EFFECTS OF NPK AND UREA FERTILIZERS ON THE SEVERITY OF PANICLE INFECTION BY ANTHRACNOSE

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Abstract

A field trial was conducted with five sorghum landraccs at the Teaching and Research Farm of the University of Maiduguri during the 1996 and 1997 wet seasons. The treatments were laid out as a split-plot in which the sorghum landraces were tested in the plots and the fertilizers in the sub- plots in a randomized, complete block design with four replications. Five sorghum cultivars [Warwarabashi, Yar-Washa, Paul Biya, KSV4 and Ex-Mali] were used in which four were landraces and an improved variety. Data collected at 40, 50, 60 and 70 days after sowing were subjected to analysis of variance according to Gomez and Gomez {1984} before analysis of Duncan's Multiple Range Test {DMRT} was used for separation of means at 1% and 5% level of significance. Results showed that the severity of panicle infection by anthracnose was higher in Yar-Washa followed by Warwarabashi in both seasons- Similarly, in 1997 cropping season, NPK and Urea treatments induced higher severity of panicle infection. Moreover, interaction effects of varieties and fertilizers showed that Yar - washa also had higher severity in all the fertilizer treatments than other varieties.

Introduction

Sorghum *(Sorghum bicolor* (L) Moench) is very important in the economy and survival of the people of the semi - arid tropics. Dogget (1988) reported that sorghum is fifth in<-importance among the World's cereals. In West Africa, Sorghum is grown mainly in the northern parts of Ghana and Nigeria and in the forest - Savanna transition zones of these countries (Baffour, 1981). It is cultivated mainly as a subsistence rain fed crop in the Sahel, Sudan, Northern and Southern Guinea Savanna zones of Nigeria, covering an area of about 4.6 million hectares (9.7% of the World Sorghum area) between latitude 6°30' and 14° N (Doggett, 1988).

Diseases constitute an important production constraint under both traditional and improved farming systems. More than 20 fungal diseases of Sorghum have been reported from Nigeria (Tyagj, 1980). Their distribution and prevalence have been reported from farmer's fields of different Sorghum -growing regions of Nigeria (Pande *et* al., 1993). Sorghums are attacked by a wide range of stem, leaf and panicle diseases caused by bacteria, fungi, viruses and other micro - organisms.

In West Africa, Sorghum is attacked by several fungi, bacteria,-viruses and parasitic weed *Striga hermonthica* (ICRISAT, 1992). The situation with nematodes is not quite clear and there appears to be no report of nematode infection of Sorghum in West Africa (ICRISAT, 1992). However, *Meloidogyne incognita* (Kofoid and white) Chitwood suppressed dry weight accumulation of

Sorghum in greenhouse test by 15%, field test yields were suppressed by 33% (Orr, 1967). There is variation in incidence and severity of the diseases according to the ecological zones. Thus, the importance of any Sorghum disease in West Africa depends to a large extent on the zone where the crop is growing. Thomas (1992) reported that importance is also related to whether a disease occurs on landraces or on introduced genotypes. There appears to be "pockets" within West Africa for the occurrence of some diseases. For example, symptoms have been reported in some countries (Tyagi, 1980; Zummo, 1984) whereas in many countries these two categories of symptoms are absent or at least have not been reported. In general, the importance of disease is related to several other factors such as the progress of the disease during the different growth stages of host and the effect of the disease on grain yield. The economic impact of pathogens is a topic of constant debate. Yield losses attributed to a particular pathogen will usually vary with sorghum - growing region and with environment (Frederiksen, 1982). Fungal diseases of sorghum not only reduce yields but also reduce the quality of the crop by contaminating the grains, which will in turn reduce both size and flavour of crops and may also constitute health hazards if they are capable of producing mycotoxins. According to Selvaraj (1978), the loss in sorghum grain ranges between 10 and 20%.

Fertilizers are important agricultural input used for improving soil fertility. By their use, it is no longer necessary to engage in bush fallow or shifting cultivation. However, fertilizer trials are usually carried out by agronomists who are often interested in forage straw grain with little or no interest on the effects of chemical fertilizers on biotic stresses. Information on sorghum diseases in Nigeria is lacking. Most Nigerian peasant fanners grow sorghum landraces, which appear preferred in local dishes. Though poor harvest index (HI) of landraces has been recognized as important attribute requiring genetic improvement, their utilization for breeding top cross hybrids with higher harvest index and consequently higher grain yields has been demonstrated (Tyagi, 1980).

Methods

Field trials were located at Teaching and Research Farm of the University of Maiduguri (Latitude 11° 53°N and longitude 13° 13E), the trials were carried out in 1996 and 1997 wet seasons.

