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Creation Of High Yielding Recombinant Inbred LinesOf Sorghum Bicolor (L.) Moench from a yield component

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ABSTRACT
The objective of this work is to determine the extent to which the evaluation of the yield component "weights thousand grains" allows the creation of recombinant inbred lines of sorghum to increase production.The plant material used is a population of 14 recombinant inbred lines of a F7 filial generation and controls CE 151262 and F2-20.The experimental setup under natural conditions uses randomized blocks with 2 repetitions. The statistical analysis was done by the Student Newmann Keuls test.The results obtained show that the "thousand-grain weight" of the recombinant inbred of 7 populations is greater than that of the controls used. These recombinant inbred, particularly L 49, can be tested for increased sorghum grain production.
Keywords: Sorghum, recombinant inbred, production, yield.

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I. INTRODUCTION

Sorghum (*Sorghum bicolor* (L.) Moench), a diploid species (2n = 20) belonging to the family of poaceae and to the tribe of Andropogoneae , tropical origin adapted to subtropical and temperate regions, could become the world's fifth cereal [1] .The stem and leaves are used as feed, the grains for food [2,3] Near half of the surfaces cultivated in sorghum are in Africa [4]Sorghum is the most widespread cereal and food crop, the largest of the savannah areas in West Africa [5]. In Senegal, its culture is essentially rainfed in the Groundnut Basin, eastern Senegal and low and medium Casamance, or in the valley of the Senegal River where it is traditionally grown on land after the flood was removed from October to November [6].

However, its culture meets difficulties linked to various constraints: soil poverty, erratic rainfall, poor cultivation practices, diseases, insect pests, etc., which negatively influence production [7]. Much researches had been done to limit damage [8]. This study is a contribution to increasing the yield of sorghum by the production and evaluation of recombinant inbredlines. To what extent does the yield component "thousand-grain weight" allow the creation of recombinant inbred lines for the increase of production?

II. MATERIALS AND METHODS

II-1 Experimental conditions

The trial is conducted at the CNRA of Bambey (14 ° 42'N, 16 ° 28'W) in the department of Bambey, in the region of Diourbel (Senegal).The ground preparation, picketing operations are carried out on the ground to delimit the blocks. After sowing and emergence, a spacing of 3 plants per poquet followed by sarclo-harrowings in the request was done.Two inputs of 150 kg / ha of NPK fertilizer before planting and two of 50 kg / ha of urea at the start and at the bolting were carried out. NPK fertilizer was applied prior to sowing while urea inputs were made respectively. To prevent cross-fertilization and promote inbreeding, the panicles were embedded before the start of flowering.

II-2 Experimental set-up

The device used is in completely randomized blocks or Fisher block with two repetitions. The total agricultural area of the plot (SAT) is 2141.85 m2 and includes a useful agricultural area (SAU) of 1360 m² (the 20 blocks in total) with aisles of 1.5 m and borders of 2m. The surface area of a block or elementary plot is 68 m2 with sowing spacing of 0.4m on the line and 0.8m between the lines. Each block contains the 14 recombinant inbred and the two controls randomly assigned (Figure 1).

