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REVIEW ARTICLE

Unraveling the Potential Health Benefits of *Digera muricata*, An Underutilized Weed Plant

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ABSTRACT
Digera muricata is a medicinal annual herb that belongs to the Amaranthaceae family. It is a weed commonly found on the roadside or agricultural land and is widely distributed across India, Pakistan, Bangladesh, South Africa, Indonesia, and Afghanistan. It is commonly known by names such as kondhra, lathmuria, lahsuva, chanchali, kanjaro, and Lata Mouri. Kondhra leaves contain 8.75% protein, 41% fiber content, 13.31% carbohydrates, and 140kcal/100g of energy. The iron content in the leaves and stems of kondhra is 208.3mg/kg and 75mg/kg respectively. The roots, leaves, and shoots of the kondhra plant contain numerous essential phytochemicals, terpenoids, cardiac glycosides anthraquinone, lycopene, flavonoids, and iso-flavones all contributing to various therapeutic properties like antimicrobial, antibacterial, antidiabetic, anthelminthic, antifungal, allelopathic, antioxidant and diuretics. It can be used to treat various digestive disorders like constipation so it acts as a natural form of laxative. It can be incorporated in a variety of food items Kondhra is a weed that has high potential but is still underutilized thus, an exploration of the potential health benefits of Kondhra was done to increase its utilization.
Keywords: *Anti-oxidant, Anti-cancerous, Antibacterial, Digera muricata, Iron-rich, Laxative, Phytochemicals.*

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INTRODUCTION

The scientific name of the Kondhra plant is *Digera muricata*. It is a medicinal herb that grows annually. *Digera muricata* is a weed plant also known by common names such as kondhra, lathamuria, lahasuva, and many more which belongs to the Amaranthaceae family and is widely distributed in India. It is used in Ayurveda as an herb that acts like an astringent and laxative because it gives a cooling effect. It is also used to treat lactation-related problems postpartum by providing the mother with boiled root infusion of roots of the kondhra plant [1]. Kondhra plant is mainly present in tropical regions like Africa, Sudan, Ethiopia, Tanzania, and Madagascar, and tropical and subtropical regions of Asian countries like India, Yemen, Afghanistan, Pakistan, and Indonesia. It is a medicinal herb that has a sweet taste. In Kenya, the flowers of Kondhra are sucked by children because the flowers are rich in nectar. Kondhra leaves are used in Curry, soups, and raitas in India [2]. It's a weed that grows either on agricultural land or on roadsides and is consumed as green leafy vegetables. It is highly underutilized as it has not been commercialized and its true nutritive as well as therapeutic potential is still hidden [3]. There are a variety of wild plants that come under the family Amaranthaceae which exhibit medicinal and nutritious properties and are used by locals in the Nara desert. *Digera muricata* possesses medicinal properties as it is used as a laxative and can also be used to cure constipation. It can be consumed as a vegetable [4]. Kondhra leaves and green stems are used as vegetables and help relieve digestive problems. It is still used by people living in rural areas of various developing and underdeveloped countries due to its herbal and medicinal properties. Due to multiple phytochemicals, it can be used as an herbal drug. Along with its therapeutic use, it is nutritionally very beneficial for health as it is a good source of carbohydrates, iron, ascorbic acid, potassium, and magnesium [5]. Kondhra is a wild green leafy vegetable containing energy protein, iron, and beta-carotene making it more nutritious for human health. Iron, protein, and fat are estimated at 15.80mg, 2.48mg, and 1.01mg per 100 gm of the leaves respectively [3]. The moisture

