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Research article

Ethno botanical approaches, pharmacological and phytochemical benefits of genus sida used in traditional medicines

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ABSTRACT

The four species of Sida genus viz: Sida cordifolia L., Sida acuta Burm. f., Sida cordata Burm. f. and Sida rhombifolia L. are medicinal herbs plants reported for its used in Indian system of traditional medicines of Ayurveda and Siddha. The main objective of the review is to deliver detailed information on botanical descriptions, traditional uses, ethno medicinal benefits, pharmacological activities and meaningful knowledge on these plants for future research. Plants were collected from Agra region and identified by RARI, Jhansi, Ministry of AYUSH, Govt. of India for exact information. Scientific literature collected from journals, books and libraries, electronic sources like PubMed, Web of Science, Science Direct, Springer, Scopus and major search engines to obtain get relevant information. Several parts of Sida plants used by the traditional system of herbal medicine which are traditionally used in diarrhea, leucorrhoea, gonorrhea, asthma, wheezing, fever, cold, flu, headache, weight loss, sexual strength, hair strength, hypertension, diuretic, piles, ulcer, cancer, aphrodisiac, rheumatism, urinary, venereal, skin, respiratory and heart diseases. Pharmacological activity viz: antioxidant, antibacterial, antimicrobial, anti-inflammatory, anticancer and anti-diabetic property are present, and rich in saponins, alkaloids, flavonoids, coronaric acid, coumarins, ephedrine, pseudoephedrine and ethno medicinal property. This review will serve as a database to provide knowledgeful information about the medicinal significance, traditional uses, ethno medicinal and ethno pharmacological benefits and contribution of Sida plant

Keywords: Ayurveda and Siddha, Ethno botany, Ethno medicine, Sida, Traditional medicine

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INTRODUCTION

Today, the human population of almost the entire world is struggling with corona pandemic (Covid 19). The scientists and others scientific agencies of the world have not success in finding medicines for corona virus disease till 2020. Mostly corona virus disease attacks people with low immune systems, In such an pandemic times, the attention of people has shifted to plant produced herbal medicine which strengthens the immune system of the human body and maintenance the ability to fight against external viral and bacterial infection and diseases without or less side effect.

Plants are an important source of herbal medicine and play a vital role in human health. Human beings have been using herbal plants from thousands of years to treat different diseases [1], and have become valuable resources for primary health care especially in developing countries and in rural areas [2, 3]. Biological properties of the herbs plant are largely accountable for their secondary metabolites which obtained from the plants. According to the World Health Organization (WHO), around 80% of the world's population uses herbal medications in developing nations and have faith in traditional, largely herbal, medicines to meet their primary treatment [4-6]. The herbal medicines which make use of natural products have made a comeback and India has rich heritage of use for medicinal plants in the clinical practices. The use of therapeutic crops to preserve excellent health has been commonly noted in most developing nations [7]. Medicines obtain from herbs plants are much requirement because they are affordable and have fewer known side effects [8]. the Malvaceae family members are the largest worldwide distributed family of shrubs, herbs and small trees, commonly known as Mallow

family occurred throughout the tropical and subtropical part of all over India and Sri Lanka. The Malvaceae family encompasses 224 genera with 4225 species of shrubs, herbs and trees distributed all over the World [9].

Sida genus an ethno medicinally important genus which is the largest family genera and 200 species occur throughout tropical and subtropical parts of the World including Africa, Australia, Asia, Central, North and South America and Pacific islands but 17 species have been reported in India [10]. Sida cordifolia (L.), Sida acuta (Burm. f.), Sida cordata (Burm. f.) and Sida rhombifolia (L.) were collected from different place of the Agra region of western Uttar Pradesh and identified by the Regional Ayurveda Research Institute, Jhansi (Ministry of AYUSH, Govt. of India) to obtaining exact botanical information have been reviewed. Literature collected from various sources like books and many libraries, journals, electronic sources like PubMed, Web of Science, Science direct and many search engines to obtain get relevant information. *Sida* plants have been utilized in India for traditional medicine for over 2000 years [11] and also used in American, African and Chinese traditional medicines. Some important groups of secondary metabolite include alkaloids, flavonoids, coumarin, and others are isolated from the genus *Sida*. The *Sida* genus named 'Bala' and 'Parvati' the goddess of strength and beauty finds use in many Ayurvedic and ethnic medicinal products [12].

