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The Ethno Botany, Diverse Food uses, Claimed Health Benefits And Conservation Of Euphorbia Caducifolia Found in Sirohi District

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ABSTRACT

Euphorbia caducifolia is a subtropical succulent species of flowering plant in the family Euphorbia ceae. It is found in the arid regions of northwestern Indian subcontinent. In India it is known as the leafless milk hedge. Euphorbia caducifolia forms a dense, branching bush up to 3 m (10 ft) high and 10 m (33 ft) in diameter. The succulent stems branch frequently and tend to grow vertically. It has small oval leaves some 2.5 to 8 cm (1 to 3 in) long and 2.5 cm (1 in) wide, but these soon fall. Spines on the stipules are up to 1 cm (0.4 in) long. E. caducifolia resembles the leafy milk hedge (Euphorbia nivulia) but differs in having multiple stems, and smaller, more transitory leaves. The flowers are orange-red and appear in February and March.

KEYWORDS- Euphorbia caducifolia , succulent, Euphorbia ceae, Sirohi, flowering

INTRODUCTION

Euphorbia caducifolia has a rather limited distribution in the Thar Desert in the northwestern part of the Indian subcontinent, on the boundary between India and Pakistan.[1] This is an area of sandy hills and shifting sand dunes, with clumps of thorny vegetation, low trees, grasses and scrub. In Sirohi district of Rajasthan, it grows a lot in gardens, hilly areas, sandy regions etc. In southern Rajasthan, some of the hills are well clad with vegetation, and there Euphorbia caducifolia is associated with Butea monosperma, Millettia pinnata , Syzygium hyrianium, Wrightia tinctoria and Ziziphus nummularia. In the arid region near Sambhar Salt Lake, it is associated with thorny scrub such as Anogeissus pendula and Boswellia. The latex of Euphorbia caducifolia has been used in Pakistan as an anti-tumour agent, and the roots are also said to have anti-tumour properties.[5] The latex has also been used historically to promote the healing of wounds, and research has shown that it does indeed exhibit significant wound healing activity.[6] The plant is also a rich source of hydrocarbons (C-15 compounds) that can be processed to produce a biodiesel fuel.[1,2,3]

In Sirohi district, Euphorbia caducifolia is a Euphorbia ceae species where latex of E. caducifolia (ECL) is used by the local inhabitants for treatment of bleeding wound, cutaneous eruption and other skin diseases. Looking to the medicinal importance of the plant, it was considered worthwhile to scientifically evaluate the ECL for the wound healing activity. Phytochemical analysis of ECL revealed the presence of euphol, tirucallol, cycloartenol, methyl palmitate, 5, 9-heptadecadienoate, octadecenoate, methyl octadecenoate and

3,7,11,15-tetramethyl-2-hexadecene-l-ol (Afza et al., 1989, Goyal et al., 2012).

Apart from Sirohi, Rajasthan, Plants are a rich source of useful drugs since ancient times. In India, plants have been used for many therapeutic applications by our traditional system of medicines such as Ayurveda, Unani, Homeopathy, and Siddha. Traditional medicine system gave birth to many active compounds in early years of natural chemistry, but reports of natural products from different sources has been decreased rapidly in last decade and looking for new active compounds [1][2]. According to National Medicinal Plant Board (NMPB), a maximum number of plants using in the folk medicine compared to other documented medicine systems [3]. Now it needs to explore new natural compounds from potential folk medicinal plants and ethnomedicinal plants for better therapeutic applications. All living organisms contain an antioxidant defensive mechanism to counter the free radicals, reactive oxygen species (ROS), reactive nitrogen species (RNS) and other oxidants produced as byproducts of the metabolism. Most of the diseases caused by overproduction and reactive mechanism of free radicals [4][5]. Many medicinal plants, spices, aromatic plants using as food supplements and medicines are natural antioxidants [6]. It has been an upsurge of interest for potential antioxidants from plants sources. Euphorbia caducifolia Haines (leafless milk hedge), a folk medicinal plant belongs to Euphorbia ceae (Castor family). It is a latex-producing plant and found in rocky areas of the tropical region [7]. The plant latex is used for wound healing, leucoderma, and skin eruptions [8]. Latex and root of the plant used to treat cancer [9]. Root also used for snakebite in Maharashtra [10]. Leaf extracts of the plant were reported for its antimicrobial activity [11]. Apart, there are not many reports on phylloclade of the plant which are a rich source of biofuel and other compounds [12]. Therefore, the present study was conducted to reveal the phytochemical compounds exist in the phylloclade and to explore the ability of free radical scavenging activity as an antioxidant.

