Combining ability for resistance to soybean rust in F2 and F3 soybean populations

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Abstract

The impact of soybean rust (Phakopsora pachyrhizi) on soybean yields has been extensively studied. However, few studies have evaluated early generation segregating material under field conditions for soybean rust resistance to facilitate selection. The objective of this study was to estimate combining abilities for soybean rust resistance in the F2 and F3 populations at MUARIK and F3 populations simultaneously across five locations. Combining ability for soybean rust resistance was estimated from a half diallel cross of eight soybean using disease severity and sporulation rates as indices for resistance. A consistent contribution of additive gene action was observed at MUARIK across F2 and F3 despite high environment contribution to both severity and sporulation rate. The simultaneous evaluation of F3 populations in five diverse locations produced similar results with significant GCA effects for both traits. There were, however, greater genotypic effects to soybean rust severity and sporulation across the five test environments, although genetic systems of severity and sporulation rate acted independently. Additive and additive × additive epistatic gene effects were the most common form of GCA controlling resistance. Specific combining ability did not always contribute to soybean rust resistance. The positive correlation between parental severity, sporulation rate performance and GCA estimates suggested that selection of parents for soybean rust resistance breeding can be based on parental performance. Parental line UG 5 was the most outstanding producing the greatest number of resistant populations. This study underscores the importance of additive gene effects in the control of soybean rust severity and sporulation rate.