

NOMENCLATURAL PROBLEMS, BIOLOGY, HOST PLANT AND POSSIBLE VECTOR STATUS OF AUCHENORRHYNCHA ASSOCIATED WITH CROP PLANTS IN NIGERIA

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ABSTRACT

Several species of planthoppers and leafhoppers have been collected on crop plants in Nigeria. Only few of these, however, are known as pests and they include Hilda undata Walker (Tettigometridae), Locris spp. (Cercopidae), Peregrinus maidis Ashmead (Delphacidae), Empoasca spp. and Cicadulina spp. (Cicadellidae). The last three are the most important economically.

Empoasca spp. are widely distributed on several crop plants, notably leguminous and malvaceous crops, on which more than one species are frequently recorded. They cause direct damage to these crops and there is no record of any disease transmission. Cicadulina spp. and P. maidis are known to transmit maize streak and maize stripe virus diseases respectively. Locris spp. and H. undata are minor pests of cereals and citrus respectively.

Known biological information on these species is presented and existing problems of confused identity are highlighted.

INTRODUCTION

Several species of Auchenorrhyncha have been recorded in Nigeria as can be found in the unpublished lists representing the collections of the Department of Agricultural Biology, University of Ibadan, Department of Crop Protection, Institute of Agricultural Research, Samaru, Zaria and the Department of Plant Science, University of Ife, Ile-Ife. These are also well documented in a recent publication on insects of Nigeria by Medler (1980). This review concerns those species associated with crop plants, especially those that are known as pests.

SPECIES LIST

Some 27 species have been recorded associated with various crop plants and these are shown in Table 1. In the table, only species for which available records showed that a good series was collected on a particular crop, or that feeding and/or breeding occurred on it, have been included. Nonetheless, it is likely that some of the species included represent mere sitting records. It is, for example, felt that the delphacids here reported as associated with cotton, might have been migrants from adjacent cereal fields since delphacids generally feed on graminaceous crops. However, the records showed that a good series of the species listed were collected on cotton.

TABLE 1. List of Auchenorrhyncha associated with crop plants in Nigeria.

Species	Family	Host plant
<u>Penthimia bella</u> Stal	Cicadellidae	Potato
<u>P. vinula</u> Stal	Cicadellidae	Potato
<u>Austroasca</u> (<u>Jacobiasca</u>) <u>lybica</u> de Berg	Cicadellidae	Cotton
<u>Jacobiella fascialis</u> Jacobi	Cicadellidae	Cotton
<u>Empoasca dolichi</u> Paoli	Cicadellidae	{ Cowpea; Cotton Groundnut; Pigeon Pea; Soybean
<u>E. sudanica</u> Dworakowska	Cicadellidae	
<u>E. pikna</u> Dworakowska	Cicadellidae	
<u>E. confusania</u> Ghauri	Cicadellidae	
<u>Empoasca</u> <u>ethiopica</u> Dworakowska	Cicadellidae	Cotton
<u>Gambialoa newbyi</u> Ghauri	Cicadellidae	Citrus
<u>Exitianus taeniaticeps</u> Kirschbaum	Cicadellidae	Cotton
<u>Nephotettix modulatus</u> Melichar	Cicadellidae	Cotton
<u>Cicadulina triangula</u> Ruppel	Cicadellidae	Cotton
<u>C. mbila</u> Naude	Cicadellidae	Cotton; Maize
<u>C. arachidis</u> China	Cicadellidae	Cotton
<u>Irinula flava</u> Lindberg	Cicadellidae	Cotton
<u>Balclutha hebe</u> Kirkaldy	Cicadellidae	Cotton
<u>B. rosea</u> Scott	Cicadellidae	Cotton
<u>Poophilus adustus</u> Walker	Cercopidae	Cereals
<u>Locris rubens</u> Erichson	Cercopidae	Cereals
<u>L. maculata</u> Fabricius	Cercopidae	Cereals
<u>L. rubra</u> Fabricius	Cercopidae	Cereals
<u>Hilda undata</u> Walker	Tettigometridae	Citrus; Cotton
<u>Nycheuma idas</u> Fennah	Delphacidae	Cotton
<u>Sogatella kolophon</u> Kirkaldy	Delphacidae	Cotton
<u>Sogatodes cubanus</u> Crawford	Delphacidae	Cotton
<u>Peregrinus maidis</u> Ashmead	Delphacidae	Maize

BIOLOGY OF INDIVIDUAL SPECIES

The biology of most leafhoppers and planthoppers in Nigeria has hardly been studied. Available information in the literature usually relates only to observed damage and control.

