

Bioprospecting Potential of *Hibiscus sabdariffa* L.

for Access and Benefit Sharing



Pictures taken from Suresh and Ammaan (2017)

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1. Introduction

Ethiopia is one of the top biodiversity-rich countries in the world. The country is endowed with greater diversity of plant, animal and microbial genetic resources (EBI, 2014). The variable agro-ecological conditions and availability of diverse floral resources makes the country one of the very suitable places for the existence of large and unique biodiversity both in plants and animals. However, like any other developing countries, Ethiopia lacks technical expertise and monetary funds to explore and use the genetic resources and associated traditional knowledge significantly. Therefore, the only option for Ethiopia is to collaborate with the developed nations or domestic investors and interested one in pharmaceutical, cosmetics, medicinal and oil production industries and other companies alike to explore the genetic resources jointly and strategically.

Ethiopia has issued a proclamation on access to genetic resources and community knowledge, and community rights (Proclamation No 482/2006 and Regulation 169/2009). The Proclamation includes ownership, user rights, conditions for access, benefit sharing, types of benefits, powers and responsibilities between users and providers are the main frameworks. These procedures can be achieved in the Access and Benefit Sharing Directorate of the Ethiopian Biodiversity Institute. Based on these frameworks, the country has been implementing access and benefit sharing objective of the Convention on Biological Diversity (CBD).

Therefore, the objective of this information is to motivate and encourage any bioprospecting company or an interested individual to work on the genetic resources *Hibiscus sabdariffa* L. for medicinal uses, flavoring and preservative agents, food production, cosmetics, and the like.

2. Description of the plant

Hibiscus sabdariffa L. or or “Roselle” belongs to the family Malvaceae. It is locally called “Kerkede” (in Amharic) and Roselle or red sorrel (in English). It is an important annual herb grown up to 1.5 m successfully in tropical and subtropical climates (Mohamed *et al.*, 2012). The plant was originated from India, now cultivated throughout the tropics. The leaves and fleshy calyces are eaten as vegetables. The fleshy calyx (sepals) surrounding the fruit (capsules) are commercially important parts of Hibiscus. The whole plant can be used as a beverage. The dried calyces can be soaked in water to prepare a colorful cold drink, or may be boiled in water and taken as a hot drink. It also has some medicinal properties (Mohamed *et al.*, 2012). Moreover,

the leaves are used for animal fodder and fibre (Plotto, 2004). The seeds can be used to feed poultry and sheep. The residue from the seed oil extraction can be used to feed cattle and chicks (Mukhtar, 2007).

3. Distribution

Hibiscus sabdariffa is mainly cultivated for its calyx. There are three types of calyces: green, red and dark red, of which the red calyces, characterized by their concentration of anthocyanin, are the most frequently used. *Hibiscus sabdariffa* probably originates from Africa, where it might have been domesticated in Sudan about 6000 years ago, first for its seed and later for leaf and calyx production. In tropical Africa it is especially common in the savanna region of West and Central Africa (McClintock and El Tahir, 2011). The plants also currently cultivated by small land holding farmers of Ethiopia around Wondogenet in rotation, or as intercrop with fruits and deep-rooted crops to enhance per unit area return (Tamirat Girma *et al.*, 2014).

4. Chemical composition

Hibiscus sabdariffa L. or “Roselle” is rich in organic acids, minerals, amino acids, carotene, vitamin C and total sugar in its calyx, leaves and seeds at variable levels depending on the variety and geographical area (Mady *et al.*, 2009). The fresh calyces of *Hibiscus sabdariffa* L. contain moisture 88.26%, acid 3.74-4%, pectin 3.19%, crude protein 1.45%, ether extractives 1.97%, carbohydrates 5.86%, crude fibre, ash 0.87%, calcium 0.108%, phosphorus 0.052%, iron 0.021%; manganese, aluminium, sodium and potassium in traces, reducing sugars 0.82%, sucrose 0.29%, mucilage, gossypetin, hibiscitin chloride, ascorbic acid and anthocyanins. The seeds contain moisture 12.9%, nitrogen 3.29%, fatty oil 16.8%, cellulose 16.8%, pentosans 15.5%, starch 11.1%, myricetin, quercetin, protein 3.28% and lipids 21.1%. In addition, eighteen amino acids have also been identified and quantified (Suresh and Ammaan, 2017).

5. Medicinal uses

Hibiscus sabdariffa or “Roselle” is medicinal plant famous worldwide for having various medically important compounds called phytochemicals, well-known for its nutritional and medicinal properties. Seeds, leaves, fruits and roots of the plant are used as food and herbal medicine (Singh *et al.*, 2017) such as to treat common cold, prevent constipation, attract water (which, in turn, softens stool), facilitates the absorption of iron and thus strengthens the body’s

resistance to infection and fight against viruses (Suresh and Ammaan, 2017). Besides the dried calyx and fruit are used for tea, which is drunk either with hot or cold beverages, fermented drinks, wine, jam, jellied confectionaries, ice cream, chocolates, flavouring agents, puddings and cakes (Okoro, 2007). Hibiscus flower is mainly used as a sweet-sour, caffeine free health drinks. It is also a common additive of tea mixtures for its taste and colour. Traditionally it is used to treat appetite loss, colds, catarrh of the respiratory tract, as laxative and diuretic.

Mishra (1999) reported that compounds such as flavonoids, anthocyanins, triterpenoids, steroids and alkaloids, which are isolated and characterized from Roselle have antibacterial, antifungal and anti-parasitic actions. Roselle is rich in phenolic compounds, such as protocatechuic acid. This compound demonstrated *in vitro* protective effects against cytotoxicity and genotoxicity of hepatocytes induced by tert-butylhydroperoxide (t-BHP), through inhibiting action on DNA repair synthesis caused by t-BHP and by showing radical quenching effect (Tseng *et al.*, 1996). The calyces of *Hibiscus sabdariffa* can be used as a substitute source of the current ineffective synthetic antibiotics used against multi-drug resistant *Acinetobacter baumannii* (Emad, 2016).

Oil extracted from seeds of Roselle has been shown to have an *in vitro* inhibitory effect on *Bacillus anthracis* and *Staphylococcus albus* (Gangrade *et al.*, 1979). Moreover, hibiscus extract is reported to have antibacterial effect on *Streptococcus mutans* (Afolabi *et al.*, 2008) and on *Campylobacter species* (Yin and Chao, 2008). Roselle is also used as effective antioxidant due to its potent antioxidants such as poly-phenolic acid, flavinoids and anthocyanins (Crawford *et al.*, 1998).

6. Conclusion

Any bioprospecting company with an interest in the plantation, conservation and sustainable utilization of *Hibiscus sabdariffa* for bioprospecting or using it for commercial purposes is welcome to access the genetic resource by fulfilling the access procedures on Ethiopian Access and Benefit Sharing law: Proclamation No 482/2006 and Regulation 169/2009.

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