

PUBLICATIONS

1982



THE TEXAS AGRICULTURAL EXPERIMENT STATION / Neville P. Clarke, Director
The Texas A&M University System / College Station, Texas

FORAGE PRODUCTION OF RED AND WHITE CLOVER
IN EAST TEXAS

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Summary

Red and white clover varieties were evaluated for forage production and summer persistence on fine sandy loam soils in East Texas. Low yields were recorded on white clover the first year due to low summer rainfall. However, the white clovers did persist through the summer, and in the second year of production, the better varieties produced over 3.5 tons dry matter (DM)/ac/yr. Red clovers were planted in the fall of 1979 and 1980. Neither planting survived through the summer as a perennial, but when adequate moisture was available, dry matter production exceeded 2.6 tons/ac/yr. White clover has the potential of extending high quality forage production into the summer on the heavier, bottom-land soils of East Texas. In these experiments white clover lived through the summer as a perennial. Red clover could also be used to extend the clover growing season but would probably have to be replanted each year, as an annual forage crop.

Introduction

The need for a perennial legume that will produce high quality forage in the summer months in East Texas has been recognized (5). Cool season annual clovers such as arrowleaf (Trifolium vesiculosum Savi) and crimson (Trifolium incarnatum L.) are well adapted to East Texas (3), but most of their forage production is in the fall or early spring. Red clover (Trifolium pratense L.) and white clover (Trifolium repens L.) also produce most of their growth in the

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Keywords: Trifolium repens L./ Trifolium pratense L./ perennial/
summer survival / forage / clover / Texas.

spring, but peak growth occurs about one month later than cool season annual clovers (2). Further, the growing season for red and white clover often extends into the summer months rather than terminating in late spring. This extended production increases the forage quality of swards containing warm season perennial grasses. Associated grasses also obtain the benefit of nitrogen fixed by the legumes through decomposition of roots and nodules and transfer through grazing animals (1).

White clover is a prostrate-growing, stoloniferous pasture legume. Its ability to perennialize is dependent upon climatic conditions and the development of independent stolon root systems (4). White clover is grown on soils with adequate moisture and fertility across the eastern half of the U.S. In comparison, red clover stems grow upright from crowns, and varieties grown in the U.S. have a biennial or short-lived perennial growth habit. Red clover is grown to a lesser extent as a winter annual in the Southeast (6).

A white clover variety trial was established in the fall of 1979 and red clover variety trials were established in 1979 and 1980 to identify adapted varieties and to evaluate summer persistence under East Texas climatic conditions.

Materials and Methods

Seventeen varieties of white clover and 18 varieties of red clover were seeded at the Texas A&M University Agricultural Research and Extension Center at Overton in the fall of 1979. A red clover variety test was seeded again in the fall of 1980. All three experiments were planted in a randomized complete block design with 4 replications.

The white clover varieties were seeded October 12, 1979 on bottomland sites containing a Thenas fine sandy loam soil. The seed were broadcast on a prepared seedbed in 6- x 16-foot plots. Inoculum (Type B) was applied to the seed at 3X the recommended rate. Fertilizer applied at planting was 24-96-96 lb/acre of N-P₂O₅-K₂O, respectively. A soil test (0-6 in.) showed a pH of 5.8, and lime was applied at 1.5 T/acre. Seeding rate for the white clover varieties was six lb /acre. Balan was applied at 3 qts. active ingredient per acre to control broadleaf weeds.

Eighteen red clover varieties were seeded October 18, 1979 on a Bowie fine sandy loam soil. Fourteen pounds of seed per acre were drilled in 4.5- x 15-foot plots. Inoculum (Type B) was applied at 3X the recommended rate using a commercial adhesive. The fertilizer applied at planting was 24-150-96 lb /acre of N-P₂O₅-K₂O, respectively. A soil test (0-6 in.) indicated a pH of 4.8, and 3T/acre of lime was applied prior to planting. A second red clover variety trial was seeded October 1, 1980. The soil type, planting rate, inoculum rate and method of seeding was the same as the 1979 test. A soil test

showed a pH of 5.7 and 1.5 T/acre of lime was applied. Fertilizer applied at planting was 0-100-100 lb/acre of N-P₂O₅-K₂O, respectively.

A rotary mower was used to clip plots to 2.25 inches at each harvest. Total green forage weight per plot was determined in the field at each harvest date. A subsample from each plot was dried at 70°C and dry matter yield calculated.

