PERFORMANCE OF GRAIN SORGHUM HYBRIDS AT BUBIA

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ABSTRACT.

Three hybrid sorghums from Queensland, of open head type, Texas 608, *Texas* 626, *Pioneer* 846 *and the segregating seed of Texas* 610, *were grown in a trial near Bubia. All hybrids yielded more than twice the yield of the segregating variety in the plant crop. The best varieties, Texas* 608 *and Texas* 626, *yielded more than a ton of grain to the acre.*

The plants were allowed to ratoon, and plots were split for nitrogen fertilizer application, 100 *lb. of nitrogen as sulphate of ammonia being applied. Highly significant responses to the fertilizer were obtained, but these were not expressed in grain yield because of the attack of sorghum midge* (Contarina sorghicola) *and sorghum rust* (Puccinia purpurea). *It is suggested that, because of the build-up of plant pathogens and insect pests in the ratoon crop and volunteer plants, a ratoon crop should not be taken and that all crop residues should be destroyed by burning.*

INTRODUCTION.

For some years, farmers have been growing grain sorghum in the Markham Valley for sale as stock feed. Yields have been quite low. One farmer reported an average yield of ten cwt. of grain per acre even when the hybrid Texas 610 was planted. In another case a farmer was replanting second generation hybrid seed.

A trial was laid down at Bubia—

1. to assess production from new open headed hybrids introduced from Queensland ; and
2. to demonstrate the futility of replanting segregated hybrid seed.

MATERIALS AND METHODS.

The trial was planted at Bubia on a light clay loam on the 14th and 15th May, 1968. A randomized block design with four replicates was used.

The varieties planted were Texas 608 (T608), Texas 626 (T626), Pioneer 846 (P846) obtained from Queensland (all described as having open or semi-open heads), and segregating seed of Texas 610 (local).

Each plot consisted of six rows, 2 ft. apart, and seed was planted at 7 lb. per acre.

Plot size was 55 ft. by 12 ft. and the total trial occupied an area of 120 ft. x 118 ft.

The plant crop was harvested on 28th August, 1968. At harvest, the outside rows and 2 ft. 6 ins. of each end of each plot were discarded, giving a harvested area of 8 ft. by 50 ft. The heads were cut off close under the panicle and were dried on trays in a forced-draught oven at 50 degrees C. for three days to facilitate threshing. Following drying, heads were threshed to give a yield of dry grain. After the harvest of the plant crop, plots were divided into four sub-plots and cut back. Nitrogen fertilizer, at the rate of 100 lb. of nitrogen per acre as sulphate of ammonia was applied to two sub-plots in each plot, the treatments being allocated at random.

The ratoon crop was harvested on 15th November, 1968. The harvested sub-plot area was 12 ft. by 8 ft. Other procedures after harvest were as for the plant crop.

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RESULTS AND DISCUSSION.

Diseases and Pests.

The plant crop was generally healthy but there was some damage caused by aphids, (*Aphis* sp.) which were controlled by Thiodan insecticide at recommended rates. In addition, *Heliothis* sp. attacked unripe grain in heads, and were controlled by D.D.T.

In the ratoon crop, the plants were attacked by sorghum midge (*Contarina sorghicola*). This insect is difficult to control and its presence was not realized until flowering was well advanced. Its attack led to considerable reduction of yield which is discussed more fully below.

In the plant crop, there was some attack by plant pathogens, in particular sorghum rust (*Puccinia purpurea*) and leaf spot (*Cercospora sorghi*). These did not appear to affect yields unduly. However, in the ratoon crop, because of carry-over of the pathogens on volunteer plants, rust infection was almost universal and of very severe incidence. It was particularly bad on nitrogen-fertilized plants.

YIELDS.

Plant Crop.

The actual yield of the plant crop in lb. per acre is shown in *Table* 1.

Table 1.—Yield of Grain Plant Crop.

