



## Screening and utilization of soybean (*Glycine max* (L.) Merr.) genotypes for improving resistance against rust

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Soybean rust is a highly devastating disease, yield losses can range from 13 to 70% [1]. The disease is caused by *Phakopsora pachyrhizi* [2]. The host range includes soybean (*Glycine max* (L) Merr.), other *Glycine* species and a number of genera in the legume family [3, 4]. Four independent single dominant genes conferring resistance to four specific races of the soybean rust pathogen have been identified. The inheritance of resistance in PI 200492, PI 230970 and PI 462312 was studied [5]. The study concluded that each of these genotypes carried a single dominant allele at a different locus conferring resistance to specific rust isolates. The genotypes for rust reaction assigned to the three parental types were PI 200492-Rpp1 Rpp2 rpp2 rpp2 rpp3 rpp3, PI 230970-rpp1 rpp1 Rpp2Rpp2 rpp3rpp3 and PI 462312-rpp1rpp1 rpp2rpp1 Rpp3Rpp3. A fourth major gene conferring resistance to soybean rust was reported in PI 459025 [6]. The study showed that PI 459025 carried a single dominant gene for resistance to all the three rust isolates and that this gene was at a different locus from the three previously identified genes conferring resistance to specific rust isolates. The genotype assigned for rust resistance of PI 459025 is rpp1rpp1 rpp2rpp2 rpp3rpp3 Rpp4Rpp4. In India, the disease was first noticed in 1970 [7], but became economically important only after its reappearance in 1994 [8]. Barring four varieties, all other Indian varieties were found to be susceptible. Soybean rust has not occurred in an epidemic form in major soybean growing areas of India since last two decades, so race analysis has not been done. Therefore, there is a need to initiate work on various isolates, infection types and physiological races of rust in India [8].

To identify sources of resistance to rust, a set of 286 lines of soybean, comprising of four differentials (PI 200492, PI 230970, PI 462312 and PI 459025),

69 lines developed at IARI, 61 exotic lines and 152 lines developed at various centres under AICRP on soybean were subjected to field screening under natural epiphytotic conditions. The crop was raised during *Kharif* 2000 at "Dharwad" a hot-spot for rust. On the basis of visual symptoms, genotypes were divided into three different groups, namely, susceptible (profusely sporulating, light tan lesions), resistant (non or sparsely sporulating dark reddish brown lesions) and immune (no lesions) [9].

Out of 286 lines screened, twenty-five lines exhibited resistant reaction are listed in table 1 while the reaction of the four differentials to the rust is summarised in Table 2.

**Table 1.** Genotypes showing resistant reaction to rust

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| PK 1029, DS97-11, DS97-13, DS97-14, DS97-14, DS98-11, DS98-12, DS98-14, DS98-18, DS98-19, DS967, DS76-1-2-1, DS76-1-37-2, SL427, PK725, JS9029, PK1162, G2121, G2130G2132, G2225, EC439597, EC439599, EC439608, EC439609 and DS98-17 |
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**Table 2.** Reaction of differentials to rust

| Exotic line | PI number | Genotype                                  | Reaction to rust |
|-------------|-----------|---|------------------|
| EC 439603   | PI 200492 | Rpp1Rpp1<br>rpp2rpp2 rpp3<br>rpp3rpp4rpp4 | susceptible      |
| EC 439601   | PI 230970 | rpp1rpp1<br>Rpp2Rpp2<br>rpp3rpp3 rpp4rpp4 | susceptible      |
| EC 439608   | PI 462312 | rpp1rpp1 rpp2rpp2<br>Rpp3Rpp3<br>rpp4rpp4 | resistant        |
| EC 439617   | PI 459025 | rpp1rpp1 rpp2rpp2<br>rpp3rpp3<br>Rpp4Rpp4 | susceptible      |

Thus the reaction of the differentials to the natural epiphytotic conditions indicates the presence of more than one race of the pathogen.

Three exotic lines having more than one gene for rust resistance showed resistant reaction (Table 3).

**Table 3.** Exotic lines showing resistant reaction

| Exotic line | Pedigree                              | Reaction to rust |
|-------------|---------------------------------------|------------------|
| EC 439597   | PI 462312 × PI 230970                 | resistant        |
| EC 439599   | PI 194647 × TN #3                     | resistant        |
| EC 439609   | (CH#1 × Anoka) ×<br>(Clarke63 × 64-3) | resistant        |

This clearly indicates that there is a need for pyramiding more than one gene for resistance against rust. Race analysis using single spore culture in glass-house is needed for precise information.

#### Acknowledgement

Exotic lines used in the studies were obtained from AVRDC, Taiwan.

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