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ANNUAL CLOVER VARIETY TRIALS

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Summary

Arrowleaf clovers, Crimson Experimental, and Rose Experimental 79-58 were the most productive clovers in the variety test at Overton with yields of 4000 to 4500 pounds per acre. The yields of other entries ranged down to 1600 pounds per acre. Mt. Barker, Tallarook, Mississippi Ecotype, and Woogenellup were the most productive subterranean clovers, with yields of 4300 to 4800 pounds per acre in a subterranean clover variety test which reseeded naturally in the fall of 1979.

The most productive clovers at Angleton were Tallarook and Mt. Barker subterranean clover, Yuchi arrowleaf, and Abon Persian with yields of 7800, 6100, 5300, and 5200 pounds per acre, respectively. Mt. Barker and Woogenellup subterranean clover were the most productive during the winter months. Protein production ranged from 427 to 1623 pounds per acre and estimated N_2-fixation from 0 to 191 pounds per acre.

Introduction

Interest in growing cool season annual clovers is increasing in the eastern half of Texas because of rising nitrogen fertilizer costs. When grown with warm season perennial grasses, clovers also extend the grazing season which reduces the winter feeding period and the amount of hay and supplement needed. The amount of forage and nitrogen provided by an annual

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clover depends on the adaptability of a given species or variety to the soil and climate. Previous studies have reported yields ranging from 400 to 4000 pounds per acre for various clover varieties (3). Therefore it is essential for farmers and ranchers to select clover species and varieties suited to their particular area.

Clover variety trials were conducted on a poorly drained rice soil at Angleton and a sandy loam soil at Overton. Clover production data on these contrasting soil types will identify clover varieties and species that are best adapted to East Texas soils and climatic conditions. Protein production was determined and nitrogen fixation estimated for the variety test at Angleton and their economic value discussed.

Methods and Materials

Overton

An annual clover species/variety test was seeded October 17, 1979 on a Bowie fine sandy loam soil at Overton. The test included 21 entries consisting of both commercially available varieties and experimental lines within various Trifolium species. A soil sample taken in June showed a pH of 4.8 at the 0-6 inch depth. Dolomitic limestone was applied at the rate of 3 tons per acre in early August. Fertilizer was applied broadcast at the rate of 25-150-96 pounds per acre of N-P_2O_5-K_2O, respectively, and incorporated before planting. Weeds were controlled by a pre-plant application of Eptam 10G™ (2.5 lb A.I./ac) which was immediately incorporated. Inoculum was applied to the seed at three times the recommended rate using a commercial adhesive. Seeding rates for the nine species were as follows: arrowleaf (Trifolium vesiculosum Savi), 14 lb/ac; ball (T. nigrescens Viv.), 3.5 lb/ac; mike (T. michelianum Savi), 9 lb/ac; persian (T. resupinatum L.), 7 lb/ac; T. diffusum L. and T.

dasyurum L., 11 lb/ac; berseem (T. alexandrinum L.), crimson (T. incarnatum L.), and rose (T. hirtum All.), 19 lb/ac. Seed were drilled into a prepared seedbed in plots of six rows, spaced 8-inches apart, 15 feet in length. The test was irrigated immediately after planting and again one week later. At each harvest plots were end-trimmed and forage production determined by cutting a 12 ft. strip of the four center rows of each plot to a height of 2.25 inches.

The subterranean clover test was seeded in the fall of 1978 (3) and re-seeded naturally in 1979. No supplemental irrigation was used. Summer weeds were controlled by a single clipping in August. Maintenance fertilizer was surface applied on October 9, 1979, at the rate of 0-100-100 pounds per acre of N-P_2O_5-K_2O, respectively. Cultivars were clipped to a height of 1.25 inches at each harvest. Estimates of forage below the cutting height were not made at the last harvest.

Angleton

A cool season annual clover variety trial involving four species and ten varieties was conducted on a Lake Charles clay at the Agricultural Experiment Station at Angleton. Seeding rates were 10 pounds per acre for Persian and arrowleaf clovers and 20 pounds per acre for crimson and subterranean clovers. All seed were inoculated at the recommended rate. Plots consisted of six 8-in. rows, 15 ft. long in a complete randomized block design with four replications.

Sixty pounds of phosphorus per acre were applied on Oct. 8, 1979, the day of planting. Forage was harvested with a flail mower at a 1 in. height on February 22, March 24, April 21, and May 28. At the last harvest a 20 x 20 in. sample of the forage below the cutting height was taken on all subterranean clover plots because of their prostrate growth. Kerb (1.5 lb A.I./ac) was applied on December 1 and 2,4-DB (1.75 lb A.I./ac) on January 14 for weed control. Protein content was determined on a sample of harvested forage from

each plot by Kjeldahl procedure. Nitrogen fixation was estimated by difference in the nitrogen content between the clover forage and forage from ryegrass grown in pure stand but receiving no nitrogen fertilizer as described previously (2).