Phytochemical screening Extracts were analyzed for alkaloids, carbohydrates, glycosides, flavonoids, phenolic compounds, quinones, tannins, saponins, and terpenoids [13]. Estimation of Total Phenolic Content (TPC) The TPC of the extracts was determined using the Folin-Ciocalteu colorimetric method. 1 ml of extract was mixed with 1 ml of 1 N Folins reagents and well shaken. After 5 min, 1 ml of 10% sodium carbonate was added and incubated for 1 h at room temperature.[7,8,9] The absorbance was taken after incubation at 760 nm against blank. Total phenolic content was given as Gallic acid equivalents (GAE) [14]. Estimation of Flavonoids 0.1 ml of extract was added to 0.3 ml 5% sodium nitrite and mixed with 3 ml of 1% aluminum chloride. After 5 min incubation, 2 ml of 1 M NaOH was added and made up the volume to 10 ml with water. The solution was mixed well and measured absorbance at 510 nm against blank. The flavonoid content was calculated using rutin as standard [14]. Antioxidant Activity DPPH Scavenging Assay DPPH (2,2-diphenyl 1-picrylhydrazyl) free radical used to determine the scavenging activity of extracts [15]. DPPH (1 ml, 0.1mM) added to various concentrations of extracts and BHT (3 ml) and 0.5 h incubated in the dark and measured absorbance at 517 nm against the blank (n=3). The activity was calculated by the following equation [16]: Percentage inhibition = [(Abs control – Abs sample)/Abs control] × 100 Nitric oxide radical scavenging Activity Nitric oxide (NO) produced by Sodium Nitroprusside at pH 7.2-7.4 was determined by Griess reagent (Griess diazotization reaction). The reaction mixture (3 ml) was incubated at 25°C for 2 hr containing Sodium Nitroprusside (10 mM) and extracts with different concentrations. An Aliquot (0.5 ml) was added to Griess reagent (0.5 ml) and measured at 546nm (n=3). The activity was calculated by comparing control and test sample. Ascorbic acid used as reference compound [17].

Euphorbia is a very large and diverse genus of flowering plants, commonly called spurge, in the family Euphorbia ceae. "Euphorbia " is sometimes used in ordinary English to collectively refer to all members of Euphorbia ceae (in deference to the type genus), not just to members of the genus.[2]

Euphorbia s range from tiny annual plants to large and long-lived trees.[3] with perhaps the tallest being Euphorbia ampliphylla at 30 m (98 ft) or more.[4][5] The genus has roughly 2,000 members,[6][7] making it one of the largest genera of flowering plants.[8][9] It also has one of the largest ranges of chromosome counts, along with Rumex and Senecio.[8] Euphorbia antiquorum is the type species for the genus Euphorbia .[10] It was first described by Carl Linnaeus in 1753 in Species Plantarum.