content of the leaves and stems of the *Digera muricata* plant is 7.24% and 7.12% respectively. The percentage of ash content present in leaves and stems is 25.3% and 23.9%. both leaves and stems have the same quantity of copper i.e., 11.5mg/kg. The iron content is 208.3mg/kg and 75mg/kg in leaves and stems respectively [6]. Kondhra is rich in almost all the macronutrients fiber, carbohydrates, and proteins. It contains the least amount of fat. The leaves of *Digera muricata* are recommended in diet due to the presence of enough amount of nutrients in them. The leaves of the plant contain energy about 140 kcal/100gm, a crude protein content of 8.75%, a crude fiber content of 41%, crude carbohydrate content of 13.31%, and contains Vitamin-B2 of 2.04mg/100gm. It has relatively higher water activity than other green leafy vegetables. Water-soluble vitamins like riboflavin and minerals like potassium, iron, zinc, cobalt, manganese, cobalt, and nickel are present in sufficient amounts [7]. Among the various wild edible plant species chosen i.e., *Spondias pinnata, Chenopodium giganteum, Colocasiaa esculenta, and Digera muricata*, among which the content of all essential minerals is highest in *Digera muricata*. The dietary fiber content is very high in kondhra as compared to other plant species [8].

PHYTOCHEMICALS IN *Digera muricata*

Kondhra leaves, shoots and roots contain phytochemical constituents like flavonoids, alkaloids, saponins, and tannins with medicinal properties such as anti-fungal, diuretics, anti-oxidants, and anti-bacterial [1]. Kondhra contains essential phytochemicals like terpenoids, cardiac glycosides, anthraquinone, lycopene, flavonoids, and iso-flavones due to which it possesses properties like anti-helminthic, allelopathic, protective, and also anti-diabetic [2]. The petroleum ether, ethanol, chloroform, and distilled water extract were analyzed for the presence of a variety of phytochemicals. The results of the preliminary phytochemical tests specified the presence of alkaloids, flavonoids, terpenes, alkaloids, sterols, lignins, tannins, glycosides, and phenols. The presence of these metabolites provides kondhra properties due to which it provides protection against fungal and bacterial infections [9]. *Digera muricata* plays a vital therapeutical role in free radical mediated diseases as the use of *Digera muricata* in the treatment against the carbon tetrachloride- induced toxicity provides a strong antioxidant defense mechanism for protection. Methanolic extract of the kondhra plant has a chelating effect along with reducing properties due to the presence of chemical compounds that can lose electrons and also consist of oxidation inhibiting properties. The phenolic extract in kondhra is 41.87 mg/g GAE more than the methanolic extract. The phenolic extract also shows oxidation-inhibiting properties [10]. *Digera muricata* can be a potential herb for future use as it contains medicinal properties besides its nutritional status. Spectrophotometric analysis and phytochemical screening of the *Digera muricata* plant revealed the presence of various metals and different components like moisture, ash content, iron content, and bioactive compounds. The proximate analysis of the plant also helped in determining the difference of various components in leaves and stems. Tannins are the only phytochemicals present in leaves whereas several phytochemicals like saponins, alkaloids, and flavonoids are detected in both leaves and stems of the plant [6]. The presence of various therapeutic properties in the extract of the *Digera muricata* plant was analyzed by performing of quantitative and qualitative phytochemical tests. The disc diffusion method indicated the presence of properties that protect from fungus and bacteria by analyzing the extract of the plant. The phytochemical analysis also indicated the presence of protein, carbohydrates, polyphenols, cardiac glycosides, saponins, coumarin, steroids, and flavonoids. *Digera muricata* contains ethyl acetate extracts due to which it possesses properties that protect against fungal and microbial infections caused by microorganisms like E. coli, Streptococcus pyogenes, S. agalactiae, K. pneumoniae, and Candida albicans whose infection can cause serious health conditions like diarrhea, skin infection, pharyngitis, acute rheumatic fever, liver disease, chronic medical condition, pneumonia, meningitis, candidiasis, and UTI's. the extract also contains a chemical compound known as cyclohexadecane because of which the kondhra plant can provide protection against cancer and also scavenge-free radicles [11]. Due to methanolic extract of the *Digera muricata* plant exhibits various medicinal uses and has therapeutic properties like anti-diarrheal, anti-depressant, analgesic, and cytotoxic activities [12]. The methanolic extract of *Digera muricata* leaves when given to alloxan-induced rats, increased the tolerance of glucose, considerable decrease in blood glucose levels was observed as the dosage of methanol extract was increased. Thus, it possesses anti-diabetic activity due to the presence of the methanol extract in the leaves of the plant. The MEDM dosage also helped in reducing the cholesterol and triglyceride levels to normal levels and thus helps in improving the lipid profile [13].

