

Chapter 5

Dioscorea hispida (Dioscoreaceae): an unexplored medico-food of India

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Abstract: Uncountable organizations and people are working on food security; still, in every corner of the world people are facing food problems. Inside our forest, number of food plants is available yet many are to be discovered and explored. Yam species are such unexplored food plants abundantly available in forests. They have food and medicinal values. Keeping the importance of the yam species, authors have discussed here the utilization of *Dioscorea hispida* Dennst in day-to-day life by the tribal communities and the future aspects to mitigate the challenges regarding the lack of food and medicines.

Keywords: Food problems, Yam, Future food, Health problems

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Introduction: Human beings from the immortal time have been using about 5538 crop species for consumption purposes, among which 12 crop species share the major percentage of food security globally. Now throughout the globe, it is estimated that more than 1000 neglected and underutilized crops rich in nutrition and stress-bearing species will be utilized in future food security (Hossain et al. 2021). Many indigenous crops are available in the culture of local and tribal people referred to as neglected and underutilized, are sources of valuable nutrients, income, therapeutic properties, and possess the potential in fighting hidden hunger (Mondo et al. 2021). Among the indigenous food, roots and tubers play an important nutritional source after grains. Yam, the edible tuberous plants, supplements staple foods with micronutrients throughout the world through preserved and starchy stored foodstuff (Faugiah and Masudah 2015; Kumar 2016). Various species from the genus *Dioscorea* (family Dioscoreaceae), tubers are a valuable source of nutrition like carbohydrates, fibers, and low levels of fats, which makes them a good dietary source (Osman 1990; Faugiah and Masudah 2015). The genus is composed of about 715 species, thrive in tropical and temperate zone (Adomenien and Venskutonis 2022). Across different ethnic communities and geographic regions, diverse species of *Dioscorea* have been adopted within different habitation as a food source due to the high nutritional benefits and therapeutic values towards the treatment and cure of certain health problems plays a significant role in food security, medicine and economy in the developing countries (Obidiegwu et al. 2020). Approximately 50 species of yam are consumed as wild harvested staples or famine food. Among them *Dioscorea hispida* or wild yam is a staple subsistence food source in some tropical regions of the world. This yam is used as medicine too. *D. hispida*, also known as intoxicating yam, grows wild in India, South East Asia, Indonesia and extends to Papua New Guinea and the Philippines (Nashriyah et al. 2012). It is a staple food in some parts of the Philippines such as Palawan, Cavite, and Batangas (Murthy 2013).

Morphological features of *D. hispida*: Strong geophytic twiner; stem twining to the left, prickly, tomentose when young; tubers subglobose or irregular, up to 38 cm in diam., covered with many fibrous roots. Leaves 3-foliolate; petioles 6 – 35cm long, prickly, glabrous or finely pubescent; leaflets- the terminal one elliptic, entire, caudate-acuminate, 3 – 5-costate, base tapering lateral leaflets much oblique, shortly 2-lobed, gibbous, broader than long; petiolules 2 – 19mm long. Male flowers in dense, short, narrowly oblong axillary spikes, 6 – 8 mm long; panicles pubescent, prickly; rachis pubescent or villous; bracts of flowers small, orbicular, concave, pubescent; inner perianth lobes oblong-obovate; anthers 6, perfect, minute; female spikes 2-nate, simple, pubescent or tomentose. Capsules are quadrate, oblong, truncately rounded, and smooth. Seeds winged at the base (Plate 1-2). Flowering: June – August; Fruiting: August – September (Ummalyma et al. 2018; Saxena and Brahmam 1995).

Ecology and associated plant species: *D. hispida* is found in regions where temperature is moderate and found to be grown in association with *Dioscorea bulbifera* L., *Cissampelos pareira* L., *Celastrus paniculatus* Willd., *Lygodium flexuosum* (L.) Sw., *Dioscorea pubera* Blume, *Elephantopus scaber* L., etc.

