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## COMPARISON OF CRIMSON CLOVER VARIETIES IN NORTHEAST TEXAS

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### Summary

Eight crimson clover (*Trifolium incarnatum* L.) varieties were compared for seedling growth, dates to reach four flowering stages, and forage yield at the Texas A&M University Agricultural Research and Extension Center at Overton. There were significant differences among varieties for leaf no., leaf area, root length, and shoot weight on 23 November, 8 weeks after planting. 'Dixie' crimson clover had the highest or second highest value for all seedling parameters except nodule number. Four weeks later there were no significant differences among varieties for any seedling parameter. Maturity ranged over 35 days with 'AU Robin' being the earliest and 'Columbus' the latest maturing variety. Maturity did not influence yield. 'Flame', 'Dixie', 'Tibbee', 'Chief', and Columbus crimson clovers were the most productive at about 2 tons/acre.

### Introduction

Crimson clover is a cool-season annual legume grown throughout the southeastern US except for peninsular Florida (Knight, 1985). It is used to a limited extent as a summer annual green manure crop in the northern US. Good seedling vigor (Evers, 1982), earlier forage production than other clovers (Gilbert et al., 1993), and adaptability to a wide range of soils, make it well suited for overseeding warm-season perennial grasses (Knight, 1970). Crimson clover is preferred for overseeding hay meadows because it is earlier maturing than other cool-season legume species and therefore less competitive to the warm-season grasses initiating growth in the late spring.

Since the development of 'Dixie' in 1946, the first crimson clover released in the US (Knight, 1985), public and private plant breeders have released many new varieties. Most of the new varieties were selected for earlier maturity to be used in no-tillage crop rotations (Holderbaum et al. 1990). No published reports comparing all available varieties for flowering and yield at the same location are available. Valid comparisons for flowering dates must be made at the same location since flower development in crimson clover is influenced by temperature and photoperiod (Knight and Hollowell 1958). Seedling growth, flowering stages, and yield were compared for

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eight varieties of crimson clover at the Texas A&M University Agricultural Research and Extension Center at Overton.

### **Procedures**

Crimson varieties used in this study and their respective seed weights and germination are reported in Table 1. Low germination of 'Auburn' was due to old seed. The study was planted on a Darco fine sandy loam with a topsoil depth of greater than 48 in. Preplant fertilization was 60 lb/acre of phosphorus and potassium and 1 lb/acre boron. Seed were inoculated with the appropriate rhizobia strain immediately before planting and drilled in 7-in. rows at 16 lb pure live seed (PLS)/acre on 29 Sept. 1993. Experimental design was a complete randomized block with four replications.

Poast (sethoxydim) was applied at 1 qt/acre for annual grass control on 12 Nov. 1993. Ten seedlings were removed at random from each plot on 23 Nov. and 21 Dec. 1993. After washing soil from the roots, leaf number, leaf area, shoot weight, nodule number, root length, and root weight were determined. Broadleaf weeds were controlled with basagran (bentazone) applied at 1 qt/acre on 7 Feb. 1994. Plots were harvested on 11 Mar. 1994. Beginning in mid-March, plots were observed every Monday, Wednesday, and Friday to record date of first bud, 10% flower, 50% flower, and 90% flower. All cultivars except Columbus were harvested on 26 Apr. 1994. Columbus crimson clover harvest was delayed until 4 May 1994 because of its later maturity. Standard analysis of variance was performed on data with mean separations by Waller-Duncan Multiple Range Test at 0.05 level of significance.

### **Results and Discussion**

Differences in leaf number, leaf area, root length and shoot weight among varieties were significant at the 23 Nov. sampling date (Table 2). Dixie crimson had the highest or second highest value for all seedling parameters except nodule number. Flame and Tibbee crimson had high values for leaf number, root length, and shoot weight. AU Robin had high shoot weight and leaf number. Data from the 21 December sampling date are not reported since there were no significant differences among varieties.

AU Robin was the earliest maturing variety, reaching 50% flower on 23 Mar., 9 days before Dixie (Table 3). Tibbee is reported to be earlier than Dixie, but at this location they reached flowering stages on similar dates. 'American' and Columbus crimson clover are new varieties which reached 50% flower 3 and 5 weeks later than AU Robin.

