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Effect of salt stress on biochemical parameters in rice (*Oryza satjva* L.) genotypes

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ABSTRACT
The present investigation employing ten rice cultivars was aimed to determine the physiological basis of salt tolerance with particular reference to sodicity. The field experiment was conducted under sodic soil condition prevailing at Anbil Dharmalingam Agricultural College and Research Institute, Tiruchirapalli in India. Biochemical parameters like Soluble protein, Proline and Nitrate reductase enzyme recorded higher values in the salt tolerant cultivars. Soluble protein content was estimated in order to find out the phytosynthetic capacity of the genotypes under salt stress condition. The genotypic difference in soluble protein content could be related to grain yield. The genotypes like CORH 2, TRY(R) 2, APMS 5B and TRY 1 registered comparatively higher values for the soluble protein implying their salt tolerance behaviour. Proline, an amino acid, has been shown to accumulate in plant tissues in many species when subjected to salt and water stresses. Cultivars such as CORH 2, TRY(R) 2, TRY 1 and CO 43 had recorded higher proline content. The hybrid CORH 2 followed by ARMS 5B, TRY 1 and TRY(R) 2 established their superiority over other cultivars for the enzyme NRase . The decreased NRase activity in salt sensitive rice cultivars is possibly due to the inhibition of enzyme induction under salt stress. Under salt stress condition, uptake of NO_3 by the plants is reduced.

Key words : *Oryza sativa* L, Salt stress, Soluble protein, Proline, Nitrate reductase enzyme.

INTRODUCTION

In India, rice is cultivated in about 44.6 mha under varied eco-systems, which contributes 23 per cent of total world rice production and 45 per cent of total food production in India. In India, an area of nearly 4 mha of rice is affected by soil salinity (Paul and Ghosh, 1986). Therefore, there is a great deal of urgency for developing rice genotypes, which can sustain and set seed under high salt stress condition. Efforts to improve productivity of rice under salt stress condition need understanding of the mechanism to identify traits required for productivity improvement programme.

Understanding of adaptive mechanism for salt stress in rice is complex due to presence of ionic and osmotic compounds. Identification or development of suitable genotypes that can come up well under saline/alkaline soil is one of the immediate requirements. The crop response studies particularly of tolerance mechanism and yielding ability under saline/alkali soil condition are the major efforts for the improvement of rice productivity under salt stress condition. Rice is considered to be a salt sensitive crop (Flowers and Yeo 1981). However, considerable variability for salinity resistance among rice varieties is also apparent (Yeo and Flowers 1982). This paper reports the effect of salt stress on biochemical parameters like soluble protein, Proline and Nitrate reductase enzyme in rice

MATERIALS AND METHODS

Field experiments were conducted under sodic soil condition at Anbil Dharmalingam Agricultural College and Research Institute, Tiruchirapalli. Ten rice genotypes were raised in the nursery under moderate level of soil sodicity. Transplanting of seedlings was done 28 days after sowing in the main field under sodic soil condition. Two to three seedlings $hill^{-1}$ were planted in the main field in the spacing of 20 x 10 cm. The study was conducted in the wet season (2002-2003) in Randomized Block Design and each treatment was replicated thrice. Plant samples were drawn at transplanting, tillering, panicle initiation and flowering stages for assessing the biochemical characters. Soluble protein content was determined by the procedure described by Lowry *et al.* (1951), and expressed as mg g^{-1} on fresh weight basis. The amino acid proline content was estimated in fully expanded leaf at transplanting, tillering, panicle initiation and flowering stages following the method of Bates *et al*. (1973) and expressed on µg g^{-1} on fresh weight basis. The nitrate reductase activity was estimated as per the method suggested by Nicholas *et al.* (1976), and expressed as µ moles NO_2 g^{-1} h^{-1} fresh weight. The mean values of the above mentioned observations were subjected to the statistical analyses and the genotypes were tested for their significance by adopting the procedure of Panse and Sukhatme (1961).

RESULTS AND DISCUSSION

Soluble Protein Content

Soluble protein content was estimated in order to find out the phytosynthetic capacity of the genotypes under salt stress condition. The genotypic difference in soluble protein content could be related to grain yield. The total soluble protein content determines the dry matter accumulation of crops since it represents the efficiency of the RuBPease, the carboxylating enzyme in C_3 plants (Plaut, 1974). A strong positive correlation between soluble protein and grain yield has been established in this study (0.742**). Vijayaraghavan (1994) had reported a reduction in soluble protein content under salt stress situation. However, the genotypes like CORH 2, TRY(R) 2, APMS 5B and TRY 1 registered comparatively higher values for the soluble protein implying their salt tolerance behaviour (Table 1). Protein contents in

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