Academic Journal of Plant Sciences 4 (1): 19-21, 2011
ISSN 1995-8986

Distribution of Viruses on Okra Plants Grown in Southwestern Nigeria

[1]O.O. Odedara, [2]E.I. Ayo-John, [1]M.T. Bankole, [1]B.G. Tinuala, [1]O.D. Odetayo,
[1]T.I. Adebulehin, [1]O.D. Adesomoju and [1]E.O. Imaku

[1]Department of Microbiology, College of Natural Sciences, University of Agriculture, Abeokuta (UNAAB), Nigeria
[2]Department of Crop Production and Protection, College of Plant Sciences, University of Agriculture, Abeokuta, Nigeria

Abstract: A survey was conducted in August, 2010 at six local governmental areas(LGA) of Ogun State in southwestern Nigeria for the assessment of viral diseases of okra plants (*Abelmoschus esculentus L.*). One hundred and fifty leaf samples were collected and virus-indexed using Double Antibody Sandwich Enzyme Linked Immunosorbent Assay(DAS-ELISA). The antibodies used were those raised against *Okra mosaic virus* (OkMV), genus *Tymovirus* and *Cucumber mosaic virus* (CMV), genus *Cucumovirus*. Antiserum against OkMV reacted positively to antigens in 10.7% (16/150) of the samples collected, while 89.3% (134/150) were negative. Highest incidence of OkMV was detected in samples collected from Iporo-Ileke and Fadama(UNAAB) at Odeda LGA. None of the samples tested showed any positive reaction to CMV. This preliminary result is a key pointer to the management of viral diseases of okra plants in Nigeria.

Key words: Survey · Incidence · *Okra mosaic Tymovirus* · *Cucumber mosaic Cucumovirus*

INTRODUCTION

Okra (*Abelmoschus esculentus*) is an important vegetable crop in most of the tropics including Nigeria [1]. It is cultivated for its fibrous fruits or pods containing round, white seeds. The fruits are harvested at immature stage to be eaten as a vegetable and okra roots and stems are used for cleaning the cane juice from which gur or brown sugar is prepared [2]. Its ripe seeds could be roasted, ground and used as coffee substitute in some countries, while the extracts from the field is viewed as alternative source of edible oil containing unsaturated fats such as oleic and linoleic acids. Okra is of high medicinal value that has been found useful against genito-urinary disorders and relief from haemorrhoids [3, 4].

It was claimed that it has originated from Africa, it is known with different names all around the world. Though many viruses have been known to infect okra plant in some parts of the world, such available information remains scanty in Nigeria. Among the viruses identified to infect okra in other parts of the world are Okra yellow vein mosaic virus (OkYMV), Okra leaf curl virus (OkLCV) and Okra mosaic virus (OkMV).

OkMV had been reported from Nigeria and other parts of West Africa and its natural host range include *Corchorus olitorius*, *Hibiscus rosa-sinensis*, *Indigofera spictata* and *Sida* spp. It is transmitted by a chrysomelid beetle, *Podagrica sjostedti*. It can be controlled by synthetic pyrethroid and aqueous neem [5, 6].

OkLCV is a begomovirus and is endemic in West Africa. It is transmitted by *Bemisia tabaci* and can be best detected by PCR [7].

In southwestern Nigeria, okra is a very important soup condiment that is consumed daily in almost all homes and restaurants. In combinations with other vegetables such as pepper and tomatoes, it forms a good mixture for semi-solid foods commonly eaten in every part of southwestern Nigeria, but it's production is been threatened by various pests including viruses, which therefore necessitated the purpose of this research to indicate the level of incidence of viruses responsible for the decreased performance of okra plants on farmers' fields in southwestern Nigeria.

Corresponding Author: O.O. Odedara, Department of Microbiology, University of Agriculture, Abeokuta, P.O. Box: 96, UNAAB P.O., Nigeria. E-mail: sdara@hotmail.com.

MATERIALS AND METHODS

Field's Survey: Surveys were conducted during the planting period in August, 2010 and six local governmental areas (LGA) viz: Abeokuta North, Ifo, Obafemi Owode, Odeda, Remo and Yewa North were visited at Ogun state, in the southwestern region of Nigeria. At each local government area (LGA), two farms were visited with exception of farm at Yewa LGA whereas only one was surveyed. On the field, a sub-plot of 4X 4m was marked out with a measuring tape and leaf samples showing mosaic or any other symptoms or apparently healthy were collected from 14-15 representative plants from the sub-plot, from which severity scores and disease incidence were also recorded. Leaf samples were collected aseptically into polythene bags, labelled and kept on ice packs in a cooling box before being transported into the laboratory (UNAAB Biotechnology Centre) for serological indexing. In the laboratory, samples were kept at 4°C for not more than 24 h before being indexed.