Results and Discussion

Overton

The clover variety test was harvested a total of six times (Table 1). Because the crimson clover entries were in full flower on April 8, they were not cut until April 30 when it was determined that forage production would be maximized. Various other entries were not harvested on all six dates due to insufficient growth.

As in a similar study in 1979 (3), the four arrowleaf clover entries yielded the most forage. RRPS-4 arrowleaf, an experimental from Tifton, Georgia, yielded 4484 pounds per acre of dry forage (Table 1). Crimson Experimental and Rose Experimental 79-58 yielded 4074 and 4025 pounds per acre, respectively, and were not significantly different from RRPS-4. The T. diffusum and T. dasyurum experimental types did not yield well and had a shortened production period.

The reseeded subterranean clover test was also harvested on six dates, November 30 to May 9 (Table 2). Some entries were not harvested on each date due to a lack of forage. Yarloop, one of the eleven cultivars in the original test, did not reseed and was omitted from the 1979-80 test. Mt. Barker produced the most forage over the entire season, 4771 pounds per acre, and was followed by Tallarook, Mississippi Ecotype, and Woogenellup. It is important to note that the most productive varieties reseeded well in the fall of 1979 even though they were mowed close (1.25 inches) throughout the previous growing season (3). Ability to reseed when clipped to a short height may indicate

good reseeding characteristics under grazing conditions. Mt. Barker produced 64% more forage in 1979-80 than in the establishment year of 1978-79. An increase in forage production following reseeding of some subterranean clover varieties has been shown in a similar study (1).

Angleton

Late fall and winter forage production was low because sufficient rainfall to initiate germination did not occur until Oct. 30. Mt. Barker and Woogenellup subterranean clover had the highest winter forage production (Table 3). Although there were significant differences between varieties at the second cutting, dry matter production only ranged from 430 to 980 pounds per acre. Crimson varieties were significantly lower than the other species by the third harvest because of their earlier maturity. At the last harvest Tallarook subclover produced 4060 pounds per acre, 1500 pounds more than Abon Persian, the next highest variety. Subterranean clover production at the last harvest was directly related to maturity, with Woogenellup (early mid-season) yielding 290 pounds, Mt. Barker (late mid-season) yielding 2060 pounds, and Tallarook (late season) yielding 4060 pounds per acre. Approximate percentage of the forage at the last harvest below the cutting height was 100, 60, and 35% for Woogenellup, Mt. Barker, and Tallarook, respectively.

Protein production is similar to yield since there was little difference between varieties for percent protein (Table 4). However it is important to point out the protein and nitrogen production of clovers to demonstrate their economic value as protein supplements for grazing livestock and contribution of nitrogen to the pasture system. If only half of the protein produced by March 24 was utilized by livestock and valued at 35¢/pound (equal to cottonseed meal at $14.70/cwt), protein value per acre of the clover would range from $38 for Meechee arrowleaf to $100 for Woogenellup subterranean clover.

Symbiotic N_2-fixation was estimated by subtracting the nitrogen in the ryegrass forage grown in a pure stand receiving no nitrogen fertilizer from the nitrogen in the clover forage. This method does underestimate symbiotic N_2-fixation since the ryegrass removes more soil nitrogen than the clover because of its fiberous root system and the soil is its only nitrogen source. This is obvious from the calculated value of zero N_2-fixation for Dixie crimson clover.

Abon persian, Amclo and Yuchi arrowleaf, and all subterranean clovers fixed about 100 pounds of nitrogen per acre or more. Estimated N_2-fixation of Tallarook subterranean clover was 191 pounds per acre. If only half of 100 pounds of fixed nitrogen were returned to the soil and uniformly distributed, it would have a nitrogen fertilizer value of $17.50 to $20.00 per acre (35-40¢/lb N).