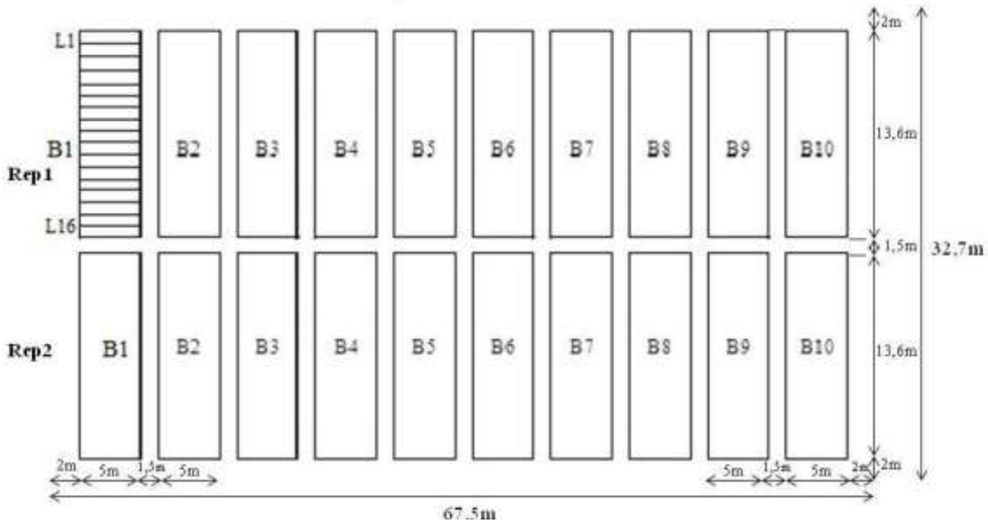


Figure 1: Experimental design. B = Block; Rep = Repetitions; Spacing = 0.40 x 0.80 m.

II-3 Plant material

The plant material used consisted of a population of 14 recombinant inbred of sorghum from a F7 filial generation and 2 controls recombinant inbred: CE151-262 used as a parent at first crosses with an "average weight thousand grains" equal to 27.5g; and F2-20 with an "average weight thousand grains" equal to 25g.The generation of recombinant inbred was obtained by successive including selfing from an F1 generation resulting from the cross between a pure white breed variety, the CE151-262 of the Senegalese Institute of Agronomic Research [9] with average productivity and a variety of red seed purebred, the 90EON343 of Texas (America) introduced for its high yield potential. Recombinant inbred of filial generation F8 (crossing F7xF7) are obtained.

II-4 Parameter measured.

A destructive sampling of panicles was carried out at maturity. On each line, five (5) panicles are harvested at random. For each panicle, the weight "thousand (1000) grains per panicle" (PMP), which is a good indicator of yield, is estimated by weighing.

II-5 Statistical analysis and treatment.

The comparison of the observed variables is carried out using the analysis of the variance and the test of separation of the means of Student Newman Keuls (SNK) by the software SAS 9.1. The data are transformed to eliminate the hetero-elasticity of the variance (stabilize the variance distribution) [10] .TD = log10 (D + 1). TD = transformed data, D = values of the raw data, log10 the natural logarithm based on 10.

III. RESULTS AND DISCUSSION

96 recombinant inbred harvested from the F8 generation have a "thousand-grain weight" of between 19.9 and 27 g.The "thousand-grain weight" of 17 recombinant inbred is significantly higher than that of controls recombinant CE151-262 and F2-20. The L49 line has the best yield. For the 79 other recombinant inbred, no significant difference was observed compared to controls EC 151-262 and F2-20 (Table 1).

Table 1. "Average weights 1000 grains" of different recombinant inbred in relation to the 2 controls. Means followed by the same letters are not significantly different at a probability level α = 5%.

Recombinant inbred lines	"Weight 1000 grains (g)"	Test SNK
L49	27±0	a
L106	26.5±0.5	abc
L64	26±0	abc
L108	25.5±0.5	abcd
L46	25.5±0	abcd
L 7	25±1	abcde
L 150	24.5±1.5	abcdef
L 122	24.5±0.5	abcdef
L149	24.5±3.5	abcdef
L 50	24±0	abcdefg

L 44	24±0	abcdefg
L40	24±0	abcdefg
L 54	24±0	abcdefg
L 53	24±1	abcdefg
L 66	24±0	abcdefg
L 30	24±1	abcdefg
L CE 151-262 Control	22.93±0.44	abcdefgh
L F2-20 Control	19.9±0.44	abcdefgh

