INCIDENCE OF PESTS AND DISEASES OF ACHA AT BADEGGI IN THE SOUTHERN GUINEA SAVANNA ZONE OF NIGERIA

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ABSTRACT

Studies were carried out on nine accessions of Acha (Digitaria exilis Stapf and Digitaria Iburua Stapf to evaluate them for their susceptibility to insect pests, fungi, weeds, birds and rodents. These accessions were Nibang, Tsala, Nkpos, Arrasbang, Nipiya I, Nipiya II, Ebut, Chenesera and Gongrradong. Stemborers were the main insect pest found associated with the crop. Four of the accessions were highly susceptible and had a significantly low yield. Other insects pests observed were the beetles and the leaf hoppers. Various species of fungi, weeds, birds, and rodents `were found associated with the crop. However, yield losses due to the pest were not quantifiable but could have the potentials of assuming the status of major pests.

Keywords: Incidence, Pests, Diseases and Acha,

INTRODUCTION

Acha (*Digitaria exilis* Stapf and *D. iburua*) is an annual cereal plant in the grass family poaceae (graminae) which is indigenous to West Africa and sahel parts of Africa (Dalziel, 1937 and Annegers,1973). Purseglove (1975) reported that the crop is widely grown from Senegal to Cameroun and majorly on the Fouta-Djallon, Guinea and Bauchi-Pleateau where it is a major staple crop. These two species are commonly known as Acha in Nigeria, fonio in Senegal,Togo,Burkina Faso and Ghana,Findo in Gambia and Guinea, Findi in Mali and Sudan and Pom or Pohim in Cote d' Ivoire or even hungry rice (Stapf 1915 and Rachie,1974). The crop is said to be the oldest indigenous West Africa cereal with cultivation dating back to 5000Bc (Purseglove 1975). Vietmeyer *et al* (1976) estimated that each year, West African farmers devote approximately 300,000 hectares to cultivate Acha and the crop supplies food to 3-4 million people.

In Nigeria, the crop is widely used and very popular in the central or middle belt zone where it is usually grown. It has been reported that Acha is grown where the soil is on the most part poor and sandy (Dalziel, 1937). Similarly, Purseglove (1975) reported that the crop can grow on poor shallow and rocky soils. He also added that nitrogen rich manure when applied excessively to the crop causes loading. Acha has been reported to be a most nutritious and tasty grain (Jideani, 1990 and Vietmeyer *et al*, 1976) the seed is rich in methionine and crystine amino acid that are vital in human nutrition and are usually lacking in major cereals such as rice, Wheat, Sorghum, Barely and Rye (Vietmeyer *et al.*, 1976).Other prospects of Acha include high crude lipid value, high digestible energy, high melting quality and enzymes production and longer shelf life. Despite the importance of this ancient crop of West Africa where most of the cultivation takes place, current knowledge on the origin, evolution, distribution, genetic diversity, pests and dieses complex in Nigeria remains inadequate. This study therefore was undertaken to generate information on pests and diseases of this important but neglected crop.

MATERIALS AND METHODS

Field trials were carried out at the experimental field of National Cereals Research Institutes, Badeggi in the Southern Guinea Savanna Zone of Nigeria. This was to evaluate nine accessions of Acha for their pests and disease status. The accessions were Nibang, Tsala, Nkpwos, Arrasbang, Nipiya II, Chenesara, Nipiya I, Ebut and Gongeradong. The land was cleared, ploughed and harrowed after which leveling was done. The experiment was laid out in a randomized complex block design with three replicates and nine treatments (I. e. the nine accessions). Plot size was 3m x4m. planting was done on the flat by broadcasting the seeds at 75kg/ha in june.2004 The gross area of the experimental plot measured 525m2 including the 1m alley way separating replications two and three.

Insects were sampled at sixty days after sowing early in the morning from each plot using sweep net after which they were brought to laboratory for Identification. This was done by visual comparison of the collected samples with the preserved samples in the laboratory. In the case of stem borers, scoring was done using a scale of 1-5 as follows based on the abundance of dead hearts Observed on each plot. Dead heart is recognized by gently pulling the growing point which removes easily with a pungent smell.

1. No damage (i. e. Dead hearts absent),
2. Negligible damage showing few dead hearts,
3. Dead hearts occurring in about half of the entire plants in a plot.
4. Slightly higher abundance of dead heart involving ¾ or above of the entire plants in a plot.
5. Total damage (i. e. dead hearts occurred in almost all the plants in the plot).

A few fungal disease, weeds birds, and rodents on the field were identified based on clear visual symptoms that are not ambiguous. Other data collected included straw weight in tones/ha and grain yield in kg/ha. All data were subjected to analysis of variance and means separated using LSD.

