Niger Agric. J. 29(1998): 122 - 129

INSECT PESTS AND DISEASE VECTORS OF PEPPER, *Capsicum* spp. in EDO AND DELTA STATES OF NIGERIA.

D.A. ENOBAKHARE
Department of Crop Science, Faculty of Agriculture, University of Benin, P.M.B. 1154, Benin City, Nigeria.
(Accepted December 1996)

ABSTRACT

Pepper farm plots in Umunede, Agbor, and Benin in Edo and Delta States, Nigeria, were continuously sampled in the rainy seasons of 1992 and 1993. Many insect pests attack peppers, *Capsicum* spp., in Nigeria and cause economic damage to varying degrees. Some are serious pests which attack leaves, fruits and shoots; and some transmit viruses especially of mosaic disease of pepper *(Myzus persicae* and *Aphis gossypii)*. The larvae of *Atherigona (Acritochaeta) orientalis* (Diptera: Muscidae) and Megaselia sp. (Diptera: Phoridae) penetrate fruits of all ages and feed on ovules, seeds and mesocarps causing fruit abscission. The major insect groups commonly observed to cause damage on pepper fruits and those which are possible virus vectors are reported.

INTRODUCTION

In most tropical countries, pepper *Capsicum* ssp., is cultivated as an important garden crop. It is included in diets as a spice *(C. frutescens*, hot pepper) in a variety of local foods, and also as a condiment in vegetable salad. Its use as a preservative of soyabean and cowpea from weevil attack, is widespread in the rural parts of Nigeria, where modern preserving facilities are scanty.

Yield of pepper is limited by the damage from a wide range of associated insect pests. In Nigeria, Iheagwam and Nwakiti (1980) first reported *Atherigona orientalis* and *Megaselai* sp. as two principal dipterous insect pests causing pepper fruit rot and abscission in Eastern Nigeria. Though there are a few reports of the incidence of premature fruit dropping and rotting of leaves (Elmore & Campbell, 1951; Foschi, 1959; Foott, 1970), a study of the regular pests of pepper some of which may be disease vectors or pollinators has been largely overlooked.

The present paper reports on a study of the insect pests, pollinators and disease vectors of pepper in Nigeria undertaken during the rainy season of 1992 and 1993.

MATERIALS AND METHODS

The investigation was conducted in the farmlands of Umunede, Agbor and Benin in Edo and Delta States, Nigeria, where pepper is widely intercropped with tomatoes. In each location, two plots, 50 x 30m, were sampled continuously in the rainy seasons of

1992 and 1993, from sprouting to fruit formation. In each plot, thirty 10 x 5cm cylindrical plastic (sleeve) cages were placed over the plants to trap hemipterous pests. Other pests were collected by pooters, sweep nets and handpicking into collecting jars. For studies on bug damage, two pests, *Nezara viridula* and *Dysdercus peocilus,* were caged singly on small, undamaged pepper fruits in twenty randomly selected replicates per location and the nature of damage to the fruits observed and recorded for a period of fifteen days. In all, fifty plastic cages with fine mesh gauze were used. In every plot, extensive collections of fruits which dropped were made and dissected in the laboratory. Larvae of insect pests were counted and reared to maturity for identification. The presence of aphid vectors and the incidence of pepper mosaic virus were monitored in all plots during the study period. Surveys for aphids and virus incidence were conducted every five days for about three months in each growing season. All plants were examined and the aphid species noted and for virus incidence, the proportion of plants showing symptoms were recorded. Crude extracts prepared from infected plants were inoculated on to test plants to confirm the presence of the virus

RESULTS AND DISCUSSION

The importance of aphids as vectors of viruses is well known (Kennedy *et al.,* 1962; Swenson, 1968; Eastop, 1977; Halbert *et al.,* 1981). In South-western Nigeria, *Aphis spiraecola* was reported on pepper (Akinlosotu, 1976) but was not found in this study. Large populations of this aphid are usually found on *Chromolaena odorata* (L.), an important and widespread perennial weed in Nigeria. The scarcity of this weed in and around the pepper fields may account for its absence. The principal aphids observed in the pepper fields were identified as *Myzus persicae* and *Aphis gossypii* (Blackman & Eastop, 1984), both of which transmit pepper mosaic virus. The presence of the virus was confirmed by discolouring and malformations of the leaves. Approximately 90% of the field plants showed characteristic symptoms of the pepper mosaic disease, including leaf curl, veinbanding, green and yellow mottling, crinkled leaves and dwarfing. In the greenhouse, pepper seedlings (40 days old) showed mosaic symptoms twelve days after contact with virus bearing aphids and three days after treatment with crude extracts from infected plants. The green stink bug (*N. viridula)* and the coreid bug *(D. poecilus)* failed to transmit the virus since characteristic mosaic symptoms were absent on pepper following exposure to large numbers of these pests.

