

## Reciprocal selection in segregating generations to identify potential combiners of cotton (*Gossypium hirsutum* L.)

SOMASHEKHAR, AYYANAGOUDA M. PATIL, S.S. PATIL AND P.M. SALIMATH

Accepted : December, 2009

### SUMMARY

Two  $F_1$  hybrids (RAHH-102 and RAHH-136), which are distinct, were identified through their predicted double cross performance as potential sources of inbred lines for hybrid cotton cultivars.  $F_4$  lines were derived from these crosses and utilized in a study on variability for combining ability. Sets of 26 lines each from the two crosses were crossed in a reciprocal fashion to the  $F_1$  parent as a tester for combining ability. The improvements in performance of  $F_1$  hybrids derived by crossing the best performing  $F_4$  lines as predicted by their reciprocal test cross performance indicated that progress could be made for gain in combining ability through a breeding procedure similar to reciprocal recurrent selection in cross pollinated crops.

**Key words :** Combining ability, Segregating generation, Reciprocal selection

Cotton improvement programmes that concentrate on the development of hybrids have contributed to improving cotton productivity (Dagaonkar and Malkandale, 1993). However, genetic gain in yield potential of hybrids appears to be approaching stagnation. In breeding programmes aimed at improving productivity of pure lines, *i.e.*, not hybrids, variability is created and exploited by practicing selecting for yield during segregating generations. However, improving the performance of hybrids requires that scientists consider the combining ability of potential parental material (Patil and Patil, 2003). In cross pollinated crops like maize, hybrid breeding programmes are supplemented by regular systematic programmes aimed at improving combining ability (Patil and Pandit, 1991). Systematic attempts have not been practiced in cotton to create variability for combining ability, *i.e.*, combining ability was not considered as a trait for improvement in hybrid breeding programmes. Reciprocal recurrent selection schemes for improving combining ability have been an integral part of hybrid breeding programmes in cross pollinated crops and such programmes have contributed to success of hybrid maize. The procedures of improving combining ability in cross pollinated species can not be followed in cotton without suitable modification. Hence, there is a need for defining procedures of improving combining ability to serve as a

pre-requisite in hybrid breeding in cotton. It is possible to recombine two, four or more lines (selected for combining ability) by single, double or multiple crossing or simulated intermating. Generally, individual plants in the  $F_4$  generation are selfed and crossed with a tester line to initiate the selection of improved inbreds. The objective of this research was to determine the combining ability among segregant  $F_4$  lines within two diverse populations.

### MATERIALS AND METHODS

Following analysis (data not shown) of a large set of single crosses, two single cross hybrids RAHH 102 (RAH10 × RA100) and RAHH 136 (RAH20 × RAH200) were selected for this study based on their predicted double cross performance (Patil and Patil, 2003). Plants within each population were advanced to the  $F_4$  generation. Twenty-six, *i.e.* single plants, from each cross were selected randomly and crossed to the reciprocal  $F_1$  hybrid as the tester parent. Thus,  $F_4$  plants from RAHH 102 were crossed with RAHH 136  $F_1$  and random  $F_4$  plants from RAHH 136 were crossed to RAHH 102  $F_1$  to establish two sets of reciprocal hybrids. A field evaluation was conducted for two sets of hybrids in Randomized Complete Block Design with three replications having two rows of 5 metre length. The whole experiment *i.e.* crossing and evaluation of the hybrids was conducted at University of Agricultural Sciences Dharwad during 2005-06 which receives an annual rainfall of 750 mm. Proper pest and disease control measure was taken to avoid economic loss. The characterization of the combining ability status of two sets of  $F_4$  (26 each) lines was determined based on the performance of the crosses (seed cotton yield) compared with the  $F_1$  reciprocal testers. Each  $F_4$  line was assigned to one of four classes

#### Correspondence to:

SOMASHEKHAR, Department of Genetics and Plant Breeding, University of Agricultural Science, DHARWAD (KARNATAKA) INDIA

#### Authors' affiliations:

AYYANAGOUDA M. PATIL, S.S. PATIL AND P.M. SALIMATH, Department of Genetics and Plant Breeding, University of Agricultural Science, DHARWAD (KARNATAKA) INDIA