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Physiological and Biochemical Basis of Salinity Tolerance in Indian mustard (B. juncea)

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Salt tolerance during germination is crucial for the seedling establishment. Germination percentage and seedling vigor index II are highly related with salinity tolerance. We evaluated a set of 36 advanced introgression lines (ILs) and donor wild species in two separate salinity blocks with salinity levels of RSC 0, 3, 6.5 and 10 in first and EC 0, 3, 6, 9 and 12 in the second during 2015-16. Four ILs, identified on the basis of their performance, were repeat tested along with the released variety (PBR357) and national salinity check, CS52 during 2016-17. Flowering and fruiting durations were reduced and reproductive phase was longer in PBR 357 while IL, JT163 maturated in 144 days. Significant differences existed for the studied physiological traits with salinity levels within the genotypes and also at three crop growth stages. SPAD, LAI, PAR showed declining trend except extinction coefficient (k) with increased salinity levels at flowering and siliquing stage. Photosynthetic pigments were highest at flowering stage with more total chlorophyll and carotenoids content in PBR 357 and CS52.Osmoprotectants and antioxidant molecules however increased with increase in salinity levels at flowering stage. JT163 and PBR357 possessed higher total soluble sugars, proline, ascorbate and tocopherols as compared to check,CS52.Estimated ionic content except for Na+ followed a declining trend with enhanced salinity. Na+/K+ ratio increased whereas K+/Na+ decreased with the increased Na+ ions in the leaves. Ionic content of the genotypes indicated lower Na+ and Na+/K+ ratio but higher K+ and K+/Na+ associated with tolerance. Decrease in Ca2+and Mg2+ ions resulted in decline in chlorophyll. Salinity had a profound effect on growth parameters, yield components, seed yield and oil content. JT 163 registered more number of branches and length of main raceme. Salt stress affected the seed filling by reducing the developed seeds and enhancing the shriveled seeds. PBR 357 had higher seed weight, biomass and nitrogen uptake. Two genotypes PBR357 and JT163 holds promise under saline conditions based on higher seed yield and tolerance index. Seed yield was positively correlated with tolerance index and negatively with susceptibility index.