Proceedings of the

2nd International Conference of Agriculture and Agricultural Technology

ICAAT 2022

Theme:

Climate-Smart Agriculture in the Post COVID Era:

A Gate Way to Food Security in Africa

Held at

Caverton Hall

Federal University of Technology Minna, Nigeria

Published by

School of Agriculture and Agricultural technology

Federal University of Technology

P. O. M. 65, Minna, Nigeria

Email: [illegible]@futminna.edu.ng

Tel: 08028573305

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EFFECT OF FRUIT AND MOTHER-PLANT AGES ON THE VIABILITY AND LONGEVITY OF OKRA (Abelmoschus esculentus L.Moench) SEEDS

*ABDULLAHI, Mohammed Ladan., H. Ibrahim and O. A. Adediran
Department of Crop production, Federal University of Technology, Minna
*Corresponding Author E-Mail: *amladan3319@gmail.com
Phone No. 08033190432

ABSTRACT

The study was carried out to determine the effect of fruit and mother-plant ages on the viability and longevity of okra (Abelmoschus esculentus L. Moench) seed. Mass planting experiment for seed production was carried out at the teaching and research farm of The Federal Polytechnic, Bida, Niger State, Nigeria, during the 2021 rainy season. The experiment consisted of two varieties of okra and nine fruit harvesting stages at different days after anthesis (DAA), which gives 2x9 treatment combinations arranged in completely Randomized Design (CRD) and replicated four times. Data were collected on the mother-plant ages at harvest on the quality of okra seed, based on seed moisture content, 100-seed weight, fruit length, number of fruits per plant, plant height, leave area, seed colour, fruit weight, seed germination test. Data collected were subjected to analysis of variance (ANOVA) using mini tab version 19 and means were separated using turkey test at 5% level of probability. The results indicated that okra seeds are influenced by age of the fruit. Also, that timing of harvest is an important factor since both early and late harvest reduces seed quality. It is concluded that okra fruit age should be considered in okra seed viability.

Keywords: Fruit, Mother-plant, okra, seed, viability

INTRODUCTION

Okra (*Abelmoschus esculentus* L.), belonging to the family *Malvaceae*, is commonly known as Lady's finger, as well as by several vernacular names, including okra, in the different geographical regions of its cultivation (Abd Elmoneim, 2021). Okra is believed to have originated near Ethiopia, where it was frequently cultivated by the Egyptians during the 12th century, and thereafter spread throughout the Middle East and North Africa (Kumar *et al.*, 2013). Okra is an annual shrub that is cultivated mostly within tropical and subtropical regions across the globe and represents a popular garden crop, as well as a farm crop. It is a widely cultivated vegetable crop and is globally known for its palatability (Yuennan *et al.*, 2014). The immature green pods of okra are usually consumed as vegetables, while the extract of the pods also serves as a thickening agent in numerous recipes for soups, as well as sauces, to augment their viscosity (Archana *et al.*, 2015). Another noteworthy application of okra fruit is their wide use in the pickle industry. The polysaccharides present in okra are used in sweetened frozen foods such as ice creams, as well as bakery products, due to

their health benefits and longer shelf-lives (Islam, 2019). Historically, okra pods were utilized for various purposes, such as in food, appetite boosters, astringents, and as an aphrodisiac (Durazzo *et al.*, 2018). Furthermore, okra pods have also been recommended to cure dysentery, gonorrhea, and urinary complications (Durazzo *et al.*, 2018). They are important source of oil and protein.

Seed longevity is a measure of how long seeds can be stored and remain viable under a given set of conditions. Seed longevity in storage varies greatly among species (Hay *et al.*, 2011) and is also determined by the cumulative effect of environment during seed maturation and harvesting. Several studies describe the relative longevity of seeds in medium- and long-term gene bank storage (Ellis *et al.*, 2018).

There are several factors that can affect the viability and longevity of seeds after harvest, including: ageing, improper storage methods, high temperature during drying, rapid drying or over drying, initial quality of seeds before storage such as fruit and plant ages during seed harvest.

Use of poor-quality seeds (poor quality of farmer saved seeds) is one of the factors responsible for low yield on farmer's field. Poor quality seed results in poor germination and poor crop stands which is significant factor affecting okra productivity. Proper and uniform stand establishment are the key factors for successful crop production in all cropping systems. To ensure such stand, even under adverse conditions, high quality seed must be planted.

Seed quality and quantity are affected by maternal identity (Farzi and Bigloo, 2010), such as maternal age (Birhanu, 2010) and maternal environment (Mathewos, 2012), which will influence the natural regeneration processes. Mother-plant and fruit ages have significant effect on seed quality.

With increasing awareness of health benefit of okra and the role it plays in pharmaceutical industries, the demand for okra is on the rise. Thus, to increase the productivity of okra to meet the increasing demand, it is important to plant high quality seeds of okra. The results emanating from this study will provide farmers with information on the fruit and mother-plant ages at which the best quality seeds can be obtained. Therefore, the objective of this study was to determine the best okra fruits harvesting stage to obtain high quality seed for the two different okra seeds variety.

