YIELD PERFORMANCE AND MARKET ACCEPTABILITY OF SELECTED SOLANUM AETHIOPICUM GILO GENOTYPES

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A DISSERTATION SUBMITTED TO THE FACULTY OF AGRICULTURAL SCIENCES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE IN AGRICULTURE AND RURAL DEVELOPMENT OF UGANDA CHRISTIAN UNIVERSITY

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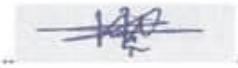
ABSRACT

This study evaluated yield performance and market acceptability of five *Solanum aethiopicum* Gilo entries. All data were subject to Analysis of variance (ANOVA) and means separated using Fishers LSD at 5% probability level. Further, data was subject to Additive main effects and multiplicative interaction (AMMI) analysis. consumer acceptability was evaluated using sensory analysis, and trader preferences were assessed through traders' physical sensory analysis. Results revealed significant ($P<0.001$) genotype, environment, and genotype × environment interaction effects on yield parameters. While G4 consistently produced the highest number of fruits across all locations (46.86-49.45 fruits/plant), fruit weight varied by location, with G6 performing best in Mukono (516.1g), the check variety in Kasese (750g), and G10 in Omoro (666.4g). The AMMI analysis demonstrated that environment and G×E interaction explained 35.8% and 35.1% of treatment variation, respectively, indicating strong environmental influence on genotype performance. Consumer sensory evaluation showed that G9 and G10 consistently received the highest acceptability ratings for whole fruit, fresh chopped, and cooked fruit attributes across all locations, while G4, despite high productivity, received consistently lower acceptability ratings. Similarly, trader acceptability assessments in urban markets revealed that G9, G10, and the check variety were highly rated for physical quality attributes, while G4 scored poorly on market acceptability. The study identified important trade-offs between yield potential and consumer/market preferences, highlighting the need for location-specific variety recommendations. Genotypes G9 and G10 demonstrated the best balance of yield performance and market acceptability, making them promising candidates for commercial production.

DECLARATION

I affirm that apart from appropriately cited references to the works of other researchers, this thesis is entirely my own, and no portion of it, in any form, has been previously submitted or presented elsewhere.



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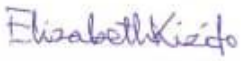

Prof. Elizabeth Balyejusa Kizito

Supervisor

DEDICATION

I dedicate this thesis to Dr. Laurie Wells, Agape Christian Children Center, African Youth Action Network for the endless love, prayer and support towards my academic journey.

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Above all, special praises and thanks go to Almighty God for enabling me come out with this thesis.

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GLOSSARY OF ACRONYMS

AIV	:	African Indigenous Vegetable
G	:	Genotype
M	:	Meter
UCU	:	Uganda Christian University
E	:	Environment
AMMI	:	Additive main effects and multiplicative interaction
ANOVA	:	Analysis of Variance
EU	:	European Union
TRI	:	*Trichoderma spp*
AMF	:	Arbuscular Mycorrhizal Fungi

CHAPTER ONE

1.0 Introduction

This chapter provides the background of the study, problem statement, objectives, conceptual fram work, hypothesis, significance, justification, and scope of the study.

1.1 Background

African Indigenous Vegetables (AIVs) have historically made a substantial contribution to smallholder farmers' incomes, and food security (Kansiime et al., 2016). Throughout sub-Saharan Africa, *Solanum aethiopicum* vegetables are culivated and they have four broad groupings recognized: Gilo, Shum, Kumba, and Aculeatum; Gilo is the most produced group for it edible fruits (Song *et al*., 2019).

Gilo is a member of the solanaceae family and the genus Solanum (Dinss et al., 2019). The Gilo group of *Solanum aethiopicum* vegetables is the main species grown for their fruit and the market for *Solanum aethiopicum* Gilo is high since the fruit is widely accessible at the markets (Dinssa et al.,2019). With a ploidy level of 2n = 24, gilo is primarily self-pollinated (Kouassi *et al*., 2014).

Solanum aethiopicum Gilo (African Eggplant) like other traditional African vegetables, has, until recently, gotten less attention from public and corporate research (Dinss *et al*., 2019). Farmers cultivate native landraces, with only a small number of modified cultivars from WorldVeg lines having been issued thus far in East and West Africa (Dinss *et al*., 2019).Therefore with advancement of crop cultivars being recently put in place, it is crucial to create cultivars of *Solanum aethiopicum* Gilo that meet market acceptability and consumer standards, stress-tolerant to biotic and abiotic factors, and have a high yield (Adeniji & Aloyce, 2012). Fruit

sensory acceptability are important quality criteria that are highlighted in product profiles (Adeniji & Aloyce, 2012).

The quality of fruit affects the perception of buyers and its marketability positively or negatively. Furthermore, new varieties must be in line with consumer tastes, which requires an understanding of the sensory qualities and market acceptability of plant genotypes (Lado et al., 2019 and Assefa *et al*., 2014). Acceptance in the marketplace has a big influence on a variety's uptake and performance (Assefa *et al*., 2014).Therefore, this research assessed yield performance, sensory attributes acceptability by consumers and traders of selected *Solanum aethiopicum* Gilo Genotypes which contributes to production of cultivars in addition to having high yields, but also favored by consumers and traders as trader acceptability of a crop can be evaluated using the physical attribute of the crop aspects such as; colour, smoothness, shininess and succulence among others.These attributes are scored using hedonic rating scales (Joseph et al., 2022). In the consumer research and sensory evaluation context,

people can convey their general level of liking or disliking of a product along a continuous scale (Cardello, 2017). The assumption of the theory is that subjective experiences, can be assessed and quantified by applying a categorical or numerical scale (Cardello, 2017).

Furthermore, African indigenous vegetable cultivars are selected based on a range of factors, including yield, market quality needs among others, and some of the major quality variables that are extensively featured are the sensory traits such as taste, shape, size, and color at the marketable stage (Dinssa et al., 2019). Fruit quality (tasting, processing/cooking, and physical attributes) influences consumers' perceptions and marketability (Dinssa et al., 2019). Uganda Christian University has been developing *Solanum aethiopicum* Gilo genotypes over the years and they are at a point where they require evaluation with end users. This therefore require evaluation of yield and yield related traits for the selected candidates solanum aethiopicum Gilo in order to get detail information which allow deployment of cultivars that meet the market and accepted by the end users by meeting both yield and market preference which is in line with the recommendation by Carneiro et al. (2020), on the need of breeders to consider consumers' desired sensory traits for adoption success of any developed variety.

1.2 Problem statement

According to Lado et all et al. (2019), poor yield performance, sensory attributes of developed cultivars and poor market acceptability limit breeding program success or adoption of released varieties. When plant breeders neglect sensory attributes, they contributes to the low adoption of improved varieties being developed (Bayiyana et al.,2024). Without proper crop selection, breeders normally produce

new varieties which are not accepted by the consumers and over 90% of improved crops are rejected by the users (Akankwasa et al., 2021).Therefore for adoption success of any developed variety, breeders must consider consumers' desired sensory traits (Carneiro et al., 2020). Uganda Christian University has been developing *Solanum aethiopicum* Gilo genotypes over the years and they are at a point where they require evaluation with end users. The absence of detailed information on the critical traits above hinders the breeder's ability to deploy cultivars that meet both agronomic and market preferences. To address this gap, there is need to systematically evaluate yield and its related traits, and market acceptability of the selected candidate *Solanum aethiopicum* Gilo genotypes. This will therefore, facilitate a successful integration of these genotypes into sustainable agricultural systems and commercial markets for heterogeneous farming communities.

1.3 Main objective

To asses and test performance of different *Solanum aethiopicum* Gilo candidate lines for heterogeneous farming communities.

1.4 Specific objectives

1. To evaluate yield and yield related traits of selected candidate *Solanum aethiopicum* Gilo genotypes across different agro-ecological zones.
2. To evaluate among consumers, the sensory acceptability of selected candidate *Solanum aethiopicum* Gilo genotypes.
3. To evaluate traders' acceptability of selected *Solanum aethiopicum* Gilo genotypes among traders in urban markets in Uganda.

1.5 Hypothesis

There is no difference in yield and yield-related traits among the selected candidate *Solanum aethiopicum* Gilo genotypes in the different agro-ecological zones.

There is no difference in sensory acceptability of selected *Solanum aethiopicum* Gilo genotypes among consumers.

There is no difference in traders' physical acceptability of selected candidate *Solanum aethiopicum* Gilo genotypes in urban markets in Uganda.

1.6 Scope of the study

This study was conducted from Mukono in Central Uganda, Omoro in northern Uganda, and Kasese in Western Uganda. Each of these locations represents different agro-ecological environment in Uganda and according to Dinssa *et al*, (2019), knowledge of the interactions between Genotype (G) and Environment (E) would assist breeders establish cultivar development strategies and determine whether to prioritize wide or selective adaptation. Each of these zones typically has different ecological and climatic conditions which influence crop production. Two growing seasons was used for the study (Season one in 2023 and season two in 2024).

The genotypes seeds used for the study were obtained from the Faculty of Agricultural Sciences seed bank at Uganda Christian University. The selected *Solanum aethiopicum* Gilo genotypes comprised of G4, G6, G9 and G10. Initially, there were a total of 11 genotypes (G1, G2, G3, G4, G5, G6, G7, G8, G9, G10, G11). However, over years in the selection process, the four genotypes were selected based on their performance and interest in their genetic qualities such as yield, disease resistance and others. Furthermore, in the study, one check variety was used

and was the green *Solanum aethiopicum* Gilo, commonly referred to as "green Ntula" by East African Seed Co LTD, obtained from commercial market.

Consumer sensory evaluation comprised of the following: fruit evaluation when whole fresh fruit, fruit evaluation when fresh and chopped, and fruit evaluation when chopped and cooked. This was based on 9-point hedonic scale adopted from Carneiro et al. (2020). This evaluation took place from Mukono, Kasese and Omoro district.

Traders' physical evaluation. Three markets (Gulu main market in Gulu, Kiko market in Mukono, and Mawa Market in Kasese) were purposively chosen for the market acceptability analysis based on their status as the primary hub for the majority of farmers and traders. The physical traits considered included: Colour, shape, size, hardness, smoothness, and succulence. The evaluation was done using a 5-point hedonic adopted from Joseph et al.(2022).

1.7 Significance

This study has capability to close vital knowledge gaps in breeding programs of the selected *solanum aethiopicum* Gilo genotypes as well as making well-informed decisions for the successful integration of the genotypes to get into agricultural systems and commercial markets.

The study has provided vital information to policy makers as far as coming up with new crop variety is concern. This is by emphasizing the need for conducting market acceptability study which involve both consumer and traders in a scientific study.

The study has contributed to provision of useful information to seeds company by clearly showing how different genotypes perform across different agro-ecological zones and this has influence on variety recommendation to farmers.

1.8 Justification

This study is positioned to contribute to the breeding programs of *Solanum aethiopicum* Gilo genotypes in Uganda particularly to the test genotypes by bringing light through combining agronomic performance with market preference while considering both the traders' views as well as the consumers. This therefore leads to removal of adoption challenges of the test genotypes and hence supporting sustainable agriculture as far as release of good variety of *solanum aethiopicum* Gilo is concern contributing to rural development.

The study is also positioned to contribute in ensuring traders and consumers sense of belonging in research. This gives trust in the findings which comes out of research as well as confidence as far as release of good variety of *solanum aethiopicum* Gilo is concern contributing to rural development.

1.9 Conceptual frame work

Dependent variables

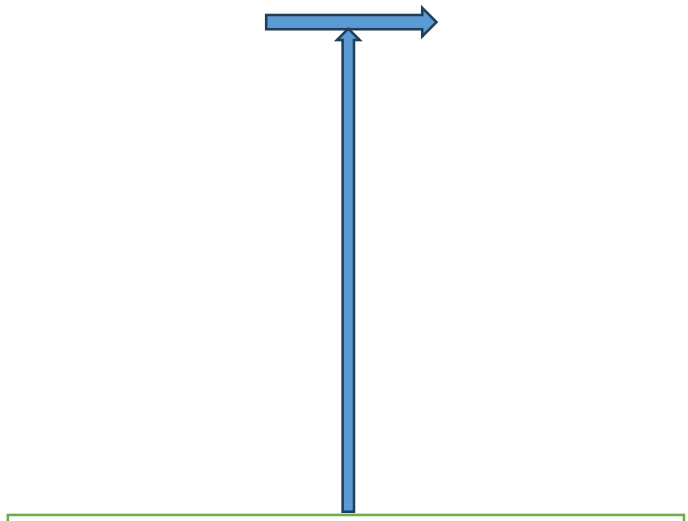
Yield traits: fruits number per plant, fruit length, fruit diameter, weight of fruit per plant

Consumer ssensory acceptability

Fresh whole fruits attributes (colour,

Independent variables

Yield traits-Factors related to genetic (Genotypes: G10, G9, G6, G4, and Check variety), and factors related to environmental.



Intervening variables

Yield traits: Crop diseases and Pest, rainfal and temperature.

Consumer sensory acceptability-factors related to demography such as gender, preferences of consumers, and past experience by the consumers.

Traders' physical acceptability -factors related to demography such as gender, preferences of traders, past experienceby traders.

Literature review

2.1 Origin, distribution and production of *Solanum aethiopicum* Gilo

Solanum aethiopicum Gilo come from a complex species which comprise of physically quite diverse groupings that were previously considered to be four distinct

species which include Gilo, Shum, Aculeatum group and Kumba (Han *et al.*, 2021). It is thought that the species originated from Africa and was domesticated from the semi-domesticated *Solanum* distichum Schumach. & Thonn., both of which are distributed throughout tropical Africa, by way of the wild *Solanum anguivi* Lam. According to Anaso (1991), the group for Gilo cultivar might have evolved from the Shum cultivar group through selection and hybridization. Several distinct edible fruit shapes, from elliptic to spherically depressed, are produced by the Gilo group (Han *et al.*, 2021). The Gilo group is widely distributed in humid regions of tropical Africa. Its members thrive in full sun on the forest savanna's well-drained, somewhat deep soils with a pH of 5.5–6.8, with daytime temperatures of 25–35°C and nighttime temperatures of 20 – 27°C, respectively (Han *et al.*, 2021).

2.2 Taxonomy of *Solanum aethiopicum* Gilo

Scarlet eggplant, or *Solanum aethiopicum* L., is a member of the Solanoideae sub-family within the Solanaceae family. Section Oliganthes, Dunal Bitter, Solanum subgenus Leptostemonum is where S. aethiopicum L. (2n = 24) is categorized (Adeniji *et al.*, 2013). There are four groups that make up the scarlet eggplant (*S. aethiopicum* L): Gilo, Shum, Aculeatum, and Kumba. The most significant is the Gilo, which is mostly grown in sub-Saharan Africa and is mostly self-pollinating (Adeniji *et al.*, 2013). Due to its widespread consumption in Africa, Solanum aethiopicum is significant as a leaf and fruit vegetable. The morphological variation within the genus Solanum is attributed to their wide number and Eco geographical distribution (Adeniji *et al.*, 2013).

It is a fairly woody perennial or deciduous annual, whose growth is up to 100-150 cm tall. Its bisexual and partially self-pollinated flowers and also cross-pollinated and

can produce single or group of fruits (trusses) dependent on the subspecies and varieties (Seek, 1997; Macha, 2005). The fruits vary from being sweet to bitter taste depending on the content of saponin. At maturity of the fruits, the fruit colour turns red or reddish-orange attributed to high carotene content (Macha, 2005).

2.3 Agro ecology of *Solanum aethiopicum* Gilo

According to Dinssa *et al*, (2019) *Solanum aethiopicum* Gilo are usually planted as annuals, although they are also perennial plants with persistent, rather woody stems. Deep, well-drained soils are ideal for its growth. Although irrigation can be used during the dry seasons, rain is the primary factor in the cultivation of African eggplant. The African eggplant can endure temperatures between 10 and 40^{o}C, although it prefers a pH range of 5.5 to 6.8. It also grows best in daytime temps between 20 and 30°C. Extreme cold or wet circumstances are intolerable to it.

2.4 Nutritional value, medicinal value and economic value of *Solanum aethiopicum* Gilo of *Solanum aethiopicum* Gilo

The seeds within the fruit of Solanum aethiopicum Gilo are noteworthy for their diverse nutritional profile, encompassing not only essential vitamins like vitamin C and carotene but also an array of other vital nutrients (NRC, 2006). These seeds contribute significantly to the overall health benefits associated with the consumption of *Solanum aethiopicum* Gilo. Furthermore, the fruits of *Solanum aethiopicum* Gilo are a captivating subject of interest due to their multifaceted qualities. From a nutritional standpoint, they offer a spectrum of essential elements, enhancing the overall dietary value.