Selection of these herbal plant for the study is based on the following characters such as all are belongs to the same family, all are generally used by an ethnic minority in some parts of India and all plant are employed in Ayurveda and Siddha system of flavoring medicines all told over the Glove. The present review supports many ethno medicinal benefits, traditional uses, pharmacological and phytochemical aspects and contribution of Sida plant in the traditional system of herbal medicine in India.

S. CORDIFOLIA

Vernacular names

Tamil: Chittamuttie

Bengali: Berela

Marathi: Chikana

Malayalam: Katturam

Kannada: Chittuharalu

Oriya: Oriya

Gujrat: Jangli methi

Hindi: Vatya

Nepali: Bariyar

Sanskrit: Bala

Common Name: Heart leaf Sida, Country mallow

Botanical identification

S. cordifolia is commonly known as Indian ephedra because it contains a small quantity of alkaloid ephedrine [13]. S. cordifolia is considered in the equivalent position to ephedra in China [14], is a small perennial herb or the most common plant of wild herbs under shrubs, it usually 20 cm to 1.2 m in height and representative occurred in different tropical and subtropical part (Figure 1A). In India, the genus is characterized by 5 species. However, S. cordifolia is the most common wild herbs in various tropical and subtropical regions [15].

Morphological description

The specific name cordifolia refer to heart-shaped leaf and with herbaceous, cylindrical and branched stem. Leaves are simple alternate chordate. Flower is small yellow and white in color, terminal, solitary axillary. The fruits are dark brown in color. The seed are smooth, brown, 6-8 mm in diameter. Flowering and fruiting take place all year round. The roots are 5-15 cm long with few lateral roots with taproots is branched near the tip.

Traditional applications

The whole plant of S. cordifolia is of great medicinal importance and widely used in ayurveda, folk, siddha and Tibetan systems of Indian medicine. S cordifolia known as Chitramutti in Indian Siddha system of medicine. It is used for various theratic purpose in India for dysentery, bronchial asthma [16], cold, chills, flu, headache, cough, nasal congestion, wheezing and oedema [17]. The stems, leaves and seeds of the targeted plant are also used for many medicinal purposes in traditional medicine [18]. It is also used for weight loss due to the presence of ephedrine alkaloid which controls metabolism in the human body [19]. S. cordifolia has been widely used as traditional remedies for gastrointestinal dysentery diarrhea, malarial, asthma and fevers [20].

Extract of S. cordifolia used in sexual weakness and is recommended as an effective remedy for sperm mobility and low sperm count disorders and improve sexual strength [21]. In males, taking 5-6 gram of root powder of S. cordifolia on an empty stomach in the morning increases the viscosity of semen and prevents its involuntary discharge [22]. It is also used in the traditional medicine system in China, Brazil and many other countries for a large spectrum of diseases. The roots, fruit and the entire plant of *S.* cordifolia are used in various countries and are a major source of many powerful drugs like weight loss [19], bleeding piles [14] and urinary diseases [23].

S. cordifolia is widely used in Indian medicine systems in Ayurveda, Folk, Siddha and Tibet [24]. Usage of *S. cordifolia* plant in the manufacture of Ayurvedic medicinal products and other herbal medicinal products, supported by scientific evidence, can universally ensure safe and stronger use of natural products [4]. Ginger along with S. cordifolia root is used to treat fever that comes frequently. Milk and honey combination with S. cordifolia root is used for vaginal discharges and urinary urgency, it increases sperm count and is used to increase the motility of sperms in males [25]. *S.* cordifolia leaf extract showed the highest antibacterial activity [26]. In Brazil, S.

cordifolia is generally used in Brazilian folk medicine for the treatment of asthmatic bronchitis, blenorrhea, inflammation of oral mucosa and nasal congestion, and recognized as malva branca [27, 28].

