GENETICS VARIABILITY STUDIES FOR SOME CULTIVARS OF PEPPER (PIPER NIGRUM) AND EVALUATION OF SOME GRASS CULTIVARS BY INDEX SELECTION

By

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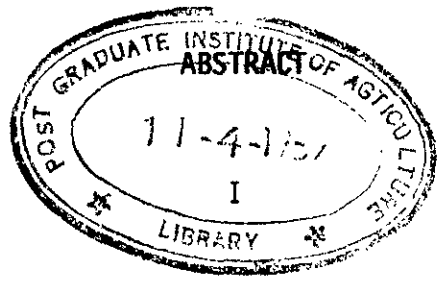

ABSTRACT

Vegetative perfomance of plants at the early growth stage has a marked influence on the performance of plants at the reproductive stage. This study was undertaken to estimate the genetic variances that exist among six cultivars of pepper (Piper nigrum L.) at early growth stages for various growth rate parameters and subsequently determine the heritabilities of these characters, and to estimate the correlations among the traits. The growth pattern of the cultivars were also investigated. Evaluation was carried out for a wide range of morphological traits: size of shoots, leaves and roots of the cultivars: Panniyur-I, Kuching, IW_5, KW_{33}, (Panniyur-I x Kuching)$_{F_1}$ and (Kuching x Panniyur-I)$_{F_1}$ at three, five and seven months of growth. The study was conducted at the Minor Export Crops research station, Matale, Sri Lanka, during 1986/87. Estimates of genotypic variance was high for shoot weight, number, area and weight of leaves, length, weight, number and volume of primary roots, and weight and volume of secondary roots showing their potential for improvement. The high heritability estimates for shoot parameters, total leaf parameters and primary root parameters indicated their importance for selection. Progress in shoot and leaf weight could be achieved by selection for other shoot and leaf growth parameters because of their close genetic association. The correlation of the shoot and leaf growth parameters with root growth parameters were found to vary from cultivar to

cultivar. No interaction was observed between the cultivars and the growth stages for most of the traits investigated. Generally, the magnitude of growth increased linearly as the growth season progressed, but the difference was significant only after five months of growth period for weight and length of shoots; number, weight and area of leaves; internode length; and weight and length of primary roots. No substantial increase was observed for number and volume of primary roots, and weight and volume of secondary roots. The corsses between Panniyur-I and Kuching generally showed better performance than both their parents and the local selections, IW_5 and KW_{33} and that of the local selections, particularly IW_5 was better than Panniyur-I and Kuching.

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Systematic evaluation of forage grasses, commonly grown in the mid-country wet zone of Sri Lanka, has not been carried out and adequate information on the desirable traits of these cultivars is not available. A study was conducted at the University of Peradeniya during 1986/87 to assess five grass cultivars: three cultivars of the species Panicum maximum - Guinea A, Guinea B and Hamil; Setaria (Setaria sphacelata) and Signal grass (Brachiaria brizantha) at pre-bloom, mid-bloom and full-bloom stages of growth and to select the most promising cultivar(s) using selection index. The correlations among the different traits for these grasses were also estimated. Evaluation was carried out for herbage dry matter yield (DMY), plant

height, tiller number, leaf: stem ratio, crude protien (CP), acid detergent fibre (ADF), neutral detergent fibre (NDF), acid detergent lignin (ADL), silica, ash, cellulose, hemicellulose content and in vitro organic matter digestibility (IVOMD). The differences among the cultivars for these traits were influenced by the stage of growth except for ash and silica. At pre-bloom, the late flowering cultivars, Signal grass and Setaria had relatively higher yield but lower quality, and the early flowering cultivars, Guinea A and Guinea B and, the medium flowering cultivar, Hamil had relatively lower yield but higher quality. At full-bloom, their difference in quality diminished, while their yield difference became more pronounced. Generally, DMY, plant height, tiller number, ADF, NDF, ADL and cellulose increased with the aging of the plants, while leaf stem ratio, IVOMD, CP, ash, silica and hemicellulose decreased. Forage quality was thus highest prior to blooming and lowest at full-bloom. DMY had an inverse relationship with the economically important quality traits, CP and IVOMD at all growth stages. This made achievement of simultaneous improvement of these traits difficult. Use of the constructed Smith- Hazel index would result in a good genetic gain of the aggregate genotype. But undesirable responses in CP, IVOMD, leaf stem ratio, ADF and NDF made its employment for screening the forage population under consideration ineffective. Guinea A, Guinea B and Hamil at mid-bloom and Signal grass and Setaria at pre-bloom were selected as the best cultivars. The selection was carried out by setting optimum levels for DMY and the important quality traits.