The attributes related to organoleptic such as taste, aroma, and texture, add to the appeal of these fruits, making them a delightful culinary experience. The

composition of fruits belonging to the Solanum aethiopicum Gilo group is 80% water, 8% carbs, 1.4% protein, and 1.5% fiber. Especially, these nutritive qualities highlight how important they are becoming in supporting food security and promoting a healthy diet (Adeniji & Aloyce, 2012). Beyond their nutritional value and organoleptic appeal, *Solanum aethiopicum* Gilo fruits have therapeutic qualities that should be explored. Especially, these fruits are known for having high concentrations of antioxidant chemicals, which are essential for maintaining health and reducing oxidative stress (Kouassi *et al*., 2014).

Solanum aethiopicum Gilo is a very widespread crop which plays an imperative part in a number of diets. It is among vital vegetable crops in most African countries (Owusu-Ansah *et al*., 2001; Grubben & Denton, 2004; Osei *et al*., 2010). The crop is not only consumed almost daily by families in both rural and urban settings, but it also represents the main source of income for many rural households contributing to farmers in Uganda and Africa at large (Asenso-Okyere *et al*., 2000; Owusu-Ansah *et al*., 2001; Weinberger & Msuya, 2004). In Ghana and Tanzania, the crop is the third most frequently grown vegetables (Weinberger and Msuya, 2004, Horna *et al*., 2007).

2.5 Multi location trials

Finding out stability and consistency of crop yield performance call for accurate assessment of genotypes in diverse environments (Valenzuela-Antelo et al., 2023). Finding outstanding genotypes is require genotype by environment interaction (GEI) since ranking best genotypes can differ between environments (Valenzuela-Antelo et al., 2023). According to Popoola et al.(2024), yield of crop varieties is affected by environmental variability which make it important for candidate varieties to tested for yield stability across different environments before release.

2.6 Hedonic scales on acceptability in plant breeding.

There are various hedonic scales use in sensory evaluation which include: 10-point, 9-point, and 5-point hedonic among others (Carneiro et al., 2020).When conducting hedonic tests, large participants number is a prerequisite to obtain reliable information, given the large heterogeneity in participant's reaction which therefore call for a minimum of 100 participants for evaluation (Lado et al., 2019). Hence the addition of sensory information into plant breeding programs offers to breeders unbiased tools to measure otherwise subjective quality traits (Lado et al., 2019).

2.7. Market and market acceptability.

A market encompasses physical location and conceptual framework where sellers and buyers come together to take part in exchange of goods, and services (Alananga Sanga, 2021). The outstanding elements of a market include the availability of buyers to buy the goods and service and sellers who provide goods or services (Alananga Sanga, 2021). Market acceptability can be defined as the degree of willingness by the consumers to purchase, use, and adopt goods or service (Dike et al., 2025). Market acceptability put into consideration how best a good is accepted by consumers in a given market (Dike et al., 2025).

2.8 Consumer acceptability of fruits and vegetables

This can base on sensory attributes (Dari *et al*., 2018). Texture attributes of vegetables and fruits are perceived with the touch sense of which can be when a sample is place in the mouth, chewed or picked by hand (Barrett et al., 2010). However, Colour and appearance which comprise of physical attributes such as size a n d

the world. It is a major horticultural crop with a global production of 153 million metric tonnes. Many landraces of tomato are used in the Northern Region of Ghana including \"Burkina\", \"Techiman\" and \"Wosowoso\" with \"Wosowoso\" been the most grown within and around the Tamale Municipality. The seed however, are farmers own seeds and farmers prefer buying those seed because they are relatively cheap compared with the foreign seeds sold on the market. The aim of this study was to evaluate the quality and shelf-life performance of some selected tomato varieties in comparison with the local landrace commonly grown by farmers in the Northern region of Ghana. Seeds of \"Wosowoso\", Popvriend, Tanga, Tengeru 1997 and Tengeru 2010 were nursed and transplanted onto a land area of 4 x 2 m2 for each treatment in completely randomized design. All samples performed well agronomically except for Tengeru 97 and 2010 which showed signs of been attached by leaf curl disease. Farmers preferred Tengeru due to the fruit size and ease of seeds extraction regardless of the leaf curl disease. Eighty percent of consumers preferred Tanya for firmness and taste.","author":[{"dropping-particle":"","family":"Dari","given":"L","non-dropping-particle":"","parse-names":false,"suffix":""},{"dropping-particle":"","family":"Nenguwo","given":"N","non-dropping-particle":"","parse-names":false,"suffix":""},{"dropping-particle":"","family":"Afari-Sefa","given":"V","non-dropping-particle":"","parse-names":false,"suffix":""}],"container-title":"Journal of Postharvest Technology","id":"ITEM-1","issue":"October","issued":{"date-parts":[["2018"]]},"page":"69-74","title":"Evaluation and consumer acceptance of five tomato (Lycopersicon esculentum Mill) cultivars in Northern Region of Ghana","type":"article-journal","volume":"6(2):69-74"},"uris":["http://www.mendeley.com/documents/?uuid=140c7c98-e9e0-423f-

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2.9 Traders acceptability and theory of sensory evaluation

Trader acceptability of a crop can be evaluated using the physical attribute of the crop aspects such as; colour, smoothness, shininess and succulence among others. These attributes are scored using hedonic rating scales (Joseph *et al*., 2022).

2.10 Theory of hedonic scaling

The theory of Hedonic scaling. In the consumer research and sensory evaluation context, people can convey their general level of liking or disliking of a product along a continuous scale (Cardello, 2017). The assumption of the theory is that subjective experiences, can be assessed and quantified by applying a categorical or numerical scale (Cardello, 2017).

2.11 Studies on Solanum aethiopicum Gilo breeding and sensory acceptability.

A number of breeding and sensory acceptability studies in Solanaceae include, but are not limited to, the following: Characterization of African eggplant cultivated in the Republic of Benin using agro morphology where 60 accessions were split into three groups via a cluster phenogram, with Gilo being one of the clusters(Aguessy et

al., 2021). In the study, weight of fruits, diameter of fruits, and number of fruits per plant were different between these groups (Aguessy et al., 2021). Another study according to Sanga et al.(2017), evaluated Wild Brinjal (Solanum gilo) Genotypes. In the study, different genotypes of wild brinjal (Solanum gilo) were gathered from several locations in the North East region of India and assessed to investigate the variations in fruit output, vegetative characteristics. There were three replications and fifteen genotypes in the Randomized Block Design (RBD) experiment. The findings demonstrated that there was significant heterogeneity across the genotypes in terms of growth, fruiting traits, and biochemical components.

Additionally, a study by Borges Pinheiro et al., (2021), where assessment of interspecific hybrids and genotypes of eggplant and gilo for resistance to root-knot nematodes was done. The study identifying sources of root-knot nematode resistance in eggplant, scarlet eggplant (gilo), and interspecific hybrids between these species as well as with wild Solanum species for use as rootstocks was the aim of the study. All eggplant accessions were discovered to be vulnerable to M. enterolobii and M. incognita.

A study by Joseph *et al*., (2022), where trader acceptability of *Solanum aethiopicum* Shum genotypes and effect of bio-control treatments on consumer sensory acceptability was done. In the study, it was revealed that with the exception of E11's hard-textured leaves, there were significant differences in the trader acceptability of genotypes based on leaf quantity, succulence, smoothness, color, and shininess ($P < 0.05$). High-end and low-end markets preferred leaf appearance (E11) and stalk-leaf quantity (E15 and E16), respectively. Reduced bitterness ($P < 0.05$) indicated that consumers preferred the bio-control-treated samples' sensory acceptability

over 85% of E15 and E16. Results using descriptive sensory tastes demonstrated that the palatability of E15 and E16 was considerably enhanced by soil bio-control treatment with TRI during the light rain season.

Furthermore, a study by Esther et al.(2023), where choosing potential garden egg (Solanum aethiopicum) cultivars in an on-station study with a multidisciplinary approach. In the study, during the 2021 rainy season, the on-station study was carried out at the National Horticultural Research Institute in Ibadan. Seven enhanced varieties were chosen from crosses produced using a half-diallel mating scheme and two local checks. Finding the best candidate kinds for multi-locational trials was the goal for the study. Three replications and a Randomized Complete Block Design were used to set up the trial. Agronomic and yield character data were gathered. A panel of twelve qualified judges conducted the sensory evaluation.

Another study was conducted according to Dinssa *et al*. (2016), evaluating *Solanum aethiopicum* entries performance across different environment in Tanzania. In the study, 21 African eggplant entries were evaluated for horticultural and fruit yield traits. The Trial were in seven different locations, each arranged in a randomized block design with three replications. In the trial, years and locations were considered to be independent. A number of crop breeding analysis were conducted and the results found that, there was high significant differences obtained among entries in term of fruit and other different traits for each location.

2.12 Selection criteria for African vegetables.

African indigenous vegetable cultivars are selected based on a range of factors, including yield, market and consumer quality needs, and tolerance to both biotic and abiotic stressors, and some of the major quality variables that are extensively

featured in product profiles include fruit taste, shape, size, and color at the marketable stage (Dinssa *et al.*, 2019).Fruit quality (tasting, processing/cooking, and physical attributes) influences consumers' perceptions and marketability (Dinssa *et al.*, 2019).

CHAPTER THREE

3.0 Methods and materials

3.1 Planting materials

Five *Solanum aethiopicum* Gilo entries were evaluated in the study. Out of the five, four entries were from breeding lines obtained from the seed bank at Uganda Christian University, Faculty of Agricultural Sciences. The remaining entry was green *Solanum aethiopicum* Gilo by East African Seed CO.LTD, obtained from commercial market. Hence the entries included four breeding lines and one commercial variety.

3.2 Test locations

Evaluation of the five entries was done in three locations in Uganda:

1. **Mukono.** Mukono falls under Lake Victoria Crescent zone characterized generally with Bimodal high rainfall (>1,200mm/ year), two rain seasons, the first in March to May and the second in September to November with average monthly rainfall of 149 mm and 132 mm, average temperature during day and night ranging from 26 ^{o}C and 16 ^{o}C, respectively and soil ferrallitic sandy clay with dark clay in the valley (Barasa, 2019 and David Akodi et al., 2016). **Kasese**. Kasese fall under Western Range Lands zone characterized by rainfall 915-1020 mm, altitude 600-1,524 m, rolling hills with some flat areas, soils are moderate to poor (Okonya et al., 2013). **Omoro**. Omoro fall under Northern Farming System zone characterized by average rainfall 1200 mm, 975-1,520 m asl., generally flat with isolated hills, fairly heavy fertile soils (Okonya et al., 2013). These locations are part of UCU Agricultural experimental fields.

3.3 Experimental design, sawing and transplanting

A randomized complete block design was used for the experiment with four replications for each of the three locations. Each unit for the experiment had 20 plots measuring 5 meters by 5 meters where each plot had four rows arranged with spacing of 1 m between plants and 1m between columns. Hence each plot had 20 plants. Seedlings were raised in seedling trays which had 66 cells for four weeks before transplanting.

3.4 Field management

One week after transplanting, NPK fertilizer was applied to the plants in each location at the rate of 200 kg. ha-1. Additionally, three weeks after transplanting, side dressing was done with Urea at the rate of 120 kg. ha-1. Weeding was managed

manually using handheld hoe. There was full and timely measures on crop protection (Seiyefa, 2025).

3.5 Data collection

3.5.1 Objective 1. To evaluate yield and yield related traits of selected candidate *Solanum aethiopicum* Gilo entries across different agro-ecological zones.

In each plot, out of the 20 plants, 10 were randomly selected and tagged. Data was collected on the following parameters: Marketable fruit (number of fruits per plant, fruit length, fruit diameter, and fruit weight per plant were recorded). The marketable fruits data was collected three time in each of the two seasons for each location. This is because, *Solanum aethiopicum* Gilo can be harvested many times, and its recommended that for fruit yield, three or more harvest is okay (Dinssa et al, 2019).

3.5.2 Data analysis.

Data was entered into Microsoft excel, sorted and exported to GenStat version 14. Data was tested for normality and where the data was not normally distributed, they were transformed to log base10. Analysis of variance was performed for each environment and a combined analysis of variance of the environments was performed, to identify genotypes with environments interactions. Followed by a combined analysis of variance of marketable fruit yield, (Weight of fruits per plant) of four *Solanum aethiopicum* Gilo genotypes and one check variety were evaluated in three locations for two seasons (2023 and 2024). Genotype and genotype by environment interaction (GGE) biplot of four *Solanum aethiopicum* gilo genotypes and one check variety were analysed across the three environments in Uganda for the two seasons (2023 and 2024). Finally, Additive Main Effect and Multiplicative

Interaction (AMMI) analysis of variance for two significant Interaction Principal Component Axes (IPCAs) on fruit yield (Weight of fruits per plant) of five *Solanum aethiopicum* gilo entries were analysed for the three locations for the two seasons (2023 and 2024) was done.

AMMI's stability value (ASV) was evaluated using a formula put forward by Purchase et al. (2000) as:

$$ASV=\sqrt{((SSIPCA1|SSIPC2)*(IPCA1score))x^2+(IPCA2score)x^2}$$

Where: IPCA1= Interaction principal component analysis axis one, IPCA2= Interaction principal component analysis axis two, SS= sum of squares.

Using GenStat software, the fruit yield biplots of the first two principal components was constructed.

3.6 Objective 2. To evaluate among consumers, the sensory acceptability of selected candidate *Solanum aethiopicum* Gilo genotypes.

3.6.1 Consumer Sensory evaluation

Five Solanum aethiopicum gilo entries were used in the study (G4, G6, G9, G10 and one check variety). For uniformity and consistency, samples from Kasese were used for the sensory acceptability in all the three locations (Kasese, Mukono, and Omoro district).

Selection of Participants

The local consumers of *Solanum aethiopicum* Gilo were the once allowed to participate in the evaluation. The preferred number for consumer's acceptability study is 100. For this study, a total of 105 consumer participants were recruited for the evaluation and only adult (over 18 years old of age), 35 participants from each

location and they were evaluated using central location approach. Each of the location is where the experiments were located and consumers of *Solanum aethiopicum* Gilo. Participation of participants was entirely voluntary, they were free to stop the interview at any point and also their responses were anonymous. The participants signed consent form for their acceptance to participate in the study.

Harvesting and transportation of samples

For sensory acceptability assessment in each location, 3 kilograms of each of the different genotypes (G4, G6, G9, G10 and one check variety) were harvested at market maturity stage. To ensure uniformity in quality of samples, samples were harvest and transported in a cooler box.

Preparation of samples

Samples were prepared in three levels for evaluation: 1. Fresh whole fruits, 2. Fresh chopped fruits, 3. Chopped and cooked fruits. Samples were prepared with high level of according to good hygiene.

Fresh whole fruits. All samples were washed as they are being prepared for acceptability evaluation. Samples were place in white disposable plates and each plate containing samples assigned with a three-digit codes. Samples were evaluated based on the following attributes: Colour, Shape, Size, Texture, Succulence, and Freshness. The evaluation was done using a nine-point hedonic scale where 1 = Dislike extremely and 9 = like extremely.

Fresh chopped fruits. All samples were washed as they are being prepared for analysis. The Gilo fruits were cut into two using stainless steel knife and chopping

board. The samples were place in white disposable plates and each plate containing samples assigned with a three-digit codes. Samples were evaluated based on the following attributes: appearance, and freshness. The evaluation was done using a nine-point hedonic scale where 1=Dislike extremely and 9=like extremely.

Chopped and cooked fruits. Five *Solanum aethiopicum* Gilo entries samples comprising of G4, G6, G9, G10 and one check variety was prepared for steaming and further sensory acceptability evaluation. The longitudinal axis of the fruits was plucked off. Samples were washed twice to remove soil as well as any dirt and water drained off the fruits. Two kilograms of each of the different genotypes were cut into smaller pieces of about 1.25 cm in diameter using stainless knife and chopping board and then immediately steamed in a perforated stainless-steel pan seated over a saucepan with steaming water. Steaming was done for 15 mins at 100°C. To maintain heat stability, a Total Energy gas (Liquidified Petroleum Gas) cylinder of 16 kg was used at a controlled constant gas flow, in an enclosed room to eliminate wind disturbance. Samples were served at room temperature in a white plastic disposable plate. Three-digit codes were assigned to the samples. Samples were evaluated based on the following attributes: appearance, aroma, bitterness, and mouth feel. The evaluation was done using a nine-point hedonic scale where 1 = Dislike extremely and 9=like extremely.

3.6.2 Data analysis objective 2

Data were entered into Microsoft excel, and sorted. Data was then exported to GenStat Version14. Data was tested for normality followed by analysis of variance using general model. Later where there was a significant difference, Bonferroni test was conducted to separate means.

