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PRELIMINARY SCREENING OF SRI LANKAN RICE GERMLASM FOR PHOSPHATE DEFICIENCY TOLERANCE

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Phosphate deficiency tolerance (PDT) is one of the significant traits in improving the varieties of rice for profitable rice farming. The annual expenditure on phosphate fertilizers for rice is Rs.1158.4 millions in Sri Lanka. If PDT rice varieties can be developed, they can be grown with reduced fertilizer applications, show a higher profit margin, and minimum negative effects of phosphate applications. PDT has been studied in other countries, especially regarding the genomic aspects. However their results cannot be directly applied in Sri Lankan rice breeding programmes and their results have to be validated for the local rice genotypes. The present study was conducted to screen some traditional and improved rice varieties developed by the Rice Research and Development Institute (RRDI), Batalagoda (Bg) for PDT. The ultimate aim of the project was to lay a foundation to select cultivars to make genetic crosses to establish segregating populations to discover genes and molecular markers to be used in marker assisted breeding of rice in Sri Lanka.

Eleven rice varieties, H4, Murungakayan, Bg352, Bg379-2, H7, Suduheenati, Bg403, H10, Bg358, At354 and Bg357, were screened for PDT at RRDI, Batalagoda. Soil where no fertilizer had been applied for the last 30 years was collected from a RRDI field as the growth medium. Two levels of phosphate concentrations, no phosphate application (5 ppm or less present in soil) and with the application of recommended phosphate concentration (30 ppm) were used with four replicates for each variety in each treatment with completely randomized design. The same rice varieties were also grown with four replicates in a field where no fertilizer had been applied for last 30 years at RRDI. Plants were maintained until the flowering stage with standard management practices. Morphological data, plant height, number of tillers, root length, shoot dry weight, and root dry weight were measured for both green house and field grown plants. The soil (growth medium) and plant phosphate content were measured at the flowering stage for green house and field grown plants. Data were analyzed using statistical software package, Minitab 16.

Plant height, number of tillers and root length of both green house and field grown plants were not significantly different between plants that were grown under recommended phosphate and no phosphate levels. However, shoot dry weight and root dry weight were significantly different between the two phosphate levels and between rice varieties, H4, H7, H10 and Bg358 and showed significantly higher shoot and root dry weights compared to other rice varieties studied. The phosphate content of the plant and soil at the flowering stage was significantly different among two phosphate levels showing higher phosphate levels in the plants at zero phosphate level. Except the rice variety Bg352 and *Suduheenati*, other rice varieties stored higher phosphate levels in the plants. But rice varieties *Suduheenati*, Bg403, H4, H10 and Bg357 absorbed more phosphate under zero phosphate levels compared to the absorption at recommended phosphate level. Rice varieties Bg358, *Suduheenati*, Bg403, H4, H7, H10 and Bg357 showed higher absorption of phosphates under phosphate starved conditions and therefore, they could be used as parents in finding genes and genomic regions behind the phosphate deficiency tolerance in rice.