

Strain Crossing For Large-Leaflet Alfalfa: A First Look

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An ongoing selection program at the University of Arizona has as its primary objective encouraging greater alfalfa yield and/or quality by increasing leaflet size. Six cycles of recurrent mass selection have been completed for large leaflet size in the cultivar 'Hayden'. The selection program appears promising. Leaflets from a population representing the fifth cycle of selection had a 75% larger mean leaflet area than the original variety 'Hayden'. However, as seen in yield trial results from the Maricopa Agricultural Center published in the 1986 Forage and Grain Report, the experimental 'Large-Leaflet' germplasm does not appear to have distinct yield advantages compared to the check variety 'Lew'.

A breeding procedure called "strain crossing" is being utilized in an attempt to improve the overall yielding ability and/or nutritional quality of this alfalfa. Recently, strain crosses in alfalfa have been shown to be an effective breeding technique for incorporating multiple pest resistance without damaging yield. Very little current information is available, however, on the feasibility of transferring more complicated characteristics, such as leaflet area.

In the spring of 1985, the population representing the most recent cycle of selection for large leaflet size was transplanted into an isolation crossing block on a 1:1 basis with plants of 'CUF 101', a popular Arizona alfalfa variety. Approximately 85 plants of each were planted (with 1 meter spacing) in alternating rows at the Plant Materials Center, in Tucson, AZ. Honeybees were placed near the field to facilitate cross-pollination between the different 'Large-Leaflet' and 'CUF 101' plants.

A progeny test was then used to evaluate how much intercrossing actually occurred between these two strains and to determine the degree to which the higher yielding capacity of 'CUF 101' was combined with the larger leaflet characteristic of the experimental population. Seed was harvested from each of the 170 individual 'CUF 101' or 'Large-Leaflet' plants. This seed (progeny) was replanted on Nov. 1986 in a nearby field in a double replicate, incomplete block lattice design. The progeny rows are being evaluated during the 1987 season for yield, leaflet area and growth rate.

Results from a harvest of the progeny test on June 15, 1987, showed that, although yield was not significantly affected by maternal parentage, leaflet area was. Leaflet area of the plants grown from seed of the 'Large-Leaflet' germplasm averaged 3.92 cm² while that of 'CUF 101' averaged only 3.33 cm². This represents more than a 15% difference in leaflet size between the 'CUF 101' vs. 'Large-Leaflet' progeny. There was a 28% difference between the 'CUF 101' and 'Large-Leaflet' parents for leaflet size (3.32 and 4.25 cm², respectively). Yield of the 'CUF 101' progeny averaged 18% below that of the 'CUF 101' parent while yield of the 'Large-Leaflet' progeny averaged 10% greater than its maternal source.

There was a slightly negative, but not statistically significant ($r^2=.04$), relationship between the single-harvest dry matter production and leaflet area in the progeny of this strain cross (Figure 1). This is encouraging because it indicates that it is possible to change this particular morphological characteristic (leaflet size) in alfalfa without hurting its yielding capacity.

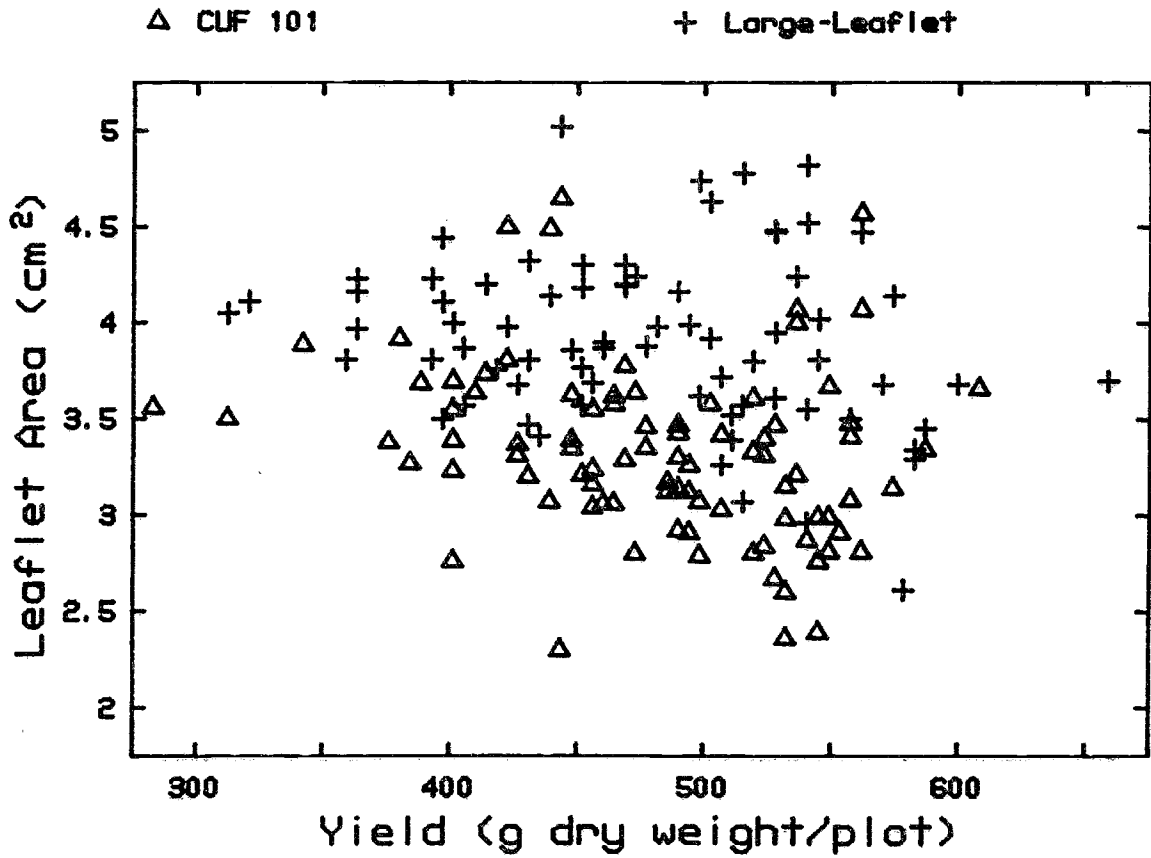


Figure 1. Relationship between leaflet area and dry matter production in the progeny of a strain cross between 'CUF 101' and 'Large-Leaflet' germplasm. Data is from the June 15, 1987 harvest only.