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Full Length Research

Mathematical experimentation on the yield performance and quality of *egusi* (melon) in Mallam Madori North East of Jigawa State in response to variety and soil fertility

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ABSTRACT: This study aimed to provide an analytic measures and measured experimentation on the cultivation of Egusi melon in Jigawa State, Nigeria. Introducing the cultivation of this valuable crop to this area will rapidly place the populace into financial freedom to be less dependent on the government. A field experiment was conducted on a field (1335 m^2), divided into two portions (667 $m^2$and 667 m^2). Clearing and shrub trimmings of the experimental areas took place on the 20th of April 2025, before the rain started. Harrowing and ridging followed after the rain fell from 10th to 12th June 2025. Planting took place in the first week of September 2025. The seeds of egusi melon (*Cucumeropsis mannii*) were planted in line (70 cm x 50 cm), with 2-3 seeds per hole of 1.5 cm - 2 cm depth. The data was analysed, and a simple nonparametric one-sample Kolmogorov test was used because equal treatment was given to both portions. The distribution of all the parameters observed was found to be normally distributed, which indicated a significant effect on the yield performance. The analysis was done using the SPSS program at 5% level of significance ($p<0.05$). The results show that Egusi melon planting in the area of study in early September is lucrative, with high yield performance and maximum seed yield. The investigation revealed that the crop needed intermittent rainfall with moderate moisture for easy germination and distinctive sprouting.

Keywords: Egusi melon, seed yield, soil fecundity, seed variety, Jigawa North-West Zone.

INTRODUCTION

A famished continent likely exploits all its available food plants to the fullest, but the case is not so in Africa. Certain valuable crops are falling into extinction, among which Egusi melon dwindle into the category. Despite lots of contributors, no much scientific support is accorded to this threat. No official promotion or inclusion in development schemes is attempted.

Egusi melon is a crop grown for its large white seeds shelled in its pods; in West Africa, it forms a component of many meals. Melon crops play an important role in the farming system and in the nutritional diet and economic well-being of the West African populace, as reported in the National Research Council (2006). The plants themselves are from the family '*Cucurbitaceae*', also called the cucurbits or gourd family. A genus of *'Cucumeropsis'* consists of about 965 species in 101 genera reported by Fajinmi (2022). Notable species is the *'Cucumeropsis mannii'* which includes watermelon *(Citrullus lanatus, Cucurbitaceae)*. Egusi melon *'Cucumeropsis mannii'* seeds are found to thicken stews and contribute to a commonly enjoyed poached dumpling. They are soaked, fermented, boiled, and wrapped in leaves to form a popular seasoning. They are also roasted and made into a spread nut unlike peanut butter. They are even compacted into

patties that serve as a meat substitute. From an overall perspective, this is a versatile crop valuable for both subsistence survival and contemporary business as posited by Falade *et al.* (2020).

Increased agricultural productivity is a major stepping stone on the path out of poverty, but farmers in sub-Saharan Africa (SSA) and South Asia (SA) face tremendous challenges in improving production. Poor soil, inefficient water use, and a lack of access to plant breeding resources, high-quality seed, and fuel and electricity, combined with some of the most extreme environmental conditions on Earth, have made yields in crop and animal production far lower in these regions than world averages (National Research Council, 2009).

According to a report in NRC (2009), the historical increase in agricultural productivity in the United States occurred largely through scientific and technological innovations. Crop productivity in SSA and SA lags far behind in most agricultural areas of the world, but there has also not been a systematic application of science and technology that could improve the situation.

In 2006, the Bill and Melinda Gates Foundation approached the NRC's Board on Agriculture and Natural Resources (BANR) about organising a study to identify recent scientific knowledge and promising technologies that could transform the production capabilities of small-holder farmers in SSA and SA. The study focused on "emerging technologies," which included existing applications that have not been widely used or adapted in SSA and SA and innovations in the conceptual or nascent developmental stage that hold promise for improving agriculture, as reported in NRC(2009).

Adhering to the developments and innovations with the emerging technologies, egusi melon farming is found to be a lucrative business that anyone interested in financial freedom should engage in. Unfortunately, little concentration is given to its farming. The hype is centred on watermelon farming, which is less consumed and less valuable compared with the Egusi melon. Most people engaged in egusi farming for personal or local consumption (peasantry).