Double antibody sandwich Enzyme linked immunosorbent assay (DAS-ELISA) described by Clarks and Adams [8] was used to test for incidence of OkMV and CMV in the samples collected. The antisera used and conjugates were kindly provided by Dr Stephan Winter of DSMZ (German collection of Microorganisms and Cell Culture, Germany. Samples were considered positive when the mean of absorbance value at 405 nm (A_{405nm}) was one and a half times greater than that of the incorporated healthy leaf samples.

RESULTS

One hundred and fifty leaf samples were collected from the field showing different symptoms such as mosaic, mottling, puckering and leaf necrosis. Mosaic and mottling were encountered in 28.7 and 23.3 % of the collected samples, respectively while puckering was found in 18.0 % (Table 1). Assessment of symptomatic expression of plants in the sub-plot for severity and

Table 1: Diverse symptoms observed on okra plants surveyed

	Symptoms observed:									
LGA	AppH.	Chl.	Mos.	Mott.	L.crl.	Gvb.	L.distn.	L.nec.	Puc.	Cupp.
Remo	2/21	2/21	0/21	10/21	0/21	0/21	2/21	1/21	4/21	0/21
Obaf. owode	3/28	3/28	8/28	2/28	2/28	2/28	2/28	4/28	8/28	3/28
Odeda	4/28	0/28	0/28	16/28	0/28	0/28	0/28	2/28	6/28	0/28
Abk. North	1/30	0/30	24/30	0/30	0/30	0/30	2/30	2/30	2/30	0/30
Ifo	0/28	2/28	10/28	6/28	2/28	0/28	0/28	10/28	0/28	1/28
Yewa North	4/15	0/15	1/15	1/15	0/15	0/15	2/15	1/15	7/15	0/15
Total	14/150	7/150	43/150	35/150	4/150	2/150	8/150	20/150	27/150	4/150
% inc.	9.3	4.7	28.7	23.3	2.7	1.3	5.3	13.3	18.3	2.7

Abbreviations: LGA-Local government area; Obaf. Owode-Obafemi owode; Abk.North-Abeokuta North; AppH-apparently healthy; Chl.-chlorosis; Mos.-mosaic; Mott.-mottling; L.crl.-Leaf curling; Gvb.-greenveinbanding; L.distn.-leaf distortion; L.nec.-leaf necrosis; Puc.-puckering; Cupp.-cupping; % inc.-percentage incidence

Table 2: Percentage incidence of *Okra mosaic virus* (OkMV) and *Cucumber mosaic virus* (CMV) on farms surveyed as detected by ELISA

		OkMV Incidence:		CMV Incidence:	
LGA	Village	Per location	Per LGA	Per location	Per LGA
Remo	Ilishan	2/15	4/21(19.0%)	0/15	0/21(0.0%)
	Owode	2/6		0/6	
Obafemi owode	Owode	0/14	2/28(7.1%)	0/14	0/28(0.0%)
	Imala	2/14		0/14	
Odeda	Iporo-ileke	2/14	6/28(21.4%)	0/14	0/28(0.0%)
	Fadama-unaab	4/14		0/14	
Abeokuta North	Alamala	0/15	0/30(0.0%)	0/15	0/30(0.0%)
	Iwofin	0/15		0/15	
Ifo	*Farm 1	2/14	2/28(7.1%)	0/14	0/28(0.0%)
	*Farm 2	0/14		0/14	
Yewa North	Joga	2/15	2/15(13.3%)	0/15	0/15(0.0%)
Total		16/150	10.7%	0/150	0.0%

Abbreviations: *Names of the villages were not known. CMV-*Cucumber mosaic virus* genus *Cucumovirus*; OkMV-*Okra mosaic virus*, genus *Tymovirus*; LGA-Local government area

disease incidence showed some variations in different field surveyed. While severity ranged from 2 at Ifo LGA to 5 at Abeokuta North, the disease incidence was 38% at Ifo and 100 % at Abeokuta North and Obafemi Owode, respectively (Table not shown). The result of ELISA however, showed 10.7 % (16/150) of the total samples collected to be positive to OkMV antiserum.