Some Euphorbia s are widely available commercially, such as poinsettias at Christmas. Some are commonly cultivated as ornamentals, or collected and highly valued for the aesthetic

appearance of their unique floral structures, such as the crown of thorns plant (Euphorbia milii). Succulent Euphorbia s from the deserts of Southern Africa and Madagascar have evolved physical characteristics and forms similar to cacti of North and South America, so they are often incorrectly [10,11,12]referred to as cacti.[11] Some are used as ornamentals in landscaping, because of beautiful or striking overall forms, and drought and heat tolerance.[7][3]

Euphorbia all share the feature of having a poisonous, latex-like sap and unique floral structures.[7] When viewed as a whole, the head of flowers looks like a single flower (a pseudanthium).[7] It has a unique kind of pseudanthium, called a cyathium, where each flower in the head is reduced to its barest essential part needed for sexual reproduction.[7] The individual flowers are either male or female, with the male flowers reduced to only the stamen, and the females to the pistil.[7] These flowers have no sepals, petals, or other parts that are typical of flowers in other kinds of plants.[7] Structures supporting the flower head and other structures underneath have evolved to attract pollinators with nectar, and with shapes and colors that function in a way petals and other flower parts do in other flowers. It is the only genus of plants that has all three kinds of photosynthesis, CAM, C3 and C4[13,14,15]

DISCUSSION

Phytochemical analysis Phytochemical studies of extracts showed the presence of various classes of metabolites. E. caducifolia showed the high quantity of terpenoids in methanol and hexane extracts as Euphorbia species are predominant with cyclic and acyclic terpenoids [18]. Test for the presence of alkaloids shown no significant colouration. Water extract was rich in carbohydrates, glycosides, tannins, phenols, flavonoids and saponins. Further experiments revealed that the presence of acidic polysaccharides and saponin glycosides. Methanol extract contained reducing sugars, glycosides and some phenolic compounds whereas in hexane extract showed positive for reducing sugars and glycosides along with terpenoids (Table 1). Estimation of total phenolic and flavonoid content Phenolic compounds such as flavonoids and tannins are excellent free radical scavengers and protect the plant from different types of oxidative damages [19]. Water extract showed the high phenolic and flavonoid contents whereas no significant amounts observed in hexane extract. Methanol extract showed good amounts of flavonoids compared to phenolics (Table 2). Antioxidant activity of the extracts might be due to the presence of phenols and flavonoids present [20][21]. Antioxidant activity Free radicals are the most reactive molecules and damage the cells. Aerobic organisms protect themselves from free radical by the defensive antioxidant mechanism, and it is necessary to provide external antioxidants in failure defensive system [22]. The extracts were analyzed for their antioxidant capacity to use as a free radical scavenger.[16,17,18] Most of the members of the castor family are a good source of natural antioxidants such as Euphorbia hirta [14], E. heterophylla [23]. E. caducifolia extracts also exhibited antioxidant activity. The potentiality of the extract to scavenge the free radical produced was considered for antioxidant activity . DPPH and NO are the two radicals used for the experiments. All extracts were showed activity on concentration dependency. Water extract exhibited more scavenging activity towards DPPH (86±1.5%) as well NO (39.23±4.7%) to hexane extract. More free scavenging activity of water extract might be due to the presence of the high phenolic and flavonoid contents. Methanol extract also exhibited similar (DPPH-77.81±1.3% and NOSA-36.03±2.71%) to water but dropped activity frequency at high concentration of the extract. Higher antioxidant activity was observed at higher concentrations . Extracts showed less ability to scavenge the NO free radical as compared to DPPH. Euphorbia caducifolia is a promising plant for the various therapeutic applications with rich contents of terpenoids, polysaccharides, tannins, flavonoids and phenolic compounds. The presence of significant amount of total phenolics and flavonoids contents in water extract might be responsible for strong antioxidant activity as compared with methanol and hexane extract. Hexane and methanol extract can be used for the terpenoid sources and water extract for phenolics and flavonoids. High contents of terpenoids in methanol and hexane extracts are useful in various applications. A further study of isolation and characterization of bioactive molecules from the plant is required for therapeutic and multiple applications.