Compared with the population in Nigeria, especially the North, where most people are engaged in farming, one can see that very few (if any) are engaged in Egusi melon farming. There is a clear need to encourage and improve Egusi farming in this area.

According to the UNESCO (2013), the state has a population of 4.35 million people, the majority of whom live in rural areas with subsistence agriculture as their main occupation. The Jigawa State Government plans to alleviate poverty in the state; introducing egusi melon farming will be supportive. The introduction of this high-value crop into the agricultural practices of farmers within the state has the potential to significantly enhance their economic autonomy, thereby diminishing dependence on governmental assistance. This intervention is particularly critical given that the state has been identified as experiencing the most severe poverty levels in Nigeria, with approximately 90 per cent of its population subsisting below the poverty threshold (defined as earning less than one United States dollar per day), according to the Central Bank of Nigeria (CBN, 2006).

Therefore, the main objective of the research is to investigate and analyse a favourable condition to cultivate Egusi melon for optimum yield in the state and to offer supplementary information needed to start a successful Egusi melon farming in Jigawa State, Nigeria.

LITERATURE REVIEW

Egusi Melon, one of the most popular members of the melon family with diverse species, has formed a significant part of the diet of many Africans and Asians. Egusi melon seed kernels are a good source of edible oil (31-59%), protein (19-37%), fibre (3-4%) and carbohydrate (8-20%). Giwa *et al.* (2020) highlighted the food uses of egusi melon and its prospects for biodiesel production. An extensive review of the nutritional compositions, oil extraction methods and analysis of the crop was also done. The research further revealed the engineering properties of egusi fruits, seeds and kernels and the energy utilisation of its biomass. Its engine performance, emission characteristics and conformity of the biodiesel to the standard specification were covered in the research. Some researchers worked on the interaction effect on the growth and yield of egusi melon in intercropping with other arable crops within the last few years (Ijoyah *et al.* 2015, Falade *et al.* 2020; Makinde *et al*. 2001).

Medicinal importance

Egusi Melon (*Cucumeropsis mannii*), family of *Cucurbitaceae* is cultivated in Africa for its important seeds used as food and medicine, supported by many researchers (Achu *et al.*, 2005; Loukou et *al*., 2007; Giwa *et al.,* 2020; Ela and Messi, 2012). Egusi melon seeds are found to be of high medicinal importance due to their rich profile of antioxidants, healthy unsaturated fats, and a valuable source of proteins (Achu*et al.*, 2005; Loukou *et al*., 2007). According to an online resource, the medicinal content of the egusi seeds is found to contribute to improving cardiovascular health, reducing blood sugar levels, and enhancing immune function. The seeds contain nutrients that aid in managing inflammation, supporting skin and hair health, aiding digestion, and combating infections.

Dietary support and development

The seeds are proven to be rich in protein and essential amino acids; it contains about 50% oil, which is comparable

to other oilseed crops (Achu *et al.*, 2005). It contains about 29.23% proteins, 56.67% lipids and 9.87% carbohydrates (Loukou *et al*., 2007). Egusi serves as a vital nutritional source to prevent malnutrition and promote healthy growth, especially in children. The uses of melon seeds as sources of oils and proteins have been evaluated by many researchers. After the hull is removed, egusi melon seeds contain about 50% oil and up to 35% proteins (Jacks et al., 1972; Ajenu *et al.*, 2021). It is revealed that most of their oil is made up of non-saturated fatty acids, thus of high nutritional value. Conjugated fatty acids among some cucurbit oils make them highly useful as dry oils (i.e. they combine readily with oxygen to form an elastic, waterproof film). The proteins, on the other hand, are principally of the globulin type and are deficient in lysine but also in sulfur-bearing amino acids. Protein Efficiency Ratios (PER) of about 30 to 70 (that of powdered skim milk is 80) have been measured. The PER improves with the addition of lysine. The use of Egusi melon seeds for their high protein and oil content has many precedents.

