Traditional medicinal plants used in different districts of West Bengal by the tribal communities

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DOI: https://doi.org/10.22271/phyto.2022.v11.i5b.14479

Abstract
Plants play one of the most important roles in providing nutrition and therapeutics to human beings and animals. Several research studies were published in different areas of the world focusing on the food content and medicinal value of plants. In rural areas, herbal products are the main source of medications for all types of diseases. The current study summarizes the uses of traditional medicinal plants by the tribal people of various parts of the state of West Bengal, India. The review highlights the use of 105 medicinally important plant species with their taxonomical features, ethno botanical uses, and pharmacological properties.

Keywords: Medicinal plants, West Bengal, tribal community, ethno botany, ethno pharmacology

Introduction
The indigenous population of India has been using medicinal plants since the prehistoric time [1]. All human civilizations used medicinal plants as a source of therapeutics because of their availability in the local environment, therapeutic activities, and fewer side effects. Plants provide various kinds of therapeutic agents that are used for the treatment of a wide range of diseases such as cancer, diabetes, malaria, inflammation, obesity, cardiovascular [2], and microbial infections [3]. Ayurveda is one of the oldest traditional healthcare systems and it is widely practiced in India and other major Asian countries. In the ancient period, Atharva Veda (Around 1200 BC) summarized traditional medical science based on medicinal plants focusing on 600 herbs. Currently, more than 80,000 plants are used for therapeutic purposes. Developing countries significantly depend on medicinal plants for providing effective therapeutics at reasonable prices. According to WHO, 80% of developing countries’ populations use plants as a source of therapeutic agents. In India, more than 6000 medicinal plant species were identified. These plants are used across all tribal communities in the country. In India, local communities use more than 50% of the plant species of any ecosystem for phytomedicine purposes and in general, over 7400 species are utilized in the primary healthcare system by various tribes. The plant biodiversity of India is one of the largest biodiversity systems in the world. Different plants are grown in different habitats with different therapeutic activities. Plants differ in their names according to the region. Plant’s local names are very important for any ethno botanical study of every specific tribal community. Plants are generally known by their local names, but the binomial nomenclature of plants is the only acceptable scientific system. A plant’s local name is given based on some characteristic features including size, shape, habitat, taste, color, importance, smell, and utility. These local names reflect the plant’s anatomy, pharmacognosy, uses, and ecology. The local name is vital for local the identification of plants. The floristic diversity of the state of West Bengal is very well known across the world. Many plant species are used not only as medicinal agents but as vegetables by the people of this state [4].

2. Discussion about medicinal plants used by tribal communities
In this study, 105 plant species of 60 families (Table 1) were found to be used for medicinal purposes by various tribes of West Bengal, India. We summarized their local names and medicinal and ethnomedical uses by tribal communities of West Bengal.