The common name "spurge" derives from the Middle English/Old French espurge ("to purge"), due to the use of the plant's sap as a purgative. The botanical name Euphorbia derives from Euphorbos, the Greek physician of King Juba II of

Numidia and Mauretania (52–50 BC – 23 AD), who married the daughter of Anthony and Cleopatra.[12] Juba was a prolific writer on various subjects, including natural history. Euphorbos wrote that one of the cactus-like Euphorbia s (now called Euphorbia obtusifolia ssp. regis-jubae) was used as a powerful laxative.[12] In 12 BC, Juba named this plant after his physician Euphorbos, as Augustus Caesar had dedicated a statue to the brother of Euphorbos, Antonius Musa, who was the personal physician of Augustus.[12] In 1753, botanist and taxonomist Carl Linnaeus assigned the name Euphorbia to the entire genus in the physician's honor.[13]

In Sirohi, the plants are annual, biennial or perennial herbs, woody shrubs, or trees with a caustic, poisonous milky latex. The roots are fine or thick and fleshy or tuberous. Many species are more or less succulent, thorny, or unarmed.[19,20] The main stem and mostly also the side arms of the succulent species are thick and fleshy, and often winged, 15–91 cm (6–36 in) tall. The succulent trees and large shrubs are mostly confined to southern and eastern Africa, but Euphorbia neutra is native to the Caatinga of Brazil and Euphorbia royleana is found in the Himalayan foothills.[14] The deciduous leaves may be opposite, alternate, or in whorls. In succulent species, the leaves are mostly small and short-lived. The stipules are mostly small, partly transformed into spines or glands, or missing.

Like all members of the family Euphorbia ceae, spurges have unisexual flowers.

In Euphorbia , flowers occur in a head, called the cyathium (plural cyathia). Each male or female flower in the cyathium head has only its essential sexual part, in males the stamen, and in females the pistil. The flowers do not have sepals, petals, or nectar to attract pollinators, although other nonflower parts of the plant have an appearance and nectar glands with similar roles. Euphorbia s are the only plants known to have this kind of flower head.[15]

Nectar glands and nectar that attract pollinators are held in the involucre, a cup-like part below and supporting the cyathium head. The "involucre" in the genus Euphorbia is not to be confused with the "involucre" in family Asteraceae members, which is a collection of bracts called phyllaries, which surround and encase the unopened flower head, then support the receptacle under it after the flower head opens.

The involucre is above and supported by bract-like modified leaf structures (usually in pairs)[citation needed] called cyathophylls', or cyathial leaves. The cyathophyll often has a superficial appearance of being petals of a flower.

Euphorbia flowers are tiny, and the variation attracting different pollinators, with different forms and colors occurs, in the cyathium, involucre, cyathophyll, or additional parts such as glands that attached to these.

The collection of many flowers may be shaped and arranged to appear collectively as a single individual flower, sometimes called a pseudanthium in the Asteraceae, and also in Euphorbia .

The majority of species are monoecious (bearing male and female flowers on the same plant), although some are dioecious with male and female flowers occurring on different plants. It is not unusual for the central cyathia of a cyme to be purely male, and for lateral cyathia to carry both sexes. Sometimes, young plants or those growing under unfavorable conditions are male only, and only produce female flowers in the cyathia with maturity or as growing conditions improve.

The female flowers reduced to a single pistil usually split into three parts, often with two stigmas at each tip Male flowers often have anthers in twos. Nectar glands usually occur in fives,[16] may be as few as one,[16] and may be fused into a "U" shape.[15] The cyathophylls often occur in twos, are leaf-like, and may be showy and brightly coloured and attractive to pollinators, or be reduced to barely visible tiny scales.

