POLICY BRIEF

APRIL 2019

The *Solanum nigrum* complex: The solution to common infectious diseases in the developing countries

Background

African indigenous vegetables (AIV) are an important livelihood resource that communities have depended on from time immemorial. They have unrealized potential to improve the health status of at-risk population and also form a significant source of food in both rural and urban areas. Various indigenous vegetables are cultivated worldwide. Surveys indicate that there are over 7,000 plant species across the world that are cultivated or harvested from the wild for food including the indigenous vegetables (Schönfeldt and Pretorius, 2011). Of the 150 plant species commonly consumed by man, 115 are indigenous African species. Studies by Schönfeldt and Pretorius, 2011 , observe that these neglected and underutilised species could play a crucial role in food security, income generation and food culture of the rural poor. Plant Resources of Tropical Africa revealed an estimated 6,376 useful indigenous African plants of which 397 are vegetables (PROTA, 2004). East Africa has a variety of these vegetables. These include African nightshade, spider plant, vegetable amaranth, slender leaf, jute mallow, cowpeas, pumpkin leaves, African kales and African eggplant among many others (Abukutsa Onyango et al., 2007; Netondo et al., 2010). In the rural areas of Tanzania, it was recognised that thirty types of indigenous vegetables are commonly utilised. These vegetables were found to be highly nutritious, have medicinal value and generated income to the farmers (Abukutsa, 2007).

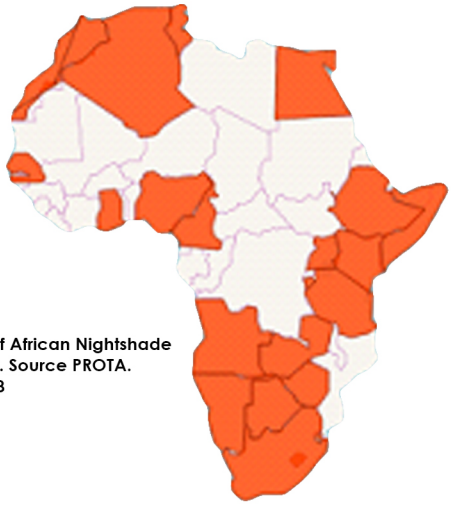
What is the issue?

Their production and consumption is, however, challenged with decline. It is observed that the age of discoveries and colonialism brought new species of crops and weeds, some of which became important sources of vegetables. Intercommunity exchange occurred mainly during intermarriages, trade and during famine. These early interactions not only increased the range of species but also the practice of eating vegetables.. According to Plant Resources of Tropical Africa (PROTA), an estimated 6,376 useful indigenous African plants exist; and 397 of these are vegetables (PROTA, 2004). Africas annual per capita production of vegetables approximated at 50kg is lower than the rest of the world, and is declining (Kamga et al., 2013). There are large differences in the amount of vegetables consumed in different Sub-Saharan African (SSA) countries. The level of vegetable consumption is very low in some countries. For instance, Ethiopia has 20kg/person/year, Malawi, Tanzania and urban Guinea has 40kg/person/year and Ghana has 50kg/person/year. Kenya stands out with an average vegetable consumption of 147kg/person/year in urban areas and 73kg/person/year in the rural areas.

Diversity of indigenous vegetables has been seriously eroded due to environmental, political and socioeconomic factors. As a result, most African countries have not prioritised these indigenous vegetables in crop development (Ngugi et al., 2007). This negates the benefits that the vegetables have in serving human communities that depend on them.). This progressive erosion of genetic and species diversity, knowledge that sustained production and value system also has a negative impact on adaptive solutions developed by the community in responding to social and environmental problems.
In a study done in Western Kenya, Abukutsa (2007) however observed that indigenous vegetable cultivation continue to face challenges of optimal production. Their cultivation is confined to subsistence levels, hence their potential for commercial production has not been tapped into adequately enough yet the region continues to face high poverty levels.