Research justifications

Despite all the nutritional adequacies and the potential economic well-being of farmers, there has been a continuous decline in egusi melon farming in recent decades. In spite of the cultivation of egusi melon lacking many challenges, like having some other arable crops in the country, research is much scarcer on improving and motivational practices of this crop to rural farmers. This research is intended to serve as one. The extinction frown of the valuable crop needs hasty salvaging through devoted research that focuses on improving farming practices that can also enhance higher productivity and better yield for sustainability and the promotion of its production in the state and country at large.

MATERIALS AND METHODS

Study site and experiment design

The field experiment was conducted during the 2025 rainy season at Malam Madori Local Government Area, North East zone of Jigawa State, Nigeria. The experimental site is located in the western farms area of the town, acquired within the locality. The rainy season in the area started late July 2025 and lasts until November 2025, with its peak in August and September 2025. The existing soil of the experimental area is sandy loamy. The piece of land was left fallow for a season before the experiment.

The land area used was measured at about a quarter of an acre, approximately 1335m ^{2}, bordered into two portions (667m^2 and 667m^2). A measuring tape was used to measure out the land, and clearing was done manually using axes and cutlasses. The clearing and trimming of shrubs in the experimental areas were done before the start of the rainfall, which was between May 2025 and June 2025. The harrowing follows late June 2025, and each portion was subdivided into lines separated by at least 60cm in length. Sowing took place in each portion after the rains fell when the land was moist enough in September 2025. The treatments applied were a combination of organic and inorganic manure. Specifically, animal dung (organic) manure and NPK (15-15-15) (inorganic) were used.

The seeds were planted following a spacing of 50 cm on each line at a rate of 2-3 seeds per hole of 1.5cm - 2cm depth at a spacing of 0.5m x 0.5m, resulting in 42 stands per row per portion at a seed rate of 588 stands per portion of 14 rows, and this was equivalent to 1,176stands per the land area. Adequate field maintenance was carried out to ensure that the crops perform well. Weeding was done mechanically by hand pulling and manually by means of a small hoe. These activities were carried out simultaneously with thinning and gap filling. Although the seeds were replanted three times due to the ravaging action of insects, before it survived. The melon plant was sprayed twice with insecticides (*Cypermethrin 10 EC*) within three weeks after planting, successively. The ravaging activity of the insects could not be overcome until Stingers (*Lambdacyhalothrin* 2.5% *EC*) was applied in the 6th and 7th weeks, which enhanced the flowerings. These control the insect pests' activities, and the healthy plant is sustained. Figures 1 and 2 depict the healthy plants (flowering and fruiting stages).

Data collection

Data were collected on the vine length, leaf vicinity index, chlorophyll index, and flowering days, number of fruits and fresh fruit diameter and weight. In addition, the number of seeds per dry pod was recorded for some average-sized 100 fruits. The fruits were harvested at maturity and were grouped during fruit collection and counts. The grouping was based on their sizes into large, medium and small categories, fifteen (15) fruits from each category. Subsequently, the fruits were kept and packed together to test for their storage sustainability for a long duration, as shown in Figure 3.

Data analysis

The data collected were analysed using the statistical software package SPSS Statistics 20.0, and at 5% level of significance ($p<0.05$). Descriptive statistics were calculated for all variables, including frequencies for categorical variables. The data analysed were presented as frequency tables. A simple nonparametric one-sample Kolmogorov analysis was used to analyse the data because equal treatment was given to the portions.

Figure1. A healthy egusi melon plant fruiting.

Figure 2. Egusi plant 5-6 weeks of flowering.

Figure 3. Harvested pods after the pod counts.

Figure 4. Egusi melon seeds after seed counts.

RESULTS AND DISCUSSION

The results showed that medium and small fruits of *Cucumeropsis mannii* had better storability compared to larger fruits, making them more suitable for high-quality seed production. However, seeds from bigger fruits exhibited superior characteristics despite their reduced storability. On average, small fruit produced 75 seeds, medium fruit produced 87 seeds, and large fruit produced 120 seeds (Figure 4). Other parameters, such as chlorophyll index and leaf size indices, revealed no significant differences, except for germination rate. The distribution of all observed parameters was normally distributed, as confirmed by the One-Sample Kolmogorov-Smirnov Test (Figures 5 and 6).