The fruits are three- or rarely two-compartment capsules, sometimes fleshy, but almost always ripening to a woody container that then splits open, sometimes explosively. The seeds are four-angled, oval, or spherical, and some species have a caruncle[20,21]

RESULTS

Euphorbia caducifolia is commonly found all over the Rajasthan especially in Sirohi district both in hilly and desert area. Latex of Euphorbia caducifolia is used to cure skin infections, cutaneous eruption, leucoderma and applied to cuts and wounds for speedy healing. The latex of Euphorbia caducifolia was screened for antibacterial activity. Euphorbia caducifolia extract (ECE), though the latter was used less. Gelatin is a good antimicrobial packaging material but has poor mechanical properties (like strength) and absorbs water. Adding the cacti countered these two issues. The average total solid content (TSC) of the latex was 27% and pH was found to

vary between 6 to 7. About 70% by weight of the whole coagulum (Cog) was found soluble in toluene; rest was insoluble. Toluene soluble portion (TE) was mainly composed of terpenes and terpenoids of three different molecular weights; the lowest molecular weight fraction being the dominant (82%) one. Presence of about 8% natural rubber (NR, a polyterpene), mostly of cis configuration, was also identified from the composition analysis of that portion. Due to dominant low molecular weight mass, it was tackier as compared to Cog portion when manually felt. Thermal characterization showed a low temperature melting behavior (starting at 70°C for Cog and at 104°C for TE), ideal for a tackifier resin. Both Cog and TE portions were found to exhibit high thermal decomposition temperature ensuring high process safety. The ash was rich in magnesium oxide and has a great potential to be used as the cure retarder in certain rubber compounds. Absence of any deleterious metals like copper, manganese etc. was also a great positive point towards its application standpoint.

In Sirohi, the genus Euphorbia , succulence in the species has often evolved divergently and to differing degrees. Sometimes, it is difficult to decide, and is a question of interpretation, whether or not a species is really succulent or "only" xerophytic. In some cases, especially with geophytes, plants closely related to the succulents are normal herbs. About 850 species are succulent in the strictest sense. If one includes slightly succulent and xerophytic species, this figure rises to about 1000, representing about 45% of all Euphorbia species. The milky sap of spurges (called "latex") evolved as a deterrent to herbivores. It is white, and transparent when dry, except in E. abdelkuri, where it is yellow. The pressurized sap seeps from the slightest wound and congeals after a few minutes in air. The skin-irritating and caustic effects are largely caused by varying amounts of diterpenes. Triterpenes such as betulin and corresponding esters are other major components of the latex.[17] In contact with mucous membranes (eyes, nose, mouth), the latex can produce extremely painful inflammation. The sap has also been known to cause mild to extreme Keratouveitis, which affects vision.[18] Therefore, spurges should be handled with caution and kept away from children and pets. Wearing eye protection while working in close contact with Euphorbia is advised.[18] Latex on skin should be washed off immediately and thoroughly. Congealed latex is insoluble in water, but can be removed with an emulsifier such as milk or soap. A physician should be consulted if inflammation occurs, as severe eye damage including permanent blindness may result from exposure to the sap.[19]

The poisonous qualities were well known: in the Ethiopian Kebra Nagast, the serpent king Arwe is killed with juice from the Euphorbia . [19,20,21]

CONCLUSION

Several spurges are grown as garden plants, among them poinsettia (E. pulcherrima) and the succulent E. trigona. E. pekinensis (Chinese: 大戟; pinyin: dàjǐ) is used in traditional Chinese medicine, where it is regarded as one of the 50 fundamental herbs. Several Euphorbia species are used as food plants by the larvae of some Lepidoptera (butterflies and moths), like the spurge hawkmoths (Hyles Euphorbiae and Hyles tithymali), as well as the giant leopard moth.

Ingenol mebutate, a drug used to treat actinic keratosis, is a diterpenoid found in Euphorbia peplus.