Pepper fruits which dropped from plants in the fields showed heavy infestation with larvae of the moths *Cydia sp.* and the flies *Atherigona orientalis* and *Megaselia* sp. (Table 1). Infestation of healthy fruits in the greenhouse with these larvae showed that both the moth and fly larvae could initiate rotting and subsequent dehiscence of fruits both by burrowing into the fruit and by tunnelling in the fruit wall. However, the fly larvae caused greater damage (91.7%) than the moth larvae (45.6%) on pepper fruits of all varieties. In studies of dipterous insect pests of pepper, Iheagwam and Nwakiti (1980) suggested that only *A. orientalis* and *Megaselia* sp. could cause fruit drop through mechanical injury.

The present studies indicate that fruit drop is caused by both moths and flies as a result of mechanical injury and subsequent

TABLE 1: MOTH AND FLY LARVAL INFESTATION ON PEPPER Capsicum spp.

Pepper Variety	No. of fruits collected	No. of Larvae *moths	**flies	% Infestation moths	flies
Atarodo x sp 70	350 ± 12.00	210±1.24	298±2.10	60.0	85.1
Hungarian Wax Hot	420 ± 4.49	315±0.67	378±1.67	75.0	90.0
Cavent Large Thick	200 ± 2.24	100±2.01	190±1.90	50.0	95.0
Burpee' Early Pimento	200 ± 1.45	69±1.90	176±1.30	30.0	88.0
Pimento Perfection	365 ± 2.42	164±1.40	343±1.04	45.0	94.0
LOcal Sweet scented	491 ± 1.96	74±1.60	473±1.33	15.1	96.3

**Cydia* sp. (Tortricidae: Lepidoptera)
***Atherigona orientalis* (Muscidae) and *Megaselia* sp. (Phoridae)

TABLE 2: BUG DAMAGE ON PEPPER FRUITS (n = 20)

Insect Pest	Adults per cage	No. of fruits with rot symptoms
N. viridula (Green shield bug)	20	19±1.02
D. poecilus (Coreid bug)	20	18±1.0

TABLE 3: PESTS OF PEPPER, Capsicum spp. IN EDO & DELTA STATE, NIGERIA

No	Order	Family	Name of Species	Part of Plant Attacked
1.	HEMIPTERA	Cicadellidae	*Empoasca* spp. e.g. *S. fasci-alis* (Jacob) *lybica* (De Berg)	Nymph and adult attack leaves and flowers.
2.	"	Aphididae	*Myzus Persicae* *Aphis gossypii*	Nymph and adult attack leaves, flowers, young shoots and fruits. Transmit pepper mosaic virus.
3.	"	Pseudcococcidae	*Ferrisia virgata*	Nymph and adult attack leaves, young shoots and fruits.
4.	"	Coccidae	*Saissetia coffeae*	Nymph and adult attack leaves, and stems.
5.	"	Pyrrhocoridae	*Dysdercus fasciatus*, *D. poecilus*	Nymph and adult attack stems and pods.
6.	"	Coreidae	*Acanthocoris clovipes*, *A. scabrator*, *Anoplocnemis* sp., *Leptoglossus australis*	Nymph and adult attack young branches, leaves and fruits.
7.	"	Pentatomidae	*Nezara viridula*, *Cyclopetta obscura*, *Eurydena pulchra*	Nymph and adult attack leaves, young shoots fruits.
8.	DIPTERA	Muscidae	*Atherigona orientalis*	Both *Atherigona* and *Megaselia* lay eggs on rotten fruits and larvae
9.	"	Phoridae	*Megaselia sp.*	develop on rotten fruits. They cause fruit drop in pepper fields.
10.	"	Trypetidae	*Dacus* sp	Larvae feed on fruits and cause rotting.
11.	LEPIDOPTERA	Noctuidae	*Anomis sabulifera*, *Heliotis armigera*, *Spodoptera littoralis*	Larvae feed on fruit and cause rotting.

No	Order	Family	Name of Species	Part of Plant Attacked
12.	"	Lymantriidae	*Euproctis producta*	Larvae feed on leaves
13.	"	Totricidae	*Cydia* sp.	Larvae tunnel in fruits.
14.	"	Pieridae	*Pleris* sp.	Larvae feed on leaves.
15.	HYMENOP-TERA	Vespidae	*Vespula media, Vespa* sp.	Pollinators.
16	"	Megachilidae	*Leaf cutting bee*	Cut holes on leaves.
17.	ORTHOP-TERA	Mantidae	*Pseudocrebotra* sp. (praying mantis)	Predatory on moths and flies
18.	"	Acrididae	*Oedaleus nigeriensis*	Nymph and adult attack leaves, and young shooths.
19.	"	"	*Oxycatantops spissus*	Nymph and adult attack leaves, and young shooths.
20.	ODONATA	Libelludiae	*Urothemis assignata* (dragonfly)	Feed on leaves
21.	THYSANOP-TERA	Thripidae	*Thrips tabaci*	Attacks flowers.

fungal and bacterial attack.

