

Production, Utilisation and Indigenous Knowledge of Spider plant among Smallholder Farmers in Nyaribari Chache Sub County, Kisii County

By

¹Nyamwamu Nyarang'o Charles, ²Pascaline Jeruto, ³Elizabeth Njenga, ⁴Lizzy Mwamburi

¹School of Science, Biological Sciences department, University of Eldoret, P. O. Box 1125 Eldoret, Kenya. Tel. +254725566033; Email; nyamwamucharles@gmail.com

²School of Science, Biological Sciences department, University of Eldoret, P. O. Box 1125 Eldoret, Kenya. Tel. +254720326629; Email; pasjeru@gmail.com

³School of Science, Biological Sciences department, University of Eldoret, P. O. Box 1125 Eldoret, Kenya. Tel. +254716980251; Email; njengae@yahoo.com

⁴School of Science, Biological Sciences department, University of Eldoret, P. O. Box 1125 Eldoret, Kenya. Email; lizzymwamburi@hotmail.com; Cell phone: +254729205412

*Corresponding author: Nyamwamu, N.C

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Abstract: Spider plant (*Cleome gynandra*) exists as cultivated or semi-cultivated crop with ecological, social and cultural values. It plays a significant role in the nutrition and food security of people in Kenya. This study sought to better establish the production, utilization and indigenous knowledge of spider plant among smallholder farmers in Nyaribari Chache sub county, Kisii County. A household survey was carried out for collection of primary data. Ten administrative sub-locations were randomly sampled for the study. Twenty households were randomly sampled from each sub-location to make a sample size of 200 households. Questionnaires and interviews were administered to collect primary data. Both descriptive (frequencies and percentages) and inferential analysis (t-test) were utilized to analyze data gathered. Spider plant utilization among smallholder farmers was due to factors such being tasty and nutritious, rich in iron, its medicinal has fast growth rate and suitable for recovering patients among others. There was a statistical significance ($p < 0.05$) among variables on production, utilization and indigenous knowledge of spider plant. These findings will be of significance to stakeholders especially ministry of agriculture and relevant NGOs to formulate policies to govern production of spider plant among small scale farmers in the study area and beyond.

Keywords: Cleome, Production, Utilization, Indigenous, Smallholder, Kisii

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1.0 INTRODUCTION

A significant vegetable in Kenya's rural areas is the spider plant (*Cleome gynandra*), a member of the Capparaceae family. The vegetable is a substantial contributor to household food security since it is a rich

source of nutrients, particularly vitamins (A and C) and minerals (calcium and iron) [18]. According to nutritional studies, spider plant (*Cleome gynandra*) is more nutritious than exotic vegetables like cabbage because it contains

higher levels of β -carotene, vitamin C, protein, iron, calcium, and magnesium, all of which are essential for preventing diseases linked to nutrient deficiencies [13]. Food and nutritional insecurity is a problem in the majority of Sub-Saharan African nations, including Kenya. In most African countries, the consumption of local vegetables such as the spider plant seem essential for generating cash and enhancing health and food security [5]. Reduced dietary diversity at the family level due to diminishing production and consumption of local vegetables may have detrimental nutritional effects [18].

With a focus on ecogeographic assessment, collection, evaluation, and identification of potential germplasm, the AVRDC-Regional Center for Africa (RCA) has been doing research and development, providing training, and disseminating information about indigenous vegetables since 1998 [5]. The NARES, NGOs, corporate sector, and more than 12,000 African farmers have all received more than 5 tonnes of base seed of traditional green vegetables as a result. As a result, spider plant is growing in popularity and is a lucrative crop for Kenya's small-scale farmers. Farmers have identified the following areas as research priorities for traditional vegetables like spider plants: crop production methods, vegetable preparation and use, postharvest handling, particularly preservation methods and simple processing, introduction of new species, demonstrations, and seed production techniques [13]. The spider plant, however, has been viewed as a small crop and has been given little attention in most agronomic research and development programs due to the lack of data on their cultivation, total yields, and sales. In Nyaribari Chache sub county, Kisii County, this study aimed to determine the state of spider plant production, utilization, and indigenous knowledge among smallholder farmers.