3.7 **Objective** 3. **To evaluate traders' acceptability of selected *Solanum aethiopicum* Gilo genotypes among traders in urban markets in Uganda.**

3.7.1 Trader physical quality acceptability analysis

Method as used by Mulindwa *et al*., (2022) was adopted. Three markets (Gulu Main Market, Kiko Market in Mukono, Mawa Market in Kasese) were purposively chosen for the trader acceptability analysis based on their status as the primary hub for the majority of farmers and consumers close to the areas of study.

Five *Solanum aethiopicum* Gilo entries samples which included: G4, G6, G9, G10 and one check variety. For uniformity and consistency, samples from Kasese were used for the traders' physical acceptability evaluation in all the three locations (Gulu main market, Kiko market in Mukono, Mawa market in Kasese). These markets were selected as each of them represent the main destination for each the location of the experiment across the agro-ecological zones. A cross-sectional study design was used where 35 respondents who were already trading in Gilo were chosen at random from each market making a total of 105 respondents. The respondents were given consent form to read and sign and they were free to leave the evaluation at any point. Each of them was given the Five *Solanum aethiopicum* Gilo entries samples: G4, G6, G9, G10, and one Check variety in order to score the physical quality acceptability. Entries were sorted, and cleaned.

One kilogram of each entry was well place in square open wooden box of 15*15*8cm and presented to the traders. The samples were coded with three-digit codes. Samples were evaluated based on the following attributes: fruit colour, fruit shape, fruit size, fruit hardness, fruit freshness, and fruit succulence. A five-point hedonic rating scale was used were; 1 = dislike a lot and 5 = like a lot (Lawless & Heymann,

2010) to provide scores to the attributes. The five-point was appropriate with consideration of shorter time it take to finish evaluating traders as they are mobile since they are in their business premises and customers could easily work in to buy things.

3.7. 2 Data analysis objective 3.

Data were entered into Microsoft Excel, and sorted. Data was then exported to GenStat version14. Data was tested for normality followed by analysis of variance using two-way ANOVA. Later where there was a significant difference, Bonferroni test was conducted to separate means. **Note**: during the analysis for traders' acceptability, gender was not considered as over 95% of traders selling Solanum aethiopicum Gilo were female.

CHAPTER FOUR

4.1 Results

4.1.2 Objective 1. To evaluate yield and yield related traits of selected candidate Solanum aethiopicum Gilo genotypes across different agro-ecological zones.

In this objective, marketable fruit data were collected from 10 tagged plants per plot. Data was collected across two seasons on the following variables: number of fruits per plant, fruit length, fruit diameter, and fruit weight per plant.

Number of fruits per plant by environment

Check variety had the highest number of fruits (38.62±7.264) in Kasese, followed by Mukono (30.08±7.896), and least in Omoro (26.48±4.958) respectively. The overall mean number of fruits for check variety across all three locations was 31.73±8.50 (Table 1). G10 had the highest number of fruits (30.19±5.662) in Omoro, followed by (27.11±9.512) in Kasese respectively and least (18.66±5.6.3) in Mukono respectively (Table 1). The overall mean number of fruits for G10 across all three locations was 25.32±8.644 (Table 1). G4 had the highest number of fruits (49.45±10.65) in Mukono, followed by (47.20±15.61) and least (46.85±9.253) in Omoro respectively. The overall mean number of fruits for G4 across all three locations was 47.84±13.021 (Table 1). G6 had the highest number fruits (45.75±10.64) in Omoro, followed by Kasese (44.37±21.40), and least number (38.82±7065) in Mukono respectively (Table 1). The overall mean number of fruits for G6 across all three locations was42.98±14.64 (Table 1). G9 had the highest number of fruits (23.48±3.955) in Omoro, followed by (20.66±7.100) in Kasese and least number of fruits (18.80±3.803) in Mukono respectively. The overall mean number of fruits for G9 across all three locations was 20.98±5.507 (Table 1).

G4 had the highest number of fruits (49.45±10.65) in Mukono, followed by G6 (38.82±7.065c), then check variety (30.08±7.896), G10 (18.66±5.6.3) and least was G9 (18.80±3.803) respectively (Table 1). G4 again had the highest number of fruits (47.20±15.61) in Kasese, followed by G6 (44.37±21.40), then Check variety (38.62±7.264), G10 (27.11±9.512) and least was G9 (20.66±7.100) respectively (Table 1). G4 once more had the highest number of fruits (46.86±9.253), followed by G6 (45.75±10.64), then G10 (30.19±5.662), then the check variety (26.48±4.958) and the least was G9 (23.48±3.955) respectively (Table 1). In terms of the overall mean fruit number for the three locations, G4 had the highest number of fruits (47.84± 13.02), followed by G6 (42.98±14.64), then the check variety (31.73±8.50), G10 (25.32±8.644), and lastly G9 (20.98±5.507) (Table 1).

In all the three environments, number of fruits per plant was highly significantly different between genotypes (P<0.001) and the mean for all the three locations was highly significantly different (P<0.001) (Table 1).

Table 1. **Showing the Mean Number of fruits per plant by environment**

Genotype	Environments			
	Mukono	Kasese	Omoro	Mean

Check V	30.08±7.896[b]	38.62±7.264(1.5791[a])	26.48±4.958[a]	31.73±8.50(1.4858[c])
G10	18.66±5.6.3[a]	27.11±9.512(1.4062 [b])	30.19±5.662[b]	25.32±8.644(1.3755[b])
G4	49.45±10.65[d]	47.20±15.61(1.6420 [e])	46.86±9.253[c]	47.84± 13.02(1.6628[e])
G6	38.82±7.065[c]	44.37±21.40(1.5924 [c])	45.75±10.64[c]	42.98±14.64(1.6076[d])
G9	18.80±3.803[a]	20.66±7.100(1.2851 [d])	23.48±3.955[a]	20.98±5.507(1.3049[a])
Mean	31.16	35.59	33.55	33.77(1.4873)
F-test(P)	<0.001	<0.001	<0.001	<0.001
LSD (5%)	2.291	4.310	2.289	1.897

Figures in brackets are derived from transformed data. Figures with the same letters shows values which are not significantly different

Fruit Length (Length in cm) by environment

Check variety had the highest fruit length (4.91±0.159) in Omoro, followed by (4.76±0.157) in Kasese, and least (4.71±0.186) in Mukono respectively (Table 2). The overall mean fruit length for check variety across all three locations was 4.79±0.177 (Table 2). G10 had the highest fruit length (6.82±0.217) in Omoro, followed by (6.10±0.463) in Mukono, and least (5.51±0.380) in Kasese respectively (Table 2). The overall mean fruit length for G10 across all three locations was 6.15±0.651 (Table 2). G4 had the highest fruit length (2.64±0.127) in Mukono, followed by (2.63±0.160) in Kasese, and least (2.58±0.0928) in Omoro respectively (Table 2). The overall mean fruit length for G4 across all three locations was 2.62±0.131 (Table 2). G6 had the highest fruit length (4.88±0.150) in Omoro, followed by (4.85±0.193) Mukono, and least (4.73±0.381) in Kasese respectively (Table 2). The overall mean fruit length for G6 across all three locations was 4.82±0.269 (Table 2). G9 had the highest fruit length (5.74±0.347) in Omoro, followed by (5.51±0.325) in Mukono, and least (5.25±0.449) Kasese respectively. The overall mean fruit length for G9 across all three locations was 5.53±0.430 (Table 2).

G10 had the highest fruit length (6.10±0.463) in Mukono, followed by G9 (5.51±0.325), Then G6 (4.85±0.193c), check variety (4.71±0.186) and least was G4 (2.64±0.127) respectively (Table 2). G10 again had the highest fruit length (5.51±0.380) in Kasese, followed by G9 (5.25±0.449), then check variety (4.76±0.118), G6 (4.73±0.381) and least was G4 (2.63±0.160) respectively (Table 2). G10 had the highest fruit length (6.82±0.217) in Omoro, followed by G9 (5.74±0.347), then check variety (4.91±0.159), G6 (4.88±0.150) and least was G4 (2.58±0.0928) respectively (Table 2). In term of the overall mean fruit length for the three locations, G10 had the highest fruit length (6.15±0.651), followed by G9 (5.53±0.430), then G6 (4.82± 0.269), (4.79±0.177b) and lastly t was (2.62±0.131) respectively (Table 2).

In all the three environments, fruit length was highly significantly different between genotypes ($P<0.001$) and the mean for all the three locations showed significance ($P<0.001$) (Table 2).

Table 2. **Showing Fruit Length (Length in cm) by environment**

Genotype	Environments			
	Mukono	Kasese	Omoro	Mean
Check V	4.71±0.186[b]	4.76±0.118[b]	4.91±0.159[b]	4.79±0.177[b]
G10	6.10±0.463[e]	5.51±0.380[d]	6.82±0.217[d]	6.15±0.651[d]
G4	2.64±0.127[a]	2.63±0.160[a]	2.58±0.0928[a]	2.62±0.131[a]
G6	4.85±0.193[c]	4.73±0.381[b]	4.88±0.150[b]	4.82± 0.269[b]
G9	5.51±0.325[d]	5.25±0.449[c]	5.74±0.347[c]	5.53±0.430[c]
Mean	4.78	4.58	4.99	4.78
F-test(P)	<0.001	<0.001	<0.001	<0.001
LSD (5%)	0.0888	0.1014	0.0658	0.0684

Figures with the same letters shows values which are not significantly different

Fruit diameter (Diameter in cm) by environment

Check variety had the highest fruit diameter (3.49±0.138) in Kasese, followed by (3.31±0.129) Omoro, and least (3.15±0.117) in Mukono respectively (Table 3). The overall mean fruit diameter for check variety across all three locations was 3.31± 0.18 (Table 3). G10 had the highest fruit diameter (3.99±0.76) in Omoro, followed by (3.66±0.310) Mukono and least in (3.63±0.420) Kasese respectively (Table 3). The overall mean fruit diameter for G10 across all three locations was 3.76±0.355 (Table 3). G4 variety had the highest fruit diameter (2.83±0.0880) in Omoro and (3.63±0.223) in Kasese tied respectively and least in (2.70±0.102) in Mukono (Table 3). The overall mean fruit diameter for G4 across all three locations was 2.79±0.160 (Table 3). G6 had the highest fruit diameter (3.03±0.445) in Kasese, followed by (2.99±0.56) in Omoro and least (2.67±0.166) Mukono respectively (Table 3). The overall mean fruit diameter for G6 across all three locations was 2.90±0.330 (Table 3). G9 variety had the highest fruit diameter (4.12±0.299) in Kasese, followed by (4.06±0.0864) in Omoro and least (3.99±0.166) in Mukono respectively (Table 3). The

overall mean fruit diameter for G9 across all three locations was 4.06±0.209 (Table 3).

G9 had the highest fruit diameter (3.99±0.166) in Mukono, followed by G10 (3.66±0.310), then check variety (3.15±0.117), G4 (2.70±0.102) and least was G6 (2.67±0.180) respectively (Table 3). G9 again had the highest fruit diameter (4.12±0.299), followed by G10 (3.6±0.420), then check variety (3.49±0.138), G6 (3.03±0.445) and least was G4 (2.83±0.223) respectively (Table 3). G9 again had the highest fruit diameter (4.06±0.209) in Omoro, followed by G10 (3.99±0.176), then check variety (3.31± 0.129), G6 (2.99±0.156) and least was G4 (2.83±0.0880a) respectively (Table 3). In term of the overall mean fruit diameter for all the three locations, G9 had the highest fruit diameter (4.06±0.209), followed by G10 (3.76±0.355d), then check variety (3.31±0.187), G6 () and lastly was G4 (2.90±0.330) respectively (Table 3).

In all the three environments, fruit diameter was highly significantly different between genotypes ($P<0.001$) and the mean for all the three locations was highly significantly different ($P<0.001$) (Table 3).

Table 3. Showing Fruit diameter (Diameter in cm) by environment

Genotype	Environments			
	Mukono	Kasese	Omoro	Mean
Check V	3.15±0.117[b]	3.49±0.138[c]	3.31± 0.129[c]	3.31±0.187[c]
G10	3.66±0.310[c]	3.63±0.420[c]	3.99±0.176[d]	3.76±0.355[d]
G4	2.70±0.102[a]	2.83±0.223[a]	2.83±0.0880[a]	2.79±0.160[a]
G6	2.67±0.180[a]	3.03±0.445[b]	2.99±0.156[b]	2.90±0.330[b]
G9	3.99±0.166[d]	4.12±0.299[d]	4.06±0.0864[e]	4.06±0.209[e]
Mean	3.23	3.42	3.43	3.36
F-test(P)	<0.001	<0.001	<0.001	<0.001
LSD (5%)	0.05900	0.1015	0.04103	0.04665

Figures with the same letters shows values which has no significant differences between them.

Weight of fruits per plant (Yield per plant in gram) by environment

Check variety had the highest fruit weight per plant (749.7±168.3) in Kasese, followed by (514±137.8) in Mukono, and least (471.7±93.63) in Omoro respectively (Table 4). The overall mean fruit weight for check variety per plant across all three locations was 578.6±183.0 (Table 4). G10 had the highest fruit weight per plant (805.5±180.7) in Omoro, followed by (726.2±285.6) in Kasese, and least (467.3±173.8) in Mukono respectively (Table 4). The overall mean fruit weight for G10 per plant across all three locations was 666.4± 262.1(Table 4). G6 had the highest fruit weight per plant (737.2±221.4) in Omoro, followed by (661.6±288.6) in Kasese, and least (516.1±156.5) in Mukono respectively (Table 4). The overall mean fruit weight for G6 per plant across all three locations was 638.3±192.0 (Table 4). G9 had the highest fruit weight per plant (671.5) in Kasese, followed by (625.5±129.4) in Omoro, and least in (487.6±103.4) in Mukono respectively (Table 4). The overall mean fruit weight for G9 per plant across all three locations was 594.9± 192.0 (Table 4).

G6 had the highest fruit weight per plant (516.1±150) in Mukono, followed by check variety (514.3±137.8), then G9 (487.6±103.4), G4 (473.5±108.8) and least was G6

(467.3±173.8) respectively (Table 4). Check variety had the highest fruit weight per plant (749.7±168.3) in Kasese, followed by G10 (726.2±285.6), then G9 (671.5±256.1), G6 (661.6±288.6) and least was G4 (467.7±173.4) respectively (Table 4). G10 had the highest fruit weight per plant (805.5±180.7) in Omoro, followed by G6 (737.2±221.4), then G9 (625.5±129.4), G4 (495.3±98.54) and least was check variety (471.7±93.63) respectively (Table 4). In term of the mean fruit weight per plant for all the three locations, G10 had the highest fruit weight per plant (666.4±262.1), followed by G6 (638.3±244.3), then G9 (594.9±192.0), check variety (578.6±183.0b) and least was G4 (478.8±131.2) respectively (Table 4).

In all the three environments, weight of fruits per plant was highly significantly different between genotypes in Kasese and Omoro ($P<0.001$), except in Mukono ($P<0.071$), and the mean for all the three environment was highly significantly different ($P<0.001$) (Table 4).

Table 4. Showing Weight of fruits per plant (Yield per plant in gram) by environment

Genotype	Environments			
	Mukono	Kasese	Omoro	Mean
Check V	514.3±137.8	749.7±168.3^{b}	471.7±93.63^{a}	578.6±183.0^{b}
G10	467.3±173.8	726.2±285.6^{b}	805.5±180.7^{d}	666.4±262.1^{d}
G4	473.5±108.8	467.7±173.4^{a}	495.3±98.54^{a}	478.8±131.2^{a}
G6	516.1±150.5	661.6±288.6^{b}	737.2±221.4^{c}	638.3±244.3^{cd}
G9	487.6±103.4	671.5±256.1^{b}	625.5±129.4^{b}	594.9±192.0^{bc}
Mean	491.8	655	627.0	591.4
F-test(P)	0.071	<0.001	<0.001	<0.001
LSD (5%)	42.66	74.7	47.53	37.22

Figures with the same letters shows values which has no significant differences between them.

Combined analysis of variance involving 5 entries and three environments indicated highly significant differences ($P < 0.001$) among genotypes, environments, and G x E interaction (Table 5).

Table 5. Showing Combined analysis of variance of marketable fruit yield (Weight of fruits per plant) of 5 Solanum aethiopicum gilo entries evaluated in three locations for two seasons (2023 and 2024)

Source	Df	Sum square	Mean Square	F-test	Probability	Proportion of treatment sum of square (%)
Genotype	4	4960343	1240086	37.16	<0.001	29.1
Environment (E)	2	6116028	3058014	91.63	<0.001	35.8
Replication within E	3	47163	15721			
G × E	8	5997141	749643	22.46	<0.001	35.1
Residual	1182	39445719	33372			
Total	1199	56566395				

Two highly significant (P<0.000) IPCA effects were identified in the G x E interaction partial squares using the AMMI analysis (Table 6). The first axis accounted for 70.9% of the sums of squares and the remaining axes contributed 29.1% of the sums of squares, the two significant IPCAs explained 100% of the sum of squares of the G x E interaction (Table 6).