| Sl. No. | Scientific Name       | Family          | Habit  | Local Name (Bengali) | Ethno botanical uses in the locality                                                                 | Pharmacological activities                                                                 |
|--------|-----------------------|-----------------|--------|----------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| 1.     | Aegle marmelos        | Rutaceae        | Tree   | Bel                  | Fruit used in stomach diseases                                                                      Anti-inflammatory, Anti-cancer, Antimicrobial [9]                                        |
| 2.     | Reynoutria japonica   | Polygonaceae    | Herb   | Gangadha             | Leaf juices are used for stomach diseases                                                            Anti-inflammatory, Antioxidant [6]                                                        |
| 3.     | Andrographis paniculata| Acanthaceae    | Herb   | Kalmegh, Chirata     | The leaf is used for skin diseases and diabetes                                                      Anti-diabetic, Antioxidant, Anti-hepatotoxic, Anti-malarial [7]                           |
| 4.     | Catharanthus roseus   | Apocynaceae     | Herb   | Nayantara            | Leaf extract is used to treat diabetes                                                               Antidiabetic, Antimicrobial, Anti-ulcer [9]                                               |
| 5.     | Tagetes patula        | Asteraceae      | Herb   | Gandha               | Leaf extract is applied on cuts to stop bleeding                                                     Antifibrinolytic, Anti-platelet aggregation, Antibacterial [9]                            |
| 6.     | Thanberga grandiflora | Acanthaceae     | Tree   | Nil lata             | Anti-inflammatory, Antioxidant [10]                                                                  Anti-inflammatory, Antioxidant [10]                                                        |
| 7.     | Datura innoxia        | Solanaceae      | Shrub  | Kalo Dhutra          | It is used in treating asthma, cough, breast pain                                                   Anti-rabies, Anti-asthmatics, Anti-inflammatory, Anti-viral [14]                           |
| 8.     | Curcuma longa         | Zingiberaceae   | Herb   | Halad                | The rhizome paste is applied to treat skin diseases and inflammation                                Antioxidant, Anti-inflammatory, Antibacterial [12]                                           |
| 9.     | Ocimum basilicum      | Lamiaceae       | Herb   | Bana Tuls or Dural Tuls | Seed paste is applied against stings of bees and insects                                           Antifibrinolytic, Anti-diabetic, Antioxidant, Antipyretic [13]                              |
| 10.    | Boerhaavia diffusa    | Nyctaginaceae   | Herb   | Kumkum sak           | The root is used in jaundice                                                                        Anti-inflammatory, Anti-stress [14]                                                        |
| 11.    | Ranvolfia tetraphylla | Apocynaceae     | Shrub  | Sarpagandha          | Roots are used to treat skin diseases                                                                Antioxidant, Anti-inflammatory, Anti-venom [15]                                             |
| 12.    | Hibiscus rosa-sinensis| Malvaceae       | Shrub  | Jaba                 | Leaves juice is used to treat burning sensation, fatigue, and skin diseases                         Anti-inflammatory, Antimicrobial, Anti-diabetic Hypolipidemic, Astringent, Antimicrobial [16] |
| 13.    | Mentha piperita       | Lamiaceae       | Herb   | Padina               | Leaf extract is used to treat motion sickness and headache                                          Analgesic, Anti-vomiting, Anti-inflammatory [17]                                           |
| 14.    | Coriandrum sativum    | Apiaceae        | Herb   | Dhoney               | Fruits are used as a digestive stimulant                                                             Anthemic, Anti-diabetic, Antioxidant [18]                                                 |
| 15.    | Nymphaea alba         | Nymphaeaceae    | Herb   | Sadasaluk            | Seeds are used to treat diabetes                                                                    Anti-cancer, Anti-tumor [19]                                                               |
| 16.    | Leucas cephalotes     | Lamiaceae       | Herb   | Halaksha, Gouthu     | The plant is used as diaphoretic and antiseptic                                                      Anti-inflammatory, Antimicrobial, Cytotoxic [20]                                           |
| 17.    | Marsilea quadrifolia  | Marsileaceae    | Herb   | Susnisak             | Leaf juice is used to treat skin diseases                                                            Anti-inflammatory, Anti-inflammatory [21]                                                |
| 18.    | Spondias pinnata      | Anacardiaceae   | Tree   | Amra                 | Fruit is used to cure the digestive problems                                                         Anti-cancer, Antioxidant, Anti-diarrheal [22]                                            |