In Portion 1 (Table 1), the chlorophyll index had a mean of 50.57% with a standard deviation of 2.31, vine length averaged 3.19 m with a standard deviation of 0.40, the number of fruits per plant averaged 6.53, and fruit weight was 14.93 g. In Portion 2 (Table 2), similar results were observed: chlorophyll index averaged 50.67% (SD = 1.61), vine length 3.28 m (SD = 0.36), number of fruits per plant 6.47, and fruit weight 14.97 g. The asymptotic significance values across most parameters were greater than 0.05, confirming normal distribution, except for the number of fruits per plant, which was borderline significant in both portions.

Tables 3 and 4 further illustrate the mean and standard deviation of vine length and flowering days. In Portion 1, vine length averaged 3.187 m with a standard deviation of 0.398, while flowering days averaged 6.53 days (SD = 0.516). In Portion 2, vine length averaged 3.280 m (SD = 0.3629), and flowering days averaged 6.60 days (SD = 0.507). These results indicate consistency across both portions, with only slight variations in vine length and flowering days.

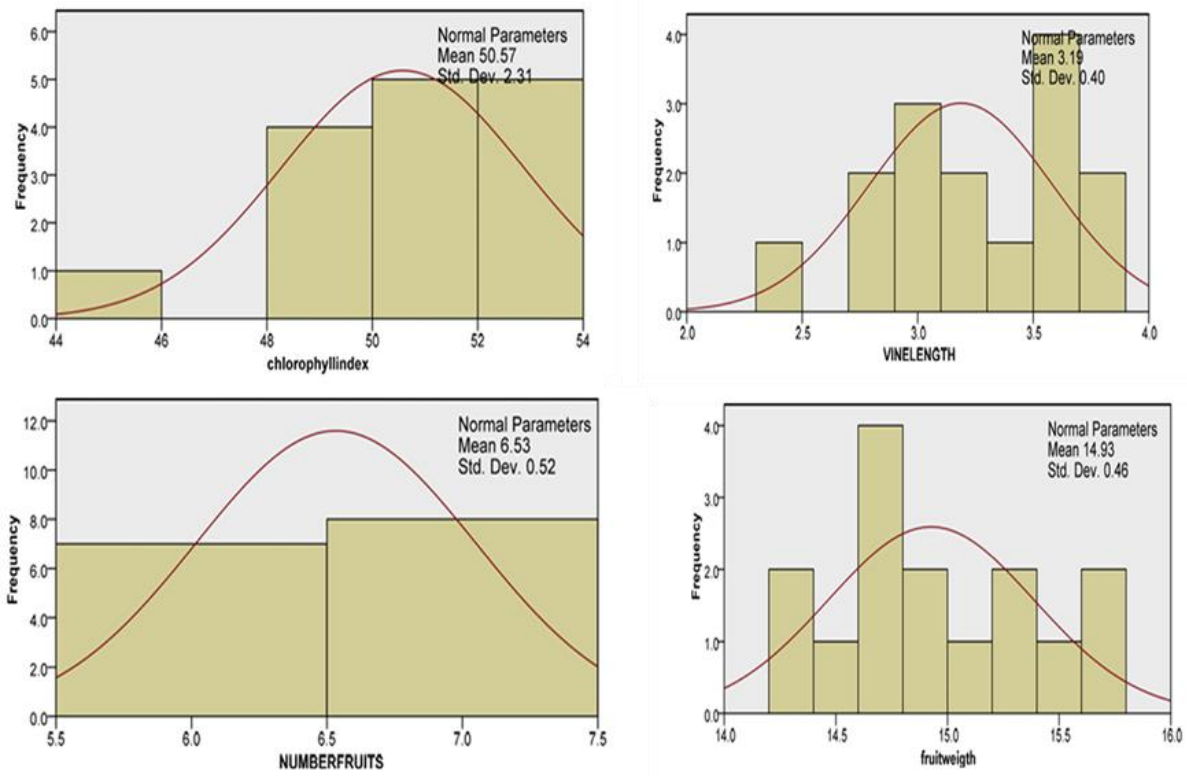

Figure 5. Normal Distribution: One-Sample Kolmogorov-Smirnov Test Portion 1.