Table 6. Showing Additive main effect and multiplicative interaction (AMMI) analysis of variance for two significant interaction principal component axes (IPCAs) on fruit yield (Weight of fruits per plant) of 5 Solanum aethiopicum gilo entries evaluated across three locations for two seasons (2023 and 2024).

Source	Df	Sum square	Mean Square	F-test	Probability	Proportion of treatment sum of square (%)
Treatment	14	17073513	1219537	36.99	<0.001	
Genotype	4	4960343	1240086	37.61	<0.001	29.1
Environment (E)	2	6116028	3058014	38.30	<0.001	35.8
Replication within E	9	718520	79836	2.42	0.01003	
G × E	8	5997141	749643	22.74	<0.001	35.1
IPCA 1	5	4253789	850758	25.80	<0.001	70.9
IPCA 2	3	1743352	581117	17.62	<0.001	29.1
Residuals	0	0				0
Error	1176	38774362	32971			
Total	1199	56566395	47178			

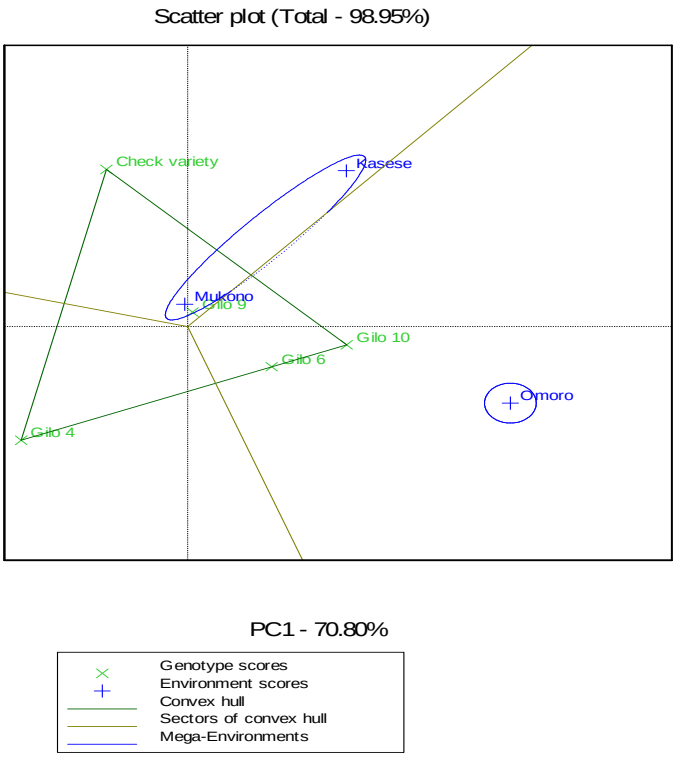
For each of the three environments used in the study, the AMMI analysis found four genotypes that perform the best in terms of fruit yield per plant (Table 7). Each entry that was found to be among the top four in each environment was also among the top four in at least one additional environment.

Table 7. **Showing Four best Solanum aethiopicum gilo entries for fruit yield (Weight of fruits per plant) by environment selected by the additive main effect and multiplicative interaction (AMMI) analysis based on two significant interaction principal component axes (IPCAs) on 5 entries in two seasons (2023 and 2024).**

Number	Environment	Mean	1	2	3	4
2	Mukono	491.8	G 6	Check V	G 9	G 4
1	Kasese	655.4	Check V	G 10	G 9	G 6
3	Omoro	627.0	G 10	G 6	G 9	G 4

The GGE biplot analysis classified the three environments into two major clusters of environments (Fig 1). One of the two clusters comprised two of the three environments-Mukono and Kasese. The remaining environment is made up of Omoro. The GGE biplot analysis indicated that the three test environments are well-distributed and discriminative, as demonstrated by the environment vectors outspreading from the origin at different angles. This shows that the environments are successfully differentiating among the gilo entries. Following the ‘‘which-won-where’’ view of the GGE biplot (Yan et al., 2007), from the biplot, G4, G10 and the check variety are located at the vertices of the polygon, demonstrating they contribute most to the G×E interaction. These vertex genotypes signify entries with the greatest extreme performances which can be best or worst in specific environments. Entry G9 is positioned closer to the biplot origin demonstrate consistent performance across the three environments, making it possibly appropriate for broad recommendation (Figure 1).

Figure 1. Genotype and genotype by environment interaction (GGE) biplot of 5 Solanum aethiopicum gilo entries evaluated across three environments in Uganda in two seasons (2023 and 2024).



4.1.3 Objective 2. To evaluate among consumers, the sensory acceptability of selected candidate *Solanum aethiopicum* genotypes.

Fruits were harvested at market maturity stage and evaluated by consumers for fresh whole fruit attributes (Colour, shape, size, texture and freshness), fresh chopped fruit attributes (appearance and freshness) and finally chopped and cooked fruit attributes (appearance, aroma, bitterness, and mouth feel). A 9-point hedonic scale was used for the evaluation of consumer acceptability (reference) and grading was as follows: 9-Like extremely, 8=Like very much, 7=Like moderately, 6=Like slightly, 5=Neither like nor dislike, 4=Dislike slightly, 3=Dislike moderately,2=Dislike very much,1=Dislike extremely). A total of 105 local consumers of *solanum aethiopicum* Gilo perticipated in the evaluation. The consumers comprised of 56 women and 49 men, ranging between 21 to 67 years old.

Fresh whole fruit attributes

***Colour*:** For fresh whole fruits colour attribute G9 scored best (7.9) in Mukono, followed by G10 (7.6), then Check variety (7.0), G6 (6.2), and the least liked was G4 (6.1) respectively (Table 8). G9 again scored best (8.1) in Kasese, followed by G10 (7.9), then the Check variety (7.8), G6 (7.4), and the least liked was G4 (4.7) respectively (Table 8). G9 and G10 had the same score as best (8.7) in Omoro, followed by G6 (7.7), then Check variety (7.2) and least was G4 (7.1) respectively (Table 8). In term of the overall mean scores for all the three locations, G9 scored best (8.2), followed by G10 (8.0), then check variety (7.3), G6 (7.1) and lastly was G4 (6.0) respectively (Table 8).

Shape: For fresh whole fruits shape attribute, in Mukono, G9 scored best (8.0) in Mukono, followed by G10 (7.4), then check variety (7.3), G4 (6.0) and least was G6 (5.9) respectively (Table 8). In G9 scored best (7.8) in Kasese, followed by G10 (7.6), then Check variety (6.6), G6 (5.8), and the least was G4 (4.8) respectively (Table 8). G9 and G10 had the same score as best (8.5) in Omoro, followed by G6 (8.1), then Check variety (7.4) and least was G4 (7.6) respectively (Table 8). In term of overall mean scores for all the three locations, G9 scored best (8.1), followed by G10 (7.8), then check variety (7.1), G6 (6.6) and least was G4 (5.9) respectively (Table 8).

***Size*:** For fresh whole fruits size attribute, in Mukono, G9 scored best (8.2) in Mukono, followed by G10 (7.8), then Check variety (7.1), G6 (5.4) and least was G4 (4.9) respectively (Table 8). G10 scored best (8.1) in Kasese, followed by Check variety (8.0), then G9 (7.9), G6 (6.8), and least was G4 (4.4) respectively (Table 8). G10 scored best (8.7) in Omoro, followed by G9 (8.6), then G6 (8.1), Check variety (7.4), and least was G4 (5.6) respectively (Table 8). In term of the overall mean scores for

all the three locations, G9 and G10 had same score as best (8.2) in Mukono, followed by Check variety (7.5), then G6 (6.8) and least was G4 (5.2) respectively (Table8).

***Texture*.** For fresh whole fruits texture attribute, G9 scored best (8.1) in Mukono, followed by G10 (7.7), then Check variety (7.0), G6 (6.7), and least was G4 (5.7) respectively (Table 8). G10 scored best (7.3) in Kasese, followed by G9 (7.1), then G6 (6.0), Check variety (5.9), and least was G4 (4.6) respectively (Table 8)., G9 and G10 had the same score as best (8.5) in Omoro, followed by G6 (8.3), then Check variety (7.6), and least was G4 (6.7) respectively (Table 8). In term of the overall mean scores for all the three locations, G9 scored best (7.9), followed by G10 (7.8), then G6 (7.0), Check variety (6.8) and least was G4 (5.6) respectively (Table 8).

Freshness. For fresh whole fruits freshness attribute, G10 scored best (7.8) in Mukono, followed by G9 (7.2), then Check variety (7.0), G6 (6.7), and least was G4 (6.5) respectively (Table 8). G10 scored best (7.5) in Kasese, followed by G9 (7.2), then Check variety (6.5), G6 (6.1), and least was G4 (5.0) respectively (Table 8). G10 scored best (8.6) in Omoro, followed by G9 (8.4), then G6 (7.7), Check variety (7.3) and least was G4 (7.0) respectively (Table 8). In term of the overall mean scores for all the three locations, G10 scored best (7.8), followed by G9 (7.6), then Check variety (6.9), G6 (6.8) and least was G4 (5.6) respectively (Table 8).

Table 8. Showing Consumer acceptability of Gilo entries for whole fruit within the study locations in Uganda

Attributes	Genotypes	Study locations			Mean	l.s.d (α=5%)	c.v%
		Mukono	Kasese	Omoro			
Colour	**G4**	6.1^{a}	4.7^{a}	7.1^{a}	6.0^{a}	0.3503	17.6
	G6	6.2^{a}	7.4^{b}	7.7^{a}	7.1^{b}		
	G9	7.9^{b}	8.1^{c}	8.7^{b}	8.2^{c}		
	G10	7.6^{b}	7.9^{bc}	8.7^{b}	8.0^{c}		
	Check	7.0^{ab}	7.8^{bc}	7.2^{a}	7.3^{b}		
Shape	**G4**	6.0^{a}	4.8^{a}	6.0^{a}	5.9^{a}	0.4170	21.9
	G6	5.9^{a}	5.8^{ab}	8.1^{bc}	6.6^{b}		
	G9	8.0^{b}	7.8^{d}	8.5^{c}	8.1^{c}		
	G10	7.4^{b}	7.6^{cd}	8.5^{c}	7.8^{c}		
	Check	7.3^{b}	6.6^{bc}	7.4^{b}	7.1^{b}		
Size	**G4**	4.9^{a}	4.4^{a}	5.6^{a}	5.0^{a}	0.3562	18.4
	G6	5.4^{a}	6.8^{b}	8.1^{bc}	6.8^{b}		
	G9	8.2^{c}	7.9^{c}	8.6^{c}	8.2^{d}		
	G10	7.8^{bc}	8.1^{c}	8.7^{c}	8.2^{d}		
	Check	7.1^{b}	8.0^{c}	7.4^{b}	7.5^{c}		
Texture	**G4**	5.7^{a}	4.6^{a}	6.7^{a}	5.6^{a}	0.3962	20.8
	G6	6.7^{b}	6.0^{b}	8.3^{b}	7.0^{b}		
	G9	8.1^{d}	7.1^{bc}	8.5^{b}	7.9^{c}		
	G10	7.7^{cd}	7.3^{c}	8.5^{b}	7.8^{c}		
	Check	7.0^{bc}	5.9^{b}	7.6^{ab}	6.8^{b}		
Freshness	**G4**	6.5	5.0^{a}	7.0^{a}	6.2^{a}	0.4568	23.9
	G6	6.7	6.1^{ab}	7.7^{abc}	6.8^{b}		
	G9	7.2	7.2^{bc}	8.4^{bc}	7.6^{c}		
	G10	7.8	7.5^{c}	8.6^{c}	7.8^{c}		
	Check	7.0	6.5^{bc}	7.3^{ab}	6.9^{b}		

Figures with the same letters shows values which has no significant differences between them.

The results showed that districts, and genotypes had significant difference on the acceptability for all the attributes for the evaluated fresh whole fruits attributes: colour, shape, size, texture and freshness respectively ($P \leq 0.05$) (Table 9). Gender had no significant difference on the acceptability for all the attributes for the evaluated fresh whole fruits attributes: colour, shape, size, texture and freshness respectively ($P > 0.05$) (Table 9). District*Genotype had significant difference on the evaluated fresh whole fruits attributes acceptability for colour, shape, and size ($P \leq 0.05$), but for texture and freshness, there was no significant differences ($P>0.05$) (Table 9). District*Gender had significant difference on the evaluated fresh whole fruits attributes acceptability for colour, texture, and freshness ($P \leq 0.05$), but for size, there was no significant differences ($P>0.05$) (Table 9). Genotype*Gender had no significant difference on the acceptability for all the attributes for the evaluated fresh whole fruits attributes: colour, shape, size, texture and freshness respectively ($P>0.05$) (Table 8). District*Genotype*Gender had no significant difference on the acceptability for the evaluated fresh whole fruits attributes: colour, shape, texture and freshness respectively ($P>0.05$), but size had significant difference ($P \leq 0.05$) (Table 9).

Table 9. Showing Probability values for rejecting a null hypothesis (Ho: no differences among genotypes at a = 5%) for fresh whole fruit attributes acceptability among consumers in the study locations

SoV	Colour	Shape	Size	Texture	Freshness
District	<0.001	<0.001	<0.001	<0.001	<0.001
Genotype	<0.001	<0.001	<0.001	<0.001	<0.001
Gender	0.323	0.199	0.972	0.136	0.450
District*Genotype	<0.001	0.002	<0.001	0.228	0.073
District*Gender	0.021	0.019	0.066	<0.001	<0.001
Genotype*Gender	0.426	0.135	0.037	0.052	0.429
District*Genotype*Gender	0.212	0.200	0.044	0.099	0.501
% CV	17.6	21.9	18.4	20.8	23.9

If $P \leq 0.05$, *there is significant difference*

Fresh chopped fruit attributes

Appearance: For fresh chopped fruits appearance attribute, G9 scored best (8.2) in Mukono, followed by G10 (7.7), then Check variety (7.1), G6 (6.6), and least was G4 (5.8) respectively (Table 10). G10 scored best (7.9) in Kasese, followed by G9 (7.8), then check variety (7.1), G6 (6.3), and the least was G4 (4.6) respectively (Table 10). G9 and G10 had the same score as best (8.7) in Omoro, followed by followed by G6 (7.3), then Check variety (7.2), and least was G4 (6.3) respectively (Table 10). In term of the overall mean scores for all the three locations, G9 scored best (8.3), followed by G10 (8.1), then Check variety (7.1), G6 (6.7) and least was G4 (5.7) respectively (Table 10).

***Freshness*:** For fresh chopped fruits freshness attribute, G9 scored best (8.2) in Mukono, followed by G10 (7.7), then Check variety (7.0), G6 (6.8), and least was G4 (6.0) respectively (Table 11). G9 scored best (8.3) in Kasese, followed by G10 (8.0), then Check variety (7.7), G6 (7.1), and least was G4 (4.7) respectively (Table 10). G9 and G10 had the same score as best (8.7) in Omoro, followed by G6 (7.0), then

Check variety (6.9), and least was G4 (6.0) respectively (Table 10). In term of the overall mean scores for all the three locations, G9 scored best (8.4), followed by G10 (8.1), then check variety (7.2), G6 (6.9) and least was G4 (5.6) respectively (Table 10).

Table 10. Showing consumer's acceptability of Gilo entries for fresh chopped fruits within the study locations in Uganda

Attributes	Genotypes	Districts			Mean	l.s.d (α=5%)	c.v%
		Mukono	Kasese	Omoro			
Appearance	**G4**	5.8^{a}	5.1^{a}	6.3^{a}	5.7^{a}	0.4144	21.3
	G6	6.6^{ab}	6.3^{b}	7.3^{a}	6.7^{b}		
	G9	8.2^{d}	7.8^{c}	8.7^{b}	8.3^{c}		
	G10	7.7^{cd}	7.9^{c}	8.7^{b}	8.1^{c}		
	Check	7.1^{bc}	7.1^{bc}	7.2^{a}	7.1^{b}		
Freshness	**G4**	6.0^{a}	4.7^{a}	6.0^{a}	5.6^{a}	0.3733	19.0
	G6	6.8^{ab}	7.1^{b}	7.0^{a}	6.9^{b}		
	G9	8.2^{c}	8.3^{c}	8.7^{b}	8.4^{c}		
	G10	7.7^{bc}	8.0^{c}	8.7^{b}	8.1^{c}		
	Check	7.0^{b}	7.7^{bc}	6.9^{a}	7.2^{b}		

Figures with the same letters indicate values with no significant differences between them.