The positive okra samples included those collected from Remo, Obafemi Owode, Odeda, Ifo and Yewa North local government areas of Ogun State. Antisera raised against CMV did not react to antigens in okra leaf samples (Table 2). In all, 120 (80.0%) samples reacted negatively with antisera raised against OkMV, even though they showed virus-like symptoms. Odeda LGA recorded the highest incidence of samples responding to antibody homologous to OkMV (21.4 %), followed by the Remo LGA (19.0 %), Yewa North (13.3 %), Ifo (7.1 %), Obafemi Owode (7.1 %) in that order while all the samples collected in Abeokuta North LGA tested negative.

DISCUSSION

Okra mosaic virus (OkMV), genus *Tymovirus* had long been reported from Nigeria but its incidence is yet to be assessed especially in the study area. On the field, disease incidence was very high with severity scores but little percentage was actually diseased when leaf samples collected from the diseased plants were serologically indexed. The reason must have been due to the presence of other viruses in the sampled plants to which antiserum was not available, or the yellowing of leaves must have been due to other physical factors such as unfavourable weather conditions, soil-minerals and nutrients imbalances. At other times, infection by non-viral pathogen, damage by insect, mite, nematodes, pests, air pollution and pesticides produces virus-like symptoms [9].

The incidence recorded for OkMV in all the local governmental areas surveyed showed that the widespread nature of OkMV as previously recorded by Bozarth *et al.* [10]. The absence of OkMV in Abeokuta North LGA could probably have been due to planting of healthy seeds by the farmers in the area or probably the absence of the transmission vectors during the time of sample collection. Among vectors known to transmit OkMV are the chrysomelid beetle *Podagrica sjostedti*, *P. uniformis* and *Syagrus calcaratus* (Lana and Ajibola-Taylor, 1976).

CMV had not been reported to infect okra and probably that is the reason for the inability to detect the virus but further studies are underway for its proof and so also is the transmission of OKMV through seeds.

CONCLUSION

The detection of OkMV in okra plants is a signal to plant virus disease researchers and breeders of the need to develop more resistant lines that would be able to withstand the disease pressure on the field and also the production of virus-free planting materials for improvement in yields of okra plants.

ACKNOWLEDGEMENTS

Authors are grateful to Dr S. Winter of DSMZ, Germany for the kind donation of the antisera used in this study.

REFERENCES

1. Schippers, R., 2002. African indigenous vegetables. An overview of the cultivated species. Natural Resources Institute/ACP-EU, Technical Centre for Agricultural and Rural cooperation, Chatam, UK.
2. Chauhan, D.V.S., 1972. Vegetable Production in India. Third edition. Ram Prasad and Sons (Agra).
3. Baloch, A.F., S.M. Quayyum and A.C. Baloch, 1990. Growth and yield performance of okra (*Abelmoschus esculentus* L.) Cultivars. Gomal University Press.
4. Adams, C.F., 1975. Nutritive value of American foods in common units. US Department of Agriculture. Agricultural Handbook.
5. Lana, A.O. and T. Ajibola-Taylor, 1976. The insect transmission of an isolate of okra mosaic virus occurring in Nigeria. Annals of Applied Biol., 82: 361-364.
6. Atiri, G.I., M.F. Ivbijaro and A.D. Oladele, 1991. Effect of natural and synthethic chemicals on the incidence and severity of okra mosaic virus in okra. Tropical Agriculture, 68: 178-180.
7. Varma, A. and B. Mandal, 2003. Other vegetables. In: Virus and virus-like diseases of major crops in developing countries, Eds., Loebenstein, G. and G. Thottappilly. Kluwer Academic Publishers. Dordrecht. The Netherlands, pp: 689-717.
8. Clarks, M.F. and A.N. Adams, 1977. Characteristics of the microplate method of enzyme linked immunosorbent assay for the detection of plant viruses. J. General Virol., 34: 475-483.
9. Francki, R.I.B., M. Hollings and R.G. Milne, 1999. Detection of plant viruses based on biology methods. J. Plant Pathol., 23: 247-258.
10. Bozarth, R.F., A.O. Lana, R. Koenig and J. Reese, 1977. Properties of the Nigerian and Ivory Coast strains of the okra mosaic virus. Phytopathol., 67: 735-737.