EVALUATION OF RECURRENT SELECTION FAMILIES FOR TOLERANCE TO WATER DEFICIT IN COMMON BEAN

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INTRODUCTION

The adaptation of plants to stress environments is a challenge to modern agriculture. This requires understanding the behavior of plants in contrasting environments, with and without stress, and interrelation between them (Lizana et al., 2006). Among the various abiotic stresses, water deficiency is highlighted by the occurrence and extent of the reduction in productivity. It is estimated that 60% of the world's beans are produced in regions with water deficit. In Brazil, common bean (Phaseolus vulgaris L.) is grown in almost the whole country at various times of the year, which exposes it to a great climatic diversity. The objective of this work is to evaluate the adaptation to water deficit the families of recurrent selection $C_oS_{1:6}$ and $C_oS_{1:7}$, with carioca grain type of a base population obtained from a multiple crosses involving parents tolerant to water deficit.

MATERIALS AND METHODS

The experiments with and without water deficit, were conducted on an Oxisol at the SEAGRO Experimental Station in Porangatu-GO for two consecutive years, 2008 and 2009. We evaluated 25 families $C_oS_{1:6}$ in 2008, with carioca grain type, of a base population (Co) obtained from multiple crosses involving parents tolerant to water deficit and three tests genotypes, BRS Pérola, BRS Radiant and BAT 477. The latter is a tolerant line to water deficit from the International Center for Tropical Agriculture (CIAT). They were sown on 13/06/2008 in plots of two rows, three meter long and 45 cm spaced in a randomized block design with three replications. Of the families evaluated, in 2008 were selected 15 best-productive families in both water treatments, with and without water deficit and with better quality seed. The 15 families, plus the test genotypes used on the previous year, were reevaluated in 2009. Sowing was done on 23/05/2009 in plots similar and adopting the same agriculture practices of the previous year, but in rows spaced 40 cm. Two experiments were conducted in each year. The first was well irrigated throughout the crop growth and the other only up to 20 days after emergence, when it was applied the water deficit. Therefore, total irrigations were made in the first experiment and during the phase without water deficit in the second experiment. Irrigation water was applied when the potential of soil water to 0.15 m depth amounted to - 0.035 MPa (Silveira & Stone, 1994). During the period of water deficit was applied about a half the water irrigation used in the experiment without water deficit. We evaluated the effect of water deficit on yield and on flowering date.

RESULTS AND DISCUSSION

The water treatments significantly influenced bean yield in 2008, but did not affect the flowering date. Yield obtained was 536 kg ha^{-1} and 2259 kg ha^{-1} in the treatments with and without water deficit, respectively. It was also observed that genotypes yield differently from each other and responded with different levels of intensity to the effects of two water treatments, since it was observed a significant interaction between water levels and yield. The genotypes flowering date differed significantly, however responded with the same intensity to the effects of water treatments, since it was not observed significant interaction between water levels and flowering date. In selecting for drought tolerance was considered the yield in both water conditions, with and without water deficit, since it is desirable that the genotypes present both good yield when rainfall is normal or when it does not. The genotypes were distributed into quartiles defined by the average yield in the treatments well irrigated and with water deficit. In 2008 the average yields in treatments without and with water deficit were 2259 kg ha^{-1} and 536 kg ha^{-1}, respectively. Genotypes were selected from quartile one. That included the families of recurrent selection, number 39, 191, 20, 118, 148, 113 and 150, because they yielded above average in both water levels. They yielded fine in the irrigated treatment and were less susceptible to water deficit. All of these lines showed flowering date between 43 and 45 days after sowing (DAS) and not significantly different, except the family number 39, which flowered at 47 DAS. In 2009 were re-evaluated the 15 selected families in 2008, adopting the best criteria for productive behavior in both water levels, with and without water deficit, and a better quality of grain, plus the same lines test used in the previous year, the varieties BRS Pérola and BRS Radiance and the line BAT 477. It was conducted a joint analysis considering the results of these genotypes in 2008 and 2009. It was found that the yield of the genotypes differed significantly between the years of conducting the experiments. The yield obtained was 1503 kg ha^{-1} and 1008 kg ha^{-1} in 2008 and 2009, respectively. Flowering date was also influenced by the ears of conducting experiments. The lines were earlier in 2009, influenced probably by the anticipation of 20 days in the sowing. A joint analysis of the effect of water treatments was similar to that observed in 2008, when it was observed that only the yield was significantly affected by water treatments. It was observed 400 kg ha^{-1} and 2111 kg ha^{-1} in the treatments with and without water deficit, respectively. The genotypes presented significantly different and also flowered at different times. However, all these components responded similarly to the effects of two water treatments, because there was no significance in the interactions between water levels and genotypes for yield and flowering date. In selecting for drought tolerance considering the yield of experiments conducted in 2008 and 2009, it was adopted the same methodology used in 2008. Genotypes were selected from quartile one. That included the families of recurrent selection, number 191, 118, 20, 148 and 150, because they have above average yield in both water levels, well produced in the irrigated treatment and were less susceptible to water deficit. All these families flowered under 43 DAS, remained the same productive behavior, with and without water deficit, observed in 2008 and were also higher yielding than the genotype BAT 477, tolerant to water deficit.

CONCLUSION

The families of recurrent selection number 191, 118, 20, 148 and 159 were selected because they had good performance with and without water deficit in the two consecutive years of genotype evaluations and responded similarly to the effects of two water treatments.

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