The results showed that districts, and genotypes had significant difference on the acceptability for all the fresh chopped attributes evaluated: Appearance and freshness respectively ($P \leq 0.05$) (Table 11). Gender had significant difference on freshness acceptability ($P \leq 0.05$), but gender had no significant difference on appearance ($P>0.05$) (Table 11). District*Genotype had significant difference on the evaluated fresh chopped fruits attributes acceptability for freshness ($P \leq 0.05$), but for appearances, there was no significant differences ($P>0.05$) (Table 11). District*Gender had significant difference on the evaluated fresh chopped fruits attributes acceptability for both appearance and freshness ($P \leq 0.05$) (Table 11).

Genotype*Gender had no significant difference on the acceptability for all the attributes for the evaluated fresh chopped fruits attributes: appearance and freshness respectively (P>0.05) (Table 11). District*Genotype*Gender had no significant difference on the acceptability for the evaluated fresh chopped fruits attributes: appearance and freshness respectively (P>0.05) (Table 11).

Table 11. Showing probability values for rejecting a null hypothesis (Ho: no differences among genotypes at a = 5%) for fresh chopped fruit attributes acceptability among consumers in the study locations

SoV	Appearance	Freshness
District	<0.001	0.040
Genotype	<0.001	<0.001
Gender	0.729	0.012
District*Genotype	0.389	<0.001
District*Gender	<0.001	<0.001
Genotype*Gender	0.292	0.371
District*Genotype*Gender	0.568	0.417
% CV	21.3	19.0

If P ≤ 0.05, there is significant difference

4.1.3.3 Chopped cooked fruit attributes

***Appearance*:** For chopped cooked appearance attribute, G9 scored best (8.1) in Mukono, followed by Check variety (7.8), then G10 (7.7), G6 (7.1), and least G4 (6.2) respectively (Table 12). G10 scored best (8.2) in Kasese, followed by Check variety (8.1), then G9 (7.9), followed by G6 (7.5), and least was G4 (4.9) respectively (Table 12). G10 scored best (8.5) in Omoro, G6 and G9 had same score in second position, then check variety (8.2), and least was G4 (6.8) respectively (Table 12). In term of the overall mean scores for all the three locations, G9 and G10 had the same score as best (8.1), followed by Check variety (8.0), then G6 (7.6) and least G4 (5.9) respectively (Table 12).

Aroma: For chopped cooked aroma attribute, check variety scored best (8.1) in Mukono, G6 and G10 had the had the same score as second best (7.9), then G9 (7.4) and least was G4 (6.2) respectively (Table 12). G6 scored best (8.2) in Kasese, followed by G10 (8.1), then Check variety (7.9), G9 (7.5), and least was G4 (5.1) respectively (Table 12). G10 scored best (8.5) in Omoro, followed by G6 (8.4), then Check variety (8.2), G9 (8.1), and least was G4 (6.9) respectively (Table 12). In term of overall e mean scores for all the three locations, G6 scored best (8.2), G10 and Check had the same score as second best (8.1), then G9 (7.7) and least was G4 (6.0) respectively (Table 12).

Bitterness: For chopped cooked bitterness attribute, check variety scored best (8.2) in Mukono, followed by G6 (7.9), G9 and G10 had the same score as third best (7.8) and least was G4 (5.8) respectively (Table 12). G6 scored best (8.8) in Kasese, G9 and G10 had the same score as second best (8.1), then Check variety (8.0), and least was G4 (5.9) respectively (Table 12). G9 and check had the same score as best (8.5), followed by G6 (8.4), then G10 (8.2), and least was G4 (7.4) respectively (Table 12). In term of overall e mean scores for all the three locations, G6 scored best (8.3), followed by Check variety (8.2), G9 and G10 had the same score as third best (8.1) and least was G4 (6.3) respectively (Table 12).

***Mouth feel*:** For chopped cooked mouth feel attribute, G10 scored best (8.1) in Mukono, followed by G9 (8.0), then Check variety (7.6), G6 (6.9), and least was G4 (5.9) respectively (Table 12). G9 scored best (7.9) in Kasese, G10 and check variety had the same score as send best (7.5), then G6 (7.4) and least was G4 (5.1) respectively (Table 12). G9 scored best (8.5) in Omoro, G6 and G10 had the same score as second best (8.4), then Check variety (8.2) and least was G4 (6.7)

respectively (Table 12). In term of overall mean scores for all the three locations, G9 scored best (8.1), followed by G10 (8.0), then Check variety (7.8), G6 (7.6) and least G4 (5.9) respectively (Table 12).

Table 12. Showing consumer's acceptability of Gilo genotypes for cooked fruit within the study locations in Uganda

Attributes	Genotypes	Districts			Mean	l.s.d (α=5%)	c.v%
		Mukono	Kasese	Omoro			
Appearance	**G4**	6.2^{a}	4.9^{a}	6.8^{a}	5.9^{a}	0.2793	13.6
	G6	7.1^{b}	7.5^{b}	8.3^{b}	7.6^{b}		
	G9	8.1^{c}	7.9^{bc}	8.3^{b}	8.1^{c}		
	G10	7.7^{bc}	8.2^{c}	8.5^{b}	8.1^{c}		
	Check	7.8^{bc}	8.1^{c}	8.2^{b}	8.0^{c}		
Aroma	**G4**	6.2^{a}	5.1^{a}	6.9^{a}	6.0^{a}	0.2748	13.3
	G6	7.9^{bc}	8.2^{b}	8.4^{b}	8.2^{c}		
	G9	7.4^{b}	7.5^{b}	8.1^{b}	7.7^{b}		
	G10	7.9^{bc}	8.1^{b}	8.5^{b}	8.1^{c}		
	Check	8.1^{c}	7.9^{b}	8.2^{b}	8.1^{bc}		
Bitterness	**G4**	5.8^{a}	5.9^{a}	7.4^{a}	6.3^{a}	0.1991	9.4
	G6	7.9^{b}	8.8^{c}	8.4^{b}	8.3^{b}		
	G9	7.8^{b}	8.1^{b}	8.5^{b}	8.1^{b}		
	G10	7.8^{b}	8.1^{bc}	8.3^{b}	8.1^{b}		
	Check	8.2^{b}	8.0^{b}	8.5^{b}	8.2^{b}		
Mouth feel	**G4**	5.9^{a}	5.1^{a}	6.7^{a}	5.9^{a}	0.3238	16.0
	G6	6.9^{b}	7.4^{b}	8.4^{b}	7.6^{b}		
	G9	8.0^{c}	7.9^{b}	8.5^{b}	8.1^{c}		
	G10	8.1^{c}	7.5^{b}	8.4^{b}	8.0^{bc}		
	Check	7.6^{bc}	7.5^{b}	8.2^{b}	7.8^{bc}		

Figures with the same letters indicate values with no significant differences between them.

The results showed that districts, and genotypes had significant difference in the acceptability for all the attributes. The evaluated chopped cooked fruits attributes: appearance, aroma, bitterness and mouth feel ($P \leq 0.05$) (Table 13). Gender had no significant difference on the acceptability for all the attributes for the evaluated chopped cooked fruits attributes: appearance, aroma, bitterness and mouth feel ($P > 0.05$) (Table 13). District*Genotype had no significant difference on the evaluated chopped cooked fruit attributes appearance, aroma, bitterness and mouth feel ($P>0.05$) (Table 13). District*Gender had significant difference on the evaluated chopped cooked fruits attributes: appearance, aroma, bitterness and mouth feel ($P \leq 0.05$) (Table 13). Genotype*Gender had no significant difference on the acceptability for all the attributes for the evaluated chopped cooked fruits attributes: appearance, aroma, bitterness and mouth feel ($P>0.05$) (Table 13). District*Genotype*Gender had no significant difference on the acceptability for the evaluated appearance, aroma, bitterness and mouth feel respectively ($P>0.05$) (Table 13).

Table 13. ***Showing Probability values for rejecting the null hypothesis (Ho: no differences among genotypes at a = 5%) for chopped and cooked fruit attributes acceptability among consumers in the study locations***

SoV	Appearance	Aroma	Bitterness	Mouth feel
District	<0.001	<0.001	<0.001	<0.001
Genotype	<0.001	<0.001	<0.001	<0.001
Gender	0.967	0.164	0.055	0.465
District*Genotype	<0.001	<0.001	<0.001	0.009
District*Gender	0.188	0.153	0.833	0.795
Genotype*Gender	0.650	0.919	0.913	0.941
District*Genotype*Gender	0.519	0.824	0.307	0.679
% CV	13.6	13.3	9.4	16.0

If $P \leq 0.05$, there is significant difference

4.1.4 Objective 3. To evaluate traders' acceptability of selected Solanum aethiopicum Gilo genotypes among traders in urban markets in Uganda.

Fruits were harvested at market maturity stage and evaluated by *Solanum aethiopicum* gilo traders for physical acceptance attributes among markets in Mukono(Kiko market), Kasese (Mawa market) and Gulu main market.. The following physical attributes where considered: Colour, shape, size, hardness, smoothness, and succulence. Five gilo entries were evaluated using 5-point hedonic scale according to Joseph et al. (2022), where Like a lot=5, like a little=4, Neutral=3, dislike =2, dislike a lot=1. A total of 105 traders selling *solanum aethiopicum* Gilo perticipated in the evaluation. The traders comprised of 94 women and 11 men, ranging between 24 to 52 years old.

Physical attributes acceptability

Fruit physical colour. The mean scores for all the three locations showed that check variety scored best (4.2), followed by G9 (4.0), then G6 and G10 tied (3.9) and least liked was G4 (2.2) respectively (Table 14). The Check variety in Mukono scored best (4.4), followed by G9 (4.2), then G6 (3.8), G10 (3.6), and the least liked was G4 (2.1) respectively (Table 14). In Kasese, the check variety scored best (4.3), followed by G10 (4.0), then G9 (3.9), G6 (3.7), and least liked was G4 (2.0) respectively (Table 14). In Gulu, G9 scored best (4.5), then G6 and G10 tied (4.1), followed by the check variety (3.9), and the least liked was G4 (3.3) respectively (Table 14).

***Fruit physical shape*.** The mean scores for all the three locations showed that G9 and check variety had the same score as best (4.2), followed by G10 (3.9), then G6 (3.5) and least likedG4 (2.4) respectively (Table 14). Check variety scored best (4.6) in Mukono, followed by G9 (4.2), then G6 (3.8), G10 (3.6), and least was G4 (2.1) respectively (Table 14). check variety scored best again (4.1) in Kasese, followed by G10 (4.0), then G9 (3.9), G6 (3.3), and least was G4 (2.1) respectively (Table 14). G9 scored best (4.3) in Gulu, followed by G10 (4.1), then G16 (4.0), G6 (3.9), and least was G4 (3.0) respectively (Table 14).

Fruit physicals size. The mean scores for all the three locations shows that G9 scored best (4.4), followed by check variety (4.3), then G10 (4.2), G6 (3.7) and least liked was G4 (2.2) respectively (Table 14). Check variety scored best (4.5) in Mukono, followed by G9 (4.4), then G10 (4.0), G6 (3.7), and least liked was G4 (1.9) respectively (Table 14). G9 scored best (4.6) in Kasese, G6, G10 and check had the same score as second best (4.3), and least liked G4 (2.0) respectively (Table 14). G9

scored best (4.6) in Gulu, G10 and check variety had the same score as second best (4.2), then G6 (4.1), and least was G4 (3.0) respectively (Table 14).

***Fruit physical hardness*.** The mean scores for all the three locations shows that, Check scored best (4.2), followed by G9 (4.0), then G10 (3.9), G6 (3.6) and least was G4 (2.9) respectively (Table 14). Check variety scored best (4.6) in Mukono, followed by G9 (4.2), then G10 (3.8), G6 (3.6), and least liked was G4 (2.6) respectively (Table 14). Check variety again scored best (4.1) in Kasese, followed by G10 (3.9), then G9 (3.7), G6 (3.3), and least was G4 (2.7) respectively (Table 14). G9 scored best (4.3) in Gulu, G6 and G10 had the same score as second best (4.0), then check variety (3.9), and least was G4 (3.2) respectively (Table 14).

Fruit physical freshness. The mean scores for all the three locations shows that, G9 scored best (4.1), followed by G10 (3.9), then G6 (3.7 check variety (3.6) and least was G4 (2.4) respectively (Table 14). Check variety scored best (4.3) in Mukono, followed by G9 (4.2), then G10 (4.0), G6 (3.7) and least liked was G4 (2.3) respectively (Table 14). G10 scored best (4.3) in Kasese, followed by check variety (4.1), then G9 (3.8), G6 (3.4), and least was G4 (2.3) respectively (Table 14). G9 scored best (4.3) in Gulu, followed by G6 (4.1), then G10 (3.9), check variety (3.6) and least was G4 (3.2) respectively (Table 14).

Fruit physical succulence. The mean scores for all the three locations show that, G9 scored best (4.1), followed by check variety (3.9), then G10 (3.6), G6 (3.4) and least liked was G4 (2.5) respectively (Table 14).

G9 and check variety had the same score as best (4.3) in Mukono, followed by G10 (3.8), then G6 (3.2) and the least G4 (1.9) respectively (Table 14)., G9 scored best (3.7) in Kasese, followed by check variety (3.6), then G10 (3.3), G6 (2.8), and least

liked was G4 (2.2) respectively (Table 14). G9 scored best (4.4) in Gulu, followed by G6 (4.1), then check (3.8), G10 (3.7) and least liked was G4 (3.3) respectively (Table 14).

Table 14. Showing traders' physical quality acceptability of Gilo genotypes in three selected Urban markets in Uganda

Attributes	Genotypes	Markets			Mean	l.s.d (α=5%)	c.v%
		Kiko Market (Mukono)	Mawa Market (Kasese)	Gulu main market (Gulu)			
Fruit colour	G4	2.1^{a}	2.0^{a}	3.3^{a}	2.5^{a}	0.2156	21.3
	G6	3.8^{bc}	3.7^{b}	4.1^{bc}	3.9^{b}		
	G9	4.2^{cd}	3.9^{bc}	4.5^{c}	4.0^{cd}		
	G10	3.6^{b}	4.0^{bc}	4.1^{bc}	3.9^{bc}		
	Check	4.4^{d}	4.3^{c}	3.9^{b}	4.2^{d}		
Fruit shape	G4	2.1^{a}	2.1^{a}	3.0^{a}	2.4^{a}	0.2315	23.6
	G6	3.3^{b}	3.3^{b}	4.0^{b}	3.5^{b}		
	G9	4.2^{c}	3.9^{c}	4.3^{b}	4.2^{c}		
	G10	3.6^{b}	4.0^{c}	4.1^{b}	3.9^{c}		
	Check	4.6^{c}	4.1^{c}	3.9^{b}	4.2^{c}		
Fruit size	G4	1.9^{a}	1.6^{a}	3.0^{a}	2.2^{a}	0.1998	19.5
	G6	3.7^{b}	3.3^{b}	4.1^{b}	3.7^{b}		
	G9	4.4^{cd}	4.4^{c}	4.6^{b}	4.4^{c}		
	G10	4.0^{bc}	4.3^{c}	4.2^{b}	4.2^{c}		
	Check	4.5^{d}	4.3^{c}	4.2^{b}	4.3^{c}		
Fruit hardness	G4	2.6^{a}	2.7^{a}	3.2^{a}	2.9^{a}	0.2249	22.3
	G6	3.6^{b}	3.3^{ab}	4.0^{b}	3.6^{b}		
	G9	4.2^{cd}	3.7^{bc}	4.3^{b}	4.0^{c}		
	G10	3.8^{bc}	3.9^{c}	4.0^{b}	3.9^{bc}		
	Check	4.6^{d}	4.1^{c}	3.9^{ab}	4.2^{c}		
Fruit Freshness	G4	2.3^{a}	2.3^{a}	3.2^{a}	2.6^{a}	0.2265	22.5
	G6	3.7^{b}	3.4^{b}	4.1^{bc}	3.7^{b}		
	G9	4.2^{c}	3.8^{bc}	4.3^{c}	4.1^{c}		
	G10	4.0^{bc}	4.3^{c}	3.9^{bc}	4.0^{c}		
	Check	4.3^{c}	4.1^{c}	3.6^{ab}	4.0^{bc}		
Fruit succulence	G4	1.9^{a}	2.2^{a}	3.3^{a}	2.5^{a}	0.2513	26.5
	G6	3.2^{b}	2.8^{ab}	4.1^{b}	3.4^{b}		
	G9	4.3^{c}	3.7^{c}	4.4^{b}	4.1^{d}		
	G10	3.8^{c}	3.3^{bc}	3.7^{ab}	3.6^{bc}		
	Check	4.3^{c}	3.6^{c}	3.8^{ab}	3.9^{cd}		

Figures with the same letters indicate values with no significant differences between them.

