [36].
- One author reported that ginger rhizomes are good source of micronutrients and pharmacological active compounds that could be useful in animal production to boost growth and reproduction performances. Other author reported laying performances enhancements, serum, and egg antioxidant status in Hy-Line Brown laying hens fed ginger powder during 10 weeks. The same author revealed that ginger powder at the levels of 10 and 15 g/kg of feed increased egg mass and improved serum and yolk antioxidant status[36].
- In addition, supplementation of broiler chickens diet with ginger increased total superoxide dismutase and glutathione peroxidase (GSH) activities but reduced malondialdehyde (MDA) and cholesterol concentrations in serum of chickens at 21 and 42 days old. Based on the diversity of active compounds found in ginger essential oil (phenols, terpenes, and alkaloids), they believe that this essential oil could positively influence growth performances and egg yolk status in birds[37, 38].
- The objective of below study was to investigate the efficacy of graded levels of ginger rhizome essential oil on growth and laying performances, egg yolk antioxidant and cholesterol status, and serum metabolites in Japanese quail.
- This study aimed to investigate the effect of ginger (*Zingiber officinale*, Rosc.) essential oil on growth and laying performances, egg yolk antioxidant and cholesterol status, and serum metabolites in Japanese quail. Eighty 3-week-old Japanese quails weighing between 120 and 130 g were equally and randomly assigned to four groups receiving daily and orally, respectively, 100 l/kg body weight (bw) distilled water and 50, 100, and 150 l/kg bw of ginger rhizomes essential oil, respectively. The entire feeding trial for all groups lasted for 9 weeks and the *Z. officinale* essential oil effects were studied on growth and laying performances, serum metabolites, and egg yolk antioxidant and cholesterol status[38].
- Results revealed that feed intake, live and body weights gain, feed conversion ratio, egg production, and weekly mass of eggs were not significantly ($P>0.05$) influenced by oral administration of ginger rhizomes essential oil. Unlike the abdominal fat weight which decreased significantly ($p<0.05$) in all treated quails, the oral administration of ginger rhizomes essential oil had no significant effects ($p> 0.05$) on liver, intestine, heart, and gizzard relative weights as compared to the control. Egg weight markedly ($P<0.05$) increased in Japanese quails treated with ginger rhizomes essential oil whatever the dose with reference to the control[38, 39].
- The serum content in total cholesterol, LDL-cholesterol, and transaminases (AST and ALT) decreased significantly ($P<0.05$) with 100 and 150 l/kg bw of ginger rhizomes essential oil compared to control group. In conclusion, oral administration of 100 to 150 l/kg bw of ginger rhizomes essential oil to laying Japanese quails positively influences egg weight and decreased serum and egg cholesterols without any adverse effect on feed intake and body weight gain[40, 41].



Andropogon muricatus (Ushir or Valak)

- Ushir commonly known as Khus, which is used as a coolant and antioxidant, it balances vata and pitta doshas, Guna wise it is laghu and Ruksha, Charak mentioned it in shukrashodhan group. Sushrut mentioned it in pitta samsamana
- *Andropogon muricatus* (L.) Ritz (Syn. *Vetiveria zizanioides*) belongs to the family Gramineae, locally known as 'Khus'.
- It occurs in India, Ceylon, Burma, Malaya and tropical Africa and is used medicinally for hyperactive airways disorders, such as asthma[42].
- Chemical analysis of the plant revealed the presence of sesquiterpenic compounds, such as vetivenes, vetivenol, vetivenic acid and vetivenyl acetate. Recently, various herbs and spices with aromatic reputations have been the subject of intensive research partially due to the continuous discoveries of their multifunctional properties other than their classical roles as food additives and/or fragrances.
- *A. muricatus* is one of these plants that has not been studied in the past for pharmacological evaluation except for a few activities such as antioxidant and hypotensive and antispasmodic[43].
- The present work was carried out to provide a pharmacological base for the medicinal use of *Andropogon muricatus* in airways disorders, such as asthma. In isolated guinea-pig tracheal strips, the crude extract of *Andropogon muricatus* exhibited a non-specific relaxant effect against carbachol (1mM) and high K⁺ precontractions, with EC₅₀ values of 0.10 (0.07–0.11) and 0.15mg/mL (0.11–0.18), respectively, similar to papaverine, while verapamil was more potent against high K⁺. This suggests the involvement of a non-specific relaxant effect, mediated possibly through Ca⁺⁺ channel blockade and phosphodiesterase inhibition. The functional nature of the relaxant effect was further confirmed through indirect evidence when pretreatment of the tissues with the plant extract caused potentiation of the isoprenaline inhibitory response curves, similar to papaverine, while the effect of verapamil remained unchanged[42, 43].
- These data indicate that the crude extract of *Andropogon muricatus* contains constituent(s) that mediate the tracheal relaxant effect, possibly through dual inhibition of Ca⁺⁺ channels and phosphodiesterase and provide pharmacological evidence for its medicinal use in airways disorders, particularly asthma[42].



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