The land was harrowed at the establishment of the rain (July) and marked out. Planting was done in July in both years. Missing stands were supplied at 7 days after sowing. The seedlings were thinned to three plants/stand. Two hoe weedings were carried out at second and seventh weeks after sowing respectively.

The treatments were laid as a split - plot in which the sorghum landraces were tested in the main plots and the fertilizers in the sub — plots in a randomized complete block design with four replications (Figure 1). Five sorghum cultivars were used which included four landraces and an improved variety. These are

described in Table 1.

The seeds were treated with Apron plus at the rate of 30g/kg before planting. This was to control pre- and post - emergence damping - off of seedlings.

The treatments were as follows: -FO = Control (No Fertilizer applied in plots). Fl = Basal dose of NPK (15:15:15) (259kg/ha broadcast). F2 = Urea only (lOOkg/ha broadcast).
F3 = Basal NPK + Top dressing with Urea (recommended as above and urea placed at the base of individual stand).

Before planting soil analysis was carried out to know the physio -chemical properties of the trial site.

Data were collected on the seventy of panicle infection as follows:

$$\text{Severity} = \frac{\text{I"'}}{\text{Nx4}} \times 100 \text{ (Gomez and Gomez, 1984).}$$

Where:

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n = Individual assessment. -N = The number of assessment. 4 = Highest score on the scale.

The data were collected at 40, 50, 60 and 70 days after sowing on the seventy of panicle infection.

Data collected were subjected to analysis of variance according to Gomez and Gomez (1984) before analysis of Duncan's Multiple Range Test (DMRT) was used for separation of mass at 1% and 5% level of significance.

Results

Results showed that Yar - washa had a significantly (P = 0.01) higher severity of panicle infection than other varieties in 1996 and 1997 (Table 2). Typical infection by anthracnose is presented in plate. Paul Biya, KSV_4 and EX - Mali had lower severity of panicle infection and were not significant (P=0.01) differences. Various fertilizer treatments showed no significant difference in 1996. However, NPK treatment shows significantly (P=0.01) higher in Yar - washa in all the treatments and Warwara bashi in Urea treated plots in 1997 (Table 3).

Discussion

On severity of panicle infection by anthracnose, results showed that Yar - washa has higher severity of the disease followed by Warwarasbashi in both seasons. This probably resulted in lower grain yield in these varieties in 1996. In a similar study, this was attributed to incomplete grain filling (Powell *et a/,*.1977). In 1997 cropping season, NPK and Urea treatments induced higher severity of panicle infection.

This result probably implied that improved soil fertility increased the severity of panicle infection by anthracnose. But this conclusion has contrasted 'Horst's (1990) report, which showed that improved soil fertility reduced crop damage by anthracnose. Interaction effects of varieties and fertilizers on the severity of panicle infection showed that Yar - washa also had higher severity in all the fertilizer treatments than other varieties. This has stressed the susceptibility of local cultivars to panicle infection by anthracnose. This refutes a report by Zummo (1984) that most local sorghum varieties in normal years develop grains virtually free from panicle infection. Field tolerance to grain deterioration has however been achieved in commercial brown grained sorghum cultivars (Casela *et ai,* 1992). This characteristic is determined by the presence of a testa and by high tannin content (Waniska *et ai,* 1992). They further stated that in areas where environment has not favoured panicle fungal colonization, sorghum hybrids having low tannin content normally produce high yields and find good acceptance by consumers. Yar - washa used in this research work was white grained and might have low tannin and hence responded more to panicle infection by anthracnose.