2.0 MATERIALS AND METHODS

2.1 Description of the Study Area

One of Kisii County's nine sub counties is Nyaribari Chache Sub County. Six administrative locations and a total of 17 sub-locations make up the sub county. The sub-county covers 317.4 kilometers squared [10]. Temperatures in the area range from 10 °C to 30 °C. The population of Nyaribari Chache Sub County is 608,000. But with a population growth rate of 3.8%, the population has increased significantly to over 750,000, with 18.5% living in metropolitan areas [11]. This sub county in Kenya seems to be one of the most populous sub counties in the country. A sizable percentage of the land is used for farming as a result of the city's expanding population. However, land has been distributed among the households; the average size of farmland is only 14,000 m² [15]. As a result, around a quarter of an acre has been set aside for agricultural activities. The majority of farmers practice subsistence agriculture with little market sales. Amounts of land used for food crop cultivation and cash

crop production are around 3,900 ha and 12,600 ha, respectively [14]. Dairy and small-scale poultry production are the mainstays of livestock rearing. According to the Kisii County Development Plan, (2013), 85% of the population is employed in agriculture directly or indirectly, and the anticipated rural poverty rate is 32%, with certain parts having a 60% rate [14].

2.2 Sample Size and Sampling Procedures

On comparable, small-sized pieces of paper, each of the seventeen administrative sub-locations in Nyaribari Chache Sub County was clearly identified before being folded and placed in a bucket. Ten pieces of paper were chosen at random and placed one after another to symbolize each of the six places. A total of twenty (20) families were then chosen evenly spaced along a transect laid along each of the ten randomly chosen sub-locations, yielding a sample size of two hundred (200) households that was employed for this study.

2.3 Data Collection

A survey with questionnaire administration on the 200 households was conducted in order to collect data on spider plant production, utilization and indigenous knowledge among smallholder farmers in Nyaribari Chache sub county, Kisii County.

2.4 Data Analysis

Data on spider plant production, utilization and indigenous knowledge among smallholder farmers was analysed using descriptive (frequencies) and inferential statistics (one sample t-test).

3.0 RESULTS

3.1 Indigenous Vegetables Produced in Nyaribari Chache sub county, Kisii County

Nine different indigenous vegetable crops were identified. Their English names, botanical names and vernacular names were recorded as shown in Table 3.1.

Table 3.1: Indigenous vegetables produced among smallholder farmers

No.	English Name	Botanical Name	Local Name
1	Black night shade	<i>Solanum nigrum</i>	Rinagu
2	Spider plant leaves	<i>Cleome gynandra</i>	Chinsaga
3	Pumpkin leaves	<i>Curcubita moschata</i>	Risosa
4	Pig weed	<i>Amaranthus hybridus</i>	Emboga
5	Jute leaves	<i>Corchorus olitorius</i>	Mrenda
6	Bean leaves	<i>Phaseolus vulgaris</i>	Rikuneni
7	Common nettle	<i>Urtica dioica</i>	Riise
8	African Spinach	<i>Basella alba</i>	Enderema
9	Kale leaves	<i>Brassica carinta</i>	Esukuma

3.1.1 Preference of Indigenous Vegetables Produced among smallholder farmers in Nyaribari Chache sub county, Kisii County

The frequency of households producing indigenous vegetables in Nyaribari Chache sub county, Kisii County was determined. Spider plant leaves (*Cleome gynandra*) had the highest frequency 34 (17.0%) of the households under cultivation followed by Black night shade (*Solanum nigrum*) 27 (13.5%) while the least

indigenous vegetable cultivated was common Indian spinach (*Basella alba*) with a frequency of 8 (4.0%) as indicated in Table 3.2. There was a statistical significance ($p < 0.05$) [Appendix 1 a (ii)] on preference of indigenous vegetables produced among smallholder farmers in Nyaribari Chache sub county, Kisii County.

Table 3.2: Frequency of households producing spider plant

No	Common Name	Botanical Name	Local Name	Freq. households (f)	Perc. (%) of households (%)
1	Black night shade	<i>Solanum nigrum</i>	Rinagu	27	13.5
2	Spider plant	<i>Cleome gynandra</i>	Chinsaga	34	17.0
3	leaves	<i>Curcubita spp</i>	Risosa	16	8.0
4	Pumpkin leaves	<i>Amaranthus hybridus</i>	Emboga	20	10.0
5	Pig weed	<i>Corchorus olitorius</i>	Mrenda	16	8.0
6	Jute leaves	<i>Phaseolus vulgaris</i>	Rikuneni	29	14.5
7	Bean leaves	<i>Urtica dioica</i>	Riise	15	7.5
8	Common nettle	<i>Basella alba</i>	Enderema	8	4.0
9	Indian Spinach Kale leaves	<i>Brassica oleraceae</i>	Esukuma	25	12.5
TOTALS				200	100

