SURVEY ON THE EFFECT OF OKRA MOSAIC VIRUS AND LEAF CURL VIRUS ON YIELD IN MAIDUGURI, BORNO STATE, NIGERIA

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Abstract

A field trial was conducted at the Teaching and Research Farm of the Department of Crop Protection, Faculty of Agriculture, University of Maiduguri. The aim was to evaluate the Reaction of five Okra cultivars to Okra leaf curl virus and Okra mosaic virus disease on yield in Maiduguri. The trial was laid out in a Randomized Complete Block Design (RCBD) and replicated three times. Data collected include susceptibility, expression of disease plant and yield. Data were analysed using LSD for mean separation. The result shows that all the five cultivars (long yellow and red pod), samara 46, green velvet, long and lady finger and long pods) were highly susceptible (163.3kg/ha). Incidence of Okra leaf curl virus disease was significantly lower in the cultivars; long yellow and red pods (248.9kg/ha) at 2WAG, 6WAS, 8WAG and 10WAG.However, at 8WAG, and at 10WAG, long yellow and red, samara 46 and green velvet cultivars were significantly (P=0.05) susceptible to the mosaic virus disease. The virus is one of the limiting factors of okra. Its vector being whitefly can cause infection of up to 100% of plants in a field and yield losses ranging from 90 to 94% depending on the stage of growth at which infection occurs.

Key words*: Albelmoschus esculentus*, mosaic virus, Incidence, yield, Vectors, Maiduguri.

Introduction

Okra *(Abelmoschus esculentus(L) Moench*, botanical synonym Hibiscus *esculentu*s L) is a widely-grown fruit vegetable; it is grown on about 2 million hectares annually in Nigeria (FMAWRRD, 1989). It is one of the leading fruit vegetable in the Nigerian fresh food market on the basis of land area, production, volume and value Taylon., 1996 and it features daily in the diets of most Nigerians. The crop is known by its local name in different parts of the world. In Nigeria for instance it is known as “ila” in Yoruba, “okwuru” in Igbo and “kubewa” in Hausa, Tindal, (1986). Okra is an erect, annual crop, some species growing up to 2m in height. The first pods are ready for harvest in about two months after planting, but plants continue to bloom. Okra is a warm season crop and does well in humid condition. A wide range of soil type has been found suitable for okra but well drained fertile soil with organic material is generally more suitable Adelana., 1986). Most cultivars are adapted to high temperature throughout the growing period, a monthly average temperature range of 20 – 30^0c is considered appropriate for growth, flowering and pod development. Okra is tolerant to a wide range of climatic conditions; supplementary irrigation may be required during the fruiting period

(Tindal, 1986).To enhance production, application of 60kg/ha N, 20kg/ha P and 20kg/ha K have been suggested adequate for okra production (NIHORT, 1976, Adelana, 1986; Ayodele 1993).The young shoots and leaves are eaten or used as fodder for livestock and the stem also contains fibre of considerable strength, which may be used for making fish line, traps and hammocks (Irvine, 1969). As a vegetable crop, the principal use of okra is in soup in which meat forms and important parts, the young soft pod may also be boiled or fried and eaten as a vegetable.

