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# Effects of fruit size on the quality of 'Egusi-itoo' melon (*Cucumeropsis mannii* Naudin.) seed

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**ABSTRACT**

*A study was undertaken at the Teaching and Research farm of the University of Agriculture Makurdi in 2005, 2006 and 2007 to determine the effects of fruit size on the seed quality of 'egusi-itoo' melon (Cucumeropsis mannii Naudin). Fruits at maturity were harvested and grouped based on their sizes into big, medium and small categories. Data were collected on fruit length, diameter and weight. In addition, number of seeds per fruit, dry seed weight per fruit and 100-seed weight were also taken. Thereafter, seeds were extracted and tested for viability before and after storage at ambient temperature. Results revealed that seeds extracted from bigger fruits yielded higher values over those from smaller fruits in all the other parameters studied except germination percentage where no significant differences were found among the fruit sizes. Germination of stored seeds from all fruit sizes deteriorated with storage period and completely failed when test was conducted after three years. It was therefore concluded that Cucumeropsis mannii seeds could be extracted from fruits of all sizes without jeopardizing quality.*

***Key words:*** Size, quality, germination, storage, deterioration.

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## INTRODUCTION

'Egusi-itoo' melon (*Cucumeropsis mannii*) occurs wild from Guinea Bissau east to southern Sudan and Uganda, and south to Angola, it is also cultivated mostly in West Africa especially in Nigeria (Egunjobi and Adebisi 2004). The crop plays an important role in the income generation and subsistence of many farmers in West African countries. Schippers (2000) listed 'egusi-itoo' melon among the indigenous vegetables that offer significant opportunity for the poorest people to earn a living as producers and or traders, without requiring large capital investment. Although sustained production of the crop has existed in West Africa for decades, not much attention has been paid to studies that would reduce incidences of poor germination and seedling emergence (Ogbonna and Obi, 2000). Farmers therefore witness a wide variation in germination and emergence of melon seeds in the field and therefore target plant population densities are hardly met. Consequently, high seed rates are used to guarantee optimum plant population. NIHORT (2000) recommended the sowing of four seeds per hole and that where seedling emergence is impressive, thinning to two plants per stand should be done. This practice is not only labourious but also wasteful.

Before the advent of scientific knowledge, farmers believed long ago that plants transfer good characters to their offspring. Based on this belief, the more robust and good appearing seeds were selected from farmers harvest and reserved as seed for next season planting. It has however been realized that, due to pressure of work, farmers hardly grade melon fruits based on size before seed extraction this days. The melon seeds used as planting material are therefore extracted from fruits of varying sizes. It is therefore uncertain whether or not the varying fruit sizes also

contributes to the poor seed quality which has resulted to the adoption of a high seed rate. Lehtila and Ehrien (2005) noted that seed size is a widely accepted measure of seed quality, because many earlier studies have shown that large seeds have high seedling survival. (Zimmerman and Weis, 1983; Gonzalez, 1993; Usberti and Amaral, 1999; Martinelli and Moreira de Carvalha, 1999; Mini, et al., 2000) This study was therefore set up to investigate the effect of fruit size on the seed quality of *Cucumeropsis mannii* fruits classified as big, medium and small fruits.

## MATERIALS AND METHODS

**'**Egusi-itoo' *Cucumeropsis mannii* Naudin. crop was produced for three consecutive years (2005, 2006 and 2007) at the Teaching and Research farm of the University of Agriculture Makurdi. In each year, land was cleared and ploughed with a hoe and seeds were sown on the flat on 5$^{th}$, 3$^{rd}$ and 7$^{th}$ June in 2005, 2006 and 2007 respectively. Bulk crop was established and matured fruits at harvest were categorized visually into three sizes, viz: big, medium and small and the mean diameter of the fruits in the three different groups were determined as ≥11 cm, 9 – 10.9 cm and <9 cm. respectively. Data were then collected on fruit length, diameter and weight. In addition, number of seeds per fruit, dry seed weight per fruit and 100-seed weight were also taken before seeds were tested for viability. For the 100-seed weight, four replicates of 100 seeds for each category were counted and weighed on a Metler balance and the means were determined. Germination tests were conducted on both freshly produced and stored seeds. Four replicates of 50 seeds were counted from each size group of seeds and placed on absorbent paper in Petri dishes which were then moistened with distilled water. Incubation was at room temperature (about 30$^{o}$ C) for 28 days. Germination counts were taken at two days interval and the absorbent paper was moistened as found necessary. To determine the storage ability (longevity) of seeds of the different treatments, seeds were packed in labeled polyethylene bags and stored at room temperature (about 32$^{o}$C) in the laboratory for three years. Germination tests were conducted on the stored seeds yearly for three consecutive years. Data collected in respect of all the parameters was subjected to analysis of variance (ANOVA). Those involving percentages were first transformed (angular transformation = arc sin$\sqrt{}$ %) before analysis. Where significant differences were obtained, means were separated using Duncan's Multiple Range Test at 5% level of probability.

