

The *Solanum nigrum* Complex (Black Night Shade) Grown in the Rift Valley, Western and Nyanza Provinces of Kenya

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Abstract: *Solanum nigrum* complex comprises of plant species that belong to *Solanum* section *Solanum* used as indigenous leafy vegetables in Kenya among many communities. The *Solanum nigrum* complex species have also been used traditionally as medicine. Many species make up the *Solanum nigrum* complex, and some include *S. scabrum*, *S. villosum*, *S. americanum*, *S. nigrum*, *S. americanum*, and *S. physalifolium*. The purpose of this study was to determine the species of *Solanum nigrum* complex found in Rift Valley, Nyanza and Western provinces of Kenya. Samples were collected from Eldoret-Iten, Kisumu-Nyando, Kisii-Nyamira, Nakuru, and Busia then pressed and sent to a plant taxonomist in Egerton University for classification and identification. It was established that the collected samples belonged to *S. nigrum*, *S. scabrum*, and *S. villosum* species. The morphological characteristics used to distinguish the species included shape and colour of the stems, size and shape of the leaves, size, shape and colour of the berries, and the inflorescence. *S. nigrum* was widely found in some regions with a noticeable bias towards *S. scabrum* that was preferred due to its large size of leaves and taste when cooked. However, the distribution and presence of *S. nigrum* and *S. villosum* in some of the study regions was poor.

Key words: *Solanum nigrum* complex, *S. scabrum*, *S. villosum*, *S. nigrum*.

1. Introduction

Solanum nigrum complex comprises of plant species that belong to *Solanum* section *Solanum* used as indigenous leafy vegetables in Kenya among many communities. The *Solanum nigrum* complex species have also been used traditionally as medicine. Many species make up the *Solanum nigrum* complex, and some include *S. scabrum*, *S. villosum*, *S. americanum*, *S. nigrum*, *S. americanum*, and *S. Physalifolium*. Manoko [1] identified nine African species, while Maundu et al. [2] identified five nightshade species considered common in Kenya. They include: *Solanum physalifolium*, *Solanum villosum* Miller, *Solanum nigrum* L., *Solanum scabrum* Miller, and *Solanum americanum* Miller. The genus *Solanum* is large and contains other groups with *Solanum nigrum* L. being

the most variable group. African nightshades are among the indigenous plant species used as leafy vegetables in Kenya [3] that continue to be cultivated by many Kenyan communities. The *Solanum* species do display varying amounts of phenotypic variation, mainly in their vegetative features such as stem winging, leaf size and shape, and plant habit. Usually, senescence occurs with fewer and smaller fruits and flowers with a variation in the pigmentation of the flowers [4]. They are nutritionally rich in calcium, iron, and vitamins A and C [5]. *Solanum nigrum* which is a synonym of *Solanum villosum* is believed to have originated in Eurasia, is widespread and found in Africa e.g. Kenya. Leaves and young shoots of sparsely hairy types of *Solanum nigrum* are used as a leafy vegetable and form an important part of traditional medicine in Africa. In Kenya, unripe fruits soothe toothache, and are squeezed on babies' gums to ease pain during the early stages of teething to ease

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pain. Leaves are used to treat stomachache and extracts from leaves and fruits are used to treat tonsillitis. They are, however, also widely used as leafy herbs and vegetables, as a source of fruit and for various medicinal purposes to treat ailments such as Malaria, stomach ache, colds and coughs, high blood pressure, diabetes, chest pains [6]. The plant is also used in the oriental systems of medicine for various purposes—as an antitumorigenic, antioxidant, anti-inflammatory, hepatoprotective, diuretic, and antipyretic agent [7]. The purpose of this study was to determine the species of *Solanum nigrum* complex found in Rift Valley, Nyanza and Western provinces of Kenya.

2. Materials and Methods

2.1 Study Area

Samples were collected from Eldoret-Iten, Kisumu-Nyando, Kisii-Nyamira, Nakuru, and Busia. The collected samples were pressed, and sent to a plant taxonomist in Egerton University for classification and identification.

2.2 Sample Collection

A consultation survey was carried out in the study areas where agricultural extension officers were used to provide knowledge on the *Solanum nigrum* complex species grown in the region. However, the market vendors commonly and locally known as “mama mboga” proved vital in providing the necessary information on the available species. They majorly referred to the species using two terms: “Kienyeji”, which is a local word that means Indigenous, and is used to refer to the Indigenous species, and “Agriculture” which is a term used to refer to the improved varieties that they get seeds in the agricultural stores. All the available samples in all the areas were collected, and labeled immediately using the local names pending identification. Pressed samples were taken to a taxonomist at Egerton University for identification. Clear photos and berries

taken from the field proved important in carrying out classification of the samples.

2.3 Morphology Descriptor List

A morphology descriptor list was made and developed using the morphological features described by [4]. The variations observed were used to revise the descriptor list in order to cover all the plant samples collected in all the study areas. Morphological characteristics were scored using the final version of the descriptor list. A magnifier was used to differentiate the hair-types. The morphological characteristics were observed at various points that included whole plants, stems, leaves, fruiting pedicel, inflorescence, flowers, corolla, anthers, styles, sepals and berries.

