Genetic control of margers in the annual medic cv. sephi

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Following the advent of the three aphid species, Spotted Alfalfa Aphid (Therioaphis trifolii (Monell) f. maculata), Blue Green Aphid (Acrythosiphon kondoi (Shinji) and Pea Aphid (A. pisum (Harris)), from 1977 into Australia, the annual medic breeding program of the South Australian Department of Agriculture has placed emphasis on the identification of new aphid resistant replacements for older aphid susceptible cultivars. This has been achieved through initial glasshouse testing for aphid resistance of a wide range of lines followed by build-up and distribution throughout Australia for field testing of resistant selections.

Of the lines distributed, one in particular, designated SAD6297, was found to be outstanding in parts of New South Wales, and acceptably good over much of the Australian wheat belt as a highly SAA and BCA resistant replacement for the older barrel medic cultivar Jemalong. As a result, steps were taken to register the line under the cultivar name Sephi.

However, it has become evident that the line is a mixture of two types which are indistinguishable except in leaf markings. The major proportion of the line has a brown edged, irregular water mark, centred on the upper mid vein of the upper leaflet surface. The minor proportion has a brown blotch centred on the lower mid vein of the upper leaflet surface.

As SAD6297 derives from two plants, which were both watermarked, and as attempts to rogue out the smaller proportion had proved fruitless, it was hypothesized that blotch marked individuals arise through segregation involving one or more recessive genes.

Methods

To test the hypothesis, a group of random plants from a population of SAD 6297 were progeny tested. Each parent plant was carefully characterized for leaf markers. Rods harvested from individual plants were grown on as progeny rows in flats in a cool greenhouse to facilitate leaf marker development. Each row included approximately 20 seedlings, and each seedling was assessed for leaf markers. Progeny characteristics could then be related back to the parent plant, and conclusions drawn accordingly.

Results and Discussion

Of the 35 progeny rows grown, nine segregated to reveal individuals with different markings to that of the parental line. In each case, the parental line was watermarked and the "off type" progeny were blotched. None of the nine progeny rows grown from blotched parents showed segregation for leaf markers, while seventeen progeny rows of watermarked parents were also non segregating. Of the segregating rows, the ratios of blotched progeny to watermarked progeny varied between 7 to 13 and 3 to 18. Totalled, the ratio of blotched to watermarked individuals was 49 to 135 or 27%.

These results indicate that blotched individuals in SAD6297 do arise from segregation of some of the watermarked plants. Further, the proportion of blotched individuals in the segregating progenies were all quite close to 1 in 4 and conform to that ratio when statistically tested. Coupled with the further observation that blotched individuals "breed true", it is then logical to conclude that two leaf markers in SAD6297 have arisen from genetic segregation at a single locus, with the blotch mark being recessive to the watermark. Also therefore, at least one of the two original plants of SAD6297 was heterozygous for these leaf markers.

This information has been used to facilitate the registration and release of SAD6297 as the new barrel medic cultivar Sephi, as a multiline of the two leaf marker types, and will he used to ensure future varietal stability in the relative proportion of the two markers.