Whole plant of S. cordifolia constitutes major chemical compound as ephedrine, pseudoephedrine, saponine, hypaphorine, fatty acids, coronaric acid, indole alkaloids and beta phenethylamine etc. Ephedrine and pseudoephedrine major chemical compound are used to encourage the central nervous system. Health supplements of S. cordifolia currently present on the market, S. cordifolia 400 mg (60 Capsule) may enable supercharged workout, increase energy, fat burning, weight loss and joint pain relief. Garnell Sida cordifolia-90 vegicaps, Reflex S. cordifolia complicated and caps S. cordifolia 120 tablets, S. cordifolia slimming pills, chocolate banana, S. cordifolia 1600mg and evolution S. cordifolia 400 mg capsules [4].

S. cordifolia can cause side effects due to the presence of ephedrine, such as anxiety, nervousness, insomnia, and blood pressure increase, even stroke or memory loss. The physiological effect of S. cordifolia that the no actual confirmation to support it utilized as a weight-loss supplement may reduce heart rate and blood pressure both, increases pain durability and the possible effect of antioxidant [4].

S. ACUTA

Vernacular names

Tamil: Palambasi

Bengali: Kureta, Berela

Marathi: Chikana

Gujarati: Jangali methi

Kannada: Vishakaddi

Malayalam: Malatannishiruparuva

Sanskrit: Mahabala

Oriya: Sunakhodika

English: Morning mallow

Common Name: Broom or wire weed

Botanical Identification

S. acuta is a tiny annual or perennial herb with a height up to 1.5 m. It is also known as broom weed or wire weed, spiny head Sida (Figure 1B). In English, it is known as morning mallow because the flower opens in the morning, in India, it is verified as a weedy species. The plant is native to Mexico and Central America but has spread throughout the tropics and subtropical parts of the world [29, 30].

Morphological Description

S. acuta grows in a garden, disturbing side and waste areas in India. Leaves are alternate, simple with a sharply pointed tip. Stem is branched and slightly woody with. A flower is pale yellow or orange, axillary solitary. The fruits are glabrous and brown. The bark is greenish and smooth. The plant can be commonly propagated by seed. Flowering and fruiting occurred throughout the years. All parts of S. acuta including bark, root, seeds, leaves and flowers are used throughout the globe in traditional medicine.

Traditional applications

The entire *S. acuta* plant is commonly used for long time in different types of traditional medicine to treat various ailments of the human body in many countries of the world for Asthma, headache, diabetics, leucorrhoea, urinary diseases, blood disorders and breast cancer, cough, breathing problems, bile, liver and as treatment for nervous diseases [31, 32]. Mostly leaves and roots used in fever, ulcer, dysentery, skin disease, and diarrhea [33, 34]. Leaves are considered to possess, diuretic, anthelmintic for the treatment of rheumatic affections [35]. The leaf juice of S. acuta is traditionally used throughout India for treatment of gastric disorders and vomiting [36]. S. acuta root is helpful for treat tuberculosis and in diseases associated with injury, cough, respiratory diseases and heart diseases [37].

Whole plant extract of *S. acuta* utilized for the treatment of diseases such as headache, fever, dysentery, diarrhea and skin diseases [33]. In traditional Indian medicine, the *S. acuta* roots are used in the treatment of urinary and nervous diseases as well as bile, blood and liver disorders [38]. S. acuta is also treated with renal inflammation, asthma, fever, cold, headache, worms and ulcers in Central America [39]. Leaves paste also used for hair strengthening and dandruff along with coconut oil. In Colambia, the plant is known for its treatment as snake bites and it lessened the hemorrhagic effect of Bothrops atrox venom [40]. S. acuta is one of the most commonly plant used in Nigerian traditional medicinal for the treatment of hypertension and its stems, leaves and seeds using in the different preparations [41].

S. acuta is also been used as the antimicrobial, antifungal, antioxidant, anti-plasmodial, cytotoxic activities and many other biochemical activities [34]. S. acuta exhibited a good antimalarial activity [42]. Several workers have reported the chemical composition of common root and leaves of S. acuta. Alkaloids such as ephedrine, vasicine and cryptolepine [43, 44], saponosides, steroids, phenolic compounds, tannins, flavonoids and polyphenol are also been reported [45]. S. acuta also is known as a water purifier because its extract used to remove fluoride from water [40]. The plants were used in Tamil Nadu state for treating diarrhea, bronchitis, dysentery and skin diseases [33]. This plant is also used as anti-pyretic, stomachic and diaphoretic. S. acuta is regarded as astringent, tonic, useful in treatment of urinary disease and also used in stops bleeding, nervous diseases, liver diseases and bile treatment in Indian traditional medicine [46, 47].