Variety.	Mean Yield. lb./acre.	Significance. 5 per cent. level.
Texas 608	2546 ┐	Any two means *not* enclosed in the same bracket are different at the 5 per cent. level.
Texas 626	2396 ┘	
Pioneer 846	1919	
Local	844	

The analysis of varience for the plant crop is shown in *Table* 2.

Table 2.—Analysis of Variance—Plant Crop—Heads.

Source.	d.f.	S.S.	M.S.	F.	Significance.
Varieties	3	1,497	499.00	30.13	***
Blocks	3	17	5.67	0.34	N.S.
Error	9	149	16.56		
Total	15	1,663			

The threshing percentages for the first crop were :—

Local 44.28 per cent. ; T608 55.65 per cent. ; T626 55.0 per cent. ; and P846 49.65 per cent.

Ratoon Crop.

Visual responses to applied nitrogen were very marked ; fertilized sub-plots were greener and plants considerably larger. Fertilized sub-plots also came to head more rapidly than unfertilized sub-plots.

Yield responses to applied nitrogen were very highly significant ($P<0.001$).

Analysis of variance for the ratoon crop is shown in *Table* 3.

Unfortunately, these responses were not expressed in increased grain yield. The mean yields of grain from unfertilized and fertilized treatments are shown in *Table* 4.

It is interesting to make an assessment of the yields that would have been obtained had the midge and rust not attacked the crop. This can be done using threshing percentages from the plant crop. If this is done the estimated yields would be as shown in *Table* 5.

The most important point that emerges from this is the economic loss sustained by the farmer because of the presence of the midge and the rust. If a value of grain sorghum of $52 per ton at the farm gate is assumed, the loss per acre to the farmer in money terms is as shown in *Table* 6. This does not include the cost of added fertilizer.

CONCLUSION.

Yields from the hybrids were quite good, the two best varieties in the plant crop yielding more than a ton to the acre on unfertilized land.

Responses to fertilizer nitrogen were very highly significant. However, because of the presence of the sorghum midge and rust, these were not expressed in the form of increased grain yields. At the level of fertilizer applied, increased yields were probably not economic. However, lower levels of fertilizer would still give increased yields and a trial is now in progress in the Markham Valley to assess more closely fertilizer requirements for grain sorghum.

Table 3.—Analysis of Variance—Ratoon Crop—Heads.

Source.	d. of f.	S.S.	M.S.	F.	Significance.
Blocks	3	1.360770	.453590	....	....
Varieties	3	9.549105	3.183035	8.88	**
Error	9	3.224930	.358326	....	....
Main plots	15	14.134805	13.038171	....	....
Fertilizer	1	13.038171	13.038171	81.27	***
Var. x Fert.	3	3.431896	1.1439653	7.13	**
Error	12	1.925277	.1604398	....	....
Total	31	32.530149	....	....	....

Table 4.—Mean Yield Grain Lb./Acre Ratoon Crop.

Variety.	Fertilizer Treatment.	
	N 0.	N 100.
Local	576	599
P846	393	421
T608	668	590
T626	536	1,040

Table 5.—Mean Yield of Grain Lb./Acre Ratoon Crop, Assuming Threshing Percentage of Plant Crop.

Variety.	Fertilizer Treatment.	
	N 0.	N 100.
Local	782	1,137
P846	1,022	1,616
T608	1,344	1,824
T626	1,588	2,408

Table 6.—Estimated Loss as Result of Midge and Rust Attack.

Variety.	Fertilizer Treatment.	
	N 0.	N 100.
	$	$
Local	4.78	12.49
P846	14.60	27.74
T608	15.69	28.65
T626	24.42	31.76

Although there is little doubt that a ratoon crop can be taken from sorghum in an environment with adequate rainfall, such as Bubia, this should not be done because of the build-up of plant pathogens and insect pests. Both these would probably be reduced by good crop hygiene and complete destruction of all crop residues by burning after harvest.

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