| 19.    | Anisomeles indica     | Lamiaceae       | Herb   | Gopali               | Whooping cough is treated with the leaf juice                                                        Anti-inflammatory, Anti-malarial, Analgesic [23]                                           |
| 20.    | Justicia adhatoda     | Acanthaceae     | Herb   | Basak                | Leaf juice I used as an expectorant to treat cough                                                   Anti-microbial, Antioxidant [24]                                                          |
| 21.    | Terminalia chebula    | Combretaceae    | Herb   | Haritaki             | Fruit is used against stomach disorders                                                              Antibacterial, Anti-diabetic, Antifungal [25]                                              |
| 22.    | Heliotropium indicum  | Boraginaceae    | Shrub  | Hatisur              | Root juice is used in eye and skin diseases                                                          Anti-inflammatory, Antioxidant, Antifungal [26]                                            |
| 23.    | Cajanus cajan         | Fabaceae        | Herb   | Arhar                | Leaf decoction is beneficial for jaundice                                                            Anti-inflammatory, Antioxidant [26]                                                        |
| 24.    | Ricinus communis      | Euphorbiaceae   | Herb   | Rerhi                | Seed oil is used as a painkiller                                                                    Anti-bacterial, Antioxidant [27]                                                           |
| 25.    | Glinus oppositifolius| Molluginaceae   | Herb   | Gima                 | The plant is used to treat colds, coughs, and cancer                                                Anti-microbial, Anti-inflammatory, Anti-cancer [28]                                         |
| 26.    | Eshhydra fluctuans    | Asteraceae      | Herb   | Hingcha             | The leaf is used in viral infections and diabetes                                                  Anti-viral, Anti-cancer, Anti-inflammatory [29]                                             |
| 27.    | Portulaca oleracea    | Portulacaceae   | Herb   | Nunasak              | The plant is used in asthma and stomach diseases                                                    Anti-asthmatics, Anti-diabetic, Antioxidant, Anti-inflammatory [30]                         |
| 28.    | Centella asiatica     | Apiaceae        | Herb   | Thankuni             | Plants are used as blood purifiers                                                                  Anti-inflammatory, Antioxidant, Antioxidant [31]                                             |
| 29.    | Oxalis corniculata    | Oxalidaceae     | Herb   | Amrul                | The leaf is used in indigestion, scurvy treatment, and dysentery                                    Anti-helminthic, Anti-pyretic, Anti-diarrheal, Anti-cancer [32]                                |
| 30.    | Commelina benghalensis| Commelinaceae  | Herb   | Karos sak            | Plant juice is used in treating insect bites and blisters in the eye                                Anti-inflammatory, Analgesic, Anti-cancer, Anti-viral [33]                                  |
| 31.    | Azadirachta indica    | Meliaceae       | Tree   | Neem                 | Leaf juice is used in diabetes and joint pain                                                        Anti-diabetic, Anti-inflammatory, Anti-viral [34]                                           |
| 32.    | Ficus hispida         | Moraceae        | Tree   | Dunur                | Root juice of the plant is used in curing fevers and in stomach disease                            Anti-pyretic, Anti-diarrheal, Antimicrobial, Antioxidant [35]                                 |
| 33.    | Colocasia esculenta   | Araceae         | Herb   | Kachu                | The leaf is used in scorpion bites and piles                                                        Anti-fibrinolytic, Antimicrobial, Antioxidant [34]                                          |
| 34.    | Corchorus aestuans    | Malvaceae       | Herb   | Bonkhetay            | The leaf is used to treat scorpion bites and piles                                                  Antifungal, Antioxidant [17]                                                               |
| 35.    | Clematis gouriana     | Ranunculaceae   | Herb   | Mruurva              | The leaf is used in insect bites                                                                    Anti-inflammatory, Anti melanogentic [37]                                                   |
| 36.    | Ipomoea obscura       | Convolulaceae   | Herb   | DangaKalmi           | Leaf juice is used as an antidote for insect bites                                                  Anti-tumor, Antibacterial [38]                                                            |
| 37.    | Trigonella corniculata| Fabaceae        | Herb   | Piringsak            | Leaves are used as antihelminetic                                                                  Antioxidant, Anti-microbial [36]                                                           |