S. CORDATA

Vernacular names

Tamil: Kurunthott

Knnada: Bekkinathala gida

Marathi: Bhumi petari

Gujarati: Bhoybala

Malayalam: Kuruntotti

English: Heart leaf fanpetals

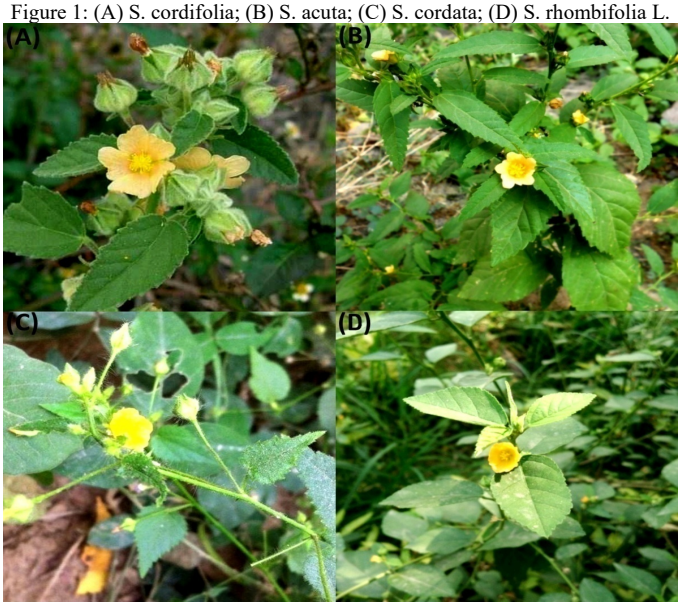
Hindi: Bhuinii

Telugu: Tirunala

Sanskrit: Nagbala, Bhumibala

Common Name: Long stalk Sida

Figure 1: (A) S. cordifolia; (B) S. acuta; (C) S. cordata; (D) S. rhombifolia L.



Botanical identification

S. cordata is a malvaceous prostrate or decumbent, ascending non-woody perennial herbs commonly known long stalk Sida or heart leaf fanpetals. It is also referred to as Bhuinii in Hindi and Bhumi bala in Sanskrit (Figure 1C). S. cordata usually growing up to 1 meter in height on the roadside, disturbing side and wasteland in India. It is indigenous to India and can be discovered throughout India, Pakistan and Sri Lanka throughout the tropical and subtropical areas.

Morphological description

Availability of S. cordata is throughout the year. Leaves are cordate, heart-shaped normally 1 to 5 cm long and 4.6 cm broad. The stem is usually climber, branched and non-woody. Flowers are generally small, axillary, solitary, pedicels, pale yellow, 14 mm in diameter heaving long stalk. Seeds look like Reni form, it length 1 mm, brownish-black in color. Flowering and fruiting depending on regional habitat but almost throughout the year.

Traditional applications

S. cordata used for the medicinal purposes in Indian traditional medicine namely Ayurveda and Siddha, the plant has good medicinal quality as a diuretic for the treatment in the uropathy and bark root of this plant is also used to treat leucorrhoea, gonorrhea and dysentery [48, 49]. Plant juice is useful to treat pimples, boils and cuts. The root is used as a making tonic and root juice is used to treat in digestion and also in gonorrhea and other venereal diseases [50]. It is widely used as antifungal, antiulcer, antibacterial, antitumor, antimalarial, antidepressant, antioxidant, anti-hyperglycemic and analgesic in Ayurvedic system of medicine [51].

Whole plant of *S. cordata* used is to make juice for treating rheumatism, gonorrhea and spermatorrhea. The root of S. cordata along with cow butter is locally used to relieve of the pain and cure piles [51]. The paste made from roots (jelly) treats for the removal of pus from wounds and boils [52]. Leaf and stem extracts of *S. cordata* consist of primary metabolites like amino acids, proteins, carbohydrates and secondary metabolites like flavonoids, alkaloids, saponins, anthraquinones, tannin, glycosides, catechins, coumarins, terpenoids, phenolics etc. [48]. Whole plant of S. cordata is thought to rejuvenate and is also administered for chronic liver diseases [53]. Seed have aphrodisiacal properties and used for gonorrhea, tenesume, colic and cystitis.

