

Mandukparni [*Centella Asiatica* (L.) Urban] and Indigenous Medicinal and Aromatic Plants Potential through Biopesticides: A Review

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ABSTRACT

Aim of this study was to review the efficacy of Mandukparni [*Centella asiatica* (L.) Urban] in curing various disorders/disease. Phytoconstituents (Secondary metabolites), safety, Purity, strength and therapeutic index of the organically cultivated plant species is higher. Organic cultivation of medicinal plants is supported by biopesticides resulting in enhanced secondary metabolites concentration along with weedicidal activity. Organic cultivation of some of the medicinal and aromatic plants such as [Mandukparni (*Centella Asiatica* (L.) Urban), Giloy (*Tinospora cordifolia*), Kaddu (*Cucurbita mexima*), Haldi (*Curcuma longa*), Alsi (*Linum usitatissimum*), Akarkara (*Anacyclus pyrethrum*), Aak (*Calotropis gigantea*), Arand (*Ricinus communis*), Marigold (*Calendule officinalis*), Neem (*Azadirachta indica*), Rosemary (*Rosmarinus officinalis*), Khus (*Vetiveria zizanioides*), Tulsi (*Ocimum sanctum*), Pamarosa (*Cymbopogon martini*), Geranium (*Pelargonium graveolens*), Pudina (*Mentha piperata*) and Rose (*Rosa indica*)] may enhance livelihood of rural poor people through ethnopharmacy, better economic returns for organic agro-produce and offshoot of natural resources conservation.

Keywords: Allelopathy, Therapeutic Index, Biopesticide, Metabolites

INTRODUCTION

Medicinal plants offer alternative remedies for various ailments in safe and efficient way. These have enough potential to cure some incurable disease also. The World Health Organization (WHO) has recently compiled a list of 28,000 plant species used as medicinal plants in different parts of the world. If we take 2000 plant species which are more reputed as herbal medicines, even then the plants which could be brought under realistic cultivation web stand about 1.9%. Experiencing the social compulsions and guided by circumstances which are alarmingly depleting natural plant wealth, people around the world are awakening to bring more and more plant species of therapeutic importance under farming system. 69% population of our country resides in rural areas. They earn their livelihood by means of intensive agriculture of crops. Exploitation of soil fertility and their natural resources occurs arbitrarily. They spend part of their income on health and hygiene oriented diseases due to poor sanitation and safety measures. They may uplift their economy through awareness (ethnomedicinal) and organic cultivation of nearby available medicinal and aromatic plants such as Mandukparni [*Centella Asiatica* (L.) Urban.], Giloy (*Tinospora cordifolia*), Kaddu (*Cucurbita mexima*), Haldi (*Curcuma longa*), Alsi (*Linum usitatissimum*), Akarkara (*Anacyclus pyrethrum*), Aak

(*Calotropis gigantea*), Arand (*Ricinus communis*), Marigold (*Calendule officinalis*), Neem (*Azadirachta indica*), Rosemary (*Rosmarinus officinalis*), Khus (*Vetiveria zizanioides*), Tulsi (*Ocimum sanctum*), Pamarosa (*Cymbopogon martini*), Geranium (*Pelargonium graveolens*), Pudina (*Mentha piperata*) and Rose (*Rosa indica*). Medicinal and Aromatic Plants (MAPs) based livelihood systems are often mediated by the market forces, and/ or related directly to employment/ income of the poor. With continued increasing demand of natural products such as Pharmaceuticals, nutraceuticals, dyes, flavours and cosmetic industries; cultivation of MAPs species have now become a popular and economically viable commodity. Biopesticides plays an active role in organic cultivation of medicinal and aromatic plants. Conventional pesticides are having high concentrations of heavy metals that accumulate in plants secondary metabolites and affecting their functional mechanism of action. Comparatively, biopesticides are safer and helpful in enhancing the useful therapeutic component of any medicinal plants i.e secondary metabolites. Apart from enhancing concentration of secondary metabolites they (biopesticides) inhibit the growth of weeds by the mechanism of allelopathy. List of some important biopesticide formulations is given as under:-

Table 1. Biopesticides Formulations helpful in Organic Farming of Medicinal Plants

| S. N. | Formulations |
|-------|---|
| 1. | Take 3kg fresh leaves and 1kg seed of Neem (<i>Azadirachta indica</i>) in copper container having 10L of Gomutra (Cow Urine). Close the container for 10 days for decomposition process. Boil the mixture after 10 days until it's half of the original volume is left. Take 500 gm green Capsicum paste and 250 gm Garlic (<i>Allium sativum</i>) paste in another container having 2 L water. Kept it for overnight. Supernatant liquid is decanted on next days. The Sattvya is settled on the bottom of the container. This Sattvya is mixed with half left solution of Gomutra and Neem. Filter it. It is very effective biopesticide . Take 250 ml from the biopesticide and mix 15 L water in it before spraying |

