Bioprospecting Potential of *Solanum nigrum* for Access and Benefit Sharing Agreement

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1. Introduction

Many tribes and cultures in Africa have an elaborated knowledge base of plants, most of which is still entirely transferred orally within the family unit or community. In developing countries, medicinal plants offer a real substitute for the treatment of human and animal ailments (Feo, 1992). Medicinal plant species can be utilized as remedies in prevention of various ailments in most part of Ethiopia (Birhan Wubet *et al.,* 2011). *Solanum nigrum* is identified as one of these having medicinal potentials and can be introduced for access and benefit sharing activities in Ethiopia.

According to the access and benefit sharing provisions of the Convention on Biological Diversity (CBD), rules and regulations had been designed to facilitate the physical access to genetic resources (and in some cases valuable traditional knowledge associated with genetic resources that comes from indigenous local community) and to ensure that any benefits derived from their utilization are shared equitably with the Providers. Therefore, the objective of this review is to encourage Users to access this identified valuable genetic resource potential for various purposes by concluding an ABS agreement with the Ethiopian Biodiversity Institute (EBI).

2. Plant description

Solanum nigrum is a dicot weed in the Solanaceae family that belongs to the Genus Solanum, which is commonly known as Black Nightshade and locally known as *Tikur awit* (Amharic) and *Hadhaawaa* or Shamara'e (Af/ Oromo). It is an erect, much-branched annual plant growing up to height of 60 cm (Hameed *et al.,* 2017). The bark is thin and easily peeled off exposing pale yellow wood. The flowers have five petals and are generally regular in shape. They may be round and flat or star-shaped, but are often bell-shaped or tubular. Members of this family are often climbers or at least scrambling plants, often with hairy stem and leaves. The leaves are variable, may be entire or dissected, without stipules, and are usually alternate (Rani *et al*., 2017).

3. Ecology and distribution

Solanum nigrum is a common herb found in wooded areas. It forms one of the largest, the most variable and widely distributed species groups in the genus *Solanum.* They are distributed from temperate to tropical regions and from sea level to high altitudes. They are commonly distributed

at an altitude of 700-2350 m in Amhara, Oromia and Southern Nations, Nationalities and Peoples' Region (SNNPR) (Hedberg *et al*., 2006).

4. Chemical composition of *Solanum nigrum*

Green unripe fruits of *Solanum nigrum* contain glycoalkaloids which becomes toxic to humans as well as livestock upon consumption. The following bioactive compounds were isolated from *S. nigrum*: solamargine, solasonine, solanine, α and β-solamagrine, solasodinsolanidine (0.09-0.65%). Solamargine and solasonine are also found in leaves. Solanine is found in all parts of the plants, which increases as the plant matures, though it is apparently modified by soil type and climate (Chauhan *et al*., 2012). Phytochemical constituents of methanolic extract of leaves of *Solanum nigrum* are alkaloids, tannins, saponins, carbohydrates and reducing sugars (Okunrobo *et al*., 2011). Similarly, the whole plant was reported to have phytochemicals such as glycosides, flavonoids, proteins, coumarins and phytosterols. Small unripe fruits of *Solanum nigrum* had a high concentration of solasodine, but both the concentration and the absolute amount per fruit decreases with fruit maturation (Nyeem *et al.*, 2017; Hameed *et al.*, 2017). Likewise, ascorbic acid in the fruits of *Solanum nigrum* and the concentration of ascorbic acid is more in fruit than in root (Kapoor *et al.*, 2004). In addition, *Solanum nigrum* seeds have high lipid content and considerable protein content and mineral elements (prominently Mg). *Solanum nigrum* oil is an important source of linoleic acid (Dhellot *et al*., 2006). Wang *et al*. (2007) also reported that 5 non-saponins, namely, 6-methoyhydroxycoumarin, syringaresinol-4-O-beta-D-glucopyranoside, pinoresinol-4-O-beta-D-glucopyranoside, 3, 4-dihydroxhbenzoic acid (IV), p-hydroxybenzoic acid and 3- methoxy-4-hydroxyienzoic acid were isolated.

5. Significance

Solanum nigrum is a potential genetic resource for bioprospecting due to its active phytochemicals in the whole plant (leaves, roots, seeds and flowers).

6. Medicinal Use

Solanum nigrum is a locally wild edible plant. It is an African pediatric plant utilized for several ailments such as feverish convulsions, eye diseases, hydrophobia and chronic skin infections. It is a potential herbal alternative which acts as an anti-cancer agent (Rani *et al.*, 2017).

The whole plant is alterative, antiperiodic, antiphlogistic, aphrodisiac, diaphoretic, diuretic, emollient, febrifuge, laxative, narcotic, purgative, sedative, stimulant and tonic. Only the fully ripe fruits should be used, the unripe fruits contain the toxin solanine. The leaves, stems and roots are used externally as a poultice; wash etc. in the treatment of cancerous sores, boils, leucoderma and wounds. Extracts of the plant are analgesic, antispasmodic, anti-inflammatory, sedative, vasodilator and vulnerary (Ecocrop, 1993-2007; Useful Tropical Plants Database, 2014).

Furthermore, the berries and leaves are mainly used for medicinal purposes. The leaves are used as poultice for rheumatic and gouty joints, skin diseases, in the treatment of anti-tuberculosis and in the production of excessive sweating (Diaphoresis). Leaves are also used to treat dropsy, nausea and nervous disorders. The decoction of the berries and flowers are useful in cough as a remedy for pulmonary tuberculosis and bronchitis, diuretic. The juice of the berries is used as an antidiarrhoeal, and in treatment of ophthalmopathy, hydrophobia and heart disease. Berries are used to possess tonic, diuretic and cathartic properties. Similarly, leaves and berries of *Solanum nigrum* are commonly used in South India for the treatment of gastric ulcers, cardioprotective activity, gastritis and other gastric problems (Nyeem *et al*., 2017; Bhatia *et al.,* 2011). Besides, their plant extracts have great potential as immune-stimulant against microorganisms and thus can be used in the treatment of infectious microbial diseases (Hanifa, 2011).

Both the crude extracts and isolated components of *S. nigrum* possess antiproliferative activity in various cancer cell lines. In addition, the aqueous leaf extract of *S. nigrum* provides protection against induced seizures in rats and a significant dose-dependent protection in chicken. In general, *S. nigrum,* a widely used plant in oriental medicine, has been shown to possess various activities such as antitumorigenic, antioxidant, antiproliferative, wound healer, phytoremediation, anti-inflammatory, anti-seizure, anti-pyretic, anti-poison, hepatoprotective, diuretic, and antipyretic (Rani *et al.*, 2017; Jain *et al*., 2011). The species was found to be effective in removing Polychlorinated Biphenyls (PCBs) from the soil and detoxifying them (Ecocrop, 1993-2007; Useful Tropical Plants Database, 2014).

Therefore, *Solanum nigrum* should be promoted as the plant genetic resource potential for bioprospecting due to the active phytochemicals in the whole plant, leaves, berries, roots and flowers), and its considerable number of medicinal uses mentioned above.

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