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THE EFFECT OF DIFFERENT LEVELS OF NITROGEN FERTILIZER ON POLLEN VIABILITY AND VISCOSITY OF *SHEMFHEN*- AN INDGENOUS CULTIVAR OF OKRA (*Abelmoschus esculentus L.Moench*).

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Abstract: Seeds of the *shemfhen* cultivar of okra were collected from Kwambai village, Takum Local Government area of Taraba State to determine the effects of levels of nitrogen fertilizer (NPK 27:10:10) on pollen viability and viscosity (draw quality) of the cultivar. The treatment consisted of three concentrations of the NPK 27:10:10 fertilizer and the fourth which is zero to serve as control (0, 5, 10 & 15g per stand). The different concentrations formed the plots. The cultivation was done in the research farm of MAUTECH, Yola located within latitude 9^0 19^0 N and longitude 12^0 30^0E with an average annual rainfall of 69mm. Cytological analysis of the pollen and viscosity test of the fruits from each plot were assessed. Pollen viability and viscosity gradually increased with increase in concentration of the NPK 27:10:10 fertilizer. However, at concentration 15g per stand many of the okra plants welted and died before maturity. Therefore, concentration 10g per stand is recommended for optimum viability and viscosity. It is concluded that pollen viability and viscosity of the cultivar are both genetically & environmentally determined.

Key words: Concentration, Pollen Viability, Shemfhen, Viscosity (Draw)

INTRODUCTION

Abelmoschus esculentus (L) Moench, belongs to the large family *Malvaceae*. It is a tropical plant and requires soil temperature range of 25- 40^0C and nutrients like nitrogen, phosphorus, potassium and trace elements for its maximum growth and performance. It is mostly cultivated for its tender pods which are very rich in carbohydrates, proteins, vitamins as well as essential amino acids and the pod's mucilage content impact a glutinous constituents to soups and gravies and gives them a desirable viscosity which facilitates swallowing of relatively rough food (Lestic, 1956; singh etal , 1977; Grubben, 1999). The cultivars of *A. esculentus* vary in times of maturity, internodes distances, shapes of fruits, fruit length & viscosity of pods (Tindal, 1983). Significant genotypic variations for many characters in okra were observed by morankinyo and mankinde (1991) and they suggested the possibility of improving okra through hybridization followed by selection. According to them, trangressive genotypes are only possible if the hybridizing parents are significantly different. In hybridization programmes, the pollen grains serve as the main tool for transfer of genetic traits from one species to another. In order to carry out an effective hybridization on a particular plant, the knowledge of its pollen viability is essentials. For okra in the past, lack of adequate knowledge of pollen viability has posed constraints on its improvement programmes. Furthermore, in addition to its nutritive values, draw in okra fruit is one of qualities being sought after. However, it was found to vary amongst and within species (Morakinyo *et al*, 1991). Therefore, knowledge of the sources of these variations is important if improvements have to be done on any given cultivar.

MATERIALS & METHODS

Seeds of the *shemfhen* cultivar were collected with adequate care to avoid agriculturally improved ones. This is because the improvement processes may have the tendency of affecting the pollen viability and viscosity.

Cultivation and Fertilizer Application

The seeds were cultivated in three plots, (A,B & C) & planting was done with three seeds per stand and later thinning carried out after seven days to ensure one plant per stand. A fourth plot was included for the purpose of control with which no fertilizer was applied on it. Weeding was done two times during the growth of the crop. Nitrogen fertilizer (NPK 27:10:10) was applied 15days after planting in the following order: Plot A=5g per stand, plot B= 10g per stand, plot C-15g per stand and the control plot is 0g per stand.

Pollen Collection, Fixation and Preservation

After maturity and before dehiscence, the pollens were collected into samples bottles according to their plots to the laboratory where they were fixed for 24hrs in *carnoyl* fluid and thereafter preserved in 70% alcohol.

Slide Preparation and Photography

The preserved pollens were thoroughly washed in 3 changes of distilled water for 15 minutes at 5 minutes interval. The washed pollens were hydrolyzed and softened for easy squashing by addition of 10% Hcl and water bathed for 20 minutes. These were further rinsed with distilled water and slides were prepared using *aceto orcein* as stain. The slides prepared from all the different concentrations of fertilizer were kept for 24hrs after which they were viewed under the microscope and the micrograph of each was taken using motic image 2.0ml of digital camera. Pollens whose protoplasm were thinly stained or appeared dwarf & shriveled were considered non-viable while those whose protoplasm absorbed the stain or are regular in shape were counted as viable (Mc Clintock, 1940).

