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# HOST PLANTS OF *BEMISIA TABACI* GENN. IN NORTHERN NIGERIA

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**Abstract:** Intensive surveys conducted at Samaru and its environs in the northern Guinea Savanna of Nigeria between October 2000 and September 2002, indicated that *Bemisia tabaci* (Genn.) infests forty two (thirty three cultivated and seven wild) species of plants. Twenty nine of the plants were found in upland, two in the lowland and eleven in both upland and lowland (fadama) areas. Heavily infested plants were distorted, chlorotic and stunted. Symptoms of virus infection were associated with some of the infested plants. This is the first comprehensive report of hosts of *B. tabaci* in Nigeria.

**Key words**: *Bemisia tabaci*, hosts, Nigeria

## INTRODUCTION

Cotton, sweet potato or tobacco whitefly, *Bemisia tabaci* (Gennadius 1889) is a very important member of the insect order Homoptera, family Aleyrodidae, sub-family Aleyrodinae (Byrene and Houck 1990). It probably originated from the Indian sub-continent (Otim-Nape et al. 1995) and it transmits over 60 plant viruses of the genera *Geminivirus*, Clostevirus, Nepovirus, Carlarvirus, Potyvirus and a rod-shaped DNA virus (Fauquet and Fargette 1990; Markham et al. 1994; Alegbejo 2000). In Nigeria, they transmit at least twenty one viruses (Alegbejo 2000). One of the main reasons for the success of *B. tabaci* as a pest and vector is its extreme polyphagy and was recorded on 506 plant species belonging to at least 77 families (Basu 1995). There are at least 1,100 species of whiteflies all over the world (Brown 1991), of these, three are known to be vectors of plant viruses (Brown and Bird 1992). Whiteflies which transmitted *geminivirus* called *Begomovirus* (EPPO 1999) are most important agriculturally causing yield loss of crops between 20 to 100% (Brown and Bird 1992). *B. tabaci* is the most important vector of *geminiviruses*.

The adult is 1.0 mm long and the male is smaller than the female. The body is whitish yellow covered with a mealy secretion. Wings are white, similar in size and shape. The third antennal joint is considerably longer than other segments of the

antennae (Gamel 1977). Freshly laid eggs of *B. tabaci* are light-yellow, changing to dark-brown at hatching. The first instar nymphs are oval, whitish-yellow with two bright red eye on the head (Patel et al. 1992). It is a serious leaf sucking pest and produces numerous chlorotic spots on infested leaves by the action of the saliva of feeding adults as well as by the removal of cell contents by the immature stages resulting in reduction of plant vigour (Byrne et al. 1990). The magnitude of infestation and the nature of extent of damage varies with plant species, season and localities (Basu 1995). *B. tabaci* is known to be present in Nigeria but no further details (EPPO 1999; CAB 2002). This study was conducted with the aim to determine the hosts of *B. tabaci* at Samaru and environs. As a direct object of study, this is the first detailed report of hosts of *B. tabaci* in Nigeria.

## MATERIALS AND METHODS

Intensive surveys were conducted weekly between the first week of October 2000 and September, 2002 at the premises of the Institute for Agricultural Research (I.A.R.), the Institute irrigated farm and farmers' fields at Samaru and its environs (latitude 11°11'N, longitude 07°38'E and altitude 686 m). Each survey was conducted early in the morning (6.30–8.30 a.m.) when the whiteflies were still sluggish. Weeds and crop plants in the surveyed areas were carefully examined for the presence of *B. tabaci*. Any plant bearing whiteflies were carefully dug up, transplanted into 30 cm diameter clay pot, covered with polyethylene bag and transported to the Crop Protection Department laboratory at IAR Samaru for examination and identification. The part of the plant infested, severity of infestation, period of infestation and the location of the surveyed area were noted. The level of infestation was classified into four; very severe (VS), severe (S), moderately severe (MS) and mild (M), using a visual rating (Alegbejo 2001). Specimens of the host plants were identified in the Weed Science Section of Soil Survey Unit while *B. tabaci* was identified in the IAR Insect Museum.

## RESULTS

Forty two (thirty five cultivated and seven wild) species of plants were identified as hosts of *B. tabaci* at Samaru under the different cultivating systems during the period October 2000 and September, 2002. Twenty nine of the plants were located in upland, two in the lowland and eleven in both upland and lowland (fadama) areas (Table 1). More host species were recorded in the dry (October–May) than in the wet season (June to September). Leaves and stems supported higher population of whiteflies than buds. Whitefly populations were generally higher at the lowland than in the upland areas. Whitefly populations were more numerous in the dry than in the wet season. Heavily infested leaves were distorted, chlororic and this often resulted in premature leaf drop. Infested plants were weak and stunted, and in some cases, they died. Virus-like symptoms were associated with some infested plants such as *Capsicum annumm* L., *C. frutescens* L., *Carica papaya* L., *Ipomoea batatas* L., *Manihot esculentum* L., *Vigna unguiculata* L., (Walp), *Sesamum indicum* L., and *Solanum nigrum* L. Honey dew was also noticed on most of the infested plants particularly during the dry season.

