

SELECTING CRIMSON CLOVER FOR HARD SEED AND LATE MATURITY

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Abstract

Available crimson clover (*Trifolium incarnatum* L.) cultivars in the USA flower approximately 2 weeks before annual ryegrass (*Lolium multiflorum* L.) which makes it difficult to manage a mixture of the two for reseeding. The objective of this study is the development of a crimson clover cultivar that flowers at approximately the same time as annual ryegrass and has a high level of hard seed to enhance reseeding. Selections for late maturity were made out of >Chief= crimson clover. After two cycles of selection for later maturity and one cycle for hard seed, nineteen half-sib lines were identified that were later maturing and had over 60% hard seed. Early growth of these lines was compared to >Dixie= crimson clover. Eight of these lines were selected to form an experimental cultivar that flowered approximately 2 weeks later than Dixie crimson.

Keywords: Reseeding annual clover, volunteer seeding

Introduction

Crimson clover and annual ryegrass are used in the southeastern USA for overseeding warm-season perennial grasses for grazing (Hoveland and Evers, 1995). The popularity of crimson clover is due to its good seedling vigor, adaptability to a wide range of soil types, and early forage production. It is considered a poor reseeder because of low level of hard seededness (Williams and Elliott, 1960). Annual ryegrass is easy to establish, adapted to a wide range of soil types, tolerates close, frequent defoliation, and is later maturing than the small grains (Evers et al., 1997).

In northeast Texas livestock must be removed from crimson clover cultivars by mid-April to provide sufficient seed for volunteer reseeding the following autumn (Evers et al., 1998). Annual ryegrass can be grazed two weeks later than crimson clover before livestock have to be removed for reseeding (Evers and Nelson, 1995). If a crimson clover-annual ryegrass mixture is managed for reseeding, livestock must be removed in mid-April resulting in a loss of two weeks of ryegrass grazing. If a crimson clover cultivar with a high hard seed level that matured approximately the same time as annual ryegrass were available, grazing of the crimson-ryegrass mixture could be extended to the end of April and still provide sufficient seed production for volunteer stand the following autumn.

Material and Methods

In the autumn of 1996, Chief crimson clover was seeded in row 0.7 m apart with plants approximately 25 cm apart within the row for a total of about 2000 plants. Plants were removed as

they began to flower until only 20 of the latest flowering plants remained. These plants were allowed to set seed that was hand harvested. The following autumn (1997) the seed were placed in a germinator and all soft seed were discarded. The remaining hard seed were hand scarified and planted in the greenhouse. Seedlings were grown in the greenhouse for 6 weeks and then 1000 plants were transplanted in the field. Early and mid-season flowering plants were removed and seed was harvested from the remaining 95 very late flowering plants. Level of hard seed was determined on the seed from each individual plant. Nineteen half-sib lines were selected with hardseededness of 60% or greater. The nineteen selected lines and Dixie crimson clover were planted at 0.8 g of seed in 3 m rows in a randomized complete block design with three replications on 23 Oct. 1998. On 5 February and 1 March 1999, seedlings were removed from 0.2-m of row to record plant density and leaf number per seedling. Shoots were separated from the roots and both dried at 60 C for 48 hours to estimate shoot and root yields. Plant height was recorded on 31 March. Flowering was recorded from February through April 1999. Analysis of variance was conducted on the data with mean separation by Fisher=s Protected LSD Test at the 0.05 level of significance.

Results and Discussion

There were significant differences ($P \leq 0.05$) among crimson clover lines for all seedling traits. Seedling density ranged from 28.3 to 85.0 seedling m^{-1} of row (Table 1). Seeding rates were based on seed weight so some of the variation in seedling density was probably due to differences in number of seed planted because of differences in seed size. None of the crimson clover lines had more leaves per seedling, shoot yield, or root yield than Dixie crimson clover. But nine of the lines had fewer

leaves per seedling than Dixie. A few of the lines had lower shoot and root yields than Dixie. All the lines except two were shorter than Dixie on 31 March because of their later maturity.

In this study, on 25 March, Dixie crimson was at 50% bloom while the 19 crimson half-sib lines all remained vegetative or in very early bud stage. By 2 April, Dixie was in full bloom and the crimson lines ranged from vegetative to one-tenth bloom. On 2 April, the half-sib lines were evaluated using all quantitative data and by visual rating of forage production potential (data not shown). Eight lines were selected to be polycrossed and the remaining entries (including Dixie) were removed by mowing and disking to restrict pollination. These eight selected crimson lines reached 50% bloom on 12 April. Seed were harvested from the selections in early June and bulked to produce an experimental cultivar. We expect this experimental cultivar to be 2 weeks later in flowering than Dixie and to be more reliable in reseeding than current crimson clover cultivars due to a higher hard seed content.

References

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Table 1 - Comparison of seedling traits of crimson clover lines with Dixie crimson clover, 1 March 1999.

Line	Density	Leaf no.	Shoot yield	Root yield	Plant ht.
	no. m ⁻¹ row	no.	g m ⁻¹ row	g m ⁻¹ row	cm
Dixie	46.7	43.3	58.8	11.8	45.9
7-2	43.3*	22.5	24.5	6.7	28.8
7-6	46.7*	38.8*	39.0	11.0*	28.8
7-8	55.0*	27.0	35.0	9.3*	25.0
7-10	48.3*	31.5*	35.5	9.5*	24.6
8-2	45.0*	31.6*	37.8	10.5*	35.6
8-8	70.0*	19.1	27.8	8.5*	22.0
8-5	55.0*	30.7*	36.8	10.7*	26.7
8-11	53.3*	20.4	23.7	7.7	22.0
8-15	56.7*	29.8*	40.3*	12.3*	26.7
9-3	81.7	33.9*	60.0*	15.3*	34.3
9-4	60.3*	27.2	45.2*	11.2*	36.4
9-7	51.7*	35.7	42.8*	11.5*	37.3*
9-9	53.3*	26.6	39.7*	10.7*	36.4
9-10	36.7*	29.2*	39.8*	7.7	32.2
11-4	46.7*	32.3*	56.5*	11.2*	37.3*
13-4	36.7*	36.4*	43.0*	8.2*	30.1
14-5	50.0*	22.8	26.5	9.8*	21.6
14-8	85.0	20.9*	50.5*	11.7*	34.3
15-2	28.3*	52.6	31.0	8.7*	25.8
Bulk 98	26.7*	54.5	32.7	7.7	
LSD _{0.05}	29.4	14.7	20.9	3.8	9.2

*Not significantly different ($P \leq 0.05$) from Dixie crimson clover.