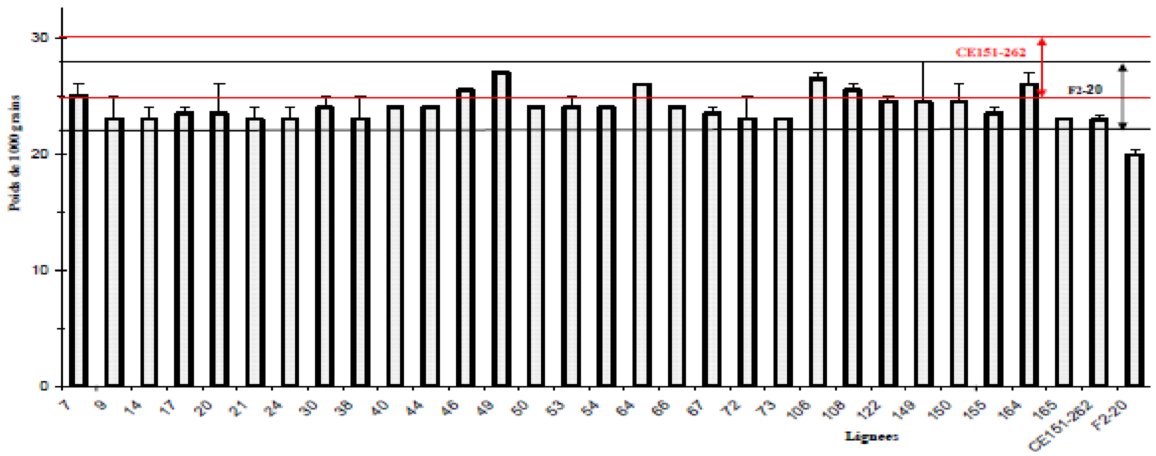
The official catalog of species and varieties grown in Senegal [9] indicates that the mean values of the "thousand-grained weights" are between 25-30 g and 22-28 g respectively for EC 151-262 and F2-20. Their "thousand-grain weight" productions do not reach the potentials defined by the catalog. He showed that moisture is a limiting factor[11]. He found that the grains harvested during the rainy season have reduced weights contrary to the grains obtained in the off-season.

The evolution of the "thousand-grain weight as a function of a few recombinant inbred lines and controls is shown in fig. 2. Fifty three (53) recombinant inbred have an average weight of 1000 grains included in the potential zone of the F2-20 control. Except the 17 recombinant inbred whose “weights One thousand grains” are superior to control EC 151-262, the other 36 lines show no significant differences between them (Table 2).

Table 2: "Average weight 1000 grains (g)" of the recombinant inbred lines included in the F2-20 control potential. The averages are not significantly different at a probability level α = 5%.

Recombinant inbred lines	« Weight 1000 grains (g)"	Test SNK
L155/L20/L67/L17/	23.5±0.5/±2.5/±0.5/±0.5	ns
L21/L14/L73/L24/L65/L72/L38/L9	23±1/±1/±0/±1/±0/±2/±2/±2	ns
L171/L56/L29/L58/L113/L109/L75/L84/L34	22.5±1.5/0.5/±1.5/±1.5/±2.5/±0.5/±0.5/±1.5/±0.5	ns
L45/L3/L16/L101/L83/L22/L147/L174/L91/L159/L27/L163/L116/L52/L146	22±0/±0/±2/±3/±3/±1/±1/±0/±1 22/±1/±0/±0/±0/±1/±1	ns

Seven (7) recombinant inbred have an average "weight thousand grains" between 25g and 27.5g especially the recombinant inbred L 49 which has the best performance. Their "one thousand grains" are significantly higher than the most productive control. This includes them in the area of potential "thousand-grain weight" of control CE 151-262. They could be a promising way for the creation of recombinant inbred lines for the increase in sorghum grain production. This good level of the "thousand-grain weight" of these recombinant obtained would be genetically explained by the successive transfer of genes responsible for the increase of the yield coming from the parent 90EON343 of Texas. These recombinant inbred lines could be subjected to further tests to reinforce their phenotypic homogeneity and even reach a maximum potential "weight thousand grains" of 30 to 35 g [11]. So low yields in West Africa [12] could be corrected.



CE151-262 Poids mille grains : 25-30g ; F2-20 : Poids mille grains : 22-28g (COEVS)

Figure 2. Evolution of the "thousand-grain weight" as a function of some recombinant inbred lines and controls.

IV. CONCLUSION

Performance evaluation was evaluated using the parameter "thousand-grain weight". The objective of this study is to produce and evaluate recombinant inbred lines with the highest yield. The test was conducted under experimental conditions in situ using a Fischer block device. The genealogical selection made it possible to identify 7 recombinant lines, particulary the recombinant inbred L 49, of the filial generation F8 with a yield "weight 1000 grains" greater than that of the controls.

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