Therapeutic properties of *Digera muricata*

Various gastrointestinal tract disorders can be cured by *Digera muricata* like digestive disorders i.e., constipation, and diarrhea. Pus formation and various skin infections are also prevented by using the paste of leaves of the *Digera muricata* plant. Urinary disorders like UTIs are treated by using the seeds and flowers of the plant [14].

Anti-diabetic properties:

GC-MS analysis helps in determining the phytochemicals present in the various extracts of the plant. Few free radicle scavenging phytochemicals present in the *Digera muricata* plant like flavonoids and polyphenols help to regulate the blood glucose level due to which the plant has anti-diabetic properties. Segregation of such phytochemicals that help in reducing the blood sugar level has the potential to produce a drug curing diabetes without showing harmful effects in the distant future [15].

Anti-oxidant properties:

Digera muricata supplementation once a week for 16 weeks in a proportion of 100, 150, and 200mg/kg body weight boosts the free radical scavenging activity and hence can be used in treating diseases caused by increased levels of free radicals. The rats under the influence of carbon tetrachloride (2ml/BW) generated oxidative stress due to which there is a considerable decrease in the body weight and relative testis weight. There is a significant increase in Thiobarbituric acid reactive substances (TBARS) i.e., a byproduct of lipid peroxidation or degradation products of fats. Also, there is a decrease in anti-oxidant enzymes in the testis like glutathione, catalase, peroxidase, etc. The incorporation of kondhra increases the levels of antioxidant enzymes and brings back the levels of TBARS and nitrites to the normal range which reduces the anti-oxidant stress [16][22]. The intoxication of carbon tetrachloride causes nephrotoxicity as it begets the formation of free radicles and causes oxidative stress. Carbon tetrachloride (CCl_4) causes lipid peroxidation due to which levels of TBARS increase and dysfunctional proteins get collected which leads to kidney injury and hence causes nephrotoxicity. Such nephrotoxicity is caused by the intoxication of carbon tetrachloride and is diminished by the supplementation of n-hexane (HDMP) and methanolic extract (MDMP) of *Digera muricata* [17].

Anti-cancerous properties:

Digera muricata is a natural product that has the potential to form an anti-cancerous drug. The leaf extract of *Digera muricata* contains various phytochemicals like alkaloids, flavonoids, terpenes, phenols, sterols, tannins, lignins, and glycosides which causes cancer cell apoptosis and shows cytotoxic activities [18]. The ethanol extract of *Digera muricata* induces apoptosis in skin cancer line B16-F10 as disclosed by the MTT assay in which the morphological changes of cells are observed for 24 hours after the treatment of extract from 20-200 µg/ml. the ethanol extract of *Digera muricata* has a wide scope in the treatment of skin cancer due to the presence of various phytochemicals that possess properties like anti-oxidant, anti-tumor, anti-bacterial, and anti-fungal [19]. Chemotherapy and other treatments cause side effects during cancer treatment procedures. The need to derive anti-cancer drugs from natural sources to reduce such side effects is high. *Digera muricata* leaf extract is one such natural resource that contains various phytochemicals that contain cytotoxic properties and can prompt apoptosis in cancer cells [18][19].

Anti-microbial properties:

The nanoparticles of ZnO were formed by using the extract of the *Digera muricata* plant. Various bioassay techniques are used to synthesize the ZnO nanoparticles i.e., ZnO NPs. *Digera muricata* extract contains essential reductant particles that help in the synthesis of the ZnO nanoparticles created by the extract. The production of ZnO can be detected by the changes in the color of the extract as the color of the extract changes from yellow to faint yellow indicating the formation of ZnO nanoparticles in the extract. Due to the production of ZnO nanoparticles in extract the antimicrobial activities like anti-fungal and anti-bacterial properties increase. The efficiency of fighting with microbes is more of ZnO nanoparticles than the extract [20]. The production of silver nanoparticles i.e., AgNPs also indicates activities that provides protection against bacteria and several other microbes by showing anti-bacterial properties in the anti-microbial assay [21].