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| 2. | Take 5kg seed of Neem (<i>Azadirachta indica</i>) powder, 1 Kg seed of Karanj (<i>Pongamia pinnata</i>), 5 Kg leaves of Satyanasi (<i>Argemone mexicana</i>) and 5Kg leaves of Neem in 200L capacity drum. Put 10-12 L Gomutra (Cow Urine) and volume make up to 150 L by water. Closed the drum for 10 days for decomposition. Distillate the mixture. Distilled product is sufficient for 1 acre of land and can be kept for 4-6 months without loss of its efficacy. |
| 3. | Take 1 kg of pounded Karanj cake, 1Kg of pounded Neem cake and 250 gms of pounded Poison nut tree seed are taken in muslin pouch. This is soaked overnight in water. In the morning the pouch is squeezed and extract is taken out. This is mixed with 1/2L of Aloe leaf juice. To this 15L of water is added. This is again mixed with 2-3L of cow's urine. Before spraying 1L of this mixture is diluted with 10L of water. For an acre 60-100L of spray is used. This controls various pests effectively. |
| 4. | Take 5Kg of Nirgandi (<i>Vitex negundo</i>) leaves and immersed in water. The leaves are boiled for half an hour and extract is filtered. The Aloe juice (2L) and Nirgandi extract are mixed together. This can be diluted in 50L of water and sprayed. |
| 5. | Take 500 gms of custard apple leaves and boil it in 1-2 L of water. Allow to boil till it becomes thick. Filter the solution to get the decoction. Take 250-300 ml of Calotropis extract. Take 500 gms of tobacco leaves and boil it in 1-2 L of water for 45 minutes. Then filter the extract. Take 250ml of biogas waste (whitish fluid which deposits in the biogas digester) and 100 gms of Copper sulphate. Mix the above ingredients with 60L of water and spray it over the crop. This is enough for 1 acre land. |

The holistic human health has been in the centre of all scientific efforts. The efforts include the conservation and improvement of human health (Physical, Mental and Spiritual). Besides healthy environment and positivity, plants have played a key role in such efforts. Among these plants, Mandukparni is one of the most important medicinal herbs.

DETAILS OF THE PLANT:

Botanical Name: *Centella asiatica* (L.) Urban

Hindi Name: Mandukparni

English Name: Gotu Kola

Family: Apiaceae

Chemical constituents: The major chemical compound found in the plant is triterpene saponosides. The active principals identified as asiatic acid, thankunic acid, madasiatic acid, madecassic acid, asiaticoside, madecassoside, betulinic acid, and isothankunic acid. Some medicinally valuable triterpenes are also identified such as brahmic acid, centellin, asiaticin and terminolic acid.

| | |
|-------------------------------|--|
| Purity: Foreign matter | -Not more than 2% |
| Total Ash | - Not more than 17% |
| Acid-insoluble Ash | - Not more than 5% |
| Alcohol | -soluble extractive - Not less than 9% |
| Water | -soluble extractive -Not less than 20% |

The Gotu Kola [*Centella asiatica* (L.) Urban] plant is native to Southeast Asia. It is a sub-tropical and tropical climate plant found in India, Sri Lanka, China, Indonesia, Pakistan, Japan, Malaysia, Tropical America, South Africa and Pacific islands. It is commonly found as a weed in crop fields and other waste places throughout India up to more than 600 m altitude. It is multitherapeutic plant utilized in various system of healing including Allopathy, Homeopathy, Unani-Tibbi and Ayurveda-Siddha. Therapeutic potential of plant depends up on escalated level of biosynthesis of secondary metabolites under organic cultivation practices. Pharmacological activity of plants increases due to enhanced biosynthesis of secondary metabolites after organic cultivation. Therapeutic index (TI) of the plant species increases.

Table2. Pharmacological effects of Mandukparni [*Centella asiatica* (Linn.) Urban]

| EFFECT | ACTION |
|-------------------|--|
| Memory Enhancer | Aqueous extract of plant showed cognitive enhancing and antioxidant properties in Streptozotocin induced cognitive impairment and oxidative stress in rats. It decreases the level of norepinephrine, dopamine, 5HT and their metabolites |
| Neuroprotective | Aqueous extract potentiates cellular oxidative defense mechanism. It protects neurons from the oxidative stress caused by exposure to excess glutamate |
| Antioxidant | It showed significant neuroprotective effect and proved efficacious in protecting rat brain against age related oxidative damage. |
| Hepatoprotective | Aqueous extract of the plant has significant preventive and therapeutic effect on dimethyl nitrosamine induced liver fibrosis in rat. |
| Cardioprotective | The alcohol extract of the whole plant showed strong cardioprotective activity in limiting ischemia-reperfusion induced myocardial infarction in rats. |
| Striae Gravidarum | Extract induces alpha-tocopherol and collagen-elastin hydrolysate; resulting in less stretch marks |
| Immunomodulatory | Alcoholic extract showed increase in white blood cellular count, bone marrow cellularity, natural killer cells and antibody dependent cellular activity. It revealed immunomodulatory activity with regard to non-specific cellular and humoral immune response. |