MATERIALS AND METHODS

Mass planting for seed production was carried out at the teaching and research farm of The Federal Polytechnic, Bida (Latitude 9° 51 N and Longitude 6° 44 E) during the 2021 rainy season. The site

is located in the southern Guinea savannah ecological zone of Nigeria. Annual rain fall distribution is between April and early October with the peak around August.

Average rainfall in this area is 120 mm while temperature ranges from 35 °C to 40 °C, the relative humidity is between 40 to 60 % around January, which later increases to between 60 to 80% towards July.

The seeds of the two varieties were sourced from National Horticultural Institute (NIHORT) Ibadan. The experiment consisted of two varieties of okra and nine fruit harvesting stages at (14, 21, 28, 35, 42, 49, 56, 63, and 70) days after anthesis (DAA). Which resulted in 18 (2 × 9) treatment combinations fitted into completely Randomized Design (CRD) and replicated four times. The field were cleared of vegetation and other debris and an area of 50m x 50m was marked out for ridges. Two seeds of okra were sown on manually constructed ridges. Thinning was done two weeks after sowing leaving one per stand. Manual weeding was done at two weeks after planting and subsequently as found necessary. NPK fertilizer were applied (20:15:15) at 200 kg/ha at the rate of 60 kg N, 30 kg P and 10 kg K at four weeks after sowing.

Date tagging of fruit from position 1-3 on the mother-plant were carried out on daily bases as the flowers open. Fruits that developed from the tagged flower were harvested at 14, 21, 28, 35, 42, 49, 56, 63, and 70 days after anthesis (DAA). The seeds extracted from the two varieties and 9 harvested fruit ages were stored in an oven at 37° C and 75 % relative humidity to accelerate the ageing process of the seeds.

100- Seed weight (g)

One hundred seeds were counted at random from the harvested produce of each treatment combinations in four replicates, weighed using Mettler balance and their mean weight was recorded in grams. Data were collected on germination percentage, germination rate index and germination index. Germination percentage was done by counting four replicates of 50 seeds each of the treatment combinations and placed on a water-moistened filter paper. Germination counts were taken at every-other-day. The incubation period was 28 days, and the results were expressed in percentages.

Germination rate index (GRI) and germination index (GI) were calculated and seed leachate electro- conductivity measured as indices to determined seed vigour during the storage periods.

Germination rate index (GRI) shows the percentage of germination per day. This was calculated using the relationship developed by Esechie (1994). Germination index is a comprehensive vigour measuring parameter which combines both germination percentage and speed (speed, duration, high and low events).

Electro-conductivity test

The electro-conductivity test was done by counting four replicates of 50 seeds from each of the treatments into beakers to which 30 ml of distilled water was added. The seeds were left in water for 24hours after which the mixture was stirred and the supernatant decanted into clean beaker (ISTA, 2006) the electro-conductivity of the supernatant was measured using jenway DDS-307 Conductivity meter. The values were expressed in siemens per meter(sm1). Data in percentages were transformed to arc sin values in order to obtain a reliable interaction between treatments before they were analysed.

The data collected were subjected to analysis of variance (ANOVA) using mini tab statistical package version 19 and means were separated using turkey test at 5% level of probability.

RESULTS AND DISCUSSION

The experiment revealed that okra seeds are influenced by age of the fruit. Table 1 shows the effect of fruit ages at harvest on the viability of okra seeds. sharp increase in seed germination percentage, germination rate index and also germination index from 28, 53, 42, 49, 56, 63 and 70 (DAA) The seeds harvested at 14 and 21 (DAA) were not viable and no germination, with L.D 88 germinating significantly than variety NHAe47-4 in all viability test. The increase in germination percentage, germination rate index (GRI) and germination index (GI) with increase in maturity could be attributed to greater inflow of assimilate with progress in seed maturation as reported by Chen et al. (2009), Kavak et al. (2012) that timing of harvest is an important factor since both early and late harvest reduces seed quality.

Table 1. Effect of fruit ages at harvest on the viability of okra seeds

Treatment	Parameters		
Varieties (V)	G.P (%)	GRI (% day-1)	GI (%)

NHAe47-4	22.50b	1.98b	56.64b
L.D 88	24.62a	2.50a	92.88a
S.E ±			
Fruit age (DAA)			
14	0.00e	0.00e	0.00e
21	0.00e	0.00e	0.00e
28	45.13c	0.10d	7.98d
35	77.92b	0.52c	26.60c
42	79.04b	0.98c	52.50b
49	80.30a	1.68b	76.50b
56	83.82a	1.80b	89.25a
63	85.50a	2.00a	91.50a
70	91.61a	2.20a	92.70a
SE±			

Key: V= Variety, GP= Germination percentage, GRI= Germination rate index, GI= Germination index

CONCLUSION

It is concluded in this research that okra fruit age should be considered in okra seed viability. This is because age of okra fruit is a major determinant of okra seed quality. Therefore, both the early and late harvest could result to low quality of okra seed.

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