

IMPROVEMENT OF ANNUAL SWEETCLOVER FOR TEXAS

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Background. Annual white sweetclover (*Melilotus alba* Desr.) is a forage legume that has been used for pasture, hay and soil improvement and is very well adapted to the blackland and prairie soils of the Southern Great Plains that extend through central Texas. Sweetclover was used through most of Texas prior to the 1950's when inexpensive nitrogen fertilizer reduced the use of all forage legumes. Animal health concerns related to dicoumarol toxicity (causes bleeding disease) also contributed to the decline of sweetclover as a hay crop.

The goal of this research project is rapid development of multiple cultivars of annual sweetclover to match specific Texas needs. Improvements will include: reduction of coumarin to eliminate sweetclover bleeding disorder in livestock; improvement of disease resistance; and development of fine-stemmed types to improve forage quality.

Research Findings. Hand crosses and bee cage crosses were made in March, April and May 2001 between Denta and Emerald sweetclover. This specific cross was made to combine the traits of low coumarin and multi-stemmed crowns. Details on the crosses and the F1 and F2 generations have been reported previously.

One hundred and forty three F3 families were chosen for further evaluation based on F2 parent data and available seed. These 143 families and 3 checks (2 entries of *M. dentata* and the cultivar Hubam) were planted on Oct. 29, 2003 at Thrall, TX. These entries were arranged in a randomized complete block design with 2 replications and planted in 6 ft. rows with 4 ft. between rows. Seed were hand scarified, tested for germination and planted at 40 seed per row. Remnant seed from germination testing were planted in flats in the greenhouse at 25 plants per entry.

Evaluation of the low coumarin F3 families was started in early March, 2004. Notes were taken on plant height, forage potential and stand. Twenty-seven families were identified with adequate stand establishment, winter survival and moderate to good early season growth. Plants in this select group of lines were 4 to 8 inches tall with a leafy, multi-stem structure. The sweetclover families were evaluated again on April 19 and April 29. Six elite lines were identified for further evaluation and seed increase. Flowering of these six lines on June 22 at Thrall, TX ranged from late bud stage to full bloom. For comparison, Hubam at the same date had completed flowering and was in the green seed stage. The six elite sweetclover lines ranged from 5 to 6 ft tall on June 22.

Seed of the six elite sweetclover lines identified at Thrall in the spring were started in the greenhouse at Overton in October, 2004. At 60 to 90 days of age all plants were assayed to

confirm low coumarin status. One line was discarded due to variable coumarin content and two additional lines discarded due to variable plant type and low vigor. Three lines were noted with good seedling phenotypes and 99% low coumarin (one plant in one of these three lines was discarded due to high coumarin). In mid December plants of these three sweetclover lines were transplanted to the field in separate blocks at the Texas A&M University Agricultural Research and Extension Center at Dallas. Six hundred and forty-five total plants were transplanted in blocks of 225, 310 and 100 for lines 2022-10, 2024-21 and 2022-32, respectively.

The three seed increase blocks at TAMUAREC Dallas were evaluated in March and April. Generally all the plants were in rosettes that ranged from 10 to 16 inches in diameter. The line 2022-32 was noted as the most leafy and the best forage type on April 15. By mid July all plants in lines 2022-10 and 2022-32 were in full bloom with some green seed and line 2024-21 ranged from vegetative to full bloom. Line 2022-10 was classified as intermediate multi-stemmed (5-10 stems per plant) and plant height ranged from 58 to 72 inches. Line 2022-32 was uniform and strongly multi-stemmed (50 to 65 stems per plant) with plant height ranging from 28 to 36 inches. Line 2024-21 was variable for stem type (single stem to multi-stemmed) and maturity. Plant height of 2024-21 ranged from 36 to 72 inches.

Line 2022-10 was generally uniform, but five plants (5/200; 2.5%) were identified as early flowering and seed of these five plants were harvested separately on July 26. The remaining plants of 2022-10 were harvested on Aug. 19. Line 2022-32 was generally uniform and was also harvested on Aug. 19. Line 2024-21 was harvested on Sept. 13. Four to five lbs of clean seed was produced for each sweetclover line.

Application. New cultivars of sweetclover are being developed for Texas. These new sweetclovers will not cause bleeding disorders in livestock and will produce high quality grazing and hay due to fine stems and the multi-stemmed trait.