

## Assessment of Sugarcane Diseases and Pests in Ten Northern States and The Federal Capital Territory of Nigeria

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### ABSTRACT

Sugarcane diseases and pests were assessed on cane farms in Niger, Kwara, Kogi, Benue, Plateau, Borno, Adamawa, Kebbi, Sokoto, Katsina and the Federal Capital Territory (FCT), and research plots at Badeggi between 1988 and 1995. Notable diseases found occurring on canes were smut, red rot, leaf blast, sugarcane mosaic and curvularia leaf spot. Pests found attacking or associated with canes were stemborers, grubs, termites, rodents and nematodes. The effects of these diseases and pests on the attacked canes were discussed.

### INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) is the major raw material for sugar production in the world. Hampson (1983) and Sivaneasn and Waller (1986) are of the view that of the 85-90 million tonnes of refined sugar produced world-wide annually, approximately 50-60% comes from sugarcane. Another raw material for sugar production is sugar beet. In Nigeria, sugar is produced from sugarcane only. Two main types of sugarcane are grown in Nigeria, the soft chewing type and the hard type grown by the sugar estates for sugar production. Cane production for chewing and sugar processing is fast becoming lucrative venture for the peasant farmers as a result of the diversification in the use of harvested cane into products like 'honey' (Molasses), local sugar ('Mazarkwoilla') and alcohol ('Ogogora'-local gin) (Anon., 1989). Present production level of 170,000 tonnes is far below the 850,000-1,000,000 tonnes estimated consumption level in the country (Anon., 1987). This is accounted for by two major Nigerian sugar factories, the Nigerian Sugar Company Bacita located at Bacita, Kwara State and the Savannah Sugar Company Limited, located at Numan, Adamawa State which is a paltry 5% of the sugar needs of consumers (Agboire, 1995).

Biological constraints from pests and diseases cause set back to achieving production targets in Nigeria. Research efforts are directed at identifying economically important pests and diseases of the sugarcane crop with a view to developing management strategies against them. Surveys were conducted in ten Northern states and the Federal Capital Territory (FCT) between 1988 and 1995 to quantify the pest and disease status of sugarcane in the areas.

## MATERIALS AND METHODS

A disease survey guide was designed for the purpose of obtaining information from the farmer on his sugarcane fields. The methods of disease assessment have been described for Niger, Kwara, Benue, Plateau and FCT, Abuja (Wada *et al* 1994). Visual assessment and collection of infested cane samples as well as soil were employed for insect and other pests. Surveys were conducted in November in Borno and parts of Adamawa in 1991 and at the same period in Kebbi, Sokoto, Katsina and Kaduna in 1994.

Damage by stem borers and termites was symptomised by number of dead hearts and assessed from the relation :

(i) Stemborers : % infested stalks =

$$\frac{\text{Number of infested stalks in 40 sugarcane stools} \times 100}{\text{Total Number of stalks in 40 sugarcane stools}}$$

Infested cane stalks were collected for dissection, rearing and identification of the infesting borer species as described by West *et al.*(1985).

(ii) A 5m x 5m area of the sugarcane field was randomly chosen for termite damage assessment. Four such random plots were demarcated and assessed for termite damage from the following relation: % termite damage =

$$\frac{\text{Number of damaged cane stalks in 5m x 5m area} \times 100}{\text{Total number of cane stalks in the 5m x 5m cane plot}}$$

(iii) Nematodes : For nematode assessment of cane fields, weeds and random soil sample collection were used. Weed species (*Ageratum conyzoides*) were uprooted and examined for galls as indication for root-knot nematode infestation. Collected soil samples from cane fields were prepared and used for nematode extraction using Baermann's method in the laboratory according to Barker (1985).

Percent absolute frequency of each species of nematode from collected soil samples was calculated from the following relation: % absolute frequency (% AF) =

$$\frac{\text{Number of samples containing a species} \times 100}{\text{Number of samples collected from each cane field.}}$$

## RESULTS AND DISCUSSION

The pest status on cane in Niger, Kwara, Benue, Plateau and the Federal Capital Territory (FCT) has been presented in Table 1. Stemborers and termites were the major insect pests of cane in these areas. Sugarcane damage by stemborers ranged from 20-24% while that by termite ranged from 10-35% in the surveyed areas, respectively.

