CHANGING THE LEAF AREA ON ALFALFA

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Summary

The leaf area index (leaf area per unit land area) of alfalfa is closely related to yield. Leaf area can be changed by selecting and breeding plants that have larger leaflets. We are increasing the total leaf area per plant and research is progressing to determine the effect of larger leaflets on water use, transpiration, photosynthesis, yield, and quality of the forage.

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Increasing yield is a primary objective of alfalfa plant breeders. In the past, yield has been increased by introducing new varieties that are resistant to disease and insect damage and also by the use of new management practices. Another possibility for increasing yield is to change the leaf area of alfalfa. The amount of leaf area on a plant, which can be utilized for photosynthetic and other physiological functions necessary for growth, is closely related to yield in some crops. Alfalfa yield is closely associated (Figure 1) with leaf area index because most of the above ground growth is removed at each harvest. Leaf area index at the spring harvest is between 5 and 6 (5 to 6 times as much leaf area compared to 1 unit of land area) and then decreases to 2.5 at the last three harvests. The yield follows the same trends as the leaf area index with early season forage production of 2 tons/acre dropping to 1 ton/acre in August.

Researchers at the University of Arizona have been developing alfalfa for larger leaflet size during the last five years. Research is now being conducted to compare the physiological and morphological effects of the large leaf characteristic. This new germplasm is being compared to Hayden which is the original variety used for selection of large leaflet clones.

Parameters including apparent photosynthesis, forage yield, leaflet size, leaf area index, specific leaf weights, leaf to stem ratios, and overall leaf area will be measured and compared to Hayden.

Preliminary results of the first two harvests indicate that the large leaf alfalfa has a greater specific leaf weight and a greater leaf-to-stem ratio. The leaflet size of the large leaf variety is twice as large as the Hayden variety. In the first harvest the leaf area index of the large leaf variety was greater than Hayden; and there was 39 percent more leaf area per stem in the large leaf variety. In the second harvest the leaf area index of the Hayden variety was greater than the large leaf; and there was only 7 percent more leaf area in the large leaf variety.

Changing the Leaf Area on Alfalfa

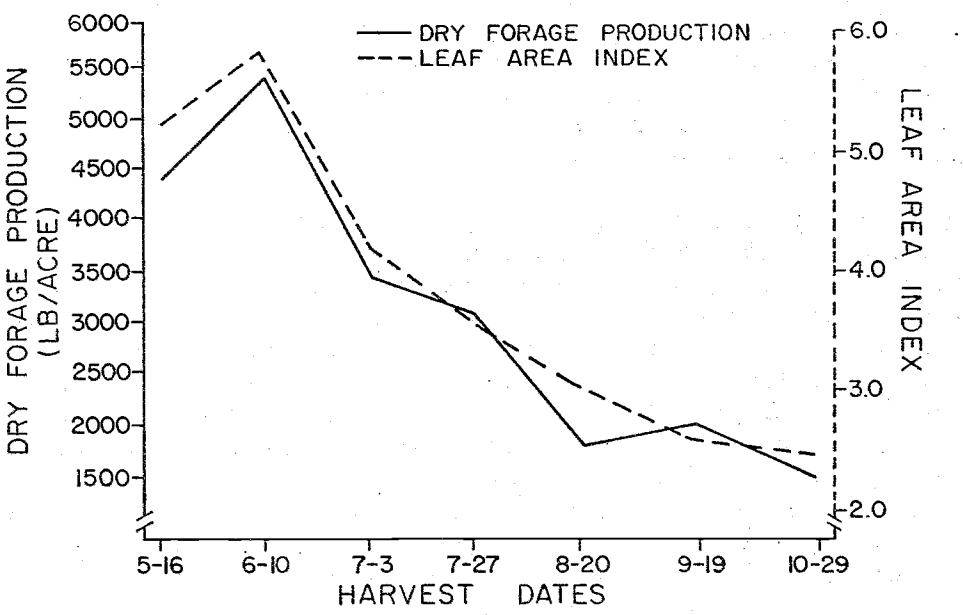

Figure 1. Seasonal leaf area index and dry forage production of alfalfa grown at Tucson, Arizona.