What is known about African nightshades (Solanum nigrum complex) in Kenya

Kenya has many, about 200, wild and weedy species of edible leafy vegetables t distributed across various counties and in many regions such as the Coast, Western, Lake Victoria and Kenyan highlands. A few of these species have been domesticated or are semi domesticated, and most of them grow as weeds or wild in disturbed and cultivated areas.. The diversity of AIVs is said to be influenced by cultural diversity and historical influence as seen in the many species of AIVs used as food. Indeed, a species can be food in one community and not in another community.(Ekesa et al., (2009) documented various indigenous vegetables available and popularly consumed among the Abaluyia. These included cowpeas leaves, jute mallow, amaranthus, pumpkin leaves, spider plant, African kales, African nightshades, slender leaf, mushroom and African vine. African leafy vegetables (ALVs) are rich in mineral nutrients and have medicinal value (Abukutsa-Onyango, 2007).
For example, amaranth and African nightshade can be used to feed those people with human immune deficiency virus (HIV/AIDS) since they are both nutritive and therapeutic (Abukutsa-Onyango, 2007). Therefore, the vegetables can be used to eliminate malnutrition and promote healthy diets in Africa, through the increased production and consumption.



Geographical Distribution of African Nightshade (Solanum species) in Africa. Source PROTA. Updated 28 November 2018

The leaves and seeds provide vitamins A and C, calcium, iron, protein, carbohydrates and lipids () (Abukutsa-Onyango, 2007).
Narrow-leaved African nightshades, also called mnavu in Swahili, is widely distributed throughout the tropics and can be found throughout East Africa.
The leaves are eaten as a cooked vegetable, often mixed with other vegetables and the fresh fruit is also consumed. Some Solanum varieties are preferred for their bitter taste while others are considered 'sweet', particularly after being boiled and the water discarded. The raw leaves contain 4% protein, 6% carbohydrates and are moderately high in Vitamin C.
Solanum species that are found in Kenyan and Tanzanian vegetable gardens include *S. americanum*, *S.scabrum* and *S.villosum*. *Solanum* plays an important role in traditional medicine in Africa and elsewhere. Five nightshade species are considered common in Kenya. Three different species of the *S. nigrum* complex growing in Western and the Rift Valley of Kenya have been identified to have antimicrobial activities (Matasyoh et. al., 2014) among other nutritional benefits. However, there is concern that these vegetables in most instances are eaten to satisfy instead of meeting the healthy demands

Required action

With 60% of the Kenyan population living below the poverty line, resulting in malnutrition and poor health, there is need for a paradigm shift in the production patterns to harness the nutrition and economic potential of indigenous vegetables. In recent years,

Kenyans have seen an increase in diet related ailments such as cardiovascular diseases, diabetes and anaemia. Indigenous vegetables are micro nutrient dense and could prove a powerful weapon in the fight against poverty and malnutrition since they are suited to local conditions. In addition, studies on antimicrobial and antifungal activities of the *S. nigrum* complex of Kenya (Matasyoh et.al., 2014) showed that different species of the *S. nigrum* complex have a considerable amount of antimicrobial activity, implying the presence of different phytochemical compounds (Table 1).

Compound	K01L	K02L	K03L	K04L	K05L	K06L	K07L	K08L	K09L	K10L
saponins	+	+	+	+	+	+	+	+	+	+
Tanins	+	+	+	+	+	-	-	-	-	-
Sterois	+	+	+	+	+	+	-	-	-	-
Cardiac glycosides	-	+	+	+	+	+	+	+	+	+
Flavanoids	+	+	+	+	+	+	+	+	+	+
Phlabotanins	-	-	-	+	-	+	+	+	+	+
Terpenoides	+	+	+	+	+	+	+	+	+	+
Alkaloids	+	+	+	+	+	+	+	+	+	+
Phenoilic Compounds	+	+	+	+	+	+	+	+	+	+