Table 1. Host Plant Species of *Bemisia tabaci* Genn at Samaru, Nigeria

| Family and species of plant[a] | Plant part infested | Level of infestation[b] | Period of infestation | Ecology |
|---|---|---|---|---|
| AMARANTHACEA | | | | |
| *Amaranthus* spp. (C) | Leaves and stems | M | Oct–April | Upland |
| *Celosia argentea* L (C) | Leaves and stems | M | Oct–April | Upland |
| ASTERACEAE | | | | |
| *Ageratum conyzoides* L (W) | Leaves and buds | M | Oct–Sept. | Upland |
| CARICACEAE | | | | |
| *Carica papaya L.* (C) | Leaves,stems and buds | S | Oct–Sept. | Upland and lowland |
| COMPOSITAE | | | | |
| *Helianthus annus* L. (C) | Leaves and stems | M | Oct–Dec. | Upland |
| *Lactuca sativus* L. (C) | Leaves, stems and buds | M | Oct–Sept | Upland and lowland |
| *Vernonia amygdalina* L (C) | Leaves, stems and buds | S | Oct–Sept. | Upland |
| *Zinia elegans* Jacq (W) | Leaves, stems and buds | M | May–Jan | Upland |
| CONVOLVULACEAE | | | | |
| *Ipomea batatas* L. (C) | Leaves and stems | M | Oct–May | Lowland |
| CRUCIFERAE | | | | |
| *Brassica* spp. (W) | Leaves and stems | M | Oct–May | Lowland |
| CUCURBITACEAE | | | | |
| *Cirtrullus lanatus* Thunberg (C) | Leaves and stems | M | Aug–May | Lowland and upland |
| *Cucumis melo* L. (C) | Leaves and stems | M | May–Oct. | Upland |
| *Cucumis sativus* L (C) | Leaves and stems | M | May–Oct. | Upland |
| *Cucumeropsis mannii* Naud (W) | Leaves and stems | MS | May–Oct. | Upland |
| *Cucurbita pepo* L. (C) | Leaves and Stems | MS | Oct–Sept | Upland |
| *Telfaria occidentalis* Hook F (C) | Leaves, stems and buds | MS | Oct–Sept. | Upland |
| EUPHORBIACEAE | | | | |
| *Manihot esculenta* Grantz | Leaves, stems and buds | VS | Oct–Sept. | Upland |
| LEGUMINOSAE | | | | |
| *Arachis hypogaea* L. (C) | Leaves, stems and buds | M | May–Nov. | Upland |
| *Cajanus cajan* L. Mill (C) | Leaves, stems and buds | M | Oct–Sept. | Upland |
| *Glycine max* L. (C) | Leaves, stems and buds | M | May–Nov. | Upland |
| *Pisum* spp. (C) | Leaves, stems and buds | M | Oct–May | Lowland |
| *Phaseolus vulgaris* L. (C) | Leaves, stems and buds | M | May–Nov. | Upland |
| *Vica Faba* L. (C) | Leaves, stems and buds | M | May–Nov. | Upland |
| *Vigna unguiculata* L. (Walp) (C) | Leaves, stems and buds | MS | May–Nov | Upland |
| MALVACEAE | | | | |
| *Gossypium hirsitum* L. (C) | Leaves, stems and buds | S | May–Jan | Upland |
| *Hibiscus canabinus* L. (C) | Leaves, stems and buds | S | May–Jan | Upland |
| *Sida* spp. (W) | Leaves, stems and buds | S | Oct–Sept | Upland |
| *Abelmoschus esculentus* L. (C) | Leaves, stems and buds | VS | Oct–Sept | Upland and lowland |
| MYRTACEAE | | | | |
| *Psidium guajava* L. (C) | Leaves, stems and buds | S | Oct–Sept | Upland |
| PEDALIACEAE | | | | |
| *Sesamum indicum* L. (C) | Leaves, stems and buds | VS | May-Nov | Upland |

