**Abstract**

Aim of this study was to review the efficacy of Mandukparni (Centella asiatica (L.) Urban) in curing various disorders/disease. Phytostimulants (Secondary metabolites), safety, Purity, strength and the rapeptic 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 weedicide activity. Organic cultivation of some of the medicinal and aromatic plants such as Mandukparni (Centella asiatica (L.) Urban), Giloy (Tinospora cordifolia), Kaddu (Cucurbita maxima), Haldi (Curcuma longa), Alsi (Linum usitatissimum), Akarkara (Anacyclus pyrethrum), Aak (Calotropis gigantea), Arand (Ricinus communis), Marigold (Calendula officinalis), Neem (Azadirachta indica), Rosemary (Rosmarinus officinalis), Khus (Vetiveria zizanioides), Tulsi (Ocimum sanctum), Pamarosa (Cymbopogon martini), Gerardium (Pelargonium graveolens), Dudina (Mentha piperata) and Rose (Rosa indica) may enhance livelihood of rural poor people through ethnopharmacy, better economic returns for organic agriculture 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 ways. 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 systems. 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 maxima), Haldi (Curcuma longa), Alsi (Linum usitatissimum), Akarkara (Anacyclus pyrethrum), Aak (Calotropis gigantea), Arand (Ricinus communis), Marigold (Calendula officinalis), Neem (Azadirachta indica), Rosemary (Rosmarinus officinalis), Khus (Vetiveria zizanioides), Tulsi (Ocimum sanctum), Pamarosa (Cymbopogon martini), Gerardium (Pelargonium graveolens), Dudina (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 play 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. No. | Formulations |
|--------|--------------|
| 1.     | Take 3kg fresh leaves and 1kg seed of Neem (Azadirachta indica) 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 (Allium sativum) paste in another container having 2L water. Kept it for overnight. Supernatant liquid is decanted on next days. The Sattvy is settled on the bottom of the container. This Sattvy 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 |
2. Take 5kg seed of Neem (Azadirachta indica) powder, 1 Kg seed of Karanj (Pongamia pinnata), 5Kg leaves of Satyanasi (Argemone mexicana) 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 1.5L 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 (Vitex negundo) 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 positivit,y 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 (Linn.) 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, madasatric acid, madecasssic acid, asiaticoside, madecassic acid, 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 multitherapic 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.

Table 2. 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 nitrosoamine 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. |
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 wildly collected plant may have heavy metals, microbial contaminations , aflatoxins , metalloids and other toxic metabolites. 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 maxima), Haldi (Curcuma longa), Alsi (Linum usitatissimum), Akarkara (Anacyclus pyrethrum), Aak (Calotropis gigantea), Anard (Ricinus communis), Marigold (Calendula 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.

**REFERENCES:**
[1] Ayurved ka Praan: Vanaushadhi vigyan (6th ed.). (2006). Mathura, Uttar Pradesh. : Yug Nirman Yojna Press.
[2] Ayurved Saar Sanghra (9th ed.). (2012). Nagpur, MH. : Shree Vaidyanath Ayurved Bhawan.
[3] Bauer, R., Tittel, G. (1996). Quality assessment of herbal preparations as preconditions of pharmacological and clinical studies. Phytomedicine, 2, 193-198
[4] Bodhisattwa, M., Nagori, B.P., Singh, R. (2011). Recent Trends in Herbal Drugs: A Review. International Journal of Drug Research and Technology, 1(1), 17-25.
[5] Dhiman, A.K.(2005). Wild Medicinal Plants of India. Dehradun, Uttarakhad :Bishen Singh Mahendra Pal Singh.
[6] Divya Jadi Bootiyan.(2011). Mathura, Uttar Pradesh: Yug Nirman Yojna Press.
[7] Donald, M.M., Arthur, P.G. (2002). Botanical medicines the need for new regulations. The New England Journal of Medicine, 347 (25), 2073-2076.
[8] Dravya Goon Vigyan Ki Pramukh Vanaushadhiyan. (2011). Haridwar, Uttar Pradesh: Shree Vedmata Gayatri Trust (TMD).

[9] Goon mei Aushadh Ratan (2012). Ajmer, Rajasthan: Krishna Gopal Ayurveda Bhawan.

[10] Gaur, R. D. (1999). Flora of the District Garhwal North West Himalaya. Srinagar, Uttarakhand: Transmedia Publication.

[11] Jadi Booti Ki Veeyavesheavik Kheti . (2011). Mathura, Uttar Pradesh: Yug Nirman Yojna Press.

[12] Jadi Booti Dwara Swasthya Sanrakshan. (2011). Mathura, Uttar Pradesh: Yug Nirman Yojna Press.

[13] Joshi, B.C., Joshi, R.K.(2014). The Role of Medicinal Plants in Livelihood improvement in Uttarakhind. International Journal of Herbal Medicine, 1(6), 55-58.

