Full Length Research Paper

Study on agronomic performances of ecotypes sesame (*Sesamum indicum* L.) under the Sudano-Sahelian climatic conditions of Mali

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Sesame is a traditional crop relegated to poor soils with low yields. In recent years, interest for the production of sesame is increasing in Mali. The food of the rural Malian populations is cruelly lacking lysine and is very low in protein (8 to 10%), lipids (6 to 8%) and minerals. In order to diversify the source of protein, and to contribute to food security in the country side of Mali, twenty ecotypes sesame collected from different locations across Mali (the 2nd, 3rd, 4th and 5th Region of Mali) and some introductions were assessed for agronomic performances in the Sudano-Sahelian area of Mali. The tests were conducted following a device in randomized complete block with four replications. Quantitative data analyses were performed using the software STATITCF. The treatment comparison was performed using the multiple comparison tests of Newman and Keuls a probability of 5%. For plant height, the ecotype Banamba1 showed the highest with an average of 153 cm against 95 cm for Poroupri which was the shortest. Regarding the number of branches per plant, ecotype VS IPR had 15 branches, while ecotypes Enoupenou and Poroupri had only two branches. Regarding the number of capsules per plant, ecotype Bènèblen1 showed an average of 327 capsules per plant, while the ecotype Enoupenou had only 60 capsules per plant. The number of seeds per capsule ranged from 73 for ecotype ECS-37 to 34 for Namsubani. For the 50% flowering period Banamba1 and ECS-37 have the flowering period with the earlier 44 days while the latest has Sikasso2 with 67 days. Compared to the weight of thousand grains, Bougouni3 and ECS-37 gave a thousand-seed weight equivalent to 3.5 g while Sikasso2 and VS IPR gave the lowest 1000-grains weight with 2.0 g each. For yield performance, the best ecotypes were VS IPR, M’Pessoba1 and Bougouni2, that is, 1853, 1816 and 1789 kg/ha, respectively. The top four ecotypes sesame identified in this study will be tested during three years to evaluate adaptation capacity, yield performance and stability and then make available to breeders for further breeding.

Key words: Sesame (*Sesamum indicum* L.), ecotypes agronomic performance, Sudano-Sahelian, Mali.

INTRODUCTION

Demand for sesame seed in the international trade is increasing due to the high quality of its oil and wide use in confectioneries and bakery products (Weiss, 1983; Salunkhe and Desai, 1986; Ashri, 1989). Cultivation of sesame is concentrated in the developing, tropical countries where it is grown mainly by small holders. As a result, the crop has received less attention by breeders (Brar and Ahuja, 1979; Weiss, 1983; Ashri, 1989). In recent years, there have been intensive efforts in different
parts of the world to assemble the dwindling germplasm resources of this ancient crop (Thangavelu et al., 1985; Paroda et al., 1985; Ashri, 1990). Mali is a tropical country whose primary objective is agro-forestry-pastoral which related activities occupy about 80% of the workforce. The rural development sector contributes on average 45% of gross domestic product (GDP). The average of the growth rate in Mali is about 3.6% per year (DNI, 2008). This growth is mainly due to the sectors agro-forestry-pastoral that has in recent years been the subject of many discussions because of their strategic importance. But we must recognize that, there are still major constraints blocking factors for recovery and promoting key chains bearing in Mali (MA, 2008). Among these sectors, the cotton sector is the main source of industrial oil extraction. But, the uncertainties on the development of the cotton sector of Mali in recent years; diversification of raw oil has become a necessity (DNI, 2008). It has therefore becomes imperative to promote other crops such as sesame oil-bearing to overcome not only the lack of oil but also to solve the severe shortage of protein in the diets of rural populations of Mali.

By common practice in hot and great food and economic potential of its products (Schilling and Cattan, 1991), sesame seems to be adapted to different environments and therefore can be a way to ensure food and income security for producers. Interest in sesame has increased in recent years because of its role as an element of diversification on the one hand and on other, a source of income for farmers as reported previously. The industry is in the process of restructuring through the efforts of the offices of development (OHVN, ODR) non-governmental organizations (NGOs) (Business Works) in production and marketing. With the commitment of these structures, we are witnessing a steady increase in acreage since 1988. Thus the areas identified in sesame were 2419 ha in 1998 increased to 3,611 ha in 1999, 6,061 ha in 2000 and 7323 ha in 2001 (Sidibe and Malé, 2003). Despite this interest and efforts for the cultivation of sesame, yields remain low and constant and ranged from 250 to 300 kg/ha (Sidibe and Malé, 2003), while there are opportunities to achieve 1000 to 1400 kg/ha. These low yields are due to ignorance or lack of appropriate cultivation techniques and especially the low potential of plant material for the production of sesame.

This study is aimed at contributing to finding solutions of encountered problems by sesame breeders in Mali and to the increased production of sesame as well as improving the nutritional quality of food for rural populations, by selection varieties of high potential productivity adapted to Sudano-Sahelian area in Mali. The specific objective is to characterize twenty ecotypes of the collection of sesame in Mali, identify two or three most productive ecotypes, make available the best productive ecotypes to farmers for increased sesame production in Mali, increase farmers' income by sesame seeds sale and improve rural diets.