Fruits Collection and Treatment

For the viscosity, fresh and soft fruits of the *shemfhen* cultivar were collected according to the concentration of the fertilizer into polytene bags tagged accordingly. 30g of each was weighed using a navigator weighing machine. The weighed fruits were blended using an electric blender for 5 minutes. A thick gelatinous extract resulted. 200cm^3 of water was measured and added to the extract and the solution filtered. Using a measuring cylinder, 50cm^3 of the filtrate of each was measured and poured into a viscometer tired to a retort stand. With the aid of a stop watch to monitor the time, the viscometer nozzle was opened and the time taken for the filtrate to flow out of the viscometer was taken to be the viscosity (draw quality). The process was repeated 3 times for each sample and the average was taken to be the viscosity of each.

RESULT AND DISCUSSION

In this study, the effect of graded application of NPK fertilizer on pollen viability and viscosity improves as the concentration of the fertilizer increased from 0g per stand to 15g per stand (Table 1&2). These remarkable improvements recorded imply that okra production and quantity improvement could be boosted by using this graded NPK fertilizer. It confirms earlier studies by Fredeen *et al* (1989) where leaf formation and expansion were found as the major role of nitrogen in vegetative development of okra. Similar reports were made earlier by

Sasbesan and Sathananda (1986) who found nitrogen and phosphorus generally increasing vegetative performance.
These results are indication that nitrogen and phosphorus affects the rate of dry matter accumulation. It is also possible to assume that factors which effectively influence the rate of vegetative development could also effectively affect in general the rate of plant growth and resultant potential dry matter accumulation.

Table 1: Percentage Pollen Viability of the cultivar (*uwaop*)

Concentration of Fertilizer (g)	Viability (%)
0.0	82.7
5.0	85.6
10.0	83.3
15.0	94.9

Table 2: Cultivar Viscosity

Concentration of Fertilizer (g)	Viscosity (s)
0.0	70.8
5.0	107.4
10.0	123.2
15.0	140.0

Effects of the Fertilizer on Pollen Viability of the Cultivar

The higher the concentration of the fertilizer, the more viable the pollen became (Table1). Since plant productivity is the function photosynthesis, it is not implausible that the constituents of the NPK fertilizer grade might have affected the chloroplast, chlorophyll and therefore pollen viability, which is the precursor to bumper fruiting. This agrees with Cooke, (2002) who opined that generally applying right quantity of fertilizer will result in increased yield of plant.

Effect of the Fertilizer on the Viscosity

The viscosity of the okra cultivar is also affected by the concentration of the fertilizer applied (Table2). This is in agreement with the finding of majanbu *et al,* (1985) who found Nitrogen and phosphorus playing enhancing role in quantity development of okra. It was observed that the rate of viscosity of the cultivar fresh pods had positive correlation with the concentration of NPK fertilizer applied.

CONCLUSION

This work has shown that, the effect of graded application of NPK fertilizer on pollen viability and viscosity improves as the concentration of the fertilizer increased from 0g per stand to 15g per stand. These remarkable improvements recorded imply that okra production and quantity improvement could be boosted by using this graded NPK fertilizer.

REFERENCE

Cooke, G.W (2002). Fertilizer for Maximum Yield (3rd ed.) ELBSS, Granada Publishing Limited, London.

Fredeen, A.L; Roa, I.M; Terry, N (1989). Influence of Phosphorus Nutrition in Growth and Carbon Partitioning in *Glycine Max*, Plant Physiology 89 (1) 225-230. Berkeley C.A; USA (*Field Abstracts*) 1989 42 (6) p.

Grubben, G.H (1999). *Tropical Vegetables and their Genetic Resources.*

Leslie, S.C (1956). *Introduction to Botany of Tropical Crops*

Majanbu, F.S; Ogunlana, V.B; Ahmed, M.K and Olanrewaju, J.D (1985). Response of Two Okra (*Abelmoschus esculentus L. moench*) varieties to fertilizer Yield Components as influenced by Nitrogen and Phosphorus Application. Fertilizer Research (6), 257-267.

Mc Clintock, L (1940). Handbook of Pollen Stain Ability.

Morakinyo, J.A and Makinde, S.C (1991). Variability and Heritability in local

Sasbesan, J. and Sathananda, C. (1986). Effect of Phosphorus and Potassium on Nodulation and Yield of Soybeans. *Tropical Agriculture 142;83-88. Department of Agron. Eastern. University Chenkalady Sri Lanka (In field Crops Abstracts (1989) 42 (9) 861.*

Singh, S.P. and Singh, H.N (1977). Combining Ability in Okra. *Indian Journal of Agricultural Science 48:455-458.*

Tindal, H.D (1983). Vegetables in the Tropics.

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