Table 1: Nutrient levels of *Digera muricata* [1][2][6].

S.No.	Parameter	Concentration
1.	Edible portion	56g/100g
2.	Moisture (in leaves)	7.24%
	Moisture (in stem)	7.12%
3.	Protein	4.3 g/100g
	Mineral contents (mg/100g)	
4.	Calcium	506
5.	Potassium	604

6.	Magnesium	232
7.	Phosphorous	63
	Trace mineral contents (mg/kg)	
8.	Iron (in leaves)	208.3
9.	Iron (in stem)	75.0
10.	Copper (in leaves)	11.5
11.	Copper (in stem)	11.5
	Vitamin content (mg/100g)	
12.	Ascorbic acid	49
13.	Thiamine	0.10
14.	Total-Carotene	17.93
15.	B-Carotene	3.36

CONCLUSION

Digera muricata is a highly underutilized weed that has the potential to be used as a green leafy vegetable. It is highly nutritious and possesses various therapeutic properties like scavenging-free radicals, protection against bacterial and microbial infection, anti-cancerous, anti-diabetic, and many more that are still to be discovered. It is highly nutritious as it consists of 208.3 mg/kg iron in the leaves, and protein is also in good amounts i.e., 4.3 gm/100gm. Along with nutrients kondhra also contains certain biologically active compounds which give it properties like protection against fungal, bacterial, or various microbes. Kondhra has proved to be beneficial in various digestion-related problems. India is ranked 107th out of 121 countries around the world which are combating against malnutrition. Kondhra and various other underutilized plants have the potential to counter this problem by conducting more research in this field.

REFERENCES

1. Sharma, N., & Vijayvergia, R. (2013). A Review on *Digera muricata* (L.) Mart-a great versatile medicinal plant. *Int. J. Pharm. Sci. Rev. Res*, *20*(1), 114-119.
2. Ghaffar, A., Tung, B. T., Rahman, R., Nadeem, F., & Idrees, M. (2019). Botanical Specifications, Chemical Composition and Pharmacological Applications of Tartara (***Digera muricata*** L.)–A Review. *Int. J. Chem. Biochem. Sci*, *16*, 17-22.
3. Sonal, Dr. Nutan. *Digera muricata* (Kondhra) leaves incorporated as a healthy and nutritional traditional product soup. Int J Home sci 2022;8920:201-206.
4. Qureshi, R., & Bhatti, G. R. (2009). Folklore uses of Amaranthaceae family from Nara desert, Pakistan. *Pak. J. Bot*, *41*(4), 1565-1572.
5. Manimekalai, P., Kaveena, R., Naveena, S., Nivetha, S., & Nivetha, N. (2020). A review on pharmacognostical and phytochemical study of (*Digera muricata* L.). *Journal of Medicinal Plants*, *8*(5), 52-6.
6. Elgailani, I. E. H. (2018). Spectrophotometric analysis of some metals and phytochemical screening of *Digera muricata* (Leaves and stems). *Pakistan Journal of Pharmaceutical Sciences*, *31*(5), 1923-1926.
7. Khan, N., Tahir, N., Sultana, A., Hussain, I., & Kim, K. S. (2013). Nutritional composition, vitamins, minerals and toxic heavy metals analysis of *Digera muricata* (L.) Mart. a wild edible plant from Peshawar, Pakistan. *Afr. J. Pharm. Pharmacol*, *7*(25), 1695-1702.Applications of Tartara (*Digera muricata* L.) -A Review. 17-22.
8. Bhatti, R. C., Hussain, S., Kaur, R., & Kumar, A. (2023). Relative Nutrient Indices As A Tool To Assess Wild Edible Plant's Nutrients Content For Future Food Security. *Journal of Pharmaceutical Negative Results*, 2093-2099.
9. Mathad, P., &Mety, S. S. (2010). Phytochemical and Antimicrobial Activity of *Digera muricata* (L.) Mart. *E-Journal of Chemistry*, *7*(1), 275-280.
10. Saini, S. (2023). In vitro antioxidant activity and total phenolic content of *Digera muricata* leaves. *World Journal of Biology Pharmacy and Health Sciences*, *14*(3), 105-112.
11. Tomer, Nalini & Ali, Irfan & Moin, Sarmad. (2022). Evaluation of Bioactive Potential of the *Digera muricata* Mart. International Journal Of Pharmaceutical Quality Assurance. 13. 402-407. 10.25258/ijpqa.13.4.10.
12. Miah, M. M., Das, P., Mridha, S. A., Kuddus, M. R., & Rashid, M. A. (2018). Bioactivities of *Digera muricata* (L.) Mart. Available in Bangladesh. *Dhaka University Journal of Pharmaceutical Sciences*, *16*(2), 251.
13. Jagatha, G., & Senthilkumar, N. (2011). Evalution of anti-diabetic activity of methanol extract of *Digera muricata* (l) mart in alloxan induced diabetic rats. *International journal of pharmaceutical sciences and research*, *2*(6), 748-752.
14. Katewa, S. S., Chaudhary, B. L., & Jain, A. (2004). Folk herbal medicines from tribal area of Rajasthan, India. *Journal of ethnopharmacology*, *92*(1), 41-46.
15. Ramalashmi, K. (2019). In vitro antidiabetic potential and GC-MS analysis of ***Digera muricata*** and Amaranthycruentus. *J Med Plants Stud*, *7*(4), 10-16.
16. Khan, M. R., & Ahmed, D. (2009). Protective effects of *Digera muricata* (L.) Mart. on testis against oxidative stress of carbon tetrachloride in rat. *Food and chemical toxicology : an international journal published for the British Industrial Biological Research Association*, *47*(6), 1393–1399.