Damage by other insects pests like grubs, scale insects and grasshoppers as well as rodent damage were negligible.

**Table 1. Insect pests of sugarcane in five states and FCT, Abuja 1988-1990.**

| State       | Insect pests status (%)         |          |              |         |
|-------------|---------------------------------|----------|--------------|---------|
|             | Stemborers<br><i>Eldana</i> sp. | Termites | Grasshoppers | Rodents |
| Niger       | 30                              | 35       | 15           | 2       |
| Kwara/Kogi  | 35                              | 30       | -            | -       |
| Benue/ Kogi | 40                              | 25       | -            | -       |
| Plateau     | 35                              | 10       | -            | -       |
| FCT         | 25                              | 15       | -            | -       |

The principal diseases in the surveyed areas were smut, red rot and leaf blast. Sugarcane mosaic (SCM) and curvularia leaf spot diseases were minor and occurred at only one location of the surveyed areas. Sugarcane diseases found on cane in Niger, Kwara, Benue, Plateau and the Federal Capital Territory (FCT), Abjua, have been reported earlier (Wada *et al.* 1994). In 1992, a disease suspected to be curvularia leaf spot of sugarcane was observed on cane experimental plots at Badeggi. Several (*Curvularia*) species were isolated from infected cane leaves (Wada and Sachilder, 1995).

Red rot was recorded on all suagrcanes attacked by either stemborers or termites. This is in agreement with some earlier reports (Bailey and Betehet, 1982; Sivanesan and Waller, 1986; Trenor and Bailey, 1989) in which predisposition of cane to red rot infection was aggravated by insects particularly stemborers and termites. Other factors like farm implements and water logging were also implicated in sugarcane disposition in infection by red rot.

The feequency of plant parasitic nematodes extracted from soil samples collected from Niger, Kwara, and the FCT shown in Table 2. Six nematode genera were consistent associated with soil samples from those sites. They were *Meloidogyne* spp. *Heterodera* spp., *Pratylenchus* sp., *Tylenchus* sp., *Helicotylenchus* sp. and *Aphelenchus* sp. The predominant nematodes in each sample site were indicative of the cropping pattern and history of each site. For instance, where sugarcane was proceeded with rice, *Hirschmanniella* sp. or intercropped with maize and vegetables, were found, *Pratylenchus* sp. and *Meloidogyne* sp. respectively. In all the three locations *Tylenchus* sp. and *Tylenchorhynchus* sp. had high frequency of occurrence, while *Rotylenchus* sp., *Aphilenchus* sp., *Hirchmaniella* sp., *Heterodera* sp. and *Helicotylenchus* sp. had frequency of occurrence level of 40% (Table 2).



The damage potential by these nematodes could be considered greatest in Kwara state followed by FCT and Niger State in that order, because pathogenicity studies over the time have indicated that *Heterodera* sp., *Meloidogyne* sp., *Helicotylenchus* sp. and *Pratylenchus* sp. are very devastating under escalated populations (Fademi, 1986).

**Table 2. Frequency of plant parasitic nematodes associated with sugarcane in Niger, Kwara, Benue and FCT 1988 & 1990.**

| Nematode                 | State/ Locality |       |       |
|--------------------------|-----------------|-------|-------|
|                          | Niger           | Kwara | FCT   |
| <i>Aphelenchus</i>       | 44.44           | 100   | 82.50 |
| <i>Belonolaimus</i>      | 0.00            | 16.50 | 0.00  |
| <i>Criconema</i>         | 55.60           | 33.00 | 75.00 |
| <i>Criconemella</i>      | 0.00            | 0.00  | 25.00 |
| <i>Dolichodorus</i>      | 33.33           | 0.00  | 0.00  |
| <i>Helicotylenchus</i>   | 44.44           | 57.80 | 75.00 |
| <i>Hemicaloosia</i>      | 11.11           | 0.00  | 0.00  |
| <i>Hemicyclophora</i>    | 11.11           | 0.00  | 0.00  |
| <i>Hemicriconemoides</i> | 66.70           | 33.33 | 62.50 |
| <i>Heterodera</i>        | 22.20           | 41.30 | 62.50 |
| <i>Hirschmanniella</i>   | 44.44           | 0.00  | 0.00  |
| <i>Hoplolaimus</i>       | 11.11           | 33.00 | 37.50 |
| <i>Longidorus</i>        | 0.00            | 41.90 | 25.00 |
| <i>Meloidogyne</i>       | 88.90           | 41.30 | 50.00 |
| <i>Pratylenchus</i>      | 88.90           | 41.30 | 50.00 |
| <i>Rotylenchus</i>       | 44.44           | 33.00 | 12.50 |
| <i>Scutellanea</i>       | 33.00           | 0.00  | 0.00  |
| <i>Trichodorus</i>       | 33.33           | 16.50 | 37.50 |
| <i>Trophurus</i>         | 11.11           | 0.00  | 0.00  |
| <i>Tylenchorhynchus</i>  | 77.80           | 82.50 | 50.00 |
| <i>Tylenchus</i>         | 77.80           | 57.80 | 62.90 |
| <i>Xiphinema</i>         | 77.80           | 16.50 | 50.00 |