Table 1: Phytochemical composition of liquid samples of the *S.nigrum* complex

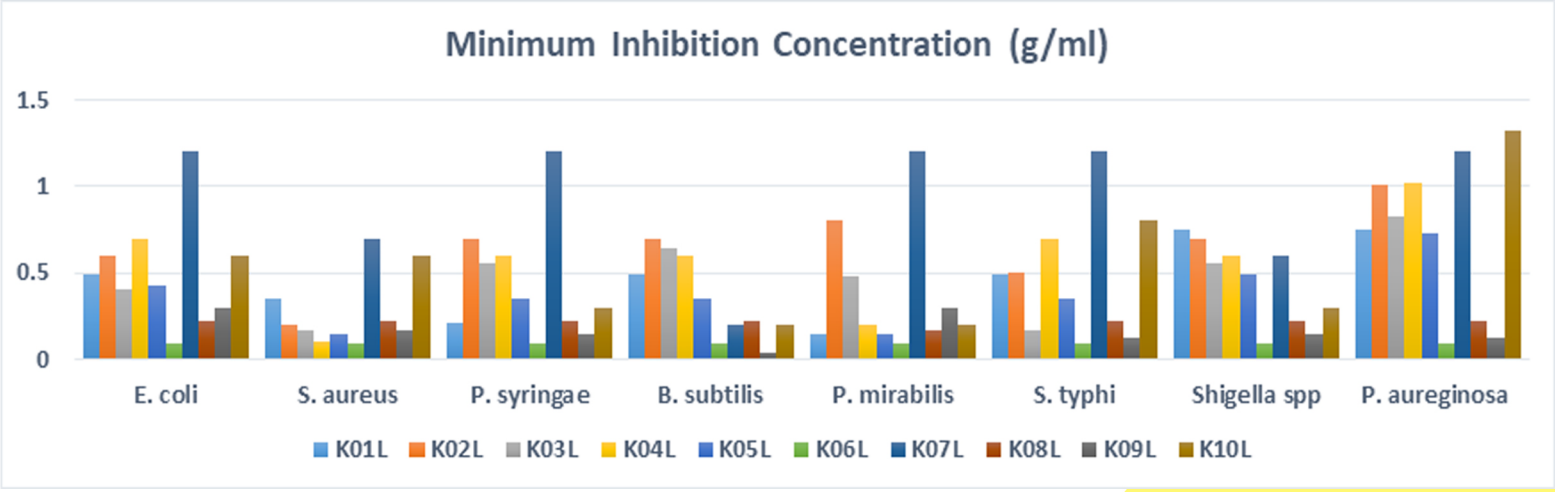
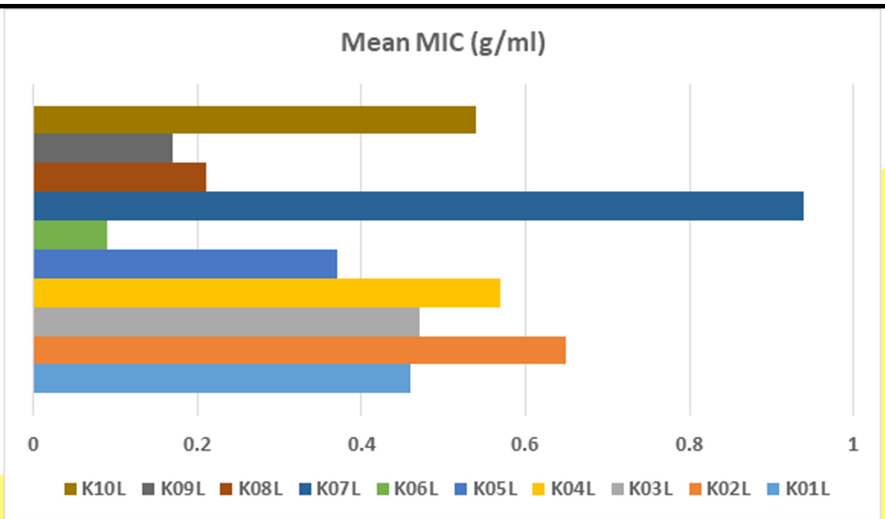
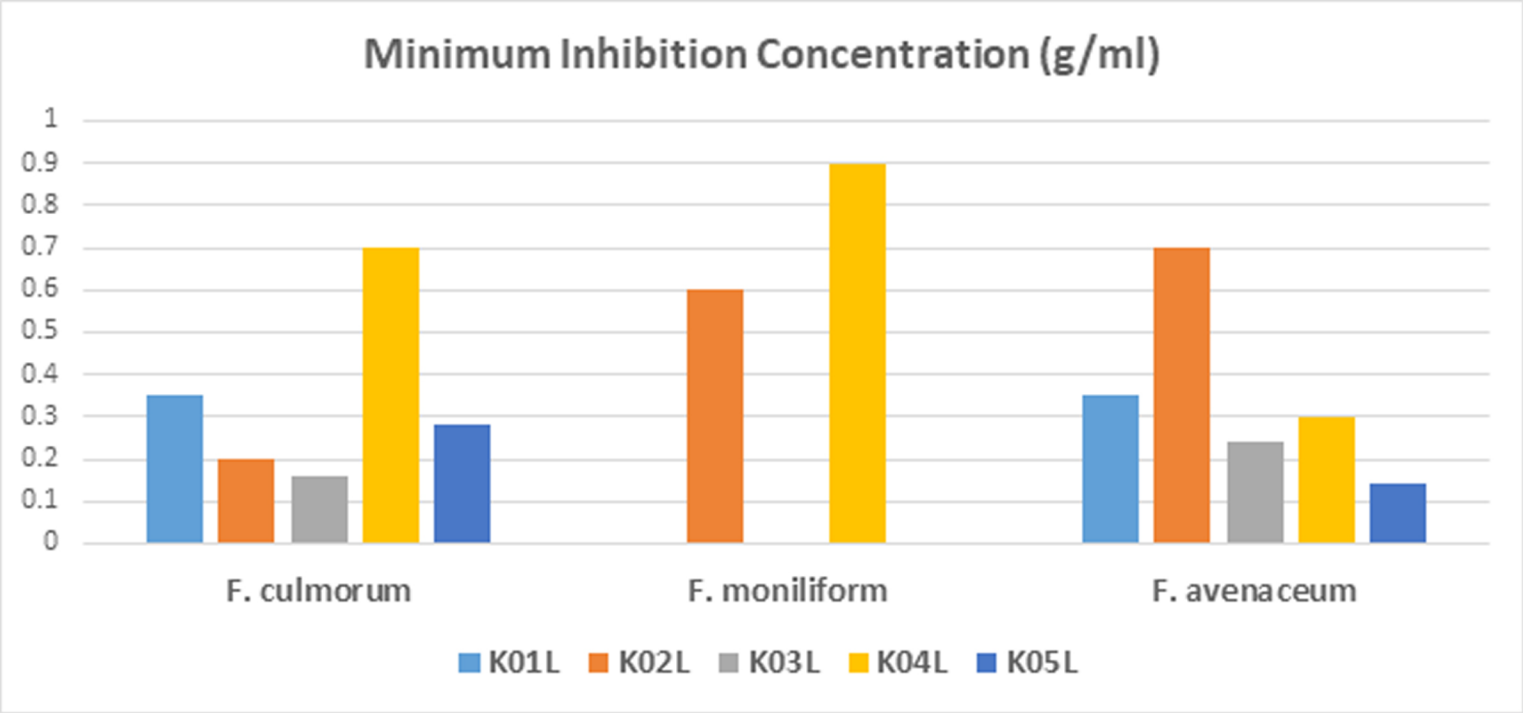