Euphorbia s are often used as hedging plants in many parts of Africa

In Sirohi, Rajasthan, Among laypeople, Euphorbia species are among the plant taxa most commonly confused with cacti, especially the stem succulents.[22] Euphorbias secrete a sticky, milky-white fluid with latex, but cacti do not.[22] Individual flowers of Euphorbias are usually tiny and nondescript (although structures around the individual flowers may not be), without petals and sepals, unlike cacti, which often have fantastically showy flowers.[22] Euphorbias from desert habitats with growth forms similar to cacti have thorns, which are different from the spines of cacti.[21]

REFERENCES

[1] Hussain, S. Sadr-Uddin & Qadir, S. A. (1970). "An autecological study of Euphorbia caducifolia Haines". Vegetatio. 20 (5/6): 329–380. doi:10.1007/BF01960959. JSTOR 20035520. S2CID 46441117.

[2] "Leafless milk hedge". Flowers of India. Retrieved 29 September 2015.

[3] "The Thar Desert". Geography Revision. Retrieved 1 October 2015.

[4] Sharma, B.K.; Kulshreshtha, Seema & Rahmani, Asad R. (2013). Faunal Heritage of Rajasthan, India: Conservation and Management of Vertebrates. Springer Science and Business Media. pp. 82, 182. ISBN 9783319013459.

[5] ^ Maffei, Massimo (2003). Dietary Supplements of Plant Origin. CRC Press. p. 217. ISBN 9780203027097.

[6] ^ Goyal, Manoj; Nagori, B.P. & Sasmal, D. (2012). "Wound healing activity of latex of Euphorbia caducifolia". Journal of Ethnopharmacology. 144 (3):

786–790. doi:10.1016/j.jep.2012.10.006. PMID 23063754 .
[7] ^ Misra, K.K. (2001). Peoples and Environment in India. Discovery Publishing House. p. 85. ISBN 9788171415861.
[8] "Euphorbia L." Plants of the World Online. Board of Trustees of the Royal Botanic Gardens, Kew. 2016. Retrieved 7 July 2015.
[9] ^ "Definition of Euphorbia ". Merriam-Webster Online Dictionary. Merriam-Webster, Inc. Retrieved 1 Feb 2016.
[10] ^ b "Euphorbia ". Fine Gardening. The Taunton Press, Inc.
[11] ^ Brenan, J.P.M.; Greenway, P.J. (1949). Check-lists of the Forest Trees and Shrubs of the British Empire #5 - Tanganyika Territory. Oxford, England: Imperial Forestry Institute. p. 214 (part 2).
[12] ^ Hargreaves, Bruce (n.d.). "Euphorbia ingens in Malawi...etc". Euphorbia Journal. 7: 78 plus diagram p. 63.
[13] ^ "World Checklist of Selected Plant Families (WCSP)". Kew Science. Royal Botanic Gardens, Kew. Retrieved 16 Apr 2011.
[14] ^ i j "Euphorbia PBI - Project Description". Planetary Biodiversity Inventory (PBI). Retrieved 1 Feb 2016.
[15] ^ b Stebbins GL, Hoogland RD (1976). "Species diversity, ecology and evolution in a primitive Angiosperm genus:Hibbertia (Dilleniaceae)". Plant Syst. Evol. 125 (3): 139–154. doi:10.1007/BF00986147. S2CID 27820065.
[16] ^ "Euphorbia botany lesson". Houzz. 30 Jun 2010. Retrieved 1 Feb 2016.
[17] ^ Carter S (2002). "Euphorbia ". In Eggli U (ed.). Dicotyledons. Illustrated Handbook of Succulent Plants. Vol. 5. Springer. p. 102. ISBN 978-3-540-41966-2.
[18] ^ "Cacti or Not? Many succulents look like cacti, but are not". CactiGuide.com. Retrieved 1 Feb 2016.
[19] ^ b c Dale N (1986). Flowering Plants of the Santa Monica Mountains. California Native Plant Society. p. 107. ISBN 978-0-88496-239-7.
[20] ^ Linnaeus C (1753). "Euphorbia ". Species Plantarum (1st ed.). p. 450.
[21] ^ Karsten and Schenk , Vegetationsbilder, Volume 15 (1924) Photoplate 6 with caption