| Family and species of plant[a] | Plant part infested | Level of infestation[b] | Period of infestation | Ecology |
|---|---|---|---|---|
| SOLANACEAE | | | | |
| *Capsicum annuum* L. (C) | Leaves, stems and buds | VS | Oct–Sept | Upland and lowland |
| *C. frutescens* L. (C) | Leaves, stems and buds | VS | Oct–Sept | Upland and lowland |
| *Datura metel* DC (W) | Leaves, stems and buds | S | Oct–Sept | Upland and lowland |
| *D. stramonium* L. (C) | Leaves, stems and buds | S | Oct–Sept | Upland and lowland |
| *Lycopersicon esculentum* Mill (C) | Leaves, stems and buds | VS | Oct–Sept | Upland and lowland |
| *Nicotiana tabacum* L.(C) | Leaves, stems and buds | VS | May–Jan | Upland |
| *Physalis* spp. (W) | Leaves, stems and buds | S | Oct–Sept | Upland and lowland |
| *Solanum gilo* Raddi (W) | Leaves, stems and buds | S | Oct–Sept | Upland |
| *S. melongena* L. (C) | Leaves, stems and buds | S | May–Nov | Upland |
| *S. nigrum* L. (W) | Leaves, stems and buds | S | Oct–Sept | Upland and lowland |
| *S. tuberosum* L. (C) | Leaves, stems and buds | S | May–Jan | Upland |
| TILIACEAE | | | | |
| *Corchorus olitorius* L. (C) | Leaves, stems and buds | S | May–Dec | Upland and lowland |

a: C = Cultivated; W = Wild
b: VS = Very Severe; S = Severe; MS = Moderately Severe; M = Mild

## DISCUSSION

This investigation shows that *B. tabaci* has a wide host range both in the dry and wet seasons at Samaru and its environs. An exhaustive list of the host plants was not strived for, due to limited resources. The resistance to insecticides, wide host range of the whitefly in addition to their occurrence throughout the year makes it impracticable to control (Della Giusta et al. 1998). The perennial weed host *Ageratum conyzoides* L, *Zinia elegans* Jacq., *Datura metel* DC., *D. stramonium* L., *Solanum nigrum* L etc) and some cultivated species (*Celosia argentea* L., *Carica papaya* L., *Cucumis* spp., *Telfaria occidentals* Hookf etc) in upland and lowland (fadama and irrigated sites) are probably important reservoirs of *B. tabaci* during the dry season.

The wild hosts that habour *B. tabaci* such as: *A. conyzoides*, *Sida* spp., *D. metel*, *D. stramonium*, *S. nigrum* etc., play an important role in harbouring whiteflies between crop plantings. Therefore attention should be paid to removing them in advance of planting susceptible crops such as: cowpea, beans, groundnut, peppers, tomato, eggplant, sweet and irish potatoes etc). These weeds also often habour whitefly transmitted viruses (Bedford et al. 1998) and may be a major source of crop virus epidemics.

The shift in agricultural practices to irrigated monoculture and the cultivation of different crop species during the last three decades at Samaru, may be responsible for the large number of host plants colonised by *B. tabaci*. Compared with most other whiteflies, which are nearly all monophagous or oligophagous and typically infest woody perennials, members of the genus *Bemisia* are polyphagous and primarily infest herbaceous, annual plant species (Brown and Bellows 1991). Azabm et al. (1970) reported 155 plant species as hosts of *B. tabaci* in Egypt while a worldwide survey in 1986 showed that four hundred and twenty plants from seventy four families were infested (Greathead 1986). Therefore more host species may be found when a very extensive survey is carried out.

The wild or alternative host plants could be used as trap crops for whitefly control measure against this pest. Further studies will be conducted on migratory pest populations, factors influencing preference for the different host plants, dispersal from wild and cultivated host plants, the natural enemies and environmental factors influencing population dynamics.

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## POLISH SUMMARY

### ROŚLINY ŻYWICIELSKIE *BEMISIA TABACI* GENN. W PÓŁNOCNEJ NIGERII

Intensywne poszukiwania w okolicy Samara oraz w północnej części Savanna w Nigerii w okresie od października 2000 do września 2002 wykazały występowanie *B. tabaci* na 33 gatunkach roślin uprawnych oraz na 7 gatunkach dzikich. Dwadzieścia dziewięć gatunków żywicielskich stwierdzono w rejonach wyżynnych, dwa gatunki – na nizinach, a jedenaście w obydwu regionach. Opanowane rośliny wykazywały zaburzenia wzrostu, skarlenie oraz chlorotyczne odbarwienia. Niektóre gatunki roślin wykazały objawy wskazujące na infekcje wirusowe. Są to pierwsze obszerne informacje o roślinach-żywicielskich *B. tabaci* w Nigerii.