3.1.2 Proportion of land allocated for production of spider plant in Nyaribari Chache sub county, Kisii County

Most of the households 176 (88.0%) had $\frac{1}{8}$ acres of land followed by 14 (7.0%) with $\frac{1}{4}$ acres, while 7 (3.5%) and 3 (1.5%) of the households had an acre and 2-3 acres of land respectively as illustrated in Table 3.3. There was

a statistical significance ($p < 0.05$) [Appendix 1 b(ii)] on proportion of land allocated for growing of spider plant among small holder farmers in Nyaribari Chache sub county, Kisii County

Table 3.3: Proportion of land allocated for growing of spider plant

Proportion of land	Frequency (f)	Percentage (%)
1/8 Acre	176	88.0
1/4 Acre	14	7.0
1 Acre	7	3.5
2-3 Acres	3	1.5
Total	200	100

3.1.3 Characteristics of spider plant types grown by smallholder farmers in Nyaribari Chache sub county, Kisii County

Majority 93 (46.5%) of the households grew spider plants with purple stems, green leaf petioles and hairy, followed by 81 (40.5%) with purple stems and leaf petioles & hairy. Fourteen (7.0%) grew spider plants with green

stems and leaf petioles and hairy while 12 (6.0%) grew those with green stems, purple leaf petioles & hairy as illustrated in Table 3.4.

Table 3.4: Characteristic of spider plants grown among smallholder farmers

Characteristic	Frequency (f)	Percentage (%)
Purple stems and leaf petioles & hairy	81	40.5
Green stems, purple leaf petioles & hairy	12	6.0
Green stems and leaf petioles and hairy	14	7.0
Purple stems, green leaf petioles and hairy	93	46.5
Total	200	100

3.1.4 Challenges of spider plant production among smallholder farmers in Nyaribari Chache sub County, Kisii County

Poor germination was identified by majority 57 (28.5%) of the respondents as the main challenge in spider plant production followed by diseases, 54 (27.0%), lack of seeds 43 (21.5%), insect pests at 36 (18.0%) while early flowering recorded the least respondents at 10

(5.0%) as illustrated in Table 3.5. There was a statistical significance ($p < 0.05$) [Appendix 1 c(ii)] on challenges of production of spider plant production among small holder farmers in Nyaribari Chache sub county, Kisii County.

Table 3.5: Challenges of spider plant production among smallholder farmers

Challenge	Frequency (f)	Percentage (%)
Early flowering	10	5.0
Insect pests	36	18.0
Lack seeds for planting	43	21.5
Diseases such as wilting	54	27.0
Poor germination	57	28.5
Total	200	100

3.2 Reasons for the utilization of the spider plant among smallholder farmers in Nyaribari Chache sub county, Kisii County

Majority of the respondents 44 (22.0%) indicated that they utilized the spider plant because it is medicinal, 31 (15.5%) is a source of energy, 30 (15.0%) preferred by aged people, 25 (12.5%) has a fast growth rate, 21 (10.5%) no cooking oil is needed, 17(8.5%) it is suitable for recovering patients, 15 (7.5%) it is rich in iron, 10 (5.0%) well adapted to ecological conditions while 7

(3.5%) indicated that it was tasty and nutritious as shown in Table 3.6. There was a statistical significance ($p < 0.05$) [Appendix 1 d(ii)] on the reasons for the utilization of spider plant among farmers in Nyaribari Chache sub county, Kisii County.

Table 3.6: Reasons for utilization of the spider plant

Attribute	Frequency (f)	Percentage (%)
Tasty and nutritious	7	3.5
Rich in iron	15	7.5
No cooking oil required	21	10.5
It is medicinal	44	22.0
Fast growth rate	25	12.5
Source of energy	31	15.5
Suitable for recovering patients	17	8.5
Preferred by aged people	30	15.0
Well adapted to ecological conditions	10	5.0
Total	200	100

3.3 Indigenous knowledge on utilization of spider plant among smallholder farmers in Nyaribari Chache Sub County, Kisii County

Indigenous knowledge on utilization of the spider plant from the respondents was established. Nine reasons for indigenous spider plant utilization were recorded. That the spider plant has medicinal properties recorded the highest frequency 50 (25.0%) followed closely by spider plant being a dish for expectant and lactating mothers with 45 (22.5%). Spider plant is a dish for special feasts 19 (9.5%), treatment for eye infections

had 18 (9.0%), it stimulates male power had a frequency of 17 (8.5%), source of strength for the aged, 13 (6.5%), boosts immunity, 12 (6.0%), general source of energy for the body, 11 (5.5%) while it is used as livestock feed had frequencies of 15 (7.5%). as illustrated in Table 3.7. There was a statistical significance ($p < 0.05$) [Appendix 1 e(ii)] on indigenous knowledge on utilization of indigenous vegetables in Nyaribari Chache sub county, Kisii County.