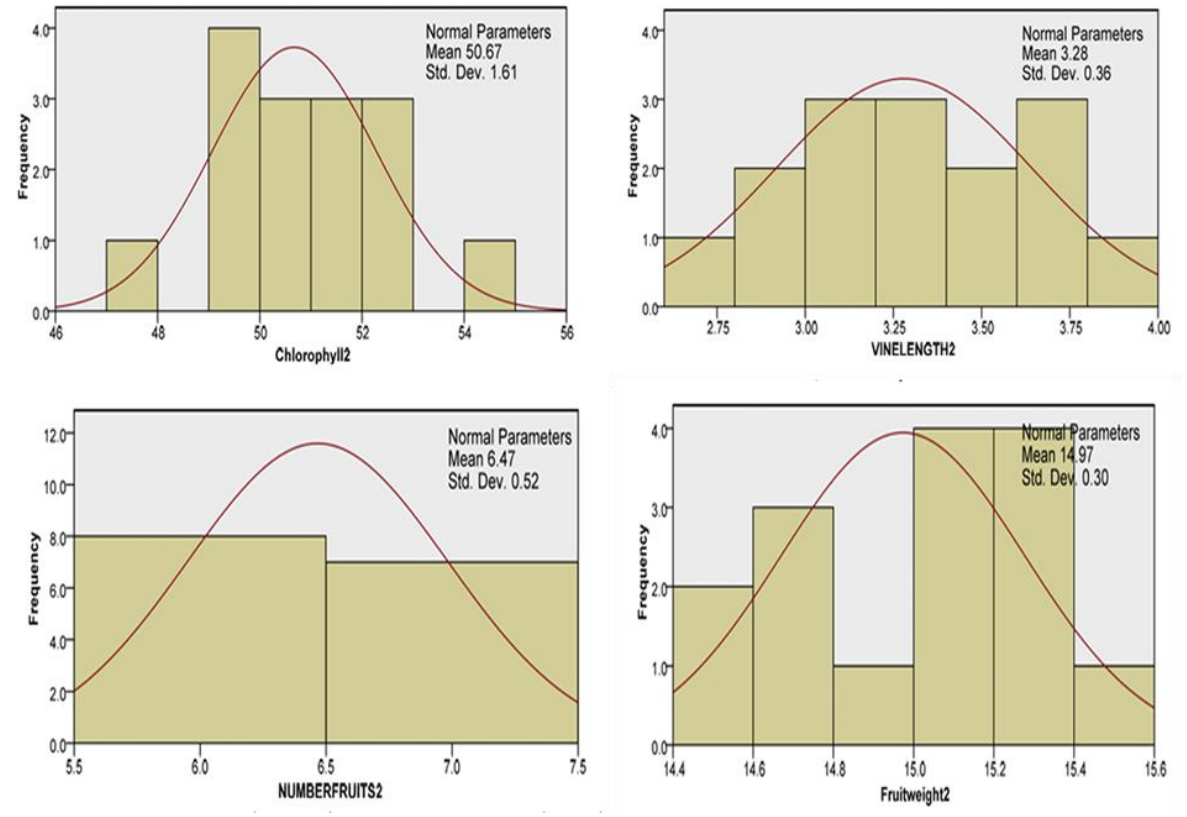

Figure 6. Normal Distribution: One-Sample Kolmogorov-Smirnov Test Portion 2.

Table 1. One-Sample Kolmogorov-Smirnov Test for the Observed Parameters in Portion1 of the *CucumeropsisMannii*

Parameters	Extreme Differences			Test Statistic	Asymptotic Sig. value	Normal Parameters	
	Absolute	Positive	Negative			Mean	Std.
Chlorophyll index (%)	0.121	0.119	-0.121	0.469	0.980	50.57	2.31
Vine length(m)	0.184	0.099	-0.184	0.714	0.687	3.19	0.40
Number of fruits per plants	0.350	0.316	-0.350	1.357	0.050	6.53	0.52
Fruit weight(g)	0.155	0.155	-0.124	0.599	0.865	14.93	0.46

Table 2. One-Sample Kolmogorov-Smirnov test for the observed parameters in portion 2 of the *Cucumeropsis mannii*

Parameters	Extreme Differences			Test Statistic	Asymptotic Sig. value	Normal Parameters	
	Absolute	Positive	Negative			Mean	Std.
Chlorophyll index (%)	0.149	0.149	-0.099	0.578	0.892	50.67	1.61
Vine length(m)	0.128	0.113	-0.128	0.495	0.967	3.28	0.36
Number of fruits per plants	0.350	0.350	-0.316	1.357	0.050	6.47	0.52
Fruit weight(g)	0.195	0.149	-0.195	0.756	0.617	14.97	0.30

Table 3. Mean, standard deviation of vine length and flowering days for portion 1.