The pods are sliced, dried and ground into powder which is used for soup thickening (Tindal, 1983). Dried seeds are as well roasted, ground and used as coffee substitute or added to coffee in EL – Salvador and Malaysia, the unsaturated fatty acid (Linoleinic and Oleic acids) extracted from Okra seeds is readily hydrogenated and utilized in margarine or butter fat. Furthermore stated that fibre of Okra serves as a good material for making paper especially the large – staked, rapidly growing West African varieties that cannot flower in the United states a nd so becomes a good source of pulp production. Okra is known to be susceptible to a wide range of diseases and pests, which result in considerable losses in the field and after harvest. In wet and dry weather, fruits can be attacked by various pathogens James, 1988), showed various fungi colonizing the rhizosphere of okra. The major pests of okra are whitefly *Bemisia tabaci*, Beetles *podagrica spp. And* Nisotra dilecta (Lana and Taylor, 1975, Atiri; 1984) some common fungal diseases includes; *Oidium abelmoschii*, *Cercoporaabdmoschii, Fusarium oxysporium*, *Erysiphe cichoraceam* and *Sphaerotheca fuliginea* which can cover the whole leaf, which may die out and drop as a result of the diseases. There are a number of other fungi and bacteria associated with okra that are known to be seed transmissible: A*scochyta abelmoschi* (pod spot) and *Macrophomina phaseolina* (charcoal rot) are frequently found to infect seedling at an early stage. Also, *Pseudomonas syingae* (bacterial blight) can be transmitted by seed (Schippers, 2000). Apart from fungal and bacterial diseases, the crop is highly susceptible to attack by virus diseases. The c ommon virus diseases known to infect Okra are the Okra leaf curl and Okra mosaic virus. The leaf curl disease mostly occurs during the wet season in the southern part of Nigeria and okra mosaic virus is the most important and widespread virus diseases of okra in Nigeria (Ewete, 1974, lana,*et al,* 1974, Oyolu 1977, Atiri,1984). Both the okra leaf curl and Okra mosaic virus is known to cause a yield reduction of between 30% and 70% economic loss. The virus is not seed borne although infectivity assay test indicates the presence of the virus in every floral part of the infected plant including the testa and embryo of immature seeds of infected cowpea, green gram and okra. Okra mosaic virus is transmitted in a non-persistent manner by the coleopteran *Podagrica decolorata* (Bruntet al, 1990). The virus is also sap-transmissible, elicit variable symptoms on infected plants, Systemic infection first appear on the youngest as vein clearing, followed by light green mosaic Koenig and Givord, 1974). Typical symptoms of okra mosaic virus on okra include vein-chlorosis, vein-banding, mosaic and stunting. Most post-harvest diseases originate in the field where pathogens attack the growing and mature produce. Part of the strategies suggested for post-harvest loss prevention by James (1988) include the use of an integrated crop management system

involving pre-and post-harvest chemical sprays using BENLATE (benomyl), carbaryl and cypermethrine to reduce spoilage of fruits after harvest. Okra mosaic is very difficult to control with insecticides or by eliminating the virus host. There is no information available on host resistance to okra mosaic virus. However, depending on the period of infection, in early infections, diseased plants are stunted with few pods in late infections however, pods that develop with diseases are only reducing in size. The first symptom of the diseases is thickening of the veins, later the leaf texture becomes rough and warty and the leaves begin to curl in an adaxial direction. Okra leaf curl diseases can be transmitted both by grafting and by whiteflies (*Bemisia tabaci* Genn). A yield loss of 10 to 80% is caused by the virus (Alegbejo,2001b) and loss incidence may reach 100%before harvest(Atiri,1984).

The objective of the study was to evaluate the fruit yield reaction of five okra cultivars to okra leaves curl virus (OLCV) and okra mosaic (OMV) disease in Maiduguri.

MATERIAL AND METHODS

The study was conducted at the Teaching and Research farm of the Faculty of Agriculture University of Maiduguri The experiment was conducted during the rainy season between July and October. The okra cultivars used for the study were collected from Institute for Agricultural Research IA Samaru Zaria and faculty of Agriculture University of Maiduguri seed unit. The cultivars were; long pod, green velvet, long yellow and red pod, Samaru 46 and long and lady finger respectively. The trial was laid out in a randomized complete block design (RCBD) each retreatment replicated 3 times. The total area for the experiment was 209m^2 with each plot measuring 3mx3m. There were 15 plots in all. Inter and intra row spacing was 60cm and there were twenty-five plants per plot. There were five rows per plot; five seeds were sown per hole and later thinned to two for proper growth and development. Hoe was used for land clearing and preparation of seed bed; seed were sown on flat bed after harrowing and pulverization. Data were collected on the yield, and disease severity at two, four, six, eight, and ten weeks after germination. The first pick was made after about two months from sowing. The fruit of each treatment were collected periodically and the average yield per plant was calculated as number of fruit per plant. The fruit yield was determined by weighing the fruits at every harvest in each plot. The entire yield per each harvest in each plot were pooled together to obtain the final yield, which were evaluated to kg/ha..Data were analysed using analysis of variance (ANOVA) while the Least Significant Differences (LSD) was used to separate means.