The disease status of sugarcane in four states and the FCT is presented in Table 3. Smut and red rot were the most prevalent diseases in all the surveyed areas. While blast occurred on canes in Niger, Kwara and Plateau States, sugarcane mosaic occurred only in Plateau State. Figures 1 to 3 also show that smut, red rot and blast diseases were found on canes in parts of Adamawa, Borno, kaduna, Katsina, Kebbi and Sokoto States. Smut was prevalent in all the 6 states surveyed. Blast and red rot were recorded in Sokoto, Kaduna, Borno, Katsina, Sokoto and Adamawa, Kaduna, Kebbi and Sokoto states respectively.

Table 3. Incidence of sugarcane diseases in four states and F.C.T. 1988-90.

| State      | LGA     | SCLG | SS    | RR    | BS    | VIS  |
|------------|---------|------|-------|-------|-------|------|
| Niger      | 11(32)* | 7    | 37.17 | 13.75 | 16.88 | 0.00 |
| Kwara      | 13(20)  | 5    | 30.42 | 28.00 | 9.00  | 0.00 |
| Benue      | 19 (20) | 5    | 24.62 | 18.00 | 0.00  | 0.00 |
| Plateau    | 12 (20) | 5    | 30.70 | 16.00 | 0.00  | 6.00 |
| FCT        | 4(12)   | 3    | 27.39 | 20.00 | 13.33 | 0.00 |
| LSD (0.05) |         |      | 5.00  | 2.50  | 4.50  | NS   |
| CV (%)     |         |      | 18    | 25    | 20    | 30   |

Figures are means of four cane fields per local government + Niger, Kwara and Benue States as at 26th August 1991.

Kwara and benue States as at 26th August 1991.

LGA = Local Government Area

SCLGA= Local Government Areas growing sugarcane

SS = % Smutted stools

RR = Red rot infected stalks

BS = blast infected stools

VIS = % virus infected stools.

\* = Total number of fields visited in each state.

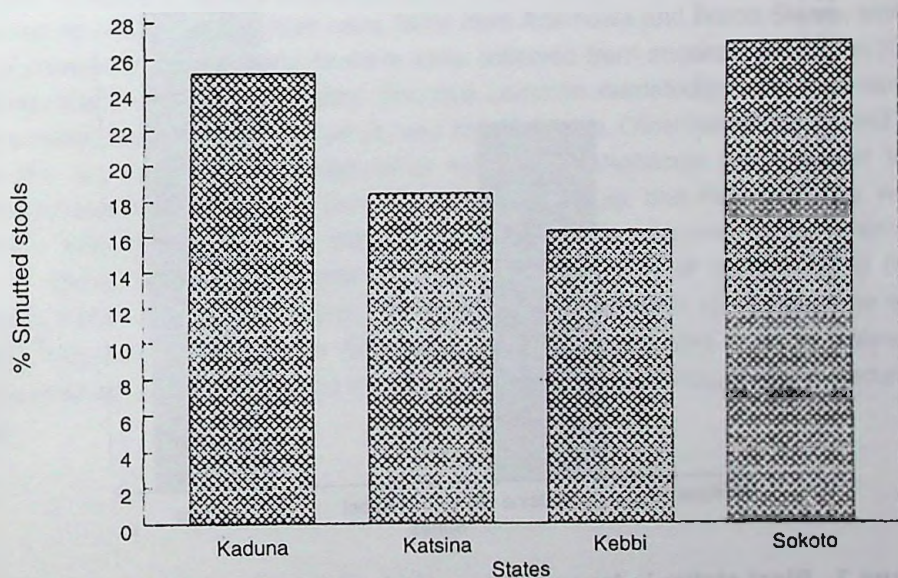


Figure 1. Smut status in four northern states of Nigeria, 1994.