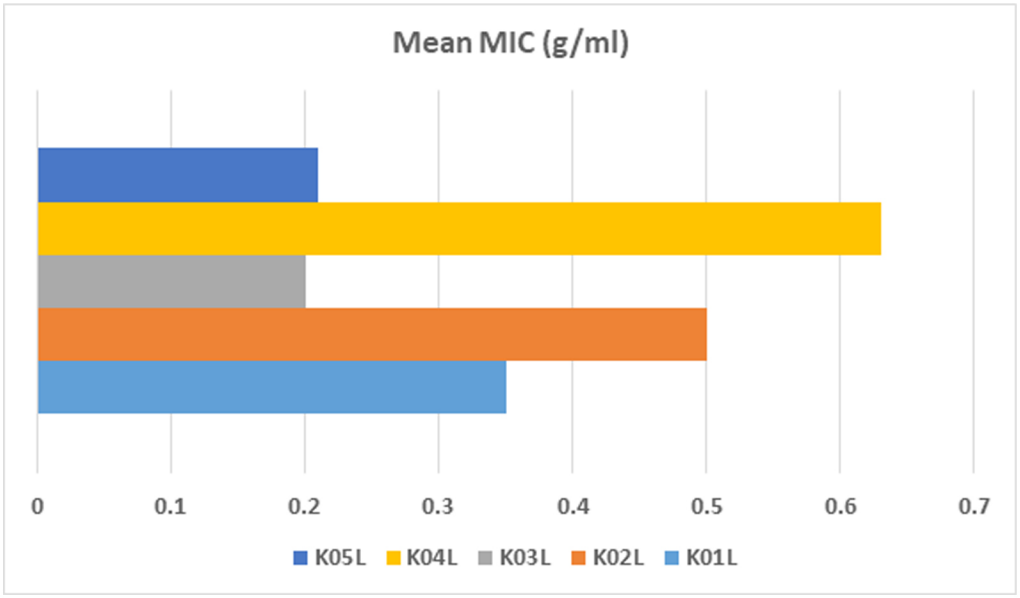
Table 2: MIC values of liquid samples of the *S. nigrum* complex against bacteria