3. Results and Discussion

The eleven populations of samples collected were narrowed down and classified into three different species namely *S. villosum*, *S. nigrum*, and *S. scabrum*. General morphological characteristics like colour of ripe berries, leaf size and shape helped to group the samples into general groups. The *S. scabrum* species is morphologically characterized with broad leaves, with its ripe seeds being black in colour but differ in size from the *S. nigrum* Mill berries, which are smaller [8]. In Busia, *S. scabrum* was popular with the locals due to its large size of leaves and lack of the bitter taste. However, it was noted that its seeds were readily available in the agricultural stores. *S. scabrum* had presence in all the study areas except Kisii-Nyamira where the locals prefer to use *S. villosum* and *S. nigrum* Mill. *S. nigrum* is an indigenous variety that grows naturally in Nyamira, Busia, and Nakuru. It is characterized with its bitter taste. In Nakuru, it usually grows in the wheat and maize plantations. Both the locals in Nyamira and Busia consider the bitter *S. nigrum* to possess medicinal value. The locals in the Kisii community believe that it cures malaria and this justified the findings reported by [9]. In Eldoret-Iten,

S. villosum has popularity and its consumption is high compared to *S. scabrum* that is also available. *S. villosum* was characterized by its less bitter taste when cooked. The leaves for this species appeared to have a serrated margin. Majority of the locals, who are the Kalenjin speaking, do not have knowledge of *S. nigrum* and therefore they do not plant it. Farmers have done extensive farming of *S. villosum* variety although *S. scabrum* is scantily planted. There was no evidence to point out the availability of naturally growing varieties in Eldoret-Iten. Farmers, who acquired the seeds from the agricultural stores, grew the two species. In Kisumu-Nyando, *S. nigrum* and *S. scabrum* were the popular varieties with *S. villosum* lacking. The seeds for *S. nigrum* and *S. scabrum* were not edible unlike *S. villosum* which were edible. The colour and size of the berries was a major distinguishing feature. *S. villosum* has orange berries while *S. nigrum* and *S. scabrum* both have black to purple berries, which differ in size. *S. nigrum* berries are small (8-11 mm) while *S. scabrum* berries are large (16-20 mm).

3.1 *S. nigrum* Complex Morphological Characteristics

S. villosum: Whole plants: grows up to 1.3 m high with hard spreading branches. Stem: green in colour with dark purplish nodes; internodes measure up to 70-100 mm; short hairs are present. Leaves: both small and medium sized, ovate with smooth margins with some serrated; green in colour with light green, networked veins; short erect hairs present on the surface. Fruiting pedicel: longer, reflexed. Inflorescence: 3-4 flowers, simple and cymose. Flowers: 9-11 mm; corolla: white; anthers: yellow and somehow conspicuous; sepals: green, ovate and reflexed away from berry. Berries: 9-10 mm, orange, globose and remains attached to the plant when ripe.

S. nigrum: whole plant: grows up to 1 m high with wide spreading branches. Stems: purple stems, purple nodes, internodes measure up to 65-90 mm. Leaves: ovate with smooth margins, pointed apex, dark green



Fig. 1 *S. villosum*.



Fig. 2 *S. nigrum*.

in colour with purple-networked veins, short hair seen with bare eyes on underside. Fruiting peduncle: faces upward. Fruiting pedicel: reflexed. Inflorescence: mixture of cymes and forked cymes on same plant, 7-10 flowers. Flowers: 10-14 mm; Corolla: white and fused at the base; anthers: yellow; sepals: triangular ovate reflexed away from the berry but occasionally adherent. Berries: 8-11 mm, purple to black and remain stuck on plant when ripe.

S. scabrum: whole plant: erect with lateral branches spreading horizontally. Stems: highly winged (dented) and succulent, green to purplish green, glabrous (no



Fig. 3 *S. scabrum*.

hair), internodes measure up to 80 mm. Leaves: ovate, wide and large, smooth entire margins, green to dark green in colour, green to purple vein colour and networked. Fruiting peduncle: faces upward. Fruiting pedicel: reflexed or erect. Inflorescence: cymose, many flowered. Flowers: showed variations in colour, white, others purple with a yellow basal star. Sepals: reflexed away from mature berry. Berries: ovoid and broad, 16-20 mm in diameter, purplish in colour, shiny, and remains on plant when ripe.

4. Conclusions and Recommendation

The research study revealed that there are three species of the *Solanum nigrum* complex found in the rift valley, western, and Nyanza provinces of Kenya. There were variations of the species that are cultivated in the different provinces largely influenced by the taste, economic reasons, and sensitization by agricultural extension officers. In some areas, some variants were preferred more than the others were. Mostly, those who considered it to have medicinal value preferred *S. nigrum*. It is recommended that more research be carried out to determine why some variants are not available in some areas for example in Eldoret-Iten where only *S. scabrum* and *S. villosum*

are cultivated. The fact that in some areas farmers depend on commercially available seeds raises questions if whether *Solanum nigrum* complex species were introduced into that area. This is yet to be determined through more research.

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