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| 38. | Polygonum plebeium | Polygonaceae | Herb | Kezmi | Leaf juice is used as a liver tonic and infection | Antimicrobial, Anti-inflammatory, Antioxidant [57] |
| 39. | Amaranthus viridis | Amaranthaceae | Herb | Ban note, Lal notey | The leaf is used in chest pain, asthma, and diabetes | Antioxidant, Anti-psyretic, Hepato-protective [38] |
| 40. | Hygrophila auriculata | Acanthaceae | Herb | Kulekhara | It is used in anemia and diabetes | Anti-diuretic, Hematopoietic, Anti-diabetic [37] |
| 41. | Tamarindus indica | Fabaceae | Tree | Tantul, Ambli | The bark is used to cure wounds, ringworms and smallpox | Antioxidant, Hypolipidemic, Anti-cancer, Anti-obesity [39] |
| 42. | Xanthium strumarium | Asteraceae | Herb | Okra phal | The plant is used in malaria and ulcers | Anti-arthritic, Anti-parasitic, Antioxidant, Anti-fungal [40] |
| 43. | Mimosa pudica | Fabaceae | Herb | Lajjibati | It is used to treat burning sensation | Antioxidant, Anti-cancer, Anti-venom [10] |
| 44. | Basella alba | Basellaceae | Herb | Painsak | The root is used to treat tuberculosis and anemia | Antioxidant, Antimicrobial, Anti-depressant [41] |
| 45. | Flacourtia indica | Salicaceae | Shrub | Bauch | The leaf is used in dysentery and fever | Anti-asthmatic, Antibacterial [42] |
| 46. | Bacopa monnieri | Plantaginaceae | Herb | BramhiSak | The leaf is used in memory improvement | Antioxidant, Antimicrobial, Anti-epileptic [43] |
| 47. | Cocos nucifera | Areceae | Tree | Narkel | Used to treat liver, skin problems, and kidney stones | Antitumor, Anti-cancer, Antibacterial, Antifungal [43] |
| 48. | Blumea lacera | Asteraceae | Shrub | Kukshima, Kukursonga | Used to treat muscular pain and headache | Anti-diarrheal, Antimicrobial, Anxiolytic [44] |
| 49. | Barleria lupulina | Acanthaceae | Herb | Bishalayakarani | Apply leaves paste to fresh wounds and cuts to stop bleeding | Anti-microbial, Anti-venom [49] |
| 50. | Chenopodium album | Amaranthaceae | Herb | Bethosak | It is used in a dyspepsia | Anthelmintic, Antioxidant [46] |
| 51. | Paederia scandens | Rubiaceae | Herb | Gadal | A fresh root decoction is used to treat rheumatism and dysentery | Anti-rheumatism, Antimicrobial, Anti-diabetic [47] |
| 52. | Cynodon dactylon | Poaceae | Shrub | Durga | The plant is used in bleeding and skin diseases | Anti-inflammatory, Antioxidant [46] |
| 53. | Oldenlandia corymbosa | Rubiaceae | Shrub | Khet Papra | Leaf juice is used against snakebites and skin diseases | Antibacterial, Hepato-protective, Anti-rheumatic, Anti-malarial, Anti-diabetic [49] |
| 54. | Solanum xanthocarpum | Solanaceae | Shrub | Kantakari | Fruit juice is applied twice a day to control eye problems | Anti-vomiting Cancer Anti-asthmatic [50] |
| 55. | Polygonum dichotomum | Polygonaceae | Herb | Biskathali | Leaves are crushed and used against dental problems | Anti-vomiting, Antioxidant, Anti-microbial [51] |
| 56. | Moringa concanensis | Moringaceae | Tree | Sojne | The leaf is used in reducing high blood pressure and for rheumatism treatment | Anti-cancer, Antibacterial, Antifungal, Anti-diabetic [52] |
| 57. | Acacia nilotica | Fabaceae | Tree | Babla | The bark is used to cure toothache | Anti-bacterial, Antioxidant, Antispasmodic, Anti-psyretic [46] |
| 58. | Lawsonia inermis | Lythraceae | Tree | Mehendi | Leaf juice is applied to reduce dandruff and hair fall | Antibacterial, Anti-diabetic, Anti-fertility, Analgesic [53] |
| 59. | Ottelia alismoides | Hydrocharitacea e | Herb | Parmikalla | Leaf extract is used to treat chicken pox | Anti-inflammatory, Antibacterial, Antifungal [46] |