K01 = *S.nigrum* ,Kisumu
K02 = *S.nigrum*,Bungoma
K03 = *S.cabrum*,Kakamega
K04 =*S.villosum*,Bungoma
K05 = *S.scabrum* ,Bungoma
K06 = *S.villosum* ,Eldoret(Ziwa)
K07 = *S.scabrum*, Kisumu
K08 = *S.villosum* ,Eldoret Ziwa
K09 = *S.nigrum* Kakamega
K10 = *S.scabrum* Edoret AMP

Table 3: MIC values of liquid samples of the S. nigrum complex against Fungi





K01= *S.nigrum*:Kisumu
K02= *S.nigrum*:Bungoma
K03= *S.cambrum*:Kakamega
K04= *S.villosum* :Bungoma
K05= *S.scabrum*:Bungoma

Similarly, all the samples of Eldoret different locations which were identified as *S. villosum* were active on all the microbes tested with one sample (K06) from Ziwa, Eldoret giving the best results. In Kisumu, the results showed that S. nigrum had activity on all microbes tested both Gram +ve and Gram –ve. In Kakamega, the indigenous *S. nigrum* species had activity on all the microbes tested too.

These results show that different species of the *S. nigrum* complex have different activities on different microbes affecting humans. *S. villosum* has the best antimicrobial activities on almost all microbes affecting humans and plants irrespective of the location where it is grown. It is also seen that *S. scabrum* and *S. nigrum* species growing in different locations contain different types of phytochemical compounds which affect microbes differently. Therefore, it would be advisable to sensitize farmers to grow all the different species available in order to obtain all the phyto chemicals for good health.

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Policy Recommendations

1. Financial investment is required in smallholder agriculture to stimulate households to expand indigenous vegetable production more especially different species of managu (Blacknight shades) with a stronger market orientation. This will also enhance improved health among the farmers and the society in general

2. Increase awareness of the health benefits of managu (Blacknight shades) and indigenous vegetables in general.

3. Encourage high quality seed production of all indigenous vegetables and the Blacknight shades as seen having important phytochemicals for good health.

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