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Comparison of NERICA and Asian rice among traits relevant to drought resistance in the field and the effects of compost

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Abstract

Recently NERICA (New Rice for Africa) was developed by a crossing of African rice (*Oryza glaberrima* Steud.) and Asian rice (*Oryza sativa* L.) in West Africa, and is considered to be drought resistant, but drought resistance of NERICA and differences between Asian rice are not clarified enough. In this research, NERICA (four cultivars and two lines), Asian rice (three cultivars and *sativa* parent of NERICA) and African rice (*glaberrima* parent of NERICA) were cultivated in the field in Shizuoka University under drought and traits of each cultivar and line relevant to drought resistance, stomatal conductance by porometer, soil water content of individual depths by TDR method, SPAD values by SPAD meter and leaf thickness by micrometer, were measured and compared with dry matter production and yield. Effects of compost were also compared among *sativa* parent, one NERICA cultivar and two NERICA lines. *Glaberrima* parent showed highest top dry weight. One NERICA line, one drought resistant Asian rice cultivar and *sativa* parent, showed higher top dry weight and yield (ear weight) than other Asian rice cultivars and NERICA cultivars and line tested. Compost tended to increase top dry weight and yield in one of NERICA line and *sativa* parent. But in one NERICA cultivar and line, top dry weight and yield were not increased. In one of Asian rice, one of NERICA line and *sativa* parent that showed high top dry weight and yield, stomatal conductance was high. On the contrary the *glaberrima* parent and in other NERICA cultivars and line it was low. In *sativa* parent compost increased stomatal conductance but in NERICA cultivar and lines it was not. Among cultivars and lines that showed high top dry weight and yield *sativa* parent and one of NERICA line SPAD value and leaf thickness were high but in one of Asian rice and *glaberrima* parent they were low. Cultivar and line differences in yield and top dry weight among Asian rice and NERICA were significantly correlated with those in stomatal conductance ($r=0.778^{**}$ and $r=0.654^*$, respectively) and those in leaf thickness ($r=0.600^*$ and $r=0.640^*$, respectively). In Asian rice cultivars average soil water content was significantly correlated with yield ($r=-0.886^*$) but in NERICA cultivars and lines it was not significant correlated ($r=-0.256$). Cultivar and line differences in leaf thickness were significantly correlated with SPAD value ($r=0.773^{**}$). In Asian rice cultivars it was significantly correlated ($r=0.962^{**}$), but in NERICA cultivars and lines it was not significantly correlated ($r=0.559$). Asian rice cultivars tended to consume soil water to increase yield but in NERICA cultivars and lines the tendency was not clear. Correlation between SPAD value and leaf thickness was different between Asian rice and NERICA cultivars and lines, and in Asian rice cultivars it was significantly correlated but in NERICA cultivars and lines it was not significant. Importance of maintaining high stomatal conductance by high leaf thickness was clarified.

Keywords: Asian rice, compost, drought resistance, NERICA, traits

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