1. INTRODUCTION

Paddy is one of the most important cereal crop of the world and also of India. Paddy revolution in India and also in other countries of Asia is mainly attributed to the evolution of photo-insensitive, fertilizer responsive, lodging resistant, disease resistant, efficient dwarf and semi-dwarf high yielding genotypes developed by crossing *Japonica* types with *Indica* ones.

India is the largest rice growing country in the world, cultivating about 44 million hectares, which is about 36 percent of the world rice acreage. The crop in India is being grown under a very wide range of ecological conditions. On the one extreme there are deep-water rice of Assam and Bengal grown in 4.5-6.5 meter deep water, whereas, on the other is the rice grown in upland crop with only 62.5-75 cm of rainfall. Rice soil varied from sandy loam to heavy clay with varying pH. The crop is grown from sea level to high altitudes in the hills.

In 1995, rice was planted in 155 million hectares (MH) world wide with a total production of 596 million tonnes (MT). In India, rice production rose from 30.4MT in 1966-67 to 131 million tonnes during 1999 on an area of 44 MH (FAO, 1999). Unlike wheat, 95 percent of the rice is grown in less developed nations, primarily in South and South-Eastern Asia. At present, India’s population is 1000 million and is expected to touch 1400 million by 2030 A.D., i.e. 50 percent more from the present population level. This projection compels us to design our future strategies in crop production accordingly so that we
may achieve the targeted 240 million tonnes of food grains by 2030 A.D. from the present level of 195.2 million tonnes. The planning has to be made keeping in view that the area under food grains is expected to decrease. In this shrinking situation we are left with no option except to increase the area under high yielding varieties and consumption of fertilizers.

In a country like India success or failure of the paddy crop depends on the vagaries of monsoon and fluctuations in yield levels are likely to cause considerable imbalance in agricultural economy of the country. The yield of paddy in India is highly unstable and unpredictable due to vagaries of the monsoon. Susceptibility of the genotypes to various diseases and insect pests and lack of cultural operations like weeding, sowing, transplanting etc., stability and predictability of crop yields are of great importance for predominantly agricultural countries like India.

In order to bring about permanent and stable increase in paddy production, evolution of suitable paddy genotype capable of giving higher yields under varied agro-climatic conditions therefore is a basic need. To meet this challenge plant breeders have to resort to unconventional approaches in addition to the programmes in vogue, for further increase in productivity of paddy. Besides, the problem of water and fertilizer management, the most important reasons for such low productivity in India has been the lack of high yielding and widely adopted genotypes suitable for diverse conditions under which rice crop is grown in the country.
These goals can be realized through the application of different breeding approaches viz., introduction, selection and hybridization. The successful implication of the said breeding approaches requires the knowledge of genotype x environment interaction, heritability, genetic advances, character associations and D² analysis.

Variation is the basis of plant breeding and the success of any crop improvement programme will largely depend on the magnitude and range of variability on the available genetic stock. A critical estimate of genetic variability is a pre-requisite for initiating appropriate breeding procedures in crop improvement programmes. The heritable variation is masked by non-heritable variation, which creates difficulty in exercising selection. Hence, it becomes necessary to spilt overall variability into its heritable and non-heritable components with the help of certain genetic parameters, which may enable the breeders to plan out proper breeding programme. Information on genetic variability among growth as well as yield components in rice has been reported by many workers (Sivasubramanian and Madhavamenon, 1973; Latif And Zamin, 1965). The path analysis furnishes a method of partitioning the correlation coefficient into direct and indirect effects and measures the relative importance of the causal factors involved (Dewy and Lu, 1959).

One of the reasons for this seems to be the sensitive behaviour of the available varieties to variable environmental growing conditions. Thus there is
an urgent need to breed the varieties, which perform consistently over
environment and possess high grain yield.

Finlay and Wilkinson (1963) suggested linear regression as a measure of
stability. Eberhart and Russell (1966) emphasized that both linear (b) and non-
linear (S²d) components of the genotype-environment interaction should be
considered while judging the phenotypic stability of a genotype. They further
suggested that an ideal variety should have high mean, unit regression and an
S²d; as small as possible. Paroda and Hayes (1971) observed that the linear
regression should simply be considered as a measure of response of a
genotype whereas the deviations around regression line are a measure of
stability.

In view of the above and the felt need of the farmers requiring fertilizer
and water economy for the cultivation for this crop, the present investigation
entitled "Genetic divergence, character associations and phenotypic stability of
some quantitative characters in rice (Oryza sativa L.) was conducted with the
following objectives-

1. To estimate the genetic variability, heritability and genetic advance for
   the different characters.

2. To estimate the nature and magnitude of character associations for
different characters.

3. To work out the direct and indirect contributions of the different
   characters towards grain yield under varying environments.
4. To study the genetic divergence and clustering pattern of rice genotypes under eight diverse environments.

5. To estimate the phenotypic stability of rice genotypes under different fertility levels at two locations.