## RESULTS

***Fruit attributes:***

In 2005, the average values of *Cucumeropsis mannii* fruit length, diameter, and weight recorded for big fruits were 11.61 cm, 10.03 cm and 0.45 kg respectively. Corresponding values for medium sized fruits were 10.07 cm, 9.09 cm and 0.25 kg respectively while those for small fruits were 7.38cm, 7.35cm and 0.15kg respectively. In 2006, average values of 13.65 cm, 11.29 cm and 0.75 kg respectively were recorded for the three attributes in respect of big fruits while medium and small fruits had values of 12.09 cm, 10.26 cm and 0.53 kg, and 9.01 cm, 8.59 cm and 0.27 kg respectively. In 2007, length, diameter, and weight of big fruits were 14.43 cm, 11.38 cm and 0.91 kg respectively; 12.33 cm, 10.15 cm and 0.54 kg respectively for medium sized fruits and 9.03 cm, 8.66 cm and 0.27 kg respectively for small fruits. The differences in the measurements among the fruit sizes were significant ($P < 0.05$) with big fruits being superior to others.

***Seed attributes:***

In the three years of study, big fruits had significantly more seeds compared with small fruits. A similar trend was observed for seed weight (Table 1). Big fruits also had higher number of seeds per fruit and dry seed weight compared to medium sized fruits in 2005 and 2007 respectively. However, no significant differences were observed in seed germination among the different fruit sizes.

***Seed storage:***

Analysis revealed that even though storage period significantly influenced the germination of stored seeds extracted from all fruit sizes (big, medium, and small), no significant effects were recorded among fruit sizes. The interaction between fruit size and storage period was non significant because there was a definite pattern of germination in which seeds tested before storage among all sizes germinated significantly better than those after one year and two years storages respectively (Table 2). The longer seeds from all fruit sizes were stored, the more viability declined. There was a uniform decline in viability due to storage period on seeds derived from all the fruit sizes.

**Table 1 Effects of fruit size on seed attributes of *Cucumeropsis mannii* produced in 2005, 2006 and 2007**

| Year | Fruit size | No. of seeds/ fruit | Dry seed wt. (g) | 100-seed wt. (g) | Germination% |
|---|---|---|---|---|---|
| 2005 | Big | 168 | 18.78 | 12.87 | 88 |
| | Medium | 138 | 13.16 | 10.05 | 84 |
| | Small | 61 | 5.24 | 8.77 | 75 |
| | LSD 5% | 24.09 | 2.34 | 2.63 | ns |
| 2006 | Big | 242 | 34.13 | 18.53 | 89.5 |
| | Medium | 199 | 22.96 | 14.97 | 81 |
| | Small | 111 | 12.62 | 12.26 | 74.5 |
| | LSD 5% | 67.43 | 5.07 | 3.44 | ns |
| 2007 | Big | 239 | 40.54 | 18.27 | 91 |
| | Medium | 176 | 23.12 | 14.80 | 93.5 |
| | Small | 111 | 10.10 | 9.87 | 89.5 |
| | LSD 5% | 51.69 | 5.10 | 5.28 | ns |

**Table 2 Effects of fruit size on percentage germination of stored *Cucumeropsis mannii* seeds.**

| | Fruit Size | | | |
|---|---|---|---|---|
| **Storage period (years)** | **Big (%)** | **Medium (%)** | **Small (%)** | **Mean** |
| 0 | 88 a | 84 ab | 75.5 abc | 83 a |
| 1 | 77.5 abc | 73 bc | 68 c | 73 a |
| 2 | 62 cd | 50 d | 46 d | 53 b |
| **Mean** | 76 a | 69 a | 63 a | |

Means followed by the same alphabet are not significantly different using DMRT at 5% probability level.

## DISCUSSION

The results of this study showed that seed yield were higher in bigger fruits compared to smaller ones. Stephenson et al. (1988) have reported similar findings in pepper and Marcelis and Hofman-Eijer (1997) in *Cucurbita pepo.* These authors explained that fruits that contained more seeds competed better for available assimilates and therefore achieves greater size. Mini *et al.* (2000) also reported in their study on effect of fruit size on seed quality of ash gourd *B.hispida* that seed yield significantly increased with increasing fruit weight and seed weight was higher in large fruits compared to medium and small fruits.

Although there has been reports from some studies which agrees that bigger seeds normally germinate higher than smaller ones, this claim is not common to all crop species. For example, Gelmond and Peles (1975) reported that larger seeds of muskmelon germinated better than smaller ones. Pantipa *et al.* (2002) also found seeds of onion (*Allium cepa* L.) with bigger diameters to germinate better than smaller ones. Furthermore, Gabriel *et al.* (2009) reported that large seeds of cowpea (*Vigna unguiculata*) produced higher germination than small seeds. In this study, seeds from big fruits were significantly superior with respect to size and weight over those from medium and small fruits. However, this superiority did not translate into germination ability, as the viability of seeds from the three fruit classes was the same. This finding is in agreement with reports by Cideciyan and Mallochi (1982), who reported that seed size has no effect on percentage germination of *Rumex obtusifolius* or on the heavier seeds of *R. crispus*. In addition, Gonzalez (1992) found seed mass not to significantly affect germination of *Virola koschnyi* Warb. Furthermore, Nielsen (1996) argued that the size or shape of maize seed has nothing to do with the genetic yield potential of the hybrid. He reported that differences in size and shape are due to the position of the kernel on the cob and concluded that genetically the various sizes and shapes of the kernels coming from an ear are identical.

Germination of all stored seeds deteriorated with storage period. The decline in seed viability after a storage period of one and two years respectively in *Cucumeropsis mannii* is indicative of seed deterioration which is linked with disruption of cell organelles due to free radical production in the cells of embryos. Sung and Jeng, (1994); Sung (1996). Seeds tested after two years storage under ambient temperature failed to attain the minimum germinative standard for certification accepted for watermelon production.

It is therefore recommended that in *Cucumeropsis mannnii*, seeds could be extracted from fruits of all sizes without jeopardizing quality.

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