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Genotype × Environment interactions of Nagina22 rice mutants for yield traits under low phosphorus, water limited and normal irrigated conditions

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Multi environment testing helps identify stable genotypes especially for adverse abiotic stress situations. In the era of climate change and multiple abiotic stresses, it becomes important to analyze stability of rice lines under both irrigated and stress conditions. Mutants are an important genetic resource which can help in revealing the basis of natural variation. We analyzed 300 EMS induced mutants of *aus* rice cultivar Nagina22 (N22) for their G × E interaction and stability under low phosphorus (P), water limited and irrigated conditions. Environmental effect and interaction were more significant than genotypic contribution on grain yield (GY), productive tillers (TN) and plant height (PH) under these three environmental conditions in dry season, 2010. GY and TN were more affected by low P stress than by water limited condition, but PH was not significantly different under these two stresses. Mutants G17, G209, G29, G91, G63 and G32 were stable for GY in decreasing order of stability across the three environments but G254 and G50 were stable only in low P, G17 and G45 only in water limited and G295 and G289 only in normal irrigated condition. We then selected and evaluated 3 high yielding mutants, 3 low yielding mutants and N22 for their stability and adaptability to these 3 environments in both wet and dry seasons for six years (2010-2015). The most stable lines based on the combined analysis of 12 seasons were G125 (NH210) under normal condition, G17 (NH686), G176 (NH363) and G284 (NH162) in low P condition and G176 (NH363) under water limited condition. G176 was the best considering all 3 conditions. When screened for 15 *Pup1* gene-specific markers, G176 showed alleles similar to N22. While two other low-P tolerant lines G17 and G65 showed N22 similar alleles only at k-1 and k-5 but a different allele or null allele at 13 other loci. These stable mutants are a valuable resource for varietal development and to discover genes for tolerance to multiple abiotic stresses.