

Initial Development of Early Blooming Annual Cool Season Legumes for Use in Conservation Tillage

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Introduction

Earlier in this century legume cover crops were in wide use. Farmers utilized various legumes for green manure crops throughout the Southeastern United States. These crops provided excellent cover for the prevention of soil erosion and they also produced valuable nitrogen for subsequent crops. With the popularity of commercial fertilizers, the use of legumes for green manure crops declined. However, agricultural scientists have again begun to do extensive work with cool season legumes for use on southern farms in conservation tillage systems.

Much of the beneficial nitrogen produced by legumes is assimilated by the time most cool season annual legumes flower. Therefore, it would be advantageous to develop various legume cultivars that display the early blooming characteristics, since this would allow for flexibility in conservation tillage systems. With this in mind, the Americus Plant Materials Center has begun a program to develop new early blooming cool season annual legume cultivars for conservation tillage use.

Legumes Used in Conservation Tillage Work

The results of a study conducted in the Piedmont of Georgia suggest that a double cropping system of reseeding crimson clover (*Trifolium incarnatum* L.) and grain sorghum (*Sorghum bicolor* L.) Moench) provided sufficient nitrogen for maximum sorghum grain yield (Touchton, et al., 1982).

Another study in Georgia used crimson clover, (*T. incarnatum* L.), subterranean clover (*Trifolium subterraneum* L.), hairy vetch (*Vicia villosa* Roth.) and common vetch (*Vicia sativa* L.) in a grain sorghum *S. bicolor* (L.) Moench) no-till system (Hargrove, 1986).

Initial Screening of Legumes

In fall 1983, the Americus Plant Materials Center started to assemble and evaluate collections of cool season annual legumes, for use as cover crops in conservation tillage systems. The center has used the initial evaluation block located on Orangeburg sandy loam at Americus, Georgia to screen approximately 1,000 cool season annual legume accessions. These legumes have included germplasm from several genera including *Lathyrus*, *Trifolium*, *Vicia* and *Medicago*. They were assembled from foreign, as well as naturalized populations. All foreign accessions came through the plant introduction system. The naturalized legumes were collected and processed by Soil Conservation Service personnel in the Southeastern United States. Each accession (a documented and numbered legume) was evaluated for adaptability, growth, vigor, winter hardiness, stand, reseeding ability, flowering date, seed production, disease resistance and insect resistance.

Early Blooming Hairy Vetch

In 1987, two early blooming hairy vetch (*V. villosa* Roth.) accessions, 9053961 and 9052057 were observed growing in the Americus Plant Materials Center initial evaluation block. Seed from these accessions were harvested on and September 18, 1987 were planted to two separate small increase blocks. On April 6, 1988 the 9053961 block was rogued except for 34 lines (plants), which were selected for vigor and mid-bloom Characteristics. On May 13, 1988 this seed was harvested according to individual lines. The 9052057 accession displayed a delay in blooming and was discarded.

On September 28, 1988 seedlings from each of the 34 selected 9053961 lines were planted to an evaluation block. The block was divided into four replications. Each line was randomly planted to each replication in a six foot by six foot spacing pattern with four seedlings per line per replication. Therefore the block consisted of 544 space planted individuals. Replacement plants were added when needed. On March 22, 1989 the entire block was evaluated for early bloom, uniformity and vigor. This evaluation resulted in the selection of the most vigorous, early blooming plants in the test. This information was used to rank all lines according to their selection results. Then 34 plants were selected that belonged to the highest ranked lines. All other plants were removed. Seed from these selected plants will be harvested and used in a similar evaluation in 1990.

Early Blooming Crimson Clover

In 1987, eleven accessions of early blooming crimson clover (*T. incarnatum* L.), were observed in the initial evaluation block at the Americus Plant Materials Center. Seed was collected from these accessions and equally bulked. On October 19, 1987, 670 seedlings from these seeds were space planted to a three foot by three foot grid system. On March 31, 1988 the 670 plants were rogued for vigor and early bloom characteristics. Two hundred plants were selected that displayed the desired phenotypic characteristics. On May 4, 1988 seed from these 200 plants were collected individually.

On October 24, 1988 seedlings from each of the 200 selected plants (lines) were planted to a stratified grid at the Americus Plant Materials Center. Each of the 200 lines were randomly planted to five replications within the grid. This produced a total of 1,000 individual plants on a two foot by two foot spacing within the rectangular grid. The grid consisted of 40 blocks with each block containing 25 plants. Rows of Tibbee Crimson Clover seedlings were space planted around the grid for comparison and competition. Replacement plants were added when individuals died.

On February 14, 1989 five plants from each 25 plant block were selected for early bloom and vigor characteristics. All other plants in the grid were removed. After cross-pollination has occurred, seed from each of the selected

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plants will be harvested. This will result in 200 lines for similar evaluation in 1990.

Future Development for Conservation Tillage

After one or two more selection cycles, the Americus Plant Materials Center hopes to develop new crimson clover and hairy vetch cultivars that will bloom early and fit into conservation tillage systems in the Southeastern United States. Seed will be provided to the Soil Conservation Service, Agricultural Research Service, universities and Agricultural Experiment Stations for conservation tillage experimentation.

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Literature Cited

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