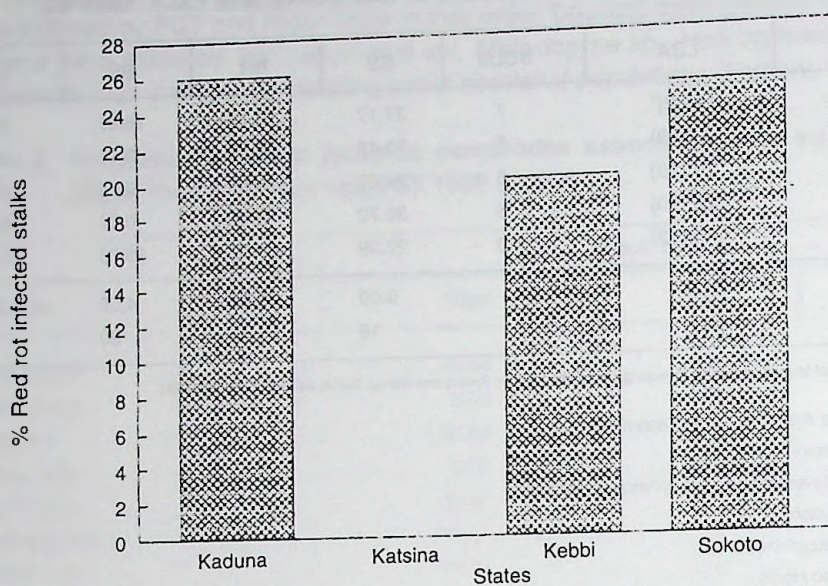


Figure 2. Red rot status in four northern states of Nigeria, 1994.

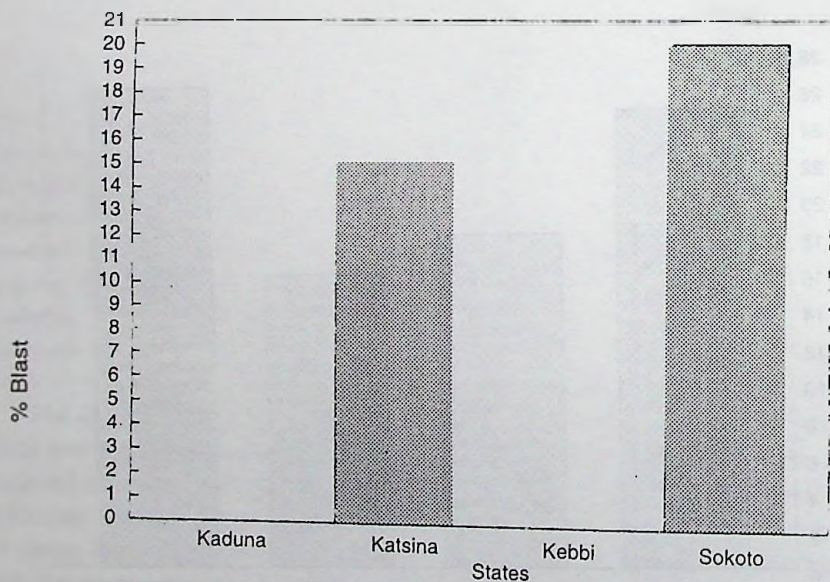


Figure 3. Blast status in four northern states of Nigeria, 1994.

Insect pests of sugarcane in these states were stemborers and termites (Table 4). Stemborers and termites caused damage to canes in the six states- ranging from 9.38 to 30%, Termite damage was slight compared to that caused by borers (Table 4). Damage to cane by rodents was not recorded in any of the six states visited.