17. Khan, M. R., Rizvi, W., Khan, G. N., Khan, R. A., & Shaheen, S. (2009). Carbon tetrachloride-induced nephrotoxicity in rats: protective role of Digera muricata. *Journal of ethnopharmacology*, *122*(1), 91–99.
18. Vidyashri, S., Elumalai, P., Raghunandhakumar, S., Lakshmi, T., & Roy, A. (2021). Anticancer effect of *Digera muricata* Leaf Extract against Prostate Cancer Cell Lines. *Journal of Pharmaceutical Research International*, *33*(62B), 431-438.
19. Dhivyadharshini, J., Elumalai, P., Raghunandhakumar, S., Lakshmi, T., & Roy, A. (2021). Investigation of Proapoptotic Effect of *Digera muricata* Leaf Extract against the Skin Cancer Cell Line (B16-F10). *Journal of Pharmaceutical Research International*, *33*(63A), 274-284.
20. Ashraf, N., Sumrra, S. H., Assiri, M. A., Usman, M., Hussain, R., Aziz, F., ... & Irfan, A. (2021). *Digera muricata* (L.) Mart. mediated synthesis of antimicrobial and enzymatic inhibitory zinc oxide bionanoparticles. *Green Processing and Synthesis*, *10*(1), 476-484.
21. Mehdi, K. A. M. R. A. N., Rehman, W. A. J. I. D., Abid, O., Fazil, S. R. O. S. H., Sajid, M. U. H. A. M. M. A. D., Rab, A. B. D. U. R., ... & Menaa, F. A. R. I. D. (2020). Green Synthesis of Silver Nanoparticles using *Ajuga parviflora* Benth and *Digera muricata* Leaf extract: Their Characterization and Antimicrobial Activity. *Rev. Chim*, *71*, 50-57.
22. Khan M.R, Rizvi W., Khan RA, (2009): Protective effect of ***Digera muricata*** (L.) Mart. on testis against oxidative stress of carbon tetrachloride in rat, Food and ChemicalToxicology;47(6):1393-1399