MATERIALS AND METHODS

The soil used was silty sand texture. The plant materials were composed of 20 best ecotypes sesame selected among the 140 prospected by the researchers of IER and IPR/IFRA in the 2nd, 3rd, 4th and 5th regions of Mali and introductions. 50 kg/ha of diammonium phosphate (DAP) was used for the fertilization.

The tests were conducted following a device in randomized complete blocks with four replications. The seeding was done at the second decade, 11th of July, 2008. The 20 entries were sown in four replications. In each replication, each ecotype was represented by six consecutive rows with 5 m length. Distances between the rows were 0.75 m and between bunches were 0.50 m. The lifecycle of plants was spread 3 to 4 months in general. The growing season was characterized by a relatively favorable rainfall in the study area. The very good distribution in time and space allowed plants to complete their growth cycle in good moisture conditions. A rainfall of 958.0 mm was recorded higher than the term average 768.8 mm of the area.

Factors studied include the levels of the variation of agronomic traits between ecotypes. Observations and measurements were carried out simultaneously on each ecotype using the following parameters: Number of days between sowing and 50% flowering plants (the average of number of days until 50% flowering carried from four plants per ecotype); plants height (cm) (the distance from the base of the culm to the tip of the capsule of the main culm carried from four plants per ecotype); number of fruiting branches per plant (number of fruiting branches per plant from four plants for each ecotype); number of capsules per plant (number of capsules per plant from four plants per ecotype); number of seeds per capsule (number of seed per capsule from four plants per ecotype); 1000 grains weight (g) (one thousand-seed weight carried from four plants per ecotype); grains yield (kg/ha) (grains yield per ecotype and per replication from six consecutive rows). The observations of days until 50% flowering plants were conducted during the vegetative period, and all other measurements carried out after the harvest.

RESULTS AND DISCUSSION

In this study, six quantitative (number of capsules per plant, number of seeds per capsule, grains yield, 1000 seed-weight, plant height and number of fruiting branches per plant) and one qualitative (days until 50% flowering plants) traits, were evaluated with 20 ecotypes sesame. The results of the experiments are thus described.

50% flowering period

The analysis of variance of 50% flowering period detected a highly significant difference between the ecotypes. The 50% flowering period varied from 44 to 67 days with mean value of 51 days. Sikasso 2 is the latest with 67 days, while Ecotypes Banamba 1 and ECS-37 are the earliest with 44 days (Figure 1). This demonstrated that, the ecotypes are very heterogeneous with respect to 50% flowering period.

Number of capsules per plant

The number of capsules per plant ranged from 327 to 60
with mean value of 185. The analysis of variance detected a highly significant difference between the ecotypes. The ecotype Bènèblen 1 provided more capsules per plant than the other with 327 capsules, while Enoupenou gives only 60 capsules per plant.

**Seed number per capsule**

The number varied from 73 to 34 with mean value of 63. Analysis of variance of seed number per capsule detected a highly significant difference between treatments. Thus, ecotype ECS-37 has 73 seeds per capsule, while Namsubani gives only 34 seeds per capsule (Figure 2).

**Grain yield**

The grain ranged from 1853 to 1050 with mean value of 1507. The IPR VS was the most productive with a yield of 1853 kg/ha, while Banamba 1 was the least productive with a yield of 1050 kg/ha (Figure 3).
1000 seed-weight

The weight of 1000 grains varied from 3.5 to 1.9 with mean value of 2.8. Analysis of variance in weight of a thousand seeds detected a highly significant difference between the ecotypes. Bougouni 3 and ECS-37 gave the highest weight with each over 3.5 g per thousand seeds, while Sikasso 2 and VS PIT gave the lowest weight of 1.9 g per thousand grain weight (Figure 4).

CONCLUSION AND RECOMMENDATION

The growing season was characterized by a relatively...
favorable rainfall in the study area. The very good
distribution in time and space allowed plants to complete
their growth cycle. A rainfall of 958.0 mm higher than the
average of 768.8 mm of the area was recorded.
For the 50% flowering period, Banamba 1 and ECS-37
have the shortest flowering period with 44 days while
Sikasso 2 is the latest with 67 days. Regarding the
number of capsules per plant, ecotype Bènèblen 1 has an
average of 327 capsules per plant, while the ecotype
Enoupenou has only 60 capsules per plant. The number
of grains per capsule ranged from 73 for ecotype ECS-37
to 34 for Namsubani. Compared to the weight of one
thousand grains, Bougouni 3 and ECS-37 gave a
thousand-seed weight equivalent to 3.5 g while Sikasso 2
and VS IPR gave the lowest 1000 grains weight with 1.9
g each. Compared to the yield performance, the best
ecotypes were VS IPR, M’Pessoba 1 and Bougouni 2 with
1853, 1816 and 1789 kg/ha, respectively. Thus, we
recommend these three ecotypes to test for about 3 or 4
years to fix the yield in farmer conditions for further study
and the best of the three most productive will be chosen
as a new high productive variety in Sudano-Sahelian of
Mali.

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