Key: Like a lot=5, like a little=4, Neutral=3, dislike =2, dislike a lot

The results showed that markets, genotype, and market*genotypes had significant difference on the acceptability for all the evaluated physical attributes: Colour, shape, size, hardness, smoothness, and succulence ($P \leq 0.05$) (Table 15).

Table 15. Showing probability values for rejecting a null hypothesis (Ho: no differences among genotypes at a = 5%) for physical attributes acceptability in study markets

SoV	Fruit Colour	Fruit Shape	Fruit Size	Fruit hardness	Fruit Smoothness	Fruit Succulence
Market	<0.001	<0.001	<0.001	<0.001	0.016	<0.001
Genotype	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Market*Genotype	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
% CV	21.3	23.6	19.5	22.3	22.5	26.5

If $P \leq 0.05$, there is significant difference

CHAPTER FIVE

5.0. Discussion

5.1 To evaluate Yield and yield related traits of selected candidate *Solanum aethiopicum* Gilo genotypes across different agro-ecological zones in Uganda.

The study revealed G4 superiority in terms of fruit number (47.84±13.021 overall mean) despite having the smallest fruit length (2.62±0.131) across all the locations, suggesting G4 produces many small fruits. Conversely, G10 demonstrated highest in terms of fruit length (6.15±0.651) but moderate number of fruit per plant (25.32±8.644), indicating a trade-off between quantity and fruit size. Location effects were evident across all parameters, with Kasese generally favoring fruit weight and diameter for most entries, while Omoro showed advantages for fruit length in several entries.

G10 attained the highest overall fruit weight per plant (666.4±262.1) across locations, followed closely by G6 (638.3±192.0), both performing better than the check variety (578.6±183.0). The variation in standard deviations in the different locations indicate that environmental factors have significant influence to fruit development. This is because, the different agro-ecological zones had difference in terms of rainfall, soil characteristics (Barasa, 2019, David Akodi et al., 2016 and Okonya et al., 2013).

This study revealed that, across all the three locations, Mukono, Kasese and Omoro, G4 performance was best in term number of fruits per plant ranging from 46.86 to 49.45 with mean for all the locations 47.84±…. The study revealed G6 as a reliable second-best across all locations, with fruit numbers ranging from 38.82 to 45.75 and

mean for all the three location as 42.98. The least entry for fruit number revealed to be G9 in all the three locations with fruit number ranging from 18.80 to 23.48 and mean for all the location as 20.98. This study reveal that all the gilo entries in this study, their fruit number are still in the range base on a similar study by Denkyirah.(2013), where the highest gilo fruit number was 92 and lowest 16. The study revealed that, in all the three environments, number of fruits per plant had significant differences between genotypes ($P<0.001$) and the mean for all the three locations showed significance difference ($P<0.001$). This can be explained by the discrimination among the *solanum aethiopicum* gilo group (Kouassi et al., 2014). Similar significant G x E results was reported (Dinssa et al., 2019).

In all the location, G10 performed best in term of fruit length ranging from 5.51cm to 6.82 cm with mean for all the environment 6.15 cm. G9 came second with fruit length ranging from 5.2cm to 5.7cm and overall mean of 5.53 cm. G4 came least with fruit length ranging from 2.58cm to 2.62cm with the overall mean of 2.62cm. This study reveal that all the gilo entries in this study, their fruit length are not far from a similar study by Denkyirah.(2013), where the highest gilo fruit length was 6.2cm and lowest 2.2cm. The study revealed that, in all the three environments, fruit length had significant differences between genotypes ($P<0.001$) and the mean for all the three locations showed significance difference ($P<0.001$). This can be explained by the discrimination among the *solanum aethiopicum* gilo group (Kouassi et al., 2014). Similar significant G x E results was reported (Dinssa et al., 2019).

This study revealed that, across all the three locations, Mukono, Kasese and Omoro, G9 performance best in term of fruits diameter ranging from 3.99cm to 4.12cm with mean for all the locations 4.06. The study revealed G10 as a reliable second-best

across all locations, with fruit diameter ranging from 3.60cm to 3.99cm and mean for all the three location as 3.76cm. Additionally, the study revealed the least entry for fruit diameter G4 in all the three locations with fruit diameter ranging from 2.70cm to 2.83cm and mean for all the location as 2.90cm. This study reveal that all the gilo entries in this study, their fruit diameter are not far from a similar study on gilo group by Kouassi et al.(2014), where the highest gilo fruit diameter was 4.27cm and lowest 1.11cm. The study revealed that, in all the three environments, fruit diameter had significant differences between genotypes ($P<0.001$) and the mean for all the three locations showed significance ($P<0.001$).

This study revealed that, G10 performed best overall with fruit weight ranging from 467.3g to 805.5g and mean for the three locations 666.4g. The study revealed G6 as a reliable second-best with fruit weight ranging from 516.1g to 737.2g and mean for all the three location as 638.3g. The study revealed the least entry for fruit weight per plant as G4 in all the three locations with fruit weight ranging from 467.7g to 495.3g and mean for all the location as 478.8g. This study reveal that all the gilo entries in this study, their fruit weight per plant are not far from a similar study on gilo group by Denkyirah.(2013), where the highest gilo fruit weight per plant was 1326.0g and lowest 447.0g. The study revealed that, in the three environments, weight of fruits per plant had significant differences between genotypes in Kasese and Omoro ($P<0.05$), except in Mukono ($P<0.05$), and the mean for all the three environment was significance ($P<0.001$).

From the study, a combined analysis of variance involving 5 entries and three environments revealed highly significant differences ($P < 0.001$) among genotypes and among environments, and in G x E interaction. This is similar to the study by

Dinssa et at. (2019), where a combined analysis of variance involving 21 entries of African eggplant (S. aethiopicum) and seven environments indicated highly significant differences (P < 0.001) among entries and among environments, and in G x E interaction. 5 entries and three environments revealed highly significant differences (P < 0.001). The result shows that there are large environmental effects (35.8%). Furthermore, there is large G×E Interaction (35.1%) as the five entries responded very differently across the three environments.

IPCA effects were identified from the G x E interaction partial squares using the AMMI analysis. With the first axis accounting for 70.9% of the sums of squares and the remaining axes accounting for 29.1% of the sums of squares, the two significant IPCAs explained 100% of the sum of squares of the G x E interaction. The study reveal that, genotypes ranked differently across locations meaning Environmental conditions significantly influence genotype performance and different genotypes in the study are suited to different locations which can be justified according to Duarah. (2022), explaining that variation in genotype performance across the environments is often associated to changes in environmental factors such as relative humidity, rainfall amount, temperature, photoperiod, soil moisture, light intensity among others. Additionally, these variations could be due to Genetic differences

The study found four genotypes from AMMI analysis that perform the best in term of fruit yield per plant. Each entry that was found to be among the top four in one environment was likewise among the top four in at least one additional environment. This is similar to the finding by Dinssa et at. (2019), where AMMI analysis identified four best performing entries in each of the seven environments in the study and

every entry identified among the best four entries in one environment was also among the best four entries in at least one of other environment.

From the study, GGE biplot analysis classified the three environments into two major clusters of environments. One of the two clusters comprised two of the three environments-Mukono and Kasese. The remaining environment is made up of Omoro. The formation of mega enviroments align with the finding by Duarah. (2022), where eight environment were classified in to four mega environments in the study of determination of growth and yield stability in Tomato (Solanum lycopersicum L.) genotypes. The GGE biplot analysis indicated that the three test environments are well-distributed and discriminative, as demonstrated by the environment vectors outspreading from the origin at different angles. This shows that the environments are successfully differentiating among the gilo entries. Following the ‘‘which-won-where’’ view of the GGE biplot (Yan et al., 2007), from the biplot, G4, G10 and the check variety are located at the vertices of the polygon, demonstrating they contribute most to the G×E interaction similar to the study by Dinssa et at. (2019), where ntries which mapped on the vertices of the polygon where considered making larger contribution to the G x E interaction, and their performances were the best or the poorest in one or more of the environments. Entry G9 is positioned closer to the biplot origin demonstrate consistent performance across the three environments, making it possibly appropriate for broad recommendation.

5.2 To evaluate among consumers, the sensory acceptability of selected candidate solanum aethiopicum genotypes.

Fresh whole fruit attributes

For fresh whole fruits consumers' evaluation, G9 and G10 reliably demonstrated superior consumer acceptance, with G9 attaining the highest mean scores for colour (8.2), shape (8.1), and texture (7.9), while G10 scored highest in fruit size (8.2 tied with G9) and freshness (7.8) which in all, falls between like moderately to like very much. The check variety and G6 maintained liking scores (6.8-7.5) and G6 (6.6-7.0) respectively which are all in the range of like slightly to like moderately. These therefore according to Lim.(2011), justifying that G9, G10,G6 and check variety were all in the range for consume liking as in all location, they got acceptable liking levels (≥6.0). G6 location specific had some scores below 6 that is in Mukono (5.9) and in Kasese (5.6). G4 generally scored lowest across all attributes (5.2-6.0), often falling below the threshold for acceptance of 6.0, mainly in Kasese where it scored poorly for colour (4.7), shape (4.8), size (4.4), texture (4.6), and freshness (5.0). Sensory characteristics of food have distinct and influential effects on acceptability according to Piqueras-Fiszman & Spence (2015), which justify the variation on the acceptability of fresh whole fruits result in this study.

Consumers' evaluation demonstrated a significant difference on District and Genotype for all the attributes ($P \leq 0.05$). Gender had no significant differences for all the attributes ($P > 0.05$). District*Genotype revealed significant difference ($P > 0.05$) in all the attributes except for texture and freshness. District* Gender revealed significant differences ($P \leq 0.05$) in all attributes except in fruit size. Genotype*Gender revealed no significant differences ($P \leq 0.05$) in all attributes. District*Genotype*Gender revealed significant differences ($P \leq 0.05$) in all attributes except in fruit texture.

Fresh chopped fruits

Appearance and freshness, much as there was location variation G9 consistently attained the highest consumer acceptance with 8.3 overall scores for appearance and 8.4 for freshness, closely followed by G10 (8.1 for both attributes) of which both G9 and G10 are like very much. The Check variety got some variation within locations but maintained like moderate acceptance levels (7.1-7.2) for both attributes, while G6 showed some variation within location with like slightly acceptable level (6.7-6.9) overall across both attributes. These therefore according to Lim. (2011), justifying that G9, G10, check variety and G6 were all in the range for consume liking as in all location, they got acceptable liking levels (≥6.0). With variation, G4 consistently scored lowest overall for both appearance (5.7) and freshness (5.6). This therefore according to Lim. (2011), justifying that G4 is below the range for consume liking as its overall in all location, got acceptable liking levels (<6.0). Location-wise, Omoro revealed the highest acceptance scores where G9 and G10 both attaining excellent ratings (≥8.0) for both attributes, while in Kasese, G4 was most discriminated showing that G9 and G10 possess superior visual appeal as different genotypes can have different sensory traits which affect acceptability (Cobos et al., 2016).

Consumers' evaluation demonstrated a significant difference on District and Genotype for all the attributes (P≤0.05). Gender had no significant differences for appearance but not for freshness (P>0.05). District*Genotype revealed significant difference (P > 0.05) for appearance while freshness was not significantly difference. District* Gender revealed significant differences (P ≤ 0.05) for all attributes. Genotype*Gender revealed no significant differences (P ≤ 0.05) for all attributes. District*Genotype*Gender revealed no significant differences (P ≤ 0.05) for all attributes.

Chopped cooked fruits

Consumers preference scores varied by attributes and locations with G9 and G10 tied overall for best appearance (8.1), G6 excelling in aroma (8.2) and bitterness (8.3), and G9 leading in mouth feel (8.1) where consumers like very much. The Check variety revealed consistently strong performance across all attributes (7.8-8.2) ranging from like moderately to like very much by the consumers, while G6 showed excellent results particularly for aroma and bitterness but moderate scores for mouth feel (7.6) liked moderately by the consumers. These therefore according to Lim. (2011), justifying that G9, G10, check variety and G6 were all in the range for consume liking as in all location, they got acceptable liking levels (≥6.0). G4 consistently performed poorest across all attributes with (5.9-6.3) ranging from neither like nor dislike to like slightly falling below the acceptance threshold and scoring mostly low in Kasese for appearance (4.9), aroma (5.1), and mouth feel (5.1). Location-wise, the study revealed that Omoro generally displayed the highest acceptance scores across genotypes and attributes, meanwhile most discrimination was in Kasese against G4, showing that G6, G9, G10, and the Check variety all have desirable cooking acceptance, with G6 being predominantly suitable where aroma and reduced bitterness are priorities. The difference acceptance score can be justified that genotypes can have different sensory traits which affect acceptability (Cobos et al., 2016).

Chopped cooked fruits, consumers' evaluation demonstrated a significant difference on District and Genotype for all the attributes ($P \leq 0.05$). Gender had no significant differences for all the attributes ($P > 0.05$). District*Genotype revealed significant difference ($P > 0.05$) in all the attributes. District* Gender revealed no significant

differences (P>0.05) for all attributes. Genotype*Gender revealed no significant differences (P > 0.05) for all attributes. District*Genotype*Gender revealed no significant differences (P > 0.05) in all attributes.

5.3 Traders' physical quality acceptability of Gilo genotypes in three selected Urban markets in Uganda

For traders' physical acceptability of the different solanum aethiopicum gilo entries grown in Kasese and evaluated by traders in Kiko market (Mukono), Mawa market (Kasese) and (Gulu main market) Gulu. Market evaluation demonstrated a significant difference (P ≤ 0.05) on markets, genotypes and their interaction on the traders' acceptability of the different physical attributes including color, shape, size, hardness, smoothness, and succulence. According to Joseph et al. (2022), differences in acceptability of genotypes could be due to genetic differences. Additional, according to Joseph et al. (2022), study on the bio treated solanum aethiopicum Shum in different markets revealed significant differences on market acceptability similar with the difference on market acceptability for the different *solanum aethiopicum* gilo entries in this study.

For fruit physical attributes evaluation by traders there was variation on the different markets. Check variety demonstrated constantly superior scores across most attributes, specifically in colour (4.2), shape (4.2), size (4.3), and hardness (4.2). **G9** demonstrated strong overall performance, leading in size (4.4), freshness (4.1), and succulence (4.1), with consistent high ratings across all markets. **G10** demonstrated moderated to good performance across attributes (3.6-4.2), showing specific strength in size (4.2) and performing steadily well in most markets. G6 demonstrated moderate performance in most attributes (3.4-3.9). G4 constantly

performed poorest for all physical attributes with scores ranging from (1.9-3.3). According to similar study by Joseph et al. (2022), Check variety, G9, G10 and G6, they were all highly accepted by traders as their scores were (≥3.0), G4 did not performed except for in Gulu specifically where (≥3.0). Location-wise, Gulu generally demonstrated a more balanced acceptance scores across genotypes and attributes, where G4 performing relatively better as compared to other Mukono and Kasese where most discrimination was observed, showing that the Check variety, G6, G9, and G10 all have required physical acceptance qualities for trading acceptance.

CHAPTER SIX

6.1 Conclusion

The extensive evaluation of the five *Solanum aethiopicum* Gilo entries across three agro-ecological zones in Uganda revealed significant difference in yield and yield-related traits among the selected candidate *Solanum aethiopicum* Gilo genotypes in the different agro-ecological zones. This is because, genotype, environment, and G×E interaction effected yield. Concerning yield performance, G4 outperformed in all locations in terms of fruit number, but fruit weight differed by genotype and location, with G10 exhibiting the best overall yield adaptation. The significant G×E interaction implies that recommendations should be location-specific, given the fact that different genotypes performing optimally in different environments.

There was significant difference in sensory acceptability of selected Solanum aethiopicum Gilo genotypes among consumers and yield related traits performance and there was significant difference in traders' physical acceptability of selected candidate *Solanum aethiopicum* Gilo genotypes in urban markets in Uganda. This is because, consumer and Market Preference showed that entries G9 and G10 and check variety received the highest consumer and trader acceptability ratings across locations for most attributes, while G4, despite high productivity in term of fruit number, faced acceptability challenges. Significant district effects on both agronomic performance and acceptability demonstrate the importance of regional testing and targeted variety deployment. This according to Carneiro et al. (2020), will allow development of new crop variety through breeding which aligns with consumer desire, willing to purchase, and sustainable.

