Performance of Selected and Non-Selected Maize Hybrids for Short ASI under Moisture Stress

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Introduction

The use of tolerant genotypes has been suggested as the solution for increasing yield under drought conditions, one of the main limitations to corn production. According to Santos et al. (1997), these losses in Brazil may vary from 14% to 28%, while Edmeades et al. (1989) estimated that 80% of the corn planted in tropical areas suffered 10% to 50% yield loss. Bolaños et al. (1993) indicated that the anthesis silk interval (ASI) is an easy-to-measure characteristic associated negatively with production under stress conditions. Betrán et al. (1997) recommended that inbred lines should present short ASI in order to obtain acceptable yield hybrid performances.

Methods

Two separate experiments were evaluated: one with moisture stress during flowering/grain filling and one under normal irrigation. A conventional sprinkler system with the lateral fixed was used. Irrigation depths were measured using catch cans. At the stress plot, irrigation was interrupted on the 55th day after planting (dap) and reinitiated at 90 dap. The applied irrigation sheets were measured in batteries of 16 collectors installed in each experiment. In order to quantify the stress, soil-water content was monitored using gravimetric methods (Fig. 1). Samples were collected at depths of 0-20, 20-40 and 40-60 centimeters. Twenty-two materials were used: 10 hybrids not selected for anthesis silk interval (NSASI), 5 hybrids with all parental inbred lines selected for short ASI (100% ASI), 5 hybrids with one parental inbred line with short ASI (50% ASI) and two commercial checks (data not shown). In both trials the experimental design was a randomized complete block with three replications.

Results

A strong moisture stress in the 0 to 20 cm layer of the soil profile was observed (Fig. 1), where possibly much of the crop's root system was concentrated. The treatments with 100% ASI generally showed a mean value of zero, and some treatments showed protogyny in both environments (data not shown). The mean yield values indicated some promising hybrids (data not shown) in both moisture stress and non-stress conditions (dual purpose). The results indicated that ear number under stress (ENCS) seems to be associated with drought tolerance and this could be used as a selection criterion along with ASI.

Conclusions

Hybrids not selected for short ASI showed a 62% mean yield reduction, while those selected for short ASI showed 44.8% to 54% mean yield reduction (100% ASI and 50% ASI, respectively) and were less sensitive to moisture stress during the flowering/grain filling period. Higher mean yields of hybrids with short ASI in stress conditions seem to be more associated with the ear number than with ASI.

References

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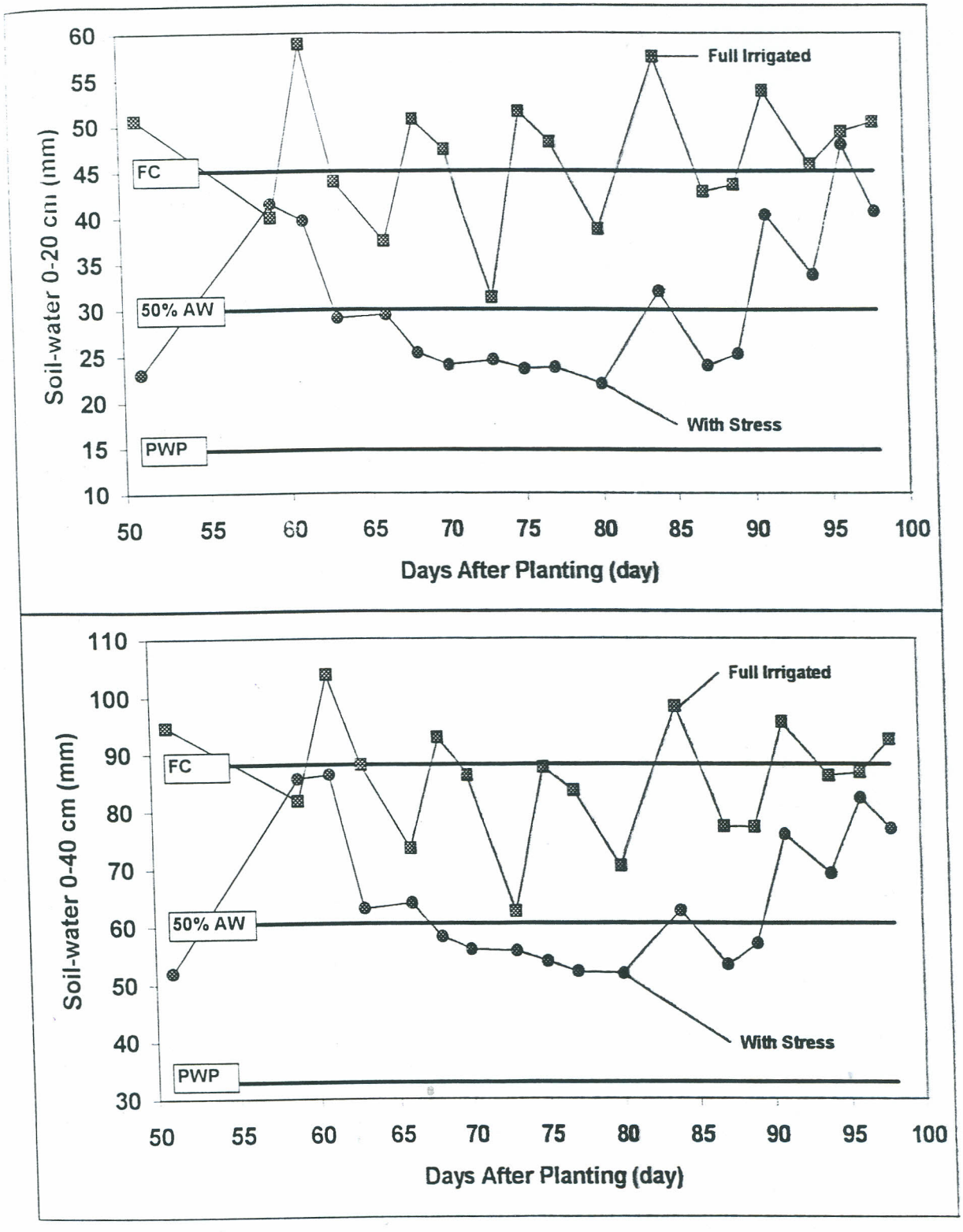

Figure 1. Soil-water storage along maize cycle submitted to full irrigation and with water stress during flowering. Janaúba, MG, Brazil, 2000.