Literature Cited

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Table 1. Dry matter production of annual clover species and cultivars - Overton, Texas, 1979

	Harvest date						Season total
	6 Feb.	27 Feb.	20 Mar.	8 April	30 April	30 May	
	lb/ac						
RRPS-4 arrowleaf	145	303	603	861	925	1617	4484 a[1]
RRPS-3 arrowleaf	79	308	599	889	1114	1323	4312 ab
Amclo arrowleaf	74	218	530	854	914	1634	4224 ab
Yuchi arrowleaf	45	85	548	883	1158	1493	4212 ab
Crimson Exp.[2]	--	57	752	--	3265	--	4074 abc
Rose Exp. 79-58	--	49	634	1464	825	1053	4025 abc
Chief crimson	14	61	581	--	3188	--	3844 bcd
Meechee arrowleaf	--	--	390	811	1537	1082	3820 bcd
Ball	--	--	207	852	1097	1420	3576 cd
Autauga crimson	29	102	638	--	2539	--	3308 de
Dixie crimson	21	133	781	--	2352	--	3287 de
Abon persian	--	--	30	284	1127	1821	3262 de
Rose Exp. 79-41	--	--	289	1125	1042	505	2961 ef
Tibbee crimson	57	163	411	--	2079	--	2710 efg
Rose Exp. 79-34	29	95	824	1017	744	--	2709 efg
T. diffusum Exp. 79-44	--	--	362	856	697	446	2361 fgh
Mike Exp. 267-270	--	17	575	988	632	--	2212 ghi
T. dasyurum Exp. 79-45	--	--	368	865	646	75	1954 hi
Berseem	74	118	107	269	665	570	1803 hi
T. diffusum Exp. 79-4	--	--	380	809	575	--	1764 hi
T. diffusum Exp. 79-30	--	--	139	746	743	--	1628 i

C.V. = 12%

[1]Yields followed by the same letter are not significantly different at the 0.05 level using Duncan's Multiple Range Test.

[2]Seed collected from farmer's field, Wood County, Texas, and supplied by Mr. J. E. Cates, Agricultural Extension Agent, Wood County.

Table 2. Dry matter production of ten reseeded subterranean clover cultivars - Overton, Texas, 1979

	Harvest date						Season total
	30 Nov.	1 Feb.	25 Feb.	24 Mar.	15 April	9 May	
	lb/ac						
Mt. Barker	101	246	678	1247	880	1619	4771 a[1]
Tallarook	--	69	383	1273	1087	1835	4647 a
Mississippi Ecotype	--	38	320	1197	1071	1806	4432 a
Woogenellup	90	301	880	1116	734	1144	4265 a
Howard	--	51	438	1057	596	494	2636 b
Dwalganup	--	--	239	740	355	578	1912 c
Seaton Park	--	64	304	605	400	--	1373 cd
Dinninip	49	124	317	310	246	--	1046 de
Daliak	--	--	--	477	294	--	771 de
Geraldton	--	--	--	362	262	--	624 e
C.V. = 15%							

[1]Yields followed by the same letter are not significantly different at the 0.05 level using Duncan's Multiple Range Test.

Table 3. Dry matter production of cool season annual clovers on a Lake Charles clay at Angleton

	Cutting date				
	22 Feb.	24 Mar.	21 Apr.	28 May	Total
	lb/ac				
Subterranean					
Tallarook	660 c[1]	630 d-f	2490 a	4060 a[2]	7840 a
Mt. Barker	1150 ab	770 b-d	2140 ab	2060 c[2]	6120 b
Woogenellup	1380 a	840 a-c	2000 bc	290 e[2]	4510 cd
Arrowleaf					
Yuchi	850 bc	650 c-e	1990 bc	1770 c	5260 c
Amclo	780 bc	860 ab	1950 bc	1120 d	4710 cd
Meechee	570 c	430 g	1820 bc	1130 d	3950 d
Crimson					
Tibbee	750 bc	980 a	730 e	--	2460 e
Chief	560 c	710 b-e	1180 d	--	2450 e
Dixie	450 c	690 b-e	820 de	--	1960 e
Persian					
Abon	630 c	460 fg	1570 c	2490 b	5150 c

[1]Values in a column followed by the same letter are not significantly different at the .05 level using Duncan's Multiple Range Test.
[2]Subterranean yields at the last harvest include an estimate of forage below the cutting height by clipping a 20" x 20" area to ground level.

Table 4. Protein production and estimated N_2-fixation of cool season annual clovers on a Lake Charles clay at Angleton

	Protein		
	By Mar. 24	Total	Estimated N-fixation
	lb/ac		
Subterranean			
Tallarook	333	1623 a[1]	191
Mt. Barker	486	1283 b	137
Woogenellup	573	1030 c	96
Arrowleaf			
Yuchi	332	1067 c	102
Amclo	388	1047 c	99
Meechee	216	862 d	70
Crimson			
Tibbee	376	506 e	13
Chief	290	510 e	17
Dixie	260	427 e	0
Persian			
Abon	248	1043 c	99

[1]Values in a column followed by the same letter are not significantly different at the .05 level using Duncan's Multiple Range Test.