6.2 Recommendation

This study provides variety commercialization strategies, and future breeding initiatives for *Solanum aethiopicum* Gilo in Uganda. Genotypes G10, G9, and Check were the most promising for immediate commercialization across Uganda due to their balance of reasonable yield and high acceptability, while G6 and the Check variety remained competitive options in specific environments.

Future breeding efforts should focus on combining the high productivity traits of G4 in term of fruit number with the superior quality attributes of G9 and G10.

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Appendix 1: Data collection tool for yield

Date data collected by:……Location:…….....

Harvest No (1st, 2nd, 3rd):……Data collected by:……

Block number	Genotypic code	Genotype name	Plant number	No of fruits per plant	Weigh of fruits per plant (g)	Fruit Length (CM)	Fruit diameter (CM)
1	186	Gilo 10	1				
1	186	Gilo 10	2				
1	186	Gilo 10	3				
1	186	Gilo 10	4				
1	186	Gilo 10	5				
1	186	Gilo 10	6				
1	186	Gilo 10	7				
1	186	Gilo 10	8				
1	186	Gilo 10	9				
1	186	Gilo 10	10				
1	230	Gilo 9	1				
1	230	Gilo 9	2				

1	230	Gilo 9	3				
1	230	Gilo 9	4				
1	230	Gilo 9	5				
1	230	Gilo 9	6				
1	230	Gilo 9	7				
1	230	Gilo 9	8				
1	230	Gilo 9	9				
1	230	Gilo 9	10				
1	125	Check V	1				
1	125	Check V	2				
1	125	Check V	3				
1	125	Check V	4				
1	125	Check V	5				
1	125	Check V	6				
1	125	Check V	7				
1	125	Check V	8				
1	125	Check V	9				
1	125	Check V	10				

Block number	Genotypic code	Genotype name	Plant number	No of fruits per plant	Weigh of fruits per plant (g)	Fruit Length (CM)	Fruit Diameter
1	328	Gilo 6	1				
1	328	Gilo 6	2				
1	328	Gilo 6	3				
1	328	Gilo 6	4				
1	328	Gilo 6	5				
1	328	Gilo 6	6				
1	328	Gilo 6	7				
1	328	Gilo 6	8				
1	328	Gilo 6	9				
1	328	Gilo 6	10				
1	435	Gilo 4	1				
1	435	Gilo 4	2				
1	435	Gilo 4	3				
1	435	Gilo 4	4				
1	435	Gilo 4	5				

1	435	Gilo 4	6				
1	435	Gilo 4	7				
1	435	Gilo 4	8				
1	435	Gilo 4	9				
1	435	Gilo 4	10				
2	328	Gilo 6	1				
2	328	Gilo 6	2				
2	328	Gilo 6	3				
2	328	Gilo 6	4				
2	328	Gilo 6	5				
2	328	Gilo 6	6				
2	328	Gilo 6	7				
2	328	Gilo 6	8				
2	328	Gilo 6	9				
2	328	Gilo 6	10				
2	435	Gilo 4	1				
2	435	Gilo 4	2				
2	435	Gilo 4	3				

2	435	Gilo 4	4				
2	435	Gilo 4	5				
2	435	Gilo 4	6				
Block number	Genotypic code	Genotype name	Plant number	No of fruits per plant	Weigh of fruits per plant (g)	Fruit Lenth (CM)	Fruith Diameter
2	435	Gilo 4	7				
2	435	Gilo 4	8				
2	435	Gilo 4	9				
2	435	Gilo 4	10				
2	230	Gilo 9	1				
2	230	Gilo 9	2				
2	230	Gilo 9	3				
2	230	Gilo 9	4				
2	230	Gilo 9	5				
2	230	Gilo 9	6				
2	230	Gilo 9	7				
2	230	Gilo 9	8				

2	230	Gilo 9	9				
2	230	Gilo 9	10				
2	125	Check V	1				
2	125	Check V	2				
2	125	Check V	3				
2	125	Check V	4				
2	125	Check V	5				
2	125	Check V	6				
2	125	Check V	7				
2	125	Check V	8				
2	125	Check V	9				
2	125	Check V	10				
2	186	Gilo 10	1				
2	186	Gilo 10	2				
2	186	Gilo 10	3				
2	186	Gilo 10	4				
2	186	Gilo 10	5				
2	186	Gilo 10	6				

2	186	Gilo 10	7				
2	186	Gilo 10	8				
2	186	Gilo 10	9				
2	186	Gilo 10	10				
3	230	Gilo 9	1				
3	230	Gilo 9	2				
Block number	Genotypic code	Genotype name	Plant number	No of fruits per plant	Weigh of fruits per plant (g)	Fruit Length (CM)	Fruit Diameter
3	230	Gilo 9	3				
3	230	Gilo 9	4				
3	230	Gilo 9	5				
3	230	Gilo 9	6				
3	230	Gilo 9	7				
3	230	Gilo 9	8				
3	230	Gilo 9	9				
3	230	Gilo 9	10				
3	328	Gilo 6	1				

3	328	Gilo 6	2				
3	328	Gilo 6	3				
3	328	Gilo 6	4				
3	328	Gilo 6	5				
3	328	Gilo 6	6				
3	328	Gilo 6	7				
3	328	Gilo 6	8				
3	328	Gilo 6	9				
3	328	Gilo 6	10				
3	435	Gilo 4	1				
3	435	Gilo 4	2				
3	435	Gilo 4	3				
3	435	Gilo 4	4				
3	435	Gilo 4	5				
3	435	Gilo 4	6				
3	435	Gilo 4	7				
3	435	Gilo 4	8				
3	435	Gilo 4	9				

3	435	Gilo 4	10				
3	186	Gilo 10	1				
3	186	Gilo 10	2				
3	186	Gilo 10	3				
3	186	Gilo 10	4				
3	186	Gilo 10	5				
3	186	Gilo 10	6				
3	186	Gilo 10	7				
3	186	Gilo 10	8				
Block number	Genotypic code	Genotype name	Plant number	No of fruits per plant	Weigh of fruits per plant (g)	Fruit Length (CM)	Fruit Diameter
3	186	Gilo 10	9				
3	186	Gilo 10	10				
3	125	Check V	1				
3	125	Check V	2				
3	125	Check V	3				
3	125	Check V	4				

3	125	Check V	5				
3	125	Check V	6				
3	125	Check V	7				
3	125	Check V	8				
3	125	Check V	9				
3	125	Check V	10				
4	125	Check V	1				
4	125	Check V	2				
4	125	Check V	3				
4	125	Check V	4				
4	125	Check V	5				
4	125	Check V	6				
4	125	Check V	7				
4	125	Check V	8				
4	125	Check V	9				
4	125	Check V	10				
4	186	Gilo 10	1				
4	186	Gilo 10	2				

4	186	Gilo 10	3				
4	186	Gilo 10	4				
4	186	Gilo 10	5				
4	186	Gilo 10	6				
4	186	Gilo 10	7				
4	186	Gilo 10	8				
4	186	Gilo 10	9				
4	186	Gilo 10	10				
4	328	Gilo 6	1				
4	328	Gilo 6	2				
4	328	Gilo 6	3				
4	328	Gilo 6	4				
Block number	Genotypic code	Genotype name	Plant number	No of fruits per plant	Weigh of fruits per plant (g)	Fruit Length (CM)	Fruit Diameter
4	328	Gilo 6	5				
4	328	Gilo 6	6				
4	328	Gilo 6	7				

4	328	Gilo 6	8				
4	328	Gilo 6	9				
4	328	Gilo 6	10				
4	435	Gilo 4	1				
4	435	Gilo 4	2				
4	435	Gilo 4	3				
4	435	Gilo 4	4				
4	435	Gilo 4	5				
4	435	Gilo 4	6				
4	435	Gilo 4	7				
4	435	Gilo 4	8				
4	435	Gilo 4	9				
4	435	Gilo 4	10				
4	230	Gilo 9	1				
4	230	Gilo 9	2				
4	230	Gilo 9	3				
4	230	Gilo 9	4				
4	230	Gilo 9	5				

4	230	Gilo 9	6				
4	230	Gilo 9	7				
4	230	Gilo 9	8				
4	230	Gilo 9	9				
4	230	Gilo 9	10				

Appendix 2: Written informed consent form for consumers

Title of Research: Yield performance and market acceptability of selected *Solanum aethiopicum* Gilo Genotypes

Principle Investigator: Mr. Kucel Newton, Tel. contact +256-776880620

Student doing master of Science in Agriculture and Rural Development, at Uganda Christian University, Faculty of Agricultural Sciences. P.O Box 4, Mukono, Uganda.

1. Introduction and Purpose of the Study

Uganda Christian University has been developing *Solanum aethiopicum* Gilo genotypes over the years and they are at a point where they require evaluation with end users. The general objective of this study is to introduce and test different *Solanum aethiopicum* Gilo candidate lines suited to heterogeneous farming

communities. The information you give us, will be confidential and only used for purposes of this study. In the process of report writing, your name will never be used and so everything you tell us will remain anonymous. We shall ask questions rate how you like the different attribute of *Solanum aethiopicum* Gilo base on 9-point hedonic scale. If you do not want to respond or take part in the study or would like to stop in the middle, you will be free to do so and we will not insist.

2. Description of the Research

A mixed methods approach will be used

3. Subject Participation

Participants will be consumers of Solanum aethiopicum Gilo, 18-year-old and above, and none smokers.

4. Potential Risks and Discomforts

This study requires participants to be consumers of Solanum aethiopicum Gilo and preparation of samples in high hygienic way, hence minimal risk is expected.

5. Potential Benefits

The findings from this study have capability to close vital knowledge gaps in breeding programs of the selected *Solanum aethiopicum* Gilo genotypes as well as making well-informed decisions for the successful integration of the genotypes to get into agricultural systems and commercial markets.

6. Confidentiality

The information you give us, will be confidential and only used for purposes of this study. In the process of report writing, your name will never be used and so everything you tell us will remain anonymous. We shall ask questions on different attributes in the *solanum aethiopicum* Gilo and you will rate how you like the

attributes using 9-point hedonic scale where 1 = Dislike extremely and 9=like extremely. Consideration will be made to have interpreter to support the participants understand everything local dialect/language base on the location.

7. Authorization

You will be authorizing us by signing this form to use this research information for; evidence intervention, education, informing breeding program among others.

8. Participation

Participation in this study is entirely voluntary. If you decide to not take part in this study, it is still okay and has no effect in any way to you.

9. Withdrawal from the Study and/or Withdrawal of Authorization

As a participant in this study, you can withdraw at any point if you choose not to proceed with the study.

10. Reimbursements

There is no reimbursement in any form. Taking part as participant is totally voluntary.

11. Whom to contact in case of ethical related concerns.

This study was Approved by Uganda Christian university Research Ethics Committee (UCU-REC) and cleared by Uganda national Council for Science and Technology (UNCST), In case of any Ethical related concerns or inquiries, you can contact UCU-REC chairperson; Prof. Peter Waiswa on 0772 405 357, pwaiswa@musph.ac.ug or UCU-REC Secretariat, Mr. Osborn Ahimbisibwe on 0775737627 or oahimbisibwe@ucu.ac.ug UNCST; Tel: +256 414 705500/ info@uncst.go.ug

I voluntarily agree to participate in this research program; to tick appropriately

Yes **No.**

I understand that I will be given a copy of this signed Consent Form.

Name of Participant: ……

Signature: …… Date: …….

Name of Researcher/designee: …….

Signature: ……. Date: ……

Appendix 3: Written informed consent form for traders

Title of Research: Yield performance and market acceptability of selected *Solanum aethiopicum* Gilo Genotypes

Principle Investigator: Mr. Kucel Newton, Tel. contact +256-776880620

Student doing master of Science in Agriculture and Rural Development, at Uganda Christian University, Faculty of Agricultural Sciences. P.O Box 4, Mukono, Uganda.

1. Introduction and Purpose of the Study

Uganda Christian University has been developing *Solanum aethiopicum* Gilo genotypes over the years and they are at a point where they require evaluation with end users. The general objective of this study is to introduce and test different *Solanum aethiopicum* Gilo candidate lines suited to heterogeneous farming communities. The information you give us, will be confidential and only used for purposes of this study. In the process of report writing, your name will never be used and so everything you tell us will remain anonymous. We shall ask questions rate how you like the different attribute of *Solanum aethiopicum* Gilo base on 9-point hedonic scale. If you do not want to respond or take part in the study or would like to stop in the middle, you will be free to do so and we will not insist.

2. Description of the Research

A mixed methods approach will be used

3. Subject Participation

Participants will be consumers of Solanum aethiopicum Gilo, 18-year-old and above, and none smokers.

4. Potential Risks and Discomforts

This study requires participants to be traders of *Solanum aethiopicum* Gilo hence minimal risk is expected.

5. Potential Benefits

The findings from this study have capability to close vital knowledge gaps in breeding programs of the selected *Solanum aethiopicum* Gilo genotypes as well as making well-informed decisions for the successful integration of the genotypes to get into agricultural systems and commercial markets.

6. Confidentiality

The information you give us, will be confidential and only used for purposes of this study. In the process of report writing, your name will never be used and so everything you tell us will remain anonymous. We shall ask questions on different attributes in the *solanum aethiopicum* Gilo and you will rate how you like the attributes using Five-point hedonic rating scale, were; 1 = dislike a lot and 5 = like a lot. Consideration will be made to have interpreter to support the participants understand everything in local dialect/language based on the location.

7. Authorization

You will be authorizing us by signing this form to use this research information for; evidence intervention, education, informing breeding program among others.

8. Participation

Participation in this study is entirely voluntary. If you decide to not take part in this study, it is still okay and has no effect in any way to you.

9. Withdrawal from the Study and/or Withdrawal of Authorization

As a participant in this study, you can withdraw at any point if you choose not to proceed with the study.

10. Reimbursements

There is no reimbursement in any form. Taking part as participant is totally voluntary.

11. Whom to contact in case of ethical related concerns.

This study was Approved by Uganda Christian university Research Ethics Committee (UCU-REC) and cleared by Uganda national Council for Science and Technology (UNCST), In case of any Ethical related concerns or inquiries, you can contact UCU-REC chairperson; Prof. Peter Waiswa on 0772 405 357, pwaiswa@musph.ac.ug or UCU-REC Secretariat, Mr. Osborn Ahimbisibwe on 0775737627 or oahimbisibwe@ucu.ac.ug UNCST; Tel: +256 414 705500/ info@uncst.go.ug

I voluntarily agree to participate in this research program; to tick appropriately

Yes **No.**

I understand that I will be given a copy of this signed Consent Form.

Name of Participant: ……

Signature: …… Date: …….

Name of Researcher/designee: …….

Signature: ……. Date: ……

Appendix 4: 9-point hedonic questionnaire for consumers

Panellist No._____

Consumers acceptability

Gilo fruit evaluation when whole fresh

Instruction. You are provided with five coded samples of different *Solanum aethiopicum* Gilo genotypes. Please assess each in terms of fruit colour, fruit shape, fruit size, fruit texture, fruit succulence, and fruit freshness. You are to evaluate and give score by giving the appropriate score to each sample and attribute in the table below. Use the score card provided. Please evaluate the samples in the order

in which they are presented. Use the water provided to rinse your mouth before and after tasting each sample and between samples.

ANSWER ALL QUESTIONS. We want to know what you think!!

If you have any questions, please ask the study coordinators.

Score the samples using hedonic scale below	
Like extremely	**9**
Like very much	**8**
Like moderately	**7**
Like slightly	**6**
Neither like nor dislike	**5**
Dislike slightly	**4**
Dislike moderately	**3**
Dislike very much	**2**
Dislike extremely	**1**

Quality attributes	**Sample No.**				
Colour					
Shape					
Size					
Texture					
Succulence					
Freshness					

Gilo fruit evaluation when fresh and chopped

Instruction. You are provided with five coded samples of different *Solanum aethiopicum* Gilo genotypes. Please assess each in terms of fruit appearance and freshness. You are to evaluate and give score by giving the appropriate score to each sample and attribute in the table below. Use the score card provided. Please evaluate the samples in the order in which they are presented. Use the water provided to rinse your mouth before and after tasting each sample and between samples.

ANSWER ALL QUESTIONS. We want to know what you think!!

If you have any questions, please ask the study coordinators.

Score the samples using hedonic scale below	
Like extremely	**9**
Like very much	**8**
Like moderately	**7**
Like slightly	**6**
Neither like nor dislike	**5**
Dislike slightly	**4**
Dislike moderately	**3**
Dislike very much	**2**
Dislike extremely	**1**

Quality attributes	**Sample No.**				
Appearance					
Freshness					

Gilo fruit evaluation when chopped and cooked

Instruction. You are provided with five coded samples of different *Solanum aethiopicum* Gilo genotypes. Please assess each in terms of appearance, aroma, bitterness, and mouthfeel. You are to evaluate and give score by giving the appropriate score to each sample and attribute in the table below. Use the score provided. Please evaluate the samples in the order in which they are presented. Use the water provided to rinse your mouth before and after tasting each sample and between samples.