Extensive rotting of the fruits was observed due to the piercing and sucking activities of *N. viridula* and *D. poecilus* (Table 2). These bugs, which fed for two weeks on all pepper varieties, left circular feeding punctures with definite margins (Cochran, 1968; Corpuz, 1969). Lesions were observed to spread without further insect activity. Wounding and rotting can produce ethylene in fruits (Iheagwam & Nwakiti, 1980) which accelerates fruit abscission (Janies, 1973; Bidwell, 1974). Production of cellwall degrading enzymes (pectinases and celluses) is stimulated by the ethylene released resulting in abscission (Rasmussen, 1973; Bidwell, 1974; Greenberg *et al.*, 1975). It is suggested that the high sugar content of mature fruits and humid climatic conditions permit rapid growth of moulds. The extent of damage to the fruits by hemipteran and dipteran larvae, varies with the variety of pepper (Table 1). Local sweet scented pepper is preferred by flies (96.3s%) whereas Hungarian Wax Hot is highly susceptible to both types of insect.

Overall, insects and vectors associated with pepper are listed in Table 3. Four major groups encountered are the Hemiptera, Lepidoptera, Diptera and Hymenoptera and members of these are probably the most important pests of pepper. It is expected that the control of these major pests would lead to a better fruit development, reduced losses and increased utilization.

ACKNOWLEDGEMENTS

I am grateful to my colleagues, too numerous to mention, who assisted in collection of the pepper fruits. In particular, I thank Kelly Ozolua of the Federal Control Pest Services, Nigeria .

REFERENCES

AKINLOSOTU, T.A. (1976). Aphids associated with local vegetables in Southwestern Nigeria. *Research Bulletin 7,* Ife, Nigeria University of Ife Inst. of Agricultural Research and Training. 10pp.

BIDWELL, R.G.S. (1974). *Plant physiology.* Macmillan Pub. Co. Inc. 302pp.

BLACKMAN, R.L. and EASTOP V.F. (1984). *Aphids on the world's Crops: An identification Guide.* Chichester: Wiley-Interscience Publication. 466pp.

COCHRAN, H.L. (1968). A new pigment fruit disorder associated with the feeding of the leaf-footed bug. *Leptoglossus phylopus* L. *Proc. Amer. Soc. Hort. Sci.* 93: 470 - 473.

CORPUZ, L.R. (1969). The biology, host range and natural enemies of *Nezara viridula* L. (Hemiptera: Pentatomidae). *Phillipine Entomologist* 1 (3); 225 - 227.

EASTOP, V.F. (1977). World-wide importance of aphids as virus vectors IN: *Aphids as Virus Vectors* eds. K.F. Harris and K. Maramorasch. Academic Press, London, pp. 3 - 62.

ELMORE, J.C. and CAMPBELL, R.E. (1951). The pepper weevil. Leafl. U S. Dept. Agric. 226.

FOOTT, W.H. (1970). Insect pests of pepper in South-western Ontario. *Canada Agric.* 15 (4): 32 - 33.

FOSCHI, S. (1959). Pests and diseases of vegetables, Capsicums. *Progr. Agric.* 5: 1060 - 1061.

GREENBERG, J., GOREN, R. and RIOV, J. (1975). The role of cellulose and polygalacturonase in abscission of young and mature Shamouti orange fruits. *Plant Physiol.* 34: 1 - 7.

HALBERT, S.E., IRWIN M.E., and GOODMAN, R.M. (1981). Alate aphid (Homoptera: Aphididae) species and their relative importance as field vectors of soyabean mosaic virus. ***Annals of Applied Biology*** 97: 1 - 9.

IHEAGWAM, E.U. and NWAKITI, O.C. (1980). Dipterous insect pests of pepper, *Capsicums*pp. in the Eastern States of Nigeria. *Rev. Zool. Afr.* 94(4): 936 - 939.

JANIES, W.O. (1973). *An Introduction to Plant Physiology.* Oxford University press. 289pp.

KENNEDY, J.S., DAY, M.F., and EASTOP, V.F. (1962). *A Conspectus of Aphids as vectors of Plant Viruses.* London: Commonwealth Agricultural Bureaux, Franham Royal. 114pp.

RASMUSSEN, G.K. (1973). Changes in cellulose and pectinase activities in fruit tissues and separation zones of citrus treated with cycloheximide. *Plant Physiol.* 51: 626 - 628.

SWENSON, K.G. 1968. Role of aphids in the ecology of viruss. *Annual Review of Phytopathology.* 6: 351 - 374.