Ethno-medicinal values: Previous studies indicate that *D. hispida* can be used as a source of medicine & food. Ethnomedicinally this yam can be used to reduce the blood glucose. Boiled tuber is used in vomiting and indigestion. Sap of tuber is applied around the affected parts and covered with clothes for one night to treat wounds and injury. Temuan tribe uses the pounded leaves from intoxicating yam for treating sores (Nashriyah et al. 2012). Tuber is used in reducing the risk of obesity, diabetes and other related health problems (Aprianita et al. 2009). Water of the soaked tuber is used in eye problems. Crushed tubers are used in fish poisoning. In the Philippines, folk stories in rural areas claimed that eating raw or improperly cooked tuber can result in a long deep sleep (Kumar et al. 2017; Murthy 2013). The tuber contains a water-soluble toxicant, dioscorine, having insecticidal and antifeedant activities (Banaag et al. 1997; Nagata et al. 1999). Boiled tuber is traditionally been used to treat constipation too by Bhuian tribe (Present study).

Food values & methods to remove toxic constituents: Tubers of *D. hispida* are used as food sources in preparing traditional foods. Traditionally, the tuber can be detoxified by boiling, roasting or soaking in flowing water for 2-3 days. Detoxified *D. hispida* is used to be a staple food in the old days for rural and tribal people where they made it into flour, cakes, pancakes, and porridge. In Odisha state, India, it was observed that tubers are mostly soaked overnight in water or left overnight in stream and subjected to successive boiling to remove the bitterness (Present study). Then tubers are boiled to remove the toxins and the thinly sliced tuber is used in making chips (Present study). In Malvasia, villagers ate intoxicating yam with glutinous rice and grated coconut, especially during breakfast or rainy season. People in New Guinea where they sliced and boiled the *D. hispida* tubers for two days to remove their toxin before cooking. Sakai people in Thailand also removed the toxin by prolonged boiling with wood ashes before eating the yam (Nashriyah et al. 2012; Kumar et al. 2017). Day by day this nutritious food has been forgotten because of the difficulties of the traditional detoxification process (Hudzarin et al. 2011; Ashri et al. 2014).

Pharmacological values: *D. hispida* is rich in primary and secondary metabolites. It shows the presence of carbohydrates, proteins, alkaloids, glycosides, saponins, tannins, phenolic compounds etc. Tubers of this yam are potentially active as an antimicrobial agent due to the high content of alkaloids and other bioactive compounds. Dioscorine is a type of toxic alkaloid, removed from the tuber prior to consume has pharmacological values (Hazrin-Chong et al. 2018). *D. hispida* also possesses high antioxidant and thrombolytic activities due to presence of phenolic compounds (Miah et al. 2018). Previous studies have demonstrated that *D. hispida* shows insecticidal properties as well as free radical scavenging properties



Plate 1: Leaf of *D. hispida* in wild habitat



Plate 2: Plant parts of *D. hispida*

(Bhamarapravati et al. 2003; Otake et al. 1995). *D. hispida* has also been used as a coating material on rubber wood and demonstrated repelling activity against white-rot fungi and termites (Mat Lazim et al. 2016). *D. hispida* possesses significant anticancer and antioxidant activity due to its higher saponins and phenolic content (Kumar et al. 2011). It has also hypoglycaemic polysaccharides that are able to reduce blood glucose levels (Estiasih et al. 2012). Further investigation on different biological activities is needed.

Conclusion: Adequate foods and medicines are the contemporary problems in most of the nations. There are numbers of medico-food plants are available in our forest and information attached with our cultures and ethnic values, still we are searching such agent and facing above both problems globally. Therefore, there is need to explore the plants used as medicine & food by the ethnic communities. For this purpose, *D. hispida* is such tuberous plant need to address its importance in the above aspect. Present study concluded that it has sound ethnomedicinal and food values. It could be used to formulate new drugs and to mitigate the food problems in its distributional areas of the world.

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