[14] Joshi, D., Joshi, G. (2011). Quality Control of Standardization of Ayurvedic Medicines (1st ed.). Varanasi, Uttar Pradesh: Chaukhambha Orientalia.

[15] Kokate, C.K., Purohit, A.P., Gokhale, S.B. (2010). Pharmacognosy (46th ed.). Pune, Maharashtra: Niral Prakashan.

[16] Singh, L.R.(2017). Medicinal and ecological potential of Kasaru (Scirpus grossus): A review. Journal of Harmonized Research, 6(3):51-53.

[17] Singh, L.R., Singh, K, Singh, D.(2018). Wild underutilized medicinal plant Motha (Cyperus rotundus Linn.). International Journal of Current Research, 10(1):64617-19.

[18] Singh, L.R. & Singh, K. (2017). Holistic health potential of Indian Pennywort (Centella asiatica(Linn.) Urban): A review. International Journal of Development Research, 07(12): 17725-17728.

[19] Singh, L.R. & Bisariya, R.S. (2017). Medicinal potential of Doob grass (Cynodon dactylon): A review. SANKALPNA (An International Multidisciplinary Journal), 5 (III): 109-112.

[20] Mehta, A. (2015). Swadeshi Chikitsa Saar (9th ed.). Jaipur, Rajasthan: Kalyan Chikitsa Prakashan.

[21] Mithal, B.M. (2015). A Text Book of Pharmaceutical Formulation (6th ed.). Delhi, India: Vallabh Prakashan.

[22] Orhan, L.E. (2012). Centella asiatica (L.) Urban: From Traditional Medicine to Modern Medicine with Neuroprotective Potential. Hindawi Publishing Corporation Evidence-Based Complementary and Alternative Medicine. doi:10.1155/2012/946259.

[23] Pandya, P. (2011). Jadi Booti Chikitsa Ek Sandarshika. Mathura, Uttar Pradesh: Yug Nirman Yojna Press.

[24] Patil, A.V., Rathod, V.S., Waghmare, M.B. (2012). Ethnobotanical Survey of Folklore Plants for treatment of Kidney stone and piles in Chandgad Tehsil of Kolhapur district in Maharashtra, India. Advances in Plant Sciences, 25(2), 725-727.

[25] Patil, P.C, Kalase, V.L., More, V.D. (2012). Ethnobotanical Survey of some medicinal plants used by local people of Patan tehsil of Maharashtra. Advances in Plant Sciences, 25(2), 719-724.

[26] Prayogic Vanaushadhi Vigyan. (2010). Mathura, Uttar Pradesh: Yug Nirman Yojna Press.

[27] Raghunathan, K. & Mitra, R. (1982). Pharmacognosy of Indigenous Drugs, Vol.1 (pp.41-50). New Delhi, India: Central Council for Research in Ayurveda and Siddha.

[28] Royal Botanical Garden, Kew.(2017). World Plants Report. Retrieved from: http://www.kew.org/science/news/state-of-the-world-plants-report-released-by-kew.

[29] Sharma, B. D., Acharya, B. K., Acharya, S.M. (2004). Divya Aushdiya, Sugandhi evam Saundaryakaran Puadh (1st ed.). Haridwar, Uttarakhand: Divya Yog Mandir.

[30] Silva, J.J.O.C., Costa, R.M.R., Teixeira, F.M. and Barbosa, W.L. (2011). Processing and quality control of herbal drugs and their derivatives. Journal of Herbal Medicine, 14(1), 114-115.

[31] Singh, K., Jakhar, M.L., Singh, D. (2008a). Medicinal Herbs and Spices (Scientific Ecofarming & Technology). Jaipur, Rajasthan: Aavishkar Publishers, Distributors.

[32] Singh, K., Jakhar, M.L., Singh, D. (2008b). Polytherapic Medicinal Plants & Spices (Post Harvest Management and Export Potential). Jaipur, Rajasthan: Aavishkar Publishers, Distributon.

[33] Singh, R.S. (2008). Vanaushadhi Nirdeshika (4th ed.). Lucknow, Uttar Pradesh: Uttar Pradesh Hindi Sanshan, Lucknow.

[34] The Ayurvedic Formulaory of India, Part-I (1978, pp. 249). New Delhi: Ministry of Health and Family Planning, Govt. of India.

[35] The Ayurvedic Pharmacopoeia of India (2008). New Delhi, India: AYUSH, MHFW, GOI.

[36] The Wealth of India (Second supplement series, Vol.-1:A-F). (2010). New Delhi, India: NISCAIR Press.

[37] Trivedi, K.P. (2010). Vanaushadhi Visheshank (Part1-6). Aligarh, Uttar Pradesh: Shree Jwala Ayurveda Bhawan, Aligarh.

[38] Uniyal, M. (2011). Medicinal Plants & Minerals of Uttarakhand Himalaya. Varanasi, U.P.: Chaukhambha Orientalia.

[39] Vanaushadhi ek Sankshipt Margdarshika. (2010). Mathura, Uttar Pradesh: Yug Nirman Yojna Press.