ANSWER ALL QUESTIONS. We want to know what you think!!

If you have any questions, please ask the study coordinators.

Score the samples using hedonic scale below	
Like extremely	**9**
Like very much	**8**
Like moderately	**7**
Like slightly	**6**
Neither like nor dislike	**5**
Dislike slightly	**4**
Dislike moderately	**3**
Dislike very much	**2**
Dislike extremely	**1**

	Sample No.

Quality attributes					
Appearance					
Aroma					
Bitterness					
Mouth feel					

Thank you for participating in this exercise

Appendix 4: 5-point hedonic questionnaire for traders

Trader physical quality acceptability questionnaire for different attribute of *solanum aethiopicum* Gilo using 5 point hedonic scale

Trader No._____

Instruction: You are provided with five coded samples of different *solanum aethiopicum* Gilo genotypes. Please assess each in terms of fruit colour, fruit shape, fruit size, fruit hardness, fruit freshness, and fruit succulence. You are to evaluate and give overall score by giving the appropriate score to each sample and attribute in the table below. Use the score provided.

Description	**Score**
Strongly Like	5

Like	4
Neither like nor dislike	3
Dislike	2
Strongly Dislike	1

Quality attributes	**Sample No.**				
Fruit colour					
Fruit shape					
Fruit size					
Fruit hardness					
Fruit freshness					
Fruit succulence					

Thank you for participating in this exercise

Appendix 6: Budget

No	**ITEM**	**PRICE (Ush)**
1	Land preparations	900,000

2	Weeding	900,000
4	Tools and agro-inputs (Fertilizers, pesticides)	400,000
5	Transport	2,000,000
6	Data collection	4,000,000
7	Stationary	200,000
	Total	**8,400,000**

Appendix 7: Research ethical committee letter of approval

UGANDA CHRISTIAN UNIVERSITY
A Centre of Excellence in the Heart of Africa

Office of the Vice Chancellor
Research Ethics Committee UG-026

08th February, 2024

KUCEL NEWTON
Uganda Christian University
+256 776880620
Email: kucelnewton72@gmail.com

UG-REC-026 APPROVAL NOTICE

To: Kucel Newton, Principal Investigator

Re: UCU-REC Application titled: *Assessing yield performance and market acceptability of selected Solanum aethiopicum Gilo Genotypes.* Nested to *Improving production efficiency of African Eggplant (Solanum aethiopicum) for small holder farmers in Sub-Saharan Africa.*

Application Number: UCUREC-2022-125

UGANDA CHRISTIAN UNIVERSITY APPROVED 'INTI' 08 FEB 2025 RESEARCH ETHICS COMMITTEE

Version: 4.1

Type: [ ] INITIAL REVIEW
[ ] Protocol Amendment
[ ] Letter Of Amendment (Loa)
[ ] Continuing Review
[ ] Material Transfer Agreement
[ ] Other, Specify:

I am pleased to inform you that the UG-REC-026; UCUREC approved the above referenced application.

Approval of the research is for the period from 08th February, 2024, to 08th February, 2025
This research is considered minimal risk category.
As Principal Investigator of the research, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research
2. Changes, amendments, and additions to the protocol or the consent form must be submitted to the REC for re-review and approval prior to the activation of the changes. The REC application number assigned to the research should be cited in any correspondence.

Research and Ethics
P.O. Box 4, Mukono, Uganda, Plot 67-173, Bishop Tucker Road, Mukono Hill
Tel: +256 (0) 312 350 885 Fax: +256 (0) 4142 90 800 Email: rec@ucu.ac.ug Web: www.ucu.ac.ug
UCUREC is accredited by Uganda National Council for Science & Technology, FDA, and National Institutes for Health of the United States of America

3. Reports of unanticipated problems involving risks to participants or other must be submitted to the REC. New information that becomes available which could change the risk: benefit ratio must be submitted promptly for REC review.

4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by subjects and/or witnesses should be retained on file. The REC may conduct audits of all study records, and consent documentation may be part of such audits.
5. Regulations require review of an approved study not less than once per 12-month period. **Therefore, a continuing review application must be submitted to the REC eight weeks prior to the above expiration date of 08th February, 2025 in order to continue the study beyond the approved period.** Failure to submit a continuing review application in a timely fashion may result in suspension or termination of the study, at which point new participants may not be enrolled and currently enrolled participants must be taken off the study.
6. The REC application number assigned to the research should be cited in any correspondence with the REC of record.
7. Your research details have been shared with the Executive secretary of Uganda National Council for Science and Technology (UNCST) and you are **not** required to get clearance since you are a Master's Degree research. Refer to UNCST Research registration and clearance Policy and guidelines (July 2016) in Uganda section 6(e).

The following is the list of all documents approved in this application by **UG-REC _026:**

	Document Title	Language	Version	Version Date
1.	Protocol	English	1.0	2021-04-27
2.	Informed Consent Form	English	1.0	2021-04-27
3.	Data collection tools	English	1.0	2021-04-27
4	Risk Mitigation plan	English	1.0	2021-04-27

Signed and Stamped

Prof. Peter Waiswa.
UCUREC Chairperson,
pwaiswa@musph.ac.ug

UGANDA CHRISTIAN UNIVERSITY
APPROVED
'INTI'
08 FEB 2025
RESEARCH ETHICS COMMITTEE

Research and Ethics

P.O. Box 4, Mukono, Uganda, Plot 67-173, Bishop Tucker Road, Mukono Hill
Tel: +256 (0) 312 350 885 Fax: +256 (0) 4142 90 800 Email: rec@ucu.ac.ug Web: www.ucu.ac.ug
UCUREC is accredited by Uganda National Council for Science & Technology, FDA, and National Institutes for Health of the United States of America

UGANDA CHRISTIAN UNIVERSITY
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VIVA FORM)

INTERNAL EXAMINER'S REPORT FOR Mr. NEWTON KUCEL'S MSc THESIS

Name of Candidate: Kucel Newton Reg. No: J22M43/006

Title of Dissertation: **Yield performance and market acceptability of selected *Solanum aethiopicum* Gilo Genotypes**

S/N	COMMENTS BY EXTERNAL EXAMINER	ACTION TAKEN	INDICATOR
1	There is need for a standard template for all theses and dissertations in the University. Be consistent in writing style. The candidate needs to check on the aesthetics and visual appeal of the document.	• Revised the UCU manual and corrected the writing style	1. The write up is now in Trebuchet MS, font size 12, double spacing etc. 2. Restructured the format contents are arranged

2	Revamp the introduction. The chapter has to guide the readers to the problem that was investigated. The conceptual framework presented at the end of the chapter need to be explained/described and the various variables should have measurable indicators.	The background is fully revamped, and variables described.	Clearly revamped right from background to conceptual framework
3	Literature review generally helps to anchor a study and is done in order: • To ensure that one does not duplicate previous studies;		

	- To discover what is most recent and authoritative scholarship about the subject; - To ascertain what are the most widely accepted definitions of key concepts on the topic; - To review the best and most relevant empirical studies on the topic; - To review the most widely accepted models and theories about the study; and - To identify the available instruments for data collection on the topic. Check to ensure that the literature review meets these criteria and that it clearly brings out the gap in knowledge that the current study served to fill. As currently presented, it is scanty and hardly brings out gaps in knowledge that this study focused on.	Literature review section has been revamped	Restructured and new literature added: Hedonic scale on acceptability in plant breeding, consumer acceptability, traders acceptability and others.

4	The methodology is generally well outlined. Check and correct subsection numbering in the chapter	Subsection numbering have been adjusted	Subsection renumbered
5	Chapter Four needs considerable adjustments. Whereas the analysis of data is fairly well done, the presentation of the results is not. Each table or figure needs to be introduced in relation to the objectives in Chapter One. The lumping of the Tables together makes the document incoherent. Check table presentations and ensure there is consistency in style and format.	1. Separated and redistributed tables throughout the chapter instead of grouping them together 2. Added introductory statements before each table/figure explicitly linking them to Chapter One objective 3. pplied consistent formatting across all tables (fonts, spacing, borders, numbering) & Standardized column headers, data presentation, and caption styles	1. Tables now appear logically within relevant text sections rather than clustered at the end 2. Each table/figure now has clear context explaining its purpose and relevance to research aims 3. Visual uniformity across all tables with matching design elements
6	The discussions are scanty and need to be redone.	1. Rediscussed the results	1. More detailed discussion

7	The conclusions need to be precise and have to mirror the objectives in Chapter One. The study peculiarly makes no recommendations. A good study should even make suggestions for further studies out of the gaps in knowledge and technology that became apparent in the course of the work.	1. The conclusion now mirrors the objectives 2. Clear conclusion now put in place 3. There are suggestions for further studies from the gap	• Clear conclusion Which align with the objectives • Suggestions for further studies
8	Edit this section using guidelines from the 7th edition of the APA manual. Ensure all cited sources are in the list and vice versa. ✦ Check for highlighted sections and comments to guide in further corrections ✦ Check and correct citations Edit the document to eliminate typos	1. Use of Mendel desktop to realign references 2. Highlighted section was used to guide correction 3. Prove reading was condacted	1. APA referencing. Style in place 2. Better highlighted sections 3. The document edited

S/N	**COMMENTS FROM INTERNAL EXAMINER**	Action taken	Indicator

1	The structure and presentation of the work is fairly okay; particularly from the first page up to end of chapter three. Chapter four is inadequately structured: it is not clear which results belong to certain specific objectives. Indeed, the discussion is also not structured according to specific objectives (or key findings). A subsection on recommendations is also missing.	1. Restructuring of chapter four	1. Chapter four revamped
2	**Background**: The background is fairly well presented though flow should be improved. Several grammatical errors have also been encountered. For instance, some sentences are too long to be understood. **Problem statement:** The central problem that was targeted is missing. However, the knowledge gap is clearly stated as "The absence of detailed information on the critical traits above hinders the breeder's ability to deploy cultivars that meet both agronomic and market preferences".	1. The background has been restructured to allow, breaking of too long sentence and ensure cohesiveness. Grammatic concern addressed 2. Problem statement addressed by adding more literature showing the magnitude of the problem 3. Main objective adjusted	1. A good background 2. More organized and clear problem statement 3. A better main objective 4. The hypothesis is statistically stated because am working with quantitative data analysis And Following statistical testing protocols

	The student should have gone slightly further by stating specific knowledge gaps as basis for each specific objective. **Objectives:** The main objectives can be improved further. The specific objectives are generally SMART. **Hypotheses:** The candidate can be asked why he chose to state statistical rather than scientific hypotheses. **Conceptual framework:** There was an interchange between dependent and independent variables! How can genotype be a dependent variable?		

3	**Origin, distribution and production:** This is okay except for some grammatical errors to be addressed. **Taxonomy:** The candidate should explain if Gilo also implies Scarlet eggplant; or if there is a difference. **Other comments:** • The hedonic scale of 1-9 is not described in detail. How did the literature under each subsection guide/inform/shape your study?	1. The grammatic errors corrected 2. The scarlet eggplant is addressed as part of Gilo group 3. The hedonic scales explained in detail	1. Grammar errors corrected 2. Scarlet concern addressed 3. Both the 5-point and 9-point hedonic explained in detail

4	**Planting materials:** **Provide a list of the study entries and a justification for including each of the entries. I note that rainfall and temperature were mentioned as intervening factors (see the conceptual framework).** **Experimental design, sowing and transplanting:** You need to clearly demonstrate that you understand what an experimental unit means. Which one is bigger: a unit or plot? **Field management:** • Did you experience any pests and diseases? If so, how did you manage the pests and diseases? • How do you compare the 200 kg/ha of NPK fertilizer and 120 kg/ha in relation to standard practice? **Data Collection:** Refer to each objective as a Study and state the study sub-title.	1. More explanations is done about rain concern. This was through irrigation of the field when there was no rain 2. The design re-explained explained 3. For pest and diseases, I did not as maximum management and crop protection was done. 4. Data collection for each objective was clearly mentioned and each objective is now mentioned before and then the data collection steps respectively.	1. Rain concern addressed 2. Better explanation of the design 3. This is explained on the method section 4. Each data collection as objective mentioned.

	• How are sections 3.2.3 and 3.3.4 different? Please revisit. Ideally, the current section 3.2.4 should be 3.2.3.1 … • Don't you think you missed capturing data relating to GxE interaction for sensory attributes? Why did you choose to use Kasese samples only; why not Mukono, Omoro or any two or all of the three sites? • During selection of participants for the sensory evaluation, please justify how 100 people was the preferred number of consumers to participate. **Data Analysis:** The subsection(s) are generally well attended to. However, there is still need for further improvement. For instance, how did you provide for 'sample preparation levels – fresh whole fruits, fresh chopped fruits, and chopped and cooked fruits?	5. The section for sub number corrected 6. The sample collected for consumers and traders' evaluation considering only Kasese is explained in relationship to uniformity and consistency 7. The 100+ people is now explained as it is the required number for consumer acceptability study. Actual minimum of 90 consumers are required for this kind of evaluation. This is now well explained in the work. 8. Section for data analysis re-organized 9.	5. Better numbering 6. Reason for Kasese explained 7. 100 consumers justified
5	**Results:** • Include subsections in line with each objective. Make the tables more scientific and sequential: use automatic captioning just above each Table.	1. Each objective mentioned for each result. 2. The table is more organized and presented scientifically	1. Objective mentioned before results. 2. Scientific table

6	**Discussion:** Provide subsections as per the specific objectives. You did not relate your findings with the existing body of knowledge! This makes the Discussion incomplete and inadequate.	1. Discussions sub divided and findings compared with other studies	1. Better presentation of findings with comparison
7	**Conclusion:** Conclusions quite reflect the original objectives of the study. **Recommendations:** Given your findings, what you recommend?	2. The recommendation now is based on the findings	1. Well-presented recommendation base on the finding
8	Some citations are not in the reference section, for example; Kasharu, 2019; Dinss *et al*., 2019; Lombart et al. (2019); FAO,2014; De Hooge et al. (2017); Lawless and Heymann (2010); Anaso (1991); Seek, 1997; Macha,2005.	1. References re-organized with Mendeley Desktop	1. Citation concern addressed 2.

	SUGGESTIONS BY VIVA VOCE PANEL	ACTION TAKEN	REMARKS
1	Your references were not clearly presented. Kindly ensure they are properly cited and presented in your work.	Updated references	The references are now okay
2	You need to justify the choice of Kasese as your primary study site, given that you also had Omoro and Mukono as part of your study areas.	The choice for Kasese is justified.	For yield and yield related traits, three locations where considered. However, for sensory evaluation, due to the need for consistency and uniformity, one location fruits were used for evaluation across the three locations.
3	In Objective 1, you examined Genotype × Environment (G × E) effects across locations. However, in Objectives 2 and 3 (consumer and trader acceptability), you only reported results from Kasese. Please explain why only Kasese was considered.	Better explanation in the write up.	I think I was not just clear, I reported results for objective. 2 and 3 covering all the three locations. Its that only fruits from one location was used in all the other locations.
4	To strengthen your analysis, you should include fruit samples from all three study locations (Kasese, Mukono, and Omoro) for consumer and trader preference assessments. This would provide a more comprehensive evaluation of acceptability.	Considered for recommendation	With resources, it will be good to test samples across location

5	Clearly indicate how you measured market acceptability and cite the source or framework you relied on for this measurement.	This is well explained in the work with papers where the approaches were adopted from. I used 9-point hedonic scale to score consumer acceptability and 5 point hedonic for traders. Acceptability.	I was not just clear during the presentation
6	Specify whether your study was conducted on-station or on-farm, as this distinction is critical for interpreting your findings.	More explanation about the UCU experimental sites across Uganda where the experiments were conducted.	Well included in the write up now
7	Provide a clearer description of your sensory analysis process in the methodology, as it is not sufficiently detailed in your current presentation	More description was added	It is now clear
8	For Objective 1 (yield performance), indicate the number of seasons over which the experiments were conducted	Number of seasons is now well stated as two seasons	Number of seasons included
9	Since your study focuses on yield and market acceptability, you need to explain how environmental factors (interruption variables) influenced your results	The is well explained now in the results and discussions	Well explained
10	There is an inconsistency: Objective 3 refers to traders, but your results mainly reflect consumer feedback. Please clarify how you collected trader data, especially since traders operate in market settings	This is now well presented in the write up	Now clear distinction for traders and consumer

1 1	Incorporate market reaction details (both consumer and trader feedback) into your results, as these are essential for your conclusions and recommendations	This has been captured	Well explained in the discussion and recommendation section