Golding (1937) reported Hilda undata Walker as a pest of grapefruit (Citrus paradisi Macf.) and Tephrosia candida (Robx.) at Ibadan, southern Nigeria. Subsequent records showed that the species was common on Solanum verbascifolium L. and occurred less frequently on Theobroma cacao L.. Jerath (1967) observed the eggs, nymphs and adults on Acacia farnesiana (L.). He noted that the pale green, cylindrical eggs were laid in batches of 5-25 on the underside of the leaves, while the nymphs and adults were mainly inside or around flowers. The eggs were parasitised by adult encyrtids (genus nr. Arrhenophagus), while the ant Camponotus acvapimensis Mayr was observed carrying the nymphs from branch to branch and feeding on their secretion.

Members of the Empoasca complex suck sap and inject toxic saliva to crops and are especially important on cotton and cowpea, even though their importance on cotton seemed to have diminished considerably with the cultivation of pubescent cottons. Damaged cowpea shows a severe scorched appearance with leaf-cupping and puckling. Parh (1979) studied the Empoasca complex on cowpea in the rainforest and guinea savanna zones of Nigeria and noted that the main species causing damage to the crop was E. dolichi Paoli, as well as an unidentified parthenogenetic female which was much less injurious. Other species caught occasionally included E. pikna Dworakowska and E. sudanica Dworakowska. The relative abundance of the different species on cowpea and other host plants can be summarised as shown in Table 2. Parh (op. cit.) also studied the biology of E. dolichi. Oviposition occurred in stem tissue, leaf veins and midribs in the insectary with the highest being in stem tissue; but in the field, most eggs were found in leaf petioles with very few in the midrib and veins. There were five nymphal instars and total development (Egg - Adult) lasted an average of 17.5 days. Parasitisation by Aphelopus sp. (Dryinidae) was also observed, and generally, the population increased with the age of the crop and as the season advanced.

VECTOR STATUS

Leafhopper and planthopper damage per se does not appear to constitute a serious economic problem on crops in Nigeria. Indeed, only two species - Jacobiella fascialis Jacobi and E. dolichi appeared to cause damage of such significance as to merit any attention; and the former species as noted earlier, seems to have diminished considerably in importance with the cultivation of pubescent, resistant cotton varieties. The picture with disease transmission, however, differs, some species being very important as vectors.

TABLE 2. Relative abundance of Empoasca spp. associated with cowpea in S. Nigeria, on different host plants.*

Species	Relative abundance
<u>E. dolichi</u>	Always highest on cowpea; second highest or highest occasionally on pigeon pea and <u>Pueraria</u> sp.
<u>E. sudanica</u>	Low population on cowpea; almost nothing on pigeon pea, <u>Pueraria</u> sp., <u>Centrosema</u> sp. and soybean; very few on <u>Phaseolus</u> sp.; considerably high on <u>Amaranthus</u> sp.
<u>E. pikna</u>	Absent to very low on cowpea; absent to low on <u>Centrosema</u> sp., <u>Phaseolus</u> sp. and soybean; usually highest on pigeon pea; high on <u>Pueraria</u> sp.; pattern on <u>Amaranthus</u> sp. somewhat sporadic.
Unidentified partheno-genetic female	High on cowpea, next to <u>E. dolichi</u> ; moderate to high on <u>Amaranthus</u> sp.; low to moderately high on <u>Phaseolus</u> sp.; absent to low on pigeon pea, soybean and <u>Centrosema</u> sp.; mostly absent on <u>Pueraria</u> sp.

*Adapted from Parh, I.A. (1979).