RESULTS AND DISCUSSION

A total of sixty- two insect species were identified on the nine accessions of acha. Out of these, fifty – four belong to the agriculturally important orders of Diptera, Lepidotera, Hemiptera, Orthopera, Coleoptera, hymenoptera and Isoptera with varying distributions in each of these orders (Table1). This represents about 87% of the total number of species collected. Within these orders, there there was a high preponderance of insect species in the hemipteran orders representing 41% of the total number of collections. This order contains most of the leafhoppers (Cicadellids) typically known for sap sucking and in some cases virus transmission (table 1). The extent of these activities due to the leafhoppers observed on the field was not quantifiable but viral symptoms were observed on the field and samples were taken for transmission studies at the International Institute for Tropical Agriculture (IITA), Ibadan, The serological tests using Enzyme linked immunosorbent Assay (ELISA) revealed that the transmission result was like that of something similar to organisms causing mild streaking in maize. It was concluded that it could be a mastrevirus (Alegbejo et al., 2002). The remaining insect species in the orders of Orthoptera, Coleoptera and Hymennoptera were observed as minor leaf feeders because their feeding was not seen to have any serious effect on defoliation and as the season progressed, some plants were able to recover from these minor feeding damages. Many other insect of non-agricultural importance were observed to be free living in nature. These were found in the orders of Odonata, Neuroptera etc.

A dipteran stem borer (Diopsis longicornis R) and lepidopteran stem borer (Sesamia species) were the most damaging of all the insects sampled to the susceptible accessions. The score for dead hearts indicated that Tsala, Chenesara, Gongeradong and Arrasbang were the most susceptible species (Table 2). Within the framework of these studies, it could be said that these two species of stem borer are major pests of Acha on the field.

Some few diseases were observed in this study indicating symptoms of damage to both grain and the foliage (Table 3). Though their pest status as at the time of conducting these studies was minor, they could have potential of attaining damage above economic threshold levels e.g smut. Among the prominent weeds observed was Striga hermonthica (Table 4) and because of its parasitic nature may be able to cause total yield loss as is the case with other cereals if it becomes endemic on Acha fields. The other weeds that were prominent are mostly ephemeral and complete their growth cycle within one year and therefore may not be considered as notorious weeds on Acha. It should be noted that that the accessions mostly effected by these pests and disease belong to the species of Digitaria exilis namely Tsala, Nkpwos, Chenesara, Gongeradong and Arrasbang. This could be due to their more succulent tissues compared to the rest of *D. iburua* species .The species of birds an rodents noticed during the season consume and damage maturing grains as well as stored grains (Table 5).

The straw weight in tones/ha and grain yield in kg/ha were highly significantly different. The lowest yields were recorded with the accessions Tsala, Nkpwos, Cheneasara and Gongeradong (Table 6). Incidentally these accessions were highly susceptible to stem borers. All the other accessions had reasonably appreciable yields. Though substantial numbers of pests and disease have been found to be associated with Acha, in this study, the only important pest at present is the stem borers. A possible control of these stem borers could be the use of an effective systemic insecticide since the larvae of the stem borer that is responsible for the damage bore into the stem of the susceptible plants. Alternatively, the use of resistant cultivars/accessions could also be way of avoiding these pests since some of the nine accessions were not affected by stem borers. This could mean that they possibly have resistant gene(s) in them, or some morphological barriers that make insect penetration difficult.

Table 1: List of insect pests found associated with Acha at Badeggi, Nigeria.