Table 3.7: Indigenous knowledge on utilization of spider plant indigenous vegetable

No.	Knowledge on Utilization of spider plant	Frequency of households (f)	Percentage of households (%)
1	Important dish for special occasions	19	9.5
2	Source of strength for the aged	13	6.5
3	General source of energy for the body	11	5.5
4	Treatment for eye infections and stomachaches	18	9.0
5	Stimulation of male potency	17	8.5
6	Used as animal feed	15	7.5
7	Dish for expectant and lactating mothers	45	22.5
8	Boost for body immunity	12	6.0
9	Medicinal properties for recuperating patients	50	25.0
TOTALS		200	100

4.0 DISCUSSIONS

4.1 Indigenous vegetables produced in Nyaribari Chache Sub County, Kisii County

The study discovered that there were comparatively fewer indigenous vegetables grown in the study area, which suggests that smallholder farmers in Nyaribari Chache Sub County had not yet recognized the importance of indigenous vegetables. These results are in line with those reported by [1], who observed that changes in livelihood had led to the replacement of native vegetables with other preferred foods like meat, milk, and other processed foods that lacked the critical micronutrients present in native leafy vegetables. The author further established that there are other causes that have decreased the growth of native vegetables in most households, including changes in diet, tastes, and false impressions. These study's results are also consistent with those obtained by [3], who found that smallholder farmers in Kabuoch Location, Homa Bay County grew fewer indigenous vegetables.

4.1.1 Preference of indigenous vegetables produced among smallholder farmers in Nyaribari Chache Sub County, Kisii County

The studied households indicated that there was a diverse preference on production of different types of indigenous vegetables. In line with these study results, [3] also established that there was preference on indigenous vegetables grown among smallholder farmers in Kabuoch Location, Homa Bay County. In a related study, [8] established that the bitter taste in slender leaf constrained its acceptance for consumption in most households. Additionally, in line with these study results, [7] noted that some indigenous vegetables like the common nettle (*Urtica dioica*) and Spider plant leaves (*Cleome gynandra*) were less likely to be preferred for utilization by well-educated urban populations.

4.1.2 Proportion of land allocated for growing of spider plant in Nyaribari Chache sub county, Kisii County

The study found out that among smallholder farmers in the study area, very little space was set aside for the cultivation of the crop produced by spider plants. Notably, the lack of available land as a result of growing human population and high demand for basic food crops has decreased the amount of native vegetable cultivation and consumption [2]. In addition to these study findings, [9] stated that overuse of land for commercial or subsistence purposes and fast urbanization posed a persistent danger to indigenous vegetable production in all cropping systems and in backyard gardens.

4.1.3 Challenges of spider plant production among smallholder farmers in Nyaribari Chache sub County, Kisii County

Insect infestations, poor germination, early flowering, and a paucity of seed for planting were among the difficulties the farmers had in the cultivation of the spider plant. Farmers said that improperly dried seed is vulnerable to pest infestation and does not germinate when stored in plastic bags. The respondents' understanding of appropriate soil management techniques and seed selection for maximizing yields was limited. This suggests that in order to increase output, agronomic study on spider plants is urgently needed, as is the sharing of best practices. In support of these findings, [6] affirms that this approach has high potential for success because the spider plant farmers are already hard working, motivated and self-confident; attributes necessary for effectiveness in extension work.

4.2 Reasons for spider plant's utilization and the percentage of respondents per attribute

This study found out that reasons behind spider plant utilization among smallholder farmers in Nyaribari Chache sub county, Kisii County was due to various factors such being tasty and nutritious, rich in iron, its medicinal has fast growth rate and suitable for recovering patients among others. Similarly, these study findings are in line with those obtained by [3] who established that the value of an indigenous vegetable to human health influenced the utilization of indigenous vegetables among smallholder farmers in Kabuoch Location, Homa Bay County. In line with these findings, [16] also showed that consumers could easily prefer indigenous vegetables such as the spider due to the value on health and nutrition.