A number of species have been reported associated with maize (Zea mays L.). These include Locris spp., Cicadulina mbila Naude, C. triangula Ruppel and Peregrinus maidis Ashmead as pests (Libby, 1968). Locris spp. cause direct damage and are minor pests but the other three species are important virus vectors (Libby, 1968; I.I.T.A., 1980 & 1981). Maize streak is a severe virus disease most prevalent on late season (August-sown) maize in Nigeria. Libby (1968) reported that it is transmitted by C. mbila while I.I.T.A. (1981) reported transmission by C. triangula. Earlier I.I.T.A. (1979) also reported that two other virus diseases frequently overlooked and/or apparently confused with maize streak, may reach epidemic proportions on maize. One of these resembles maize mottle/chlorotic stunt and shows great semblance to nutrient deficiency symptom; it is transmitted by C. triangula. The other strongly resembles maize stripe and maize hoja blanca, and is transmitted by P. maidis.

NOMENCLATURAL PROBLEMS

For virtually all groups of insects in Nigeria, there is no local expertise in taxonomy. Most identification of agricultural pests is done either through the services of the Commonwealth Institute of Entomology or through expatriate curators of institutional collections visiting established European museums (especially British Museum (Natural History)), to make comparison with identified specimens during their home leave. This has led to the perpetuation of discarded names of some pests long after redesignation by specialists or even at times, the application of different names to the same pest especially when there are no easy external morphological features for specific distinction.

The genus Empoasca Walsh typifies the situation referred to above. Up till 1973, the species considered economically important on several malvaceous and leguminous crops was called E. fascialis Jacobi (Libby, 1968; I.L.T.A., 1973). Subsequently a redefinition of the Empoasca complex revealed that two species were actually pests of cotton and these were Jacobiella fascialis and Austroasca (Jacobiasca) lybica de Berg. Despite this, however, the cotton leafhopper in Nigeria is still referred to as E. fascialis in some cases. Also, by 1975, the species attacking cowpea was identified as E. dolichi Paoli in the collection of the National Cereals Research Institute, Ibadan. However, Singh and van Emden (1979) reported that a number of species attack cowpeas in Nigeria, of which E. christiani Dworakowska appeared predominant. As noted previously, Parh (1979) made a detailed study of this Empoasca complex on cowpea in southern Nigeria and concluded that E. dolichi was the principal species, followed by an unidentified parthenogenetic female and then, E. sudanica and E. pikna. Ghauri (1979) in a carefully reasoned account on the identity of E. dolichi, showed that there was yet another species which had been mistaken for E. dolichi all along. This was described as E. confusania Ghauri. I have examined the genitalia of a series of specimens collected on cowpea in the early season (April-July) of 1982 at Ile-Ife and found that both E. dolichi and E. confusania were represented. Examination of the terminalia of the few females among the specimens also revealed that they fitted the illustration provided for the unidentified parthenogenetic female by Parh (1979). The sternal plate overlying the ovipositor base in the latter is somewhat triangular in contrast to that of E. dolichi which is somewhat quadrangular. Thus, it is possible that the unidentified parthenogenetic female is actually the female of E. confusania. Another interesting observation made in examining the male genitalia was that whilst the aedeagus of the different specimens fitted the illustrations provided for each species by Ghauri (1979), the picture with respect to the anal tube processes was different. In some specimens the relative length and shape of the processes resembled those illustrated for E. dolichi, whilst the aedeagus clearly resembled E. confusania.

Another group where there is apparent confused identity is the genus Locris Stal. Four identified species are found in different collections in Nigeria. Three of these - L. rubra Fabricius,

L. rubens Erichson and L. maculata Fabricius have been reported as minor pests of cereals. According to Adenuga (1971), one of the characters used for species distinction is the number of patches or spots and the colour of the body. He, however, observed that there were many colour forms intermediate between the generally accepted species, and that in such cases, there were no distinct differences in the genitalia. He therefore suggested that some of these species were probably varieties of a single species, noting specifically that examination of the genitalia of several specimens labelled L. rubens and L. rubra in various collections, showed no difference.

CONCLUSION

Several species records of Auchenorrhyncha have been made on crop plants in Nigeria but only a few species constitute economic pest problems. The biology and identity of even the economic pests have been little studied. Despite recent renewed interests, the identity of the Empoasca complex, especially on leguminous crops, remains confused. A carefully directed biosystematic study of this complex, covering different seasonal, geographical and host plant populations, appears to be necessary.

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