

BREEDING FOR DROUGHT RESISTANCE IN SORGHUM IN SAMARU NIGERIA

BY

D.A. ABA

PLANT SCIENCE DEPARTMENT
I. A. R. / ABU, ZARIA - NIGERIA

Objectives:

To screen segregating mutant lines of sorghum for drought (mid-season and terminal) resistance.

Justification:

Sorghum (*Sorghum bicolor* (L) Moench) is the most important cereal crop in Nigeria. It is grown in the North west, north east, the central zone and also in the derived Savanna in the south west and to a limited extent in the south east zones of Nigeria (Aba, 1996). Presently it is grown in an estimated area of about 45% of the total land area devoted to cereal production, with an estimated production of about 8 million metric tonnes (NAERLS 1996, NAERLS/APMEU 1997). Most of the sorghum is grown in the northern part of the country which lies between latitude 7.5° and 13°N of the Equator. This is where the sudan sahel ecology is found which is prone to frequent drought. The sudan and sahel ecology of Northern Nigeria has been pruned to mid-season drought and terminal droughts, with the later being more frequent and work devastating than the former.

Mid-season drought usually occurs between 3-6 wks after planting. Fortunately the first dose of fertilizer apply to the sorghum crop is usually at 3 wks after planting at the time this type off drought is being experienced the crop has taken up some fertilizers which increase its vigor. This enables the the seedlings to withstand this water stress situation for the period of 1-2 weeks, and in some cases 3f weeks of water stress. In cases where the fertilizer has just been applied, this may be more devastating causing more damage than being helpful. In most cases the seedlings survive or recover after the rains have come back.

Terminal drought is the most serious, which requires more researching into, because of its complex nature. As the name implies there is water stress at the end of the crop maturity especially during grain filling. This is the type of drought we are more concern with.

A nearly intermediate inheritance was found in wheat by Stetanovskij and

Vecestova (1939) but that it should be assumed that the situation is more complicated. In extensive experiments it could be demonstrated that it is possible to unite tolerance to drought with other useful characters such as a good growth ability (vigor) earliness and good properties in yield, not only with regard to quantity but also to quality. The genetic relations are not yet completely clarified. (Stetanovskij and Vecestova, 1939).

Methodology:

Three early maturing varieties already released and being used by farmers in the sudan/sahel ecology - SAMSORG 3 (KSV 4), NR 71176 and NR 71168 were irradiated using 250Gy of Cobalt 60^{oo} source in vienna Austria in 1995. Each population has been advanced each year with selection being carried out using similar characteristics which include plant height (short-medium) large panicles, good grain quality, cream to white seed colour, disease free plants and stay green character. The plant architecture is also being selected for, such as thinned leaves (reduced surface area of transpiration). The three populations have been advanced to M₄ and tested in micro plots in M₄ and M₅. Eleven (11) lines from NR71176, nine (9) lines from NR 71168 and fourteen (14) lines from SAMSORG 3 (KSV4) have been selected from the micro plot tests. These lines will be tested in macroplots/multilocational trials in Minjibir in Kano State and Landanawa in Katsina State as M₆. We intend to use three planting dates, starting with the recommended planting date, followed by two other planting dates of two weeks interval. This will create an artificial drought situation in the two extra planting dates. Selection will be made on the following characters - Earliness, vigor large grain size, and thinned leaves (small leaf area). The trials will be carried out for at least two years in the two locations.

Some yellow mutants have also been identified with low chlorophyl development , still yielding like any other normal plant. We shall exploit these trait to see how the water stress situation will affect it's yielding potential. This will form an entry in the trial to be conducted. The parent materials will ser as checks for each of the trial.

Breeding Scheme (On Transpaency)

Results:

Output Achieved

- For the population derived from NR 71176, 11 lines have been selected.
- For the population derived from NR71168 9 lines have been selected.
- For the population derived from SAMSORG 3 (KSV 4) 14 lines have selected.

CONSTRAINTS

- Funding is very inadequate
- Facilities required not available, i.e. pressure bomb
- Problems of Transportation to experimntatl site

REFERENCES

Aba, D.A. (1996). Sorghum - subsectorial goals, performance and medium - term Research plans. *Proceeding s of NARP Workshop Abuja, Nov., 25-29.* Monograph No. 7. pp. 79-90.

NAERLS (1996). Prospects and Problems of the 1996 cropping season. Sept. 20th - 4th October. pp. 62.

NAERLS/APMU (1997) Prospects and problems of the 1997 cropping season. Federal Department of Agriculture, Kaduna. pp. 10.

Stentanorskjii, L.A.; Veceslova, E.M. (1939).Prospects of breeding spring wheat in the arid region of southeast, *Selekcija semenor.* 5, pp. 10-12 in manual on mutation breeding. Second Edition No. 119. 1995, pp. 179.

Future Plan

- The lines selected from the three populations will be tested in drought prone areas at Mijinbir in Kano state and Landanawa in Katsina State.
- Three planting dates would be used
 - i. The recommended date of planting at the various locations
 - ii. 2 weeks after planting of the first planting
 - iii. 4 weeks after the first planting
- Selection will be based on the same characters
 - Stay green plants
 - Vigourous growing plants
 - Large good seeds
 - Plants with thinned leaves (with reduced surface area)
 - Medium tall plants (2- 3 meter tall)

Equipment:

- **Pressure bomb (Scholander et al. 1965) - Used to measure plant water-stress**
- **Thermocouple psychrometers.**
- **Molded silicone stopper is used to minimized sorghum leaf tear and crushing during measurement of water stress.**
- **Micro-computer (PC - Desk Top)**

BUDGET

GOVERNMENT OF NIGERIA

Salaries for 2 scientist	- N1,296,000.00
Salary for 1 Technician	- N 300,000.00
Serviceable Station Wagon	- N 300,000.00
Balances	- N 4,000.00
Electric Typewriter	- N 40,000.00

Total	N1,948,000.00 \$19,480

IAEA BUDGET

Inputs - fertilizer	- N30,000.00
Research Materials	- N30,000.00
Labour	- N60,000.00
Per diem for 2 Scientists @ N7,000 per day for 7 days	- N98,000.00
Per diem for one Technician@ N2500 per day for 7 days	- N17,500.00
Transportation/Vehicle maintenance	- N60,000.00
Report writing/Secretarial service	- N30,000.00
Misscellaneous	- N10,000.00

Total	N337,500.00 \$3375
