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Exploitation of heterosis and selection of superior inbreds in pearl millet

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ABSTRACT

Ten diverse inbreds were crossed in a diallel fashion, excluding reciprocals, to study the magnitude of heterosis and to identify new restorers in pearl millet. The degree of heterosis varied from cross to cross for all the characters studied. The high magnitude of heterobeltiosis was found for grain yield per plant, fodder yield per plant, plant height, number of effective tillers per plant, ear head weight, 1000 grain weight and harvest index, while moderate heterosis over better parent was exhibited for ear head girth, ear head length and number of nodes. Days to 50 per cent flowering and days to maturity displayed the least heterotic values. The maximum positive heterosis for grain yield per plant was observed to be 194.65 and 153.22 per cent over mid and better parent, respectively. The cause of heterosis in grain yield might be due to heterosis in its yield attributing traits, mainly, 1000 grain weight, fodder yield per plant, plant height, number of effective tillers per plant, ear head weight, ear head length, and harvest index. The crosses *viz*., J-2480 x D-23, J-2467 x J-2474 and J-2467 x D-23 depicted high heterosis, *per se* performance, coupled with high SCA and involved both or atleast one good combiner parents. Such crosses have potential to throw desirable transegresants in the segregating material for the development of high yielding inbred lines in pearl millet.

Key words : Pearl millet, Heterosis, Inbreds, Grain yield

INTRODUCTION

Pearl millet [*Pennisetum glaucum* (L.) R. Br.] is the fourth most important crop among the cereals cultivated in India and is grown mainly in Rajasthan, U.P., Maharashtra, Gujarat and Haryana which account for 95 % of the area under this crop. Pearl millet has an embodiment of unique features like allogamy, protogamy, male sterility, huge genetic variability and remarkable geographic diversity. These characteristics offer great possibilities of crop improvement through hybridization. Development of Tift 23A male sterile source by Burton (1965) opened new vistas for the exploitation of heterosis on commercial scale in pearl millet. In heterosis breeding programme, it is essential to study and evaluate available useful promising diverse parental lines in their hybrid combinations for yield and yield components. Selection of parents and crosses for development of new restorer parents is most critical. Hence, the present investigation was undertaken to determine the extent of heterosis and to identify new restorer lines in pearl millet.

MATERIALS AND METHODS

Ten genetically diverse restorers *viz*., J-2454, J-108, J-2448, J-2340, J-2475, J-2464, J-2480, D-23, H-77/833-2 and J-2474 were crossed in all possible combinations (excluding reciprocals) at the Main Millet Research Station, Junagadh Agricultural University, Jamnagar during summer 2004 to generate a diallel set. Forty five crosses and their ten parents were sown in a randomized block design with three replications during *kharif*-2004. Each entry was grown in a single row of 4.0 m length each with inter and intra row spacing of 60 cm x 15 cm. The recommended agronomic practices were adopted for raising the good crop. Observations were recorded on five randomly selected competitive plants for each entry, in each replication for grain yield and eleven component traits (Table 1). Days to 50 per cent flowering and days to maturity were noted on the basis of whole plot. The heterosis as percentage deviation from mid parental (relative heterosis) and better parental value (heterobeltiosis) for each character was worked out.

RESULTS AND DISCUSSION

The nature and magnitude of heterosis help in identifying superior cross combinations for their exploitation to obtain better transgressive segregants. In the commercial exploitation of hybrid vigour, excess of F_1 over better parent, is of significance. Hence, in the present investigation, the extent of heterosis over better parent for grain yield and eleven attributing traits is discussed as under.

A perusal of Table 1 revealed that the degree and direction of heterosis varied considerably for grain yield and its components. Overall, the degree of heterobeltiosis was high for grain yield per plant, fodder yield per plant, plant height, number of effective tillers per plant, ear head weight, 1000 grain weight and harvest index. Whereas, ear head girth, ear head length and number of nodes on main stem exhibited moderate heterosis over better parent. Days to 50 per cent flowering and days to maturity displayed the least heterotic values. Pearl millet being grown in erratic conditions of rainfall, the earliness in

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