DISEASE SEVERITY

Record of Okra leaf curl disease severity with the appearance of the first visual symptoms of the were then carried out at one week interval till the end of the season. Disease severity was scored based on a scale outline by Alegbejo., 1997 using scale of 1-5 as:

Disease severity (DS):

$$\frac{\sum n}{N \times 5}$$

Where:

$\sum n$ = sum of individual rating

N = Total No of plans assessed
5 = Highest score on the severity scale

On the scale 0 implies no symptom
1 – No visible symptom

3 – mild

5 – Severe mosaic and curling of leaf

The yield of the okra was measured and recorded in kilogram after harvest at the end of the experiment.

Result and discussion

Result for okra cultivars evaluated for resistant to okra mosaic virus at Maiduguri is presented in table 1. The result shows that all the cultivars were highly susceptible to the disease symptom. Expression was used as the basis for determining the diseased plants in the fields, using the scale of 1 -5 |(Alegbejo,1997) based on the percentage infection. The mean of the disease severity indicated that all the cultivars had a mean of disease severity greater than 25%, meaning that all the cultivars were highly susceptible on the incidence of Okra mosaic virus. However, long and lady finger were least susceptible, while the rest of the cultivars were significantly (p=0.05) susceptible at 2 weeks after germination (WAG), 4WAG,6WAG. Although at 8WAG and 10WAG, long yellow and red pod, samaru46 and green velvet cultivars were highly susceptible to the mosaic which is in consonance with the work of Givod and Koening,(1974), Lana et al, (1974 and Alegbejo, (1997). They stated that the mosaic virus is one of the wet season disease of okra and that the virus could produce variable symptoms on infected plants, fruit of severely infected plants could develop some chlorotic flecks and the incidence may reach 100 percent before harvest in experimental and commercial planting.

Table 1 Okra cultivars evaluated for resistance to Okra leaf curl virus (OLCV) and Okra mosaic virus (OMV) at Maiduguri during the 2006 cropping season.

Cultivars	Mean of disease severity	Resistance category
Long yellow and red pod	27.36	HS
Samara 46	31.36	HS
Green velvet	29.76	HS
Long and lady finger	28.48	HS
Long pods	31.84	HS

*HS= highly susceptible

The result on yield of okra cultivars evaluated for Okra mosaic at Maiduguri showed that there is significant (p=0.05) difference among the cultivars. The cultivar; green velvet has the highest yield (1,483.3kg/ha) followed by long yellow and red pods (163.3kg/ha) and samara 46 (248.9kg/ha) with long and lady finger (662.6kg/ha) having the lowest yield. Table 2 However show that green velvet could be said to be tolerant cultivar since it

proved to be highly resistance among all the cultivar.

Table 2: the yield (kg/ha) of okra cultivars evaluated at Maiduguri

Cultivars	Yield (kg)
Long yellow and red pod	163.3c
Samara 46	248.9c
Green velvet	1483.3a
Long and lady finger	662.6c
Long pod	705.3b
LSD	**3.24**

*Significant difference at 5% level of probability.

Conclusion

It may be concluded that the Okra cultivars are susceptible to Okra mosaic virus especially in the wet season and this may reduce the potential maximum yield. The mosaic virus causes curling of the Okra leaf thereby reducing the photosynthetic surface of the plant, the morphological and reproductive phase of Okra. Reaction of Okra to leaf curl virus was high yielding and resistant cultivars were developed and made available to farmers for mosaic free Okra production.

The alternative use of seed dressing, early planting, and use of pesticides and development of resistant crop be applied. The crops should be grown in isolation from alternative host. It is recommended to use fresh seed or seed stored in a cool dry place in case old seed is used; it would advisable to test the germination before planting.

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