| | |
|---------------------------------|---|
| Cytotoxic and Antitumour | Aqueous extract retarded the development of solid and ascites tumour in mice. Asiatic acid was reported to have anticancerous effect on skin cancer |
| Wound Healing | Extract containing asiaticoside, madecassic acid and asiatic acid that accelerate cicatrisation and grafting of wounds. Asiaticoside facilitates wound healing through an increase in peptidic hydroxyproline content, tensile strength, collagen synthesis, angiogenesis and epithelization. |
| Gastric Ulcer Healing | Asiaticoside prevented development of gastric ulcers in rats. The dose dependent reduction of gastric ulceration was associated with dose dependent increase of the GABA level in brain. |
| Effect on Skin | Alcoholic extract showed antipruritic and other curative effect on skin |
| Anti-inflammatory | Aqueous Extract showed anti-inflammatory activity that is brought about by inhibition of NO synthesis. |
| Antispasmodic | Alcoholic extract of the plant showed antispasmodic activity on acetylcholine induced contraction of rat ileum. |
| Antiprotozoal | Alcoholic extract showed antiprotozoal activity on <i>Entamoeba histolytica</i> |
| Slimming | Alcoholic extract showed slimming effect on volunteers in vivo studies |
| Antifilarial | Alcoholic extract showed considerable decrease in filarial count in dogs |
| Antitubercular and Antileprotic | Asiaticoside obtained from extract shown to be useful in treatment of leprosy and certain type of tuberculosis |
| Antipsoriatic | Aqueous extract inhibited keratinocyte replication |
| Antidepressant | It showed antidepressant effect and caused significant reduction of the corticosterone level in serum and increase in the contents of monoamine neurotransmitter in rat brain |
| Vascular/ Venous time effect | Ethanol extract improves the synthesis of collagen and other tissue protein by modulating the action of fibroblasts in the vein wall and stimulates collagen remodelling in and around the venous wall |
| Radioprotective | Extract showed radioprotective properties and pretreatment with it prior to gamma ray irradiation was found to be effective against radiation induced damage in the mouse liver |
| Anabolic effect | It prevented mortality due to low protein diet in albino rats. It increases the blood protein nitrogen & prevented fatty acid infiltration of liver |

Herbal plants offer alternative remedies for various chronic and acute ailments in safer and efficient manner. They continue to play an important role in the subsistence and economy of poor people throughout the world. According to WHO, people of underdeveloped and developing countries are relying on herbal formulations for primary healthcare purposes.

SUMMARY & CONCLUSION:

India is emerging country. Healthcare and environmental issues are of great concern. Mandukparni [*Centella asiatica* (L.) Urban] has great potential to cure various disorder and disease such as Chronic fever, Bone T.B., Tuberculosis, Blood purifier, Detoxificant, Urinary tract infection, Leprosy, Rheumatic affections, Cardio tonic, Cardiac spasm, Hypertension, Asthma, Insomnia, Aging retardant, Syphilis, Epilepsy, Female hormonal disorders and Alzheimers disease. Quality, Purity and Strength of the herb depends up on organic agricultural practices. Plant for medicinal uses should be cultivated organically because wildy collected plant may have heavy metals, microbial contaminations , aflatoxins , metalloids and other toxic metabolite accumulation in higher concentration their valuable plant parts. While organically cultivated medicinal plants have higher therapeutic potential. Phytoconstituents/ sec. metabolites percentage is enhanced in such plant species. Biopesticides helps in organic farming of medicinal plants and resulting in enhanced therapeutic potential along with weedicide activity. 69% population of our country resides in rural areas. Rural economic elevation is possible by the organic cultivation of medicinal and aromatic plants such as Mandukparni [*Centella Asiatica* (L.) Urban.], Giloy (*Tinospora cordifolia*), Kaddu (*Cucurbita mexima*), Haldi (*Curcuma longa*), Alsi (*Linum usitatissimum*), Akarkara (*Anacyclus pyrethrum*), Aak (*Calotropis gigantea*), Arand (*Ricinus communis*), Marigold (*Calendule officinalis*), Neem (*Azadirachta indica*), Rosemary (*Rosmarinus officinalis*), Khus (*Vetiveria*

zizanioides), Tulsi (*Ocimum sanctum*), Pamarosa (*Cymbopogon martini*), Geranium (*Pelargonium graveolens*), Pudina (*Mentha piperata*) and Rose (*Rosa indica*).

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CONFLICT OF INTEREST:

There is no conflict of interest.

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