Portion 1	N	Range	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Std. Error	Statistic
Vine length	15	1.3	3.187	0.1028	0.3980
Flowering days	15	1	6.53	0.133	0.516

Table 4. Mean, standard deviation of vine length and flowering days for portion 2.

Portion 2	N	Range	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Std. Error	Statistic
Vine length	15	1.2	3.280	0.0937	0.3629
Flowering days	15	1	6.60	0.131	0.507

The application of organic and inorganic fertilisers in a 4:2 ratio significantly improved fruit yield and other growth parameters. Both manure and fertiliser mixtures had a positive effect on chlorophyll index, vine length, fruit number, and fruit weight (Tables 1 and 2). The steady statistical values across both portions reinforce the reliability of these findings. This outcome aligns with earlier studies, such as Ilodibia et al. (2014), who demonstrated that poultry manure combined with NPK fertiliser was most effective for egusi melon, and Makinde et al. (2007), who reported that organo-mineral fertiliser increased vine length and leaf area, thereby enhancing seed yield. Udom *et al.* (2018) also justified the application of poultry manure two weeks before planting, followed by NPK fertiliser, for appreciable yield.

Other researchers have similarly emphasised the importance of combining organic and inorganic nutrient sources. Omotoso (2007) highlighted plant height as a key growth character linked to productivity, while Anburani and Manivannav (2002) found that fertiliser combinations influenced chlorophyll index, leaf vicinity, flowering, and yield in okra. Dzokou et al. (2025) further noted that soil suitability in the Bafia locality was marginal, with moderate limitations due to humidity, but still viable for egusi melon production.

Conclusion

In conclusion, medium and small fruits of *Cucumeropsis mannii* are more suitable for seed production because of their better storability, whereas larger fruits yield higher-quality seeds. The parameters measured were normally distributed and consistent across both portions of the study. The application of organic and inorganic fertilisers in a 4:2 ratio significantly improved yield and growth traits, confirming that integrated nutrient management is essential for optimal egusi melon cultivation.

Recommendations

Based on the findings of this study, it is recommended that farmers prioritise the use of medium and small fruits of *Cucumeropsis mannii* for seed production, as they exhibit better storability and maintain seed quality. Larger fruits may be used when superior seed traits are desired, but their reduced storability should be considered. For optimal yield and growth performance, the application of organic and inorganic fertilisers in a 4:2 ratio is strongly advised, as this combination significantly enhances fruit number, weight, vine length, and chlorophyll index. Integrating both organic and inorganic nutrient sources should therefore be adopted as a standard agronomic practice to maximise productivity and ensure sustainable cultivation of eguisi melon in the area of study.

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REFERENCES

Achu, M. B., Fokou, E., Tchiégang, C., Fotso, M., & Tchouanguep, F. M. (2005). Nutritive value of some Cucurbitaceae oilseeds from different regions in Cameroon. *African Journal of Biotechnology*, *4*(11), 329-334.

Ajenu, C. O., Ukhun, M. E., Imoisi, C., Imhontu, E. E., Irede, L. E., & Orji, U. R. (2021). Characterisation and stability studies of egusi melon seed oil (*Citrullus colocynthis* L.). *Journal of Chemical Society of Nigeria*, *46*(2), 238-244.

Anburani, A., & Manivannav, K (2002). Effect of integrated nutrient management on growth in Brinjal. South Indian Horticulture, *50*(4-6), 377-386.

Central Bank of Nigeria (2006). Central Bank of Nigeria Annual Report and Statement of Accounts for the Year Ended 31st December 2006. Retrieved from https://dc.cbn.gov.ng/cbn_annual_report/12/

Dzokou, K. J. J., Boukong, A., Enang, R. K., Tapa, T. A. L., Mekoudja, A. H. H., & Meyou, G. L. (2025). Soil characterisation and land suitability evaluation for Egusi Melon (Citrullus mucosospermus) cultivation in Bafia, centre region of Cameroon. *Open Journal of Soil Science*, *15*(03), 199-223.