Scientific name	Order	Family	Damage Caused	Damage Caused
Diopsis longicornis	Diptera	Diopsidae	Causes deadheart	Major
Sesamia spp.	Lepidoptera	Noctuidae	"	Major
Kola spectra Dist	Hemiptera	Cicadellidae	Sap sucking	Minor
Nephotettix modulatus	"	"	"	"
Melidia	"	"	"	"
Tereigoniella spp.	"	"	"	"
Nephotettix afar Ghauri	"	"	"	"
Kermesia nerusta walk	"	"	"	"
Poeliloiscata mitrata Gerst	"	"	"	"
Zetcephalus trifasciatus Lind	"	"	"	"
Balclutha eramica Lind	"	"	"	"
Aonidiella spp	"	"	"	"
Empoassea spp	"	"	"	"
Tetrigella spp	"	"	"	"
Balclutha alata Lind	"	"	"	"
Cicadalla spp	"	"	"	"
Exitamus capicola Stal	"	"	"	"
Balclutha hertensis Lind	"	"	"	"
Acomura spp	"	"	"	"
Zygena spp	"	"	"	"
Agonoscellis spp	"	Pentatomidae	"	"
Poophilus costalis WIK	"	Cercopidae	Feeding on foliage	"
Leptocorisa sordida Spin	"	Corcidae	"	"
Antesia spp	Hemiptera	Pentatomid	"	"
Liptocorsia eleganus Blot	"	Coreidae	"	"
Aeliomorpha divisa WLK	"	pentatomidae	"	"
Panominus gracillis WLK	"	Lagacidae	"	"
Mirperus jaculus Thumb	"	Coreidae	"	"
Canthrades spp	"	Cydridae	"	"
Acrida species	Orthoptera	Acrinidae	Feeding on foliage	Minor
Dinotettiti africanus Bol.	"	Tetrigidae	"	"
Chrotogonus senegalensist	"	pyrogomophidae	"	"
Aiolopua slongcorns Sjost	"	Oedipodinae	"	"
Pygomorpha spp	"	pyrogomophidae	"	"
Trilophidia contrubata WLK	"	Oedipdinae	"	"
Epsitaurus hartenti Bio	"	Catontopidae	"	"
Thisoicetrus hertenti Bol	"	"	"	"
Morphacris saguinea	"	Oedipdinae	"	"
Trilophidia replete WLK	"	Oedipdinae	"	"
Orthichita pachycera Kany	"	Acridinae	"	"
Truxais spp	"	Truxalinae	"	"
Spathostornula pgnacum	"	Catantopina	"	"
Lucust migrattoria	"	Acrididae	"	"
Piezotrachelus funbris	Coleoptera	Galerucidae	"	"
Suponella africana jac	"	Meloidae	"	"
Epicaucta oculata F.	"	"	"	"
Epilachna spp	"	Coccinellidae	"	"
Monolepta spp	"	Galerucidae	"	"
Aulocophora africana Wse	"	Coccinellidae	"	"
Tanaemymex spp	"	Galerucidae	"	"
Cercevis spiuicaudata	Hymenoptera	Formicidae	"	"
Cerceris spp	"	Sogegudae	"	"
Rivelia humfreyi Frey	"	Vespidae	"	"
Ceriagrion glabrum Bum	Diptera	platystmatidae	Nil	"
Agricnemis abnesi	Idinata	Coenagridae	"	"
Nemeoleon spp.	Odomata	Coenagridae	"	"
Pseudagrion glabrum	Neunoptera	Myrmleotidae	Feeding on foliage	Minor
Acisoma panorphordes	Odomata	Coenagrdae	"	"
Crocothemis erythraca	"	Aeschnidae	"	"
Agriocnemis machlachlani Vet	"	Lebellicidae	"	"
Formicaleon nowa	"	Coenagridae	"	"
Odontotermes spp	Neuroptera	Coenagridae	"	"
Macrotermes belicoscis	Isoptera Termitidae	Myramleorcidae	"	"

Table 2: Effect of stem borer infestation on nine accessions of Acha at Badeggi, Nigeria.

Accessions (Treatment)	Dead hearts
Nibang	1.0
Tsala	4.2
Nkpwos	2.8
Arrasbang	1.6
Nipiya II	1.0
Chenesara	4.4
Nipiya I	1.0
Ebut	1.0
Gongeradong	4.8
LSD	0.86
CV(%)	25.6

Table 3: List of Disease found associated with Acha at Badeggi , Nigeria.

Scienctific name	Damage/Disease caused	Pest status
Aspergillus flavus	Seed mould	Minor
A. niger	Discoloured seed	"
A. funigatum	Seed rot	"
F. semitectum	Leaf/seed bleach	"
Alternaria alternate	Grain wilting	"
Ustilago spp	Smut	"

Table 4: Common weeds founds on Acha field

Scienctific name	Common name	Damage caused
Digitaria horizontalis	-	-
D. mula	-	-
Striga hermothica	Giant witch weed	Wilting/ stunting
Comenelina benghalensi	-	-
Panicum maximum	Guinea grass	-

Table 5: Species of birds and rodents found on Acha

Scienctific name	Common name	Damage caused
Birds		
Dstrila melpoda	Orange-checked waxbill	Consume and damage Maturing grain
E. trolodtes	Black-rumped waxhill	"
Lonchura cucullatus	Broze manikin	"
Lagonosticta senegala	Senegal fire finexh	"
Vidua macroura	Pin-tailed whydath	"
Rodent		
Rattus rattus	Black rat	Consume stored grain
Mus Species	House mouse	"
Mostyomys matalensis	Multimammate rat	"

Table 6: Performance of nine accessions of Acha at Badeggi, Nigeria

Accessions (Treatment)	Straw weight (t/ha)	Grain Yield kg/ha
Nibang	333.3	594.4
Tsala	0.458	34.6
Nkpwos	0.417	175.0
Arcadians	1333.7	300.0
Nappy II	1194.3	647.2
Chenesara	0.292	51.4
Nippier I	1639.0	868.1
Ebut	1138.7	465.3
Gongeradong	0.236	12.6
LSD	270.7	147.6
CV (%)	42.3	24.3

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