S. RHOMBIFOLIA

Vernacular names

Tamil: Kurundotti

Bengali: Svetbarela

Marathi: Sededa

Gujarati: Baladana

Malayalam: Vankuruntotti

Sanskrit: Atibala

English: Arrowleaf Sida

Hindi: Sahadeva

Common Name: Arrowleaf Sida and Cuban jute.

Botanical identification

S. rhombifolia is an erect, annual or perennial under shrub plant commonly known as arrow leaf *Sida* and Mahabala in Ayurveda, growing as a weed in waste, disturbing and roadside (Figure 1D). S. rhombifolia is distributed throughout the tropical, subtropical temperate regions over 70 countries [28]. It commonly occurred throughout India, Sri Lanka, and Australia, especially in tropical to hot temperate and sometime open in grassland [54].

Morphological description

S. rhombifolia is grows up to 1.3 meters in height with flexuous branches. The stem is firm woody, wiry, slender, flexible, hairy and intricate branches. Leaves are simple, alternate, margins serrate, stellate hairy and rhomboid lamina which is different from S. acuta. Flowers are small, solitary, axiliary; yellowish corolla contains five petals and 1 cm in diameter. The fruit is pericarp and trigonous. Seed is smooth, dark brown and black. Flowering and fruiting take place all year round.

Traditional applications

S. rhombifolia known as Kurumthotti in Ayurvedic medicine. Plants are used by local residents as sources of medicine or drug. In India, it is used against hypertension and diabetes [55]. It is also used in diarrhea and gout treatment [56]. The roots and leaves of S. rhombifolia are sweet, bitter, cooling, unctuous, aphrodisiac;

promote sexual strength and vital factor [57]. The root of this plant, according to Ayurvedic doctors, was used for the treatment of neurological complaints and rheumatism including epilepsy [58]. The plant stem is rich in mucilage and is internally used as an emollient [59]. In India, also used for treating diabetes and hypertension [55]. It is used as a folk medicine in Indonesia to treat gout [56]. In Europe, it is also used as an anti-tuberculosis agent [60].

S. rhombifolia significant medicinal applications grown in India and Bangladesh. It has multiple properties as diaphoretic, diuretic, demulcent, stomachic, emollient, sudorific, tonic, appetite, and stimulant. Roots and leaves of this plant are used for treating gonorrhea, aphrodisiac, anti-soud, diuretic and piles [61]. Leaves of S. rhombifolia are used to treat soothing swelling, mucilage is used as an emollient, fruit is used to relieve headache and the root is used to treat rheumatism [62]. This plant has important medicinal properties such as anti-inflammation, antimicrobial, and analgesic activities [63]. Leaves of this plant contain many respectable nutrients like protein, carbohydrates, fiber, fat and ash. Other nutrient presence in the root such as choline, vaccine, pseudoephedrine, hipaphorine, beta-phenethylamine, etc. related indole alkaloids. However, roots contain alkaloids, ephedrine and saponine.

CONCLUSION

The Sida plant has long been used for traditional medicine in many countries of the world to treat numerous diseases of the human body. Medicinal herbs are going to play an important role in the next generation without side effect. All parts of the investigated plant, including bark, leaves, seeds, flower and root are used by traditional medicine. These plants have created an great opportunity for development of the medicinal properties for production of herbal drugs in both international and local levels. Multiple properties from the data based such as antioxidant, antibacterial, antimicrobial, antimalarial, antiulcer, anti-inflammatory, hypoglycemic, antipyretic, anticancer, insecticidal activities and chemical composition such as saponins, alkaloids, steroids, coumarins, phenolic compounds, tannins, flavonoids and cardiac glycosides are present in the plant extract. This review will serve as a database to provide thorough data about the medicinal significance and traditional uses in the literature of S. cordifolia, S. acuta, S. cordata and S. rhombifolia in all over the globe.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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