INVESTIGATIONS ON SEEDLING VIGOUR IN PEARL MILLET (PENNISETUM TYPHOIDES STAPF AND HUBB.)

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ABSTRACT

Experiments with the seeds and seedlings of three parents and their six hybrids revealed that parental and hybrid seeds did not differ significantly in their germinating capacity, while significant differences were seen in the rate of respiration. Leaf tissues failed to show significant differences in the rate of respiration. There did not seem to be any correlation between respiring capacity and growth rate.

Studies on the seedling characters, viz., seedling height, fresh weight, shoot to root ratio, total root length, leaf area and dry weight revealed that the early grand period of growth began soon after the germination and much differences were exhibited between parents and hybrids as early as the 10th day after germination in all characters studied, except shoot-root ratio and total root length. Hybrids attained relatively better growth during the early stages of development and gradually differences ceased to exist by 50th day. An exception to this trend was fresh weight.

INTRODUCTION

INVESTIGATIONS on the physiological aspects of heterosis have been given relatively little attention and the concern has been mostly with its genetic basis. However, it has been postulated that the development of hybrid vigour for the most part lies in the early post germination growth stages. Results of some studies in this context made on three inbred parents and their hybrids of pearl millet are reported herein.

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MATERIAL AND METHODS

Three inbred parents, i.e., P.T. 852/2 (P3), P.T. 870 (P5) and P.T. 888 (P8), whose F1 hybrids manifested marked heterosis (Mahadevappa, 1965) were chosen for this study. Seeds from a single plant of each of the three inbreds, their three crosses and the reciprocals were sown in circular pots in six rows of six hills each replicated thrice. Two seeds were dibbled per hill in order to avoid gaps but only one was retained after germination. It was ascertained that all the pots were uniform for the soil and manurial ingredients.

Samples of four plants were removed every 10th day for 50 days for analysis. Duplicate samples were also sown in Petri-dish for observation on germination percentage. Observations were made on (i) germination percentage, (ii) height of seedling, (iii) fresh weight, (iv) total root length, (v) shoot-root ratio, (vi) leaf area, (vii) dry weight and (viii) respiration. The product of maximum length, maximum width and the constant 0.747 was taken to give the surface area of leaf. Respiration of seeds and leaf tissues was studied by estimating the amount of oxygen uptake in the cultures using Warburg Apparatus. The respiration of leaf tissue was studied on the 30th day only.

RESULTS

The mean values of ad the above observations and results of statistical analysis are furnished in Table I. There were no significant differences among the cultures in germination percentage. Seeds of P3, P8 and (P5×P3) showed a high respiration rate, while it was markedly low in the seeds of P5, (P3×P5) and (P5×P3). Leaf tissues, however, failed to show significant differences.

As regards the seedling characters, parents and hybrids differed significantly on all the days except on the 50th day. Throughout the experiment the hybrid seedlings were taller than either of the parents although this difference was significant only in a few cases. In fresh weight also, hybrids were much heavier than their parents with a few exceptions. The shoot-root ratio remained higher in hybrids than in parents, only up to the 50th day. All the hybrids and P8 showed a greater leaf area. In respect of dry weight, although differences failed to be significant on the 20th and 50th days, hybrids were relatively heavier than parents. Total root length was uniform for all the cultures on the 10th, 40th and 50th days, while they varied significantly on rest of the days. The cross (P3×P5) deviated from the general trend in most of the characters studied. It had a low expression in the very young stages, sometimes lower than even its parents and by the 40th or 50th day.