Ela, A. M., & Messi, J. (2012). Yield responses of Cucumeropsis mannii (Cucurbitaceae) to the presence or the absence of the insect foraging activity at Nkolbisson in Cameroon. *Journal of Animal and Plant Sciences*, *13*(3), 1791-1799.

Fajinmi, O. O., Olarewaju, O. O., Arthur, G. D., Naidoo, K., & Coopoosamy, R. M. (2022). A review of the role of the Cucurbitaceae family in food security in West Africa. *Journal of Medicinal Plants for Economic Development*, *6*, 155.

Falade, O. S., Otemuyiwa, I. O., Adekunle, A. S., Adewusi, S. A., & Oluwasefunmi, O. (2020). Nutrient composition of watermelon (*Citrullis lanatus* (Thunb.) Matsum. & Nakai) and egusi melon (*Citrullus colocynthis* (L.) Schrad.) seeds. *Agriculturae Conspectus Scientificus*, *85*(1), 43-49.

Giwa, S. O., & Akanbi, T. O. (2020). A review on food uses and the prospect of egusi melon for biodiesel production. *BioEnergy Research*, *13*(4), 1031-1045.

Ijoyah, M. O., Fanen, F. T., & Egbe, M. O. (2015). Egusi melon-okra intercrop: yield effects as influenced by the interaction of time of introducing okra x cropping systems at Makurdi, Nigeria. *International Letters of Natural Sciences*, 38, 27-45.

Ilodibia, C. V., Achebe, U. A., Udeorah, S. N., Okeke, N. F., & Ezeabara, C. A. (2014). Growth and yield response of "Egusi" melon (*Citrulus lanatus* L.) to different nutrient sources in ultisol of south-eastern Nigeria. *Nigeria Agricultural Journal*, *45*(2), 21-26.

Jacks, T. J., Hensarling, T. P., & Yatsu, L. Y. (1972). Cucurbit seeds: I. Characterisations and uses of oils and proteins. A review. *Economic Botany*, *26*(2), 135-141.

Loukou, A. L., Gnakri, D., Djè, Y., Kippré, A. V., Malice, M. J. P. B., Baudoin, J. P., & Bi, I. A. (2007). Macronutrient composition of three cucurbit species cultivated for seed consumption in Côte d'Ivoire. *African Journal of Biotechnology*, *6*(5), 529-533.

Makinde, E. A., Akande, M. O., & Agboola, A. A. (2001). Effects of fertiliser type on performance of melon in a maize-melon intercrop. *ASSET - Series A: Agriculture & Environment*, *1*(2), 151-158.

Makinde, E. A., Ayoola, O. T., & Akande, M. O. (2007). Effects of organo-mineral fertiliser application on the growth and yield of egusi melon. *Australian Journal of Basic and Applied Sciences*, *1*(1), 15-19.

National Research Council (2006). Lost Crops of Africa: Volume II: Vegetables. Washington, Dc: The National Academies Press. Retrieved from https://doi.org/10.17226/11763.

National Research Council (2009). *Emerging Technologies to Benefit Farmers in Sub-Saharan Africa and South Asia*. Washington, DC: The National Academies Press. Retrieved from https://doi.org/10.17226/12455.

Omotoso, S. O., & Shittu, O. S. (2007). Effect of NPK fertiliser rates and method of application on growth and yield of okra (Abelmoschus esculentus (L.) Moench) at Ado-Ekiti, southwestern Nigeria. *International Journal of Agricultural Research*, *2*(7), 614-619.

UNESCO (2013). State education sector strategic plan (SESP) 2013-2022 Jigawa State. The Federal Republic of Nigeria. Retrieved from https://planipolis.iiep.unesco.org/en/2013/state-education-sector-strategic-plan-sesp-2013-2022-jigawa-state-6655

Udom, G. N., Ukpabio, A. O., Harry, G. I. &Aderi, O. S. (2018). Effect of sowing dates and spacings on growth and yield of egusi melon (*Cucumeropsis mannii naud*) in Uyo, Nigeria. *Nigerian Journal of Agricultural Technology*, 15(1), 27-33.