| 60. | Cassia occidentalis | Fabaceae | Herb | Kasinda | Root extract is used in snakebites | Anti-hepatotoxic, Anti-plasmodial, Antitoxin [46] |
| 61. | Enhydra fluctuans | Asteraceae | Herb | Hingcha | Leaf extract is applied on cuts to stop bleeding | Anti-cancer, Antioxidant, Antimicrobial [54] |
| 62. | Cassia alata | Fabaceae | Herb | Chakora | The leaf is used for skin diseases and painful sensation | Antioxidant, Anti-cancer [55] |
| 63. | Clitoria ternatea | Fabaceae | Herb | Aparajita | Root juice with honey is used for mental health improvement in children | Anti-inflammatory, Anti-psyretic, Antioxidant [56] |
| 64. | Butea monosperma | Fabaceae | Tree | Palas-baha | Bark and seed are used for insects' bites and skin diseases | Antioxidant, Anti-inflammatory, Anti-cancer, Anti-ulcer [57] |
| 65. | Barleria cristata | Acanthaceae | Herb | Swetjhinti | Leaf juice is used as tooth paste and jaundice | Anti-diarrheal, Anti-fertility, Anti-microbial [54] |
| 66. | Coccinia indica | Cucurbitaceae | Shrub | Kuchfol | Leaf juice is used for head cooling and reducing blood sugar | Anti-diabetic, Anti-hyperglycemic, Anti-inflammatory [59] |
| 67. | Nyctanthes arbor-tristis | Oleaceae | Tree | Siuliful | Leaf juice is used for diabetic treatment | Anti-psyretic, Anti-fungal, Anti-arthritis, Anti-diabetic [48] |
| 68. | Argemone mexicana | Papaveraceae | Herb | Shialkanta | Leaf juice is used for jaundice. Seeds are used in ulcer treatment | Nematocidal, Anti-fertility, Anti-ulcer, Anti-HIV, Anti-stress [40] |
| 69. | Ziziphus mauritiana | Rhamnaceae | Tree | Kul | Root juice is used as a blood purifier | Anthelmintic, Antibacterial, Anti-fungal [46] |
| 70. | Achyranthes aspera | Amaranthaceae | Herb | Apang | Leaf juice is used in asthma and snake bites | Antimicrobial, Antibacterial, Anti-plasmodia [91] |
| 71. | Tribulus terrestris | Zygophyllaceae | Herb | Gokhur | Extract of young leaves is eaten with honey | Antibacterial, Antioxidant, Anti-diabetic, Anti-spasmodic, Anti-urothlic [52] |
| 72. | Cleome gynandra | Cleomeaceae | Herb | Shulte | Leaf juice is used in jaundice | Anti-cancer, Anti-fungal, Anti-diabetic [55] |
| 73. | Artocarpus lakoocha | Moraceae | Tree | Madar, Dahua | Leaf juice is used in worm diseases | Antimicrobial, Antioxidant, Anti-diabetic [49] |
| 74. | Sida rhombifolia | Malvaceae | Herb | Jhurgachh | The plant is used in skin diseases and rheumatism | Anti-inflammatory, Anti-microbial [65] |
| 75. | Melastoma malabathricum | Melastomataceae | Herb | Futki | Whole parts are used to treat stomachache | Antioxidant, Antimicrobial, Anti-psyretic [46] |
| 76. | Tinospora | Menispermaceae | Herb | Gulancha | The bark is soaked in water for 6 to 8 hours | Anti-diabetes, Antiviral, |
Conclusions
Almost in every corner of West Bengal, plants are used as medicine by local tribal communities. Herbal preparations made from traditional medicinal plants are used to treat common ailments prevalent in the area such as cuts, wounds, cough and cold, pain, stomachache, liver problems, diabetes, skin disorders, microbial infections, and tuberculosis [80-104]. This review provides a glimpse of traditional medicinal plants used by the tribal communities of West Bengal, India which are typically used by the tribal communities since ancient times.

Acknowledgements: The authors of the article are grateful to the tribal communities of various districts of West Bengal, India for their valuable help in the documentation of indigenous ethno medicinal knowledge. The authors are also thankful to Seacom Skills University for all kinds of support to complete the review work.

Conflict of interest
The author declares no conflict of interest.

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