4.3 Indigenous knowledge on utilization of spider plant among smallholder farmers in Nyaribari Chache Sub County

The study revealed that possession of indigenous knowledge on utilization of spider plant influenced its utilization among smallholder farmers in Nyaribari Chache Sub County. In tandem with these findings, [3] who established that farmers had some native knowledge of how to use spider plants and their value as an indigenous vegetable crop, particularly in terms of human nutrition and health. For example, they knew that spider plants were tasty and nutritious, rich in iron, and that their medicinal uses included making them suitable for recovering patients. Similar results were achieved by [7], who found that consuming the native vegetable made from the spider plant is important and that knowledge of this fact affects consumption of the vegetable. Depending

on the value placed on it as a native vegetable, the spider plant was used differently at the household level. [19] noted observed that a sufficient amount of indigenous knowledge among individuals increases the level of usage of indigenous vegetables among rural residents provided additional support for these findings.

Similar findings were made by [4], who noted that only older consumers in Nigeria had a strong desire for fluted pumpkin and English spinach. In accordance with these findings, [17] highlighted that only a tiny portion of the Indian people used native vegetables because they included antioxidant components that might prevent and treat diseases caused by malnutrition. Vegetables from indigenous cultures have been shown to boost maternal health and eye sight. [12] also noted that indigenous vegetables play a significant role in human health since they are known to improve maternal and young child health as well as minimize vitamin A and iron deficiencies in susceptible populations such as the elderly and pregnant women, thus, supports these findings.

5.0 CONCLUSION

There were a relatively a small number of indigenous vegetables cultivated in Nyaribari Chache sub county, Kisii County. The study also established that the smallholder farmer's preference on spider plant influenced production and utilization of this indigenous vegetable crop to the extent of affecting the proportion of land allocated for the growing of this indigenous vegetable crop.

There were challenges of spider plant production among smallholder farmers in Nyaribari Chache sub county, Kisii County which included insect pests, poor germination, early flowering and lack of seed for planting. Spider plant utilization among smallholder farmers in Nyaribari Chache sub county, Kisii County was due to various factors such being tasty and nutritious, rich in iron, its medicinal has fast growth rate and suitable for recovering patients among others.

The farmers had some indigenous knowledge on spider plant utilization in terms of its value as an indigenous vegetable crop particularly on human nutrition and health such as the spider plant being tasty and nutritious, rich in iron, its medicinal has fast growth rate and suitable for recovering patients among others.

RECOMMENDATIONS

Emphasis on production and utilization of the spider plant among farmers in the study area and beyond. It is also of great importance for the introduction and conservation of a variety of other indigenous vegetables to the community in the study area.

There is a need for intensification of agronomic research on nutritional value of other indigenous

vegetables and dissemination of the knowledge to households. This will aid in widening household understanding of plant husbandry and thus improve indigenous vegetables production.

The ministry of Agriculture should conduct promotional campaigns on the importance of embracing the spider plant and other indigenous vegetables on human diet. Additionally, communities should be advised to source and plant varieties of indigenous vegetables adapted to their respective ecological regions.

CONFLICT OF INTEREST

"The author(s) declare(s) that there is no conflict of interest." There was no role of the funding sponsors in the design of the study; in the collection, analyses or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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Appendix 1: Data Analysis Output

a). Preference of Indigenous Vegetables Produced in Nyaribari Chache sub county, Kisii County

i) One sample statistics				
	N	Mean	Std. Deviation	Std. Error Mean
L	9	10.5556	4.11130	1.37043

ii) One sample statistics

Test Value = 0						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
L	7.702	8	.001	10.55556	7.3953	13.7158

b). Proportion of land allocated for production of spider plant in Nyaribari Cache sub county, Kisii County

i) One sample statistics

	N	Mean	Std. Deviation	Std. Error Mean
P	4	25.0000	42.06146	21.03073

ii) One sample statistics

Test Value = 0						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
P	1.189	3	.002	25.00000	-41.9292	91.9292

C). Challenges of spider plant production among smallholder farmers in Nyaribari Cache sub County, Kisii County

i) One sample statistics

	N	Mean	Std. Deviation	Std. Error Mean
C	5	20.0000	9.38749	4.19821

ii) One sample statistics

Test Value = 0						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
C	4.764	4	.004	20.00000	8.3439	31.6561

d). Reasons for the utilization of the spider plant among smallholder farmers in Nyaribari Cache sub county, Kisii County

i) One sample statistics

	N	Mean	Std. Deviation	Std. Error Mean
U	9	11.1111	5.81366	1.93789

ii) One sample statistics

Test Value = 0						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
U	5.734	8	.000	11.11111	6.6423	15.5799

e). Indigenous knowledge on utilization of spider plant among smallholder farmers in Nyaribari Chache sub County, Kisii county

i) One sample statistics

	N	Mean	Std. Deviation	Std. Error Mean
IK	9	11.1111	7.31769	2.43923

ii) One sample statistics

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
IK	4.555	8	.002	11.11111	5.4862	16.7360