There was not a strong relationship between maturity (Table 3) and yield (Table 4). Early maturing varieties tended to be more productive at the first harvest but Auburn and Flame were exceptions. Although varieties were planted on a pure live seed basis, Auburn stands were not as good as the other varieties. Seedling and plant vigor was probably poor because of old seed. The late maturing Columbus and American crimson had very low productivity at the first harvest. At the second harvest, only AU Robin and American produced less than 3000 lb/acre. Columbus was not harvested until 4 May after it reached 90% flower. Delaying harvest another week or two may have resulted in a small yield increase.

Flame, Dixie, Tibbee, Chief, and Columbus produced similar yields although they reached 50% flower over a range of 30 days. In northeast Texas, Dixie crimson clover initiates a spring growth surge about a month before bud stage. Later maturing varieties begin this growth surge later in spring and therefore are not higher yielding than early maturing varieties. Daylength appears to have a greater influence on maturity than temperature. The early maturity of the crimson species is an advantage for overseeding hay meadows, as a green manure crop in summer crop rotations, and early clover forage production. The late maturing varieties have potential to extend the growing season when mixed with early maturing varieties. They also would work well in annual ryegrass mixtures that are managed for reseeding since they would flower at approximately the same time. Late maturing varieties may be more productive in the northern US where daylength is longer at favorable temperatures for growth. The study will be repeated to verify this first year's data.

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Table 1. Seed weight and germination percentage of eight crimson clover varieties grown at Overton, Texas.

Variety	100 seed wt.	germ.	Variety	100 seed wt.	germ.
	g	%		g	%
American	.592	73	Columbus	.375	88
Auburn	.315	33	Dixie	.497	97
AU Robin	.495	95	Flame	.511	90
Chief	.424	94	Tibbee	.464	98

Table 2. Seedling parameters of eight crimson clover varieties sampled on 23 Nov. 1993.

Variety	Leaf no.	Leaf area	Root length	Nodule no.	Shoot wt.	Root wt.
		in. <sup>2</sup>	in.		g	g
American	3.44 b <sup>1</sup>	1.09 cb	3.8 ab	16.3	.051 b	.019
Auburn	5.41 a	0.97 c	3.5 b	14.9	.039 b	.010
AU Robin	4.86 a	1.13 cd	3.7 ab	18.4	.054 ab	.016
Chief	4.39 ab	1.15 cd	3.8 ab	15.7	.045 b	.014
Columbus	3.59 b	0.94 c	3.8 ab	13.6	.041 b	.011
Dixie	5.15 a	1.54 a	4.0 a	17.3	.075 a	.018
Flame	4.93 a	1.24 b	3.9 a	17.5	.053 ab	.015
Tibbee	4.39 ab	1.28 b	4.0 a	16.5	.055 ab	.016

<sup>1</sup>Values within a column followed by the same letter are not significantly different at 0.05 level, Waller-Duncan Multiple Range Test.

Table 3. Dates on which eight crimson clover varieties reached four flowering stages at Overton, Texas.

Variety	First bud	Flowering		
		10%	50% (M <sup>1</sup> )	90%
AU Robin	16 Mar	21 Mar	23 Mar (0)	30 Mar
Auburn	18 Mar	25 Mar	28 Mar (5)	6 Apr
Flame	18 Mar	23 Mar	28 Mar (5)	4 Apr
Tibbee	21 Mar	25 Mar	30 Mar (7)	4 Apr
Dixie	21 Mar	26 Mar	1 Apr (9)	5 Apr
Chief	23 Mar	30 Mar	4 Apr (12)	11 Apr
American	6 Apr	11 Apr	15 Apr (23)	20 Apr
Columbus	18 Apr	25 Apr	27 Apr (35)	2 May

<sup>1</sup>Maturity-days to reach 50% flower after AU Robin.

Table 4. Yield of eight crimson clover varieties at Overton, Texas.

Cultivar	11 Mar	26 Apr	Total
Flame	361 b <sup>1</sup>	4055 a	4416 a
Dixie	580 a	3649 ab	4229 a
Tibbee	649 a	3545 ab	4194 a
Chief	380 b	3791 a	4170 a
Columbus	107 c	3787 a <sup>2</sup>	3894 ab
Auburn	41 c	3271 abc	3312 bc
AU Robin	632 a	2659 c	3291 bc
American	9 c	2878 bc	2886 c

<sup>1</sup>Values within a column followed by the same letter are not significantly different at the 0.05 level, Waller-Duncan Multiple Range Test.

<sup>2</sup>Harvested 4 May.