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The Compatible Pyramiding of *Pup1* and *AG1* in Rice

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[Introduction]

Direct-seeded rice, effective nutrient-acquisition rice is needed to cropping system against the climate changes. *Pup1* (Phosphorous uptake 1) containing *PSTOL1* is known as useful QTL to uptake phosphate in rice under upland/rainfed conditions. *qAG-9-2* (*AG1*) shows tolerant germination phenotype in anaerobic conditions with *OsTPP7*. To adapt changes of climate and cropping system, IR64-Pup1-AG1 (I-PA) was developed by stacking of *Pup1* and *qAG-9-2* and tested the function of each QTLs in each stress conditions.

[Materials and Methods]

IR64-Pup1-AG1 (I-PA) was developed by crossing and genotyped using KASP markers. Phosphate uptake ability of I-PA was assessed using normal soils. Phosphate concentrations were set by supplied and non-supplied and water content was mimicked upland conditions. To test *AG1* function of I-PA, plants were directly sowed in paddy field soils and grown in growth chamber. Phenotypes were evaluated with 2, 7 WAT (weeks after transplanting) and 3 WAT plants for phosphate uptake and anaerobic germination ability, respectively.

[Results and Discussion]

Introduction of QTLs containing key genes was checked using gene-specific markers and background similarity of I-PA to IR64 was 80%. Under P uptake ability screening conditions, I-PA showed shortest height under both conditions. However, tiller number / plant and root length were significantly increased under P-supplied condition at 7 weeks. Total P contents and transcriptional levels of *PSTOL1* in I-PA showed same levels to I-Pup1. Under anaerobic germination conditions, I-PA showed increased survival rate to I-Pup1 and the *OsTPP7* was expressed higher than shoots of I-AG1. I-PA showed shortest height and highest number of tiller/plant under paddy field, which is consistent results with P uptake ability screening conditions. Fertility and 100 grains weight were significantly decrease in I-PA, however, yield showed same level with IR64 because of increased spikelet number. From these results, independent functions of introduced QTLs, which leads to improved rooting in early stage, and nondecreasing yield were confirmed in I-PA.

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