

Water dynamics affect physio-biochemical responses, yield and quality characters, Pb loadings and final grain Pb contents in fragrant rice

Umair Ashraf

Minhaj University, Pakistan

Conference Proceeding



Abstract

Lead (Pb) pollution in agricultural lands and its entrance in to the food chain via soil-Pb-plant systems have serious concerns. Present study investigated four different water regimes i.e., a) CP: continuous ponding b) AWD-BF: alternate wetting and drying (AWD) before flowering; c) AWD-AF: AWD after flowering; and AWD-TM: AWD till maturity (soil water potential kept -25 kPa for all AWD treatments) were employed in two fragrant rice cultivars i.e., Guixiangzhan and Nongxiang-18 with 800 mg kg^{-1} of soil Pb level. Results revealed that water dynamics induced oxidative stress while also regulated the both enzymatic and non-enzymatic activities in both rice cultivars, however the oxidative damage was more in Nongxiang-18 while Guixiangzhan proved efficient for antioxidant responses under Pb stress. All water treatments were found statistically similar ($P \geq 0.05$) for net photosynthesis and gas exchange attributes for both rice cultivars (except net photosynthesis and intercellular CO_2 in Nongxiang-18). AWD conditions markedly reduced the Pb contents and translocation factor (TF) for root, shoot, leaves, ears (at grain filling) and grain (at maturity) compared with CP whilst on average, the Pb concentrations in respective organs were 1.41, 2.63, and 3.86-fold higher (except roots), respectively in Nongxiang-18 than Guixiangzhan. Means of all AWD treatments caused 28.15 and 17.33% reduction in grain Pb contents than CP in Guixiangzhan and Nongxiang-18, respectively. Furthermore, most of the yield and quality components were remained statistically similar ($P > 0.05$) (except grains panicle $^{-1}$ for both rice cultivars) under all water regimes, however, only AWD-TM for Guixiangzhan and all AWD treatments for Nongxiang-18 resulted in significant yield reductions ($P < 0.05$). In addition, relative changes (RC) of grain yields significantly correlated ($r = 0.81$) with grains panicle $^{-1}$ whereas strength of association for Pb concentration differs among connected and disconnected organs. In sum, Pb loadings in fragrant rice can be regulated by effective management and controlling irrigation water; however, care must be taken for water limits for rice to avoid yield loss.

Biography

Umair Ashraf is working as assistant Professor, Department of Botany, University of Education, Lahore, Pakistan. He has over 150 international and national publications with 21 impact factor that have been cited more than 3650 times.

umair.ashraf@ue.edu.pk



Citation: Umair Ashraf, Water dynamics affect physio-biochemical responses, yield and quality characters, Pb loadings and final grain Pb contents in fragrant rice, Agriculture Congress 2021, 15th International Conference on Agriculture and Horticulture, March 16, 2021, 06