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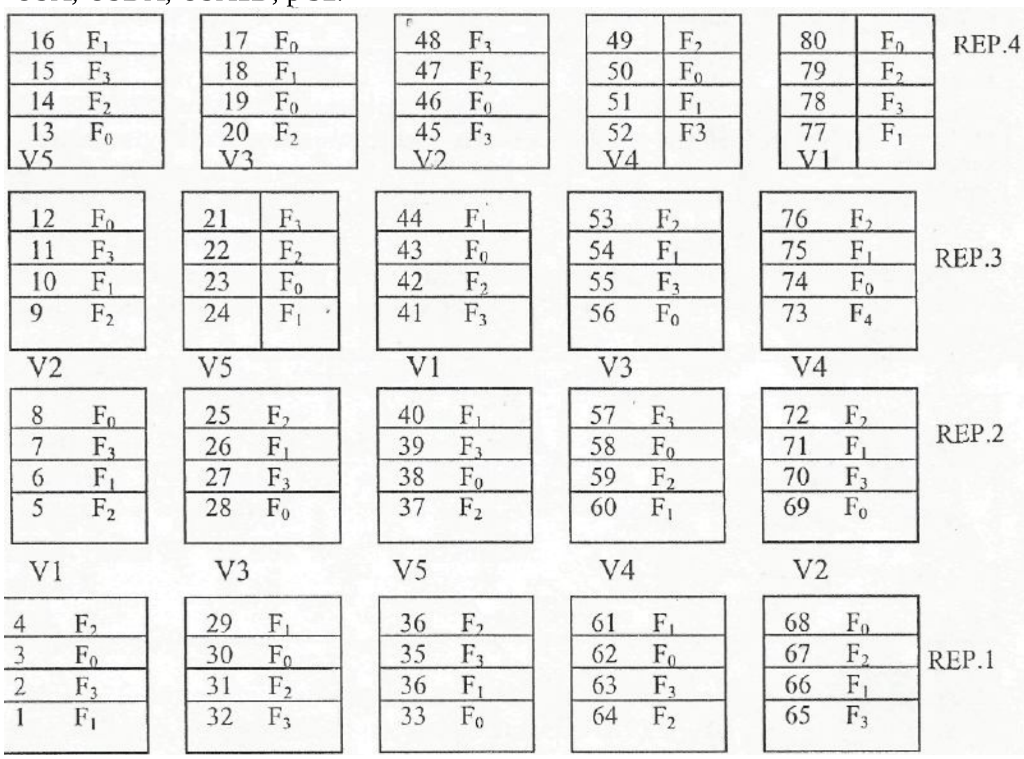

REP.l

V3 VI V5 V2 V4

Figure 1. Experimental Layout (Split Plot)

Treatments

FO - Control
FI = Basal Dose of NPK (Recommended Dose) F2 = Urea Only (Recommended Dose/Ha) F3 = Basal NPK + Top Dressing With Urea

Sorghum Varieties
V1 = Warwarabashi V4 - KSV4
V2 = Yar - Washa V5 = Ex -Mali
V3 = Paul Biya

Table 1: Information on the Five Sorghum Cultivars Tested in Field Trials

	Plant height	Leaf colour	Panicle Position, Density Shape	Grain colour	Days to 50% heading 1996 1997
Warwarabashi	2.3m	Green	Erect Loose Cylindrical	Reddish brown	72 days 64 days

Yar-Washa	2m	Light -green	Erect Loose Cylindrical	White	54 days 54 days
Paul Biya	2m	Light-green	Erect loose cylindrical Mediate	White	66 days 66 days
Ex-Mali	2m	Light-green	Goose - Compact Ovoid necked	Cream	89 days 90 days
ksv4 (improved check	1.8M	Green	Erred Compact Cylindrical	Cream	67 days 75 days

Table 2: Effect of NPK and Urea Fertilizers on the Seventy of Panicle Infection by Anthracnose in 1996 and 1997

	Severity of Panicle Anthracnose (%)	
Treatment	1996	1997
Variety (V)		
Warwarabashi	52. 7b	56.4b
Yar-Warsha	68.2a	65. 9a
Paul Biya	25 *Ac*	25.4c
KSV_4	25.4c	25.4c
Ex-Mali	25.4c	25.4c
SE-+	1.41	1.32
	* *	* *
Fertilizer (F)		
NPK	38.9a	40.4a
Urea	39.9a	39.2ab
NPK-Urea	39. 2a	38.4b
Check	37.7a	38.5b
SE+-	0.91	0.70
	NS	NS
Interaction		
VXF	NS	*

Means followed by the same letter within the same column and treatment are not signficantly different according to Duncan's Multiple Range Test (DMRT).
**= significant at 1% probability
* - Significant at 5% probability
NS=Not significant

Table3: Interaction effect of fertilizers and sorghum landraces on the severity of panicle infection by anthracnose in 1997.

Severvily of Panicle Infection by Anthracnose (%}					
Fertilizer	Warwarabashi	Yar-washa	Paul Biya	KSV_4	Ex-Mali
NPK Urea	58.1b	70.0a	25. 4c	25. 4a	25 *Ac*
NPK+Urea	61.5a	61.5a	25.4c	25. 4c	25.4c
Check	53.86	25.4c	25.4c	25.4c	25.4c
S.E±	52.1b	67.2a 2.99	25.4c	25.4c	25.4c

Means followed by the same letters are not significantly (P=0.01) different according to Duncan's Multiple Range Test (DMRT).

Plate 7. Head of Warwanabashi showing panicle infection of sorghum anthracnos

Plate 2. Head of Warwarabashi showing panicle infection of sorghum anthracnose

Plate 7 Head of Warwarabashi showing panicle infection of sorghum anthracnose