**Table 4. Insect pest status of sugarcane in parts of Adamawa, Borno\*, Kaduna, Katsina, Kebbi and Sokoto states 1991 and 1994.**

| State   | Pest status |          |         |
|---------|-------------|----------|---------|
|         | Stem borers | Termites | Rodents |
| Adamawa | 27.50       | 15.00    | -       |
| Borno   | 30.00       | 10.00    | -       |
| Kaduna  | 10.00       | 0.00     | -       |
| Katsina | 0.00        | 0.00     | -       |
| Kebbi   | 9.38        | 15.63    | -       |
| Sokoto  | 25.00       | 9.35     | -       |

\*Survey carried out in 1991.

Plant parasitic nematodes associated with sugarcane in Adamawa, Borno, Kaduna, Katsina, Kebbi and Sokoto states are presented in Table 5. Two nematodes were very common on soils collected from cane fields from Adamawa and Borno States, while nine major nematode genera were found in soils collected from sugarcane fields in Kaduna, Katsina, Kebbi and Sokoto states. The two common nematodes from Adamawa and Borno states were *Helicotylenchus* sp. and *Xiphinema* sp. Other nematodes found in soils from the two states were *Pratylenchus* sp. and *Hoplolaimus* sp. However the two generally acclaimed sugarcane nematodes *Meloidogyne* sp. and *Heterodera* sp. were not found in soils from the states. *Helicotylenchus* had 100% frequency of occurrence in all the six states, while *Meloidogyne* sp. had 100% frequency of occurrence in Kaduna, Katsina, Kebbi and Sokoto States. *Trychodorus* sp. *Tylenchus* sp. *Xiphenema* sp., had 100% frequency occurrence in Adamawa, Borno, Kaduna and Katsina states. While *Longidorus* sp. and *Pratylenchus* sp. had 100% frequency of occurrence in Kaduna state only.



**Table 5. Frequency of Plant Parasitic nematodes associated with sugarcane in Adamawa and parts of Kaduna, Borno\* Katsina, Kebbi and Sokoto States 1991 and 1994.**

| Nematode               | Adamaws | Borno | Kaduna | Katsina | Kebbi | Sokoto |
|------------------------|---------|-------|--------|---------|-------|--------|
| <i>Criconeimoides</i>  | 0       | 0     | 0      | 0       | 50.0  | 0      |
| <i>Helicotylenchus</i> | 100     | 100   | 100    | 100     | 100   | 100    |
| <i>Hoplolaimus</i>     | 82.50   | 75.00 |        |         |       |        |
| <i>Longidorus</i>      | 0       | 0     | 100    | 50      | 0     | 25     |
| <i>Meloidogyne</i>     | 0       | 0     | 100    | 100     | 100   | 100    |
| <i>Paratylenchus</i>   | 0       | 0     | 100    | 50      | 0     | 75     |
| <i>Pratylenchus</i>    | 82.50   | 75    | 100    | 100     | 100   | 100    |
| <i>Trichodorus</i>     | 0       | 0     | 100    | 100     | 37.5  | 0      |
| <i>Tylenchus</i>       | 0       | 0     | 100    | 100     | 75.5  | 25.5   |
| <i>Xiphenema</i>       | 100     | 100   | 0      | 0       | 0     | 0      |

\* Survey carried out in 1991.

Sivanesan and Waller (1986) reported the occurrence of 19 diseases of sugarcane in Nigeria. Throughout these surveys, no more than 5 diseases were found occurring on sugarcane. This could be an indication of the disappearance of destructive disease like ratoon stunting disease (RSD), pineapple disease, pokkah boeng and leaf scald among others. The low status of blast and the absence of other diseases as recorded during these surveys does not suggest that they could not attain epiphytotic dimensions in conducive environments and with evolution of pathotypes in future. Effective disease management strategies and ensuring clean sanitary conditions of planting sugarcane fields will check their menace.

Principal insect pests earlier reported to be problems of sugarcane production in Nigeria (Jerth, 1968) were recorded attacking canes during these surveys pointing to the need for their effective management. These were species of *Eidana* and *Chilo* and termites *Microtermes* and *Amitermes*. Encountered sugarcane nematodes (*Heterodera* spp and *Meloidogyne* spp) have to be carefully managed by avoiding cropping sugarcane in sandy areas and on fields grown to vegetables like tomatoes and okra.

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