Results and Discussion

Two harvests were taken in the first year of the white clover test, and no single entry was identified as clearly superior (Table 1). Yields ranged from 3167 to 1763 lbs DM/acre. Two entries, La-S1 and Tamar, yielded significantly less than twelve of the varieties tested. Of the varieties commercially available, Regal and Tillman were the highest yielding in 1979-80. Five harvests were taken in the second year of the white clover test (Table 2). The increased yield and number of harvests were probably due to more rainfall in May-July of 1981 (Table 3). In 1980-81 the varieties Lucky, Arcadia, and Tillman were the highest yielding commercially available white clovers at Overton. It should be noted that in the summer of 1980 precipitation was below average (Table 3). However, the white clovers planted in the fall of 1979 survived through the summer and resumed active growth in the fall of 1980.

Four harvests were taken from the red clover varieties planted in 1979 (Table 4). Yields ranged from 5300 to 3950 lbs DM/acre for Chesapeake and Norlac, respectively. Most of the differences in yield among selections were concentrated in the lower rankings. Due to dry conditions in June 1980 (Table 3) this trial terminated growth earlier than normal. Red clover varieties planted in 1980 were harvested three times with production extending into July (Table 5). This trial was very uniform with production ranging from 3461 lbs DM/acre by Lakeland to 2635 lbs DM/acre by Norlac.

In both 1979 and 1980, red clover behaved as an annual at Overton, showing some potential for summer production when moisture conditions are adequate. The best potential use of red clover in East Texas may be to extend clover production into the summer months.

White clover will often persist through the summer and produce moderate yields (Table 1 and 2) of high quality forage under East Texas conditions. However, it does require a soil with good water holding capacity, and production will halt when water is limiting. Two years of yield trial data and observations suggest that white clover seeded on bottomland soils will survive a dry summer in a semi-dormant condition. If moisture is available, summer dry matter production may be good to excellent.

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Table 1. White Clovers Grown on a Prepared Seedbed. Overton, TX 1979-80

Entry	Harvest Date		Season Total
	5-5-80	6-12-80	
	-----lbs DM/A-----		
S. C. Medium ^{2/}	1932	1235	3167 a ^{1/}
S. C. Nem. Tol. ^{2/}	1569	1544	3113 a
L8-101 ^{2/}	1680	1355	3035 a
K6-8 Ladino ^{2/}	1654	1371	3025 a
L8-100 ^{2/}	1563	1444	3007 a
Fla. XPL ^{2/}	1724	1224	2948 ab
Regal	1535	1339	2874 abc
Tillman	1596	1257	2853 abc
Nolin's Imp.	1893	940	2833 abc
Lucky	1560	1258	2818 abc
Sacramento	1491	1228	2719 abc
Arcadia	1415	1250	2665 abc
Calif. Ladino	1226	1050	2276 bcd
Rector	1472	749	2221 cd
Tamar	1476	427	1903 d
La. S-1	1267	496	1763 d

C.V. = 15.5%

^{1/}Numbers within a column not followed by the same letter differ (P<.05) according to the Duncan's Multiple Range test.

^{2/}Experimental varieties or germplasm.

Table 2. White Clovers Grown on a Prepared Seedbed. Overton, TX 1980-81

Entry	Harvest Date					Total
	3-20-81	4-13-81	5-21-81	6-12-81	7-16-81	
	-----lbs DM/A-----					
Fla. XPL ^{2/}	1343	1610	1412	1480	1329	7174 a ^{1/}
L8-100 ^{2/}	1571	1457	1010	1408	1597	7043 ab
Lucky	1583	1418	1109	1284	1613	7007 ab
L8-101 ^{2/}	1511	1516	1084	1437	1435	6983 ab
Calif. Ladino	1499	1501	1171	1309	1451	6931 ab
S. C. Med. ^{2/}	1391	1424	1061	1479	1541	6896 abc
S. C. Nem. Tol. ^{2/}	1535	1497	1133	1327	1386	6878 abc
Arcadia	1343	1427	1152	1367	1526	6815 abcd
Tillman	1499	1354	950	1187	1404	6394 bcde
K6-8 Ladino ^{2/}	1367	1224	989	1192	1521	6293 cdef
Regal	1223	1295	1022	1235	1468	6243 def
Sacramento	1139	1302	1179	1161	1275	6056 ef
La. S-1	1355	1646	1477	1265	0	5743 fg
Nolin's Imp.	1151	1678	1425	1206	0	5460 gh
Tamar	1103	1572	1158	1133	0	4966 h
Rector	1427	1282	1097	1041	0	4847 h

C.V. = 62.2%

^{1/} Numbers within a column not followed by the same letter differ ($P < .05$) according to the Duncan's Multiple Range test.

^{2/} Experimental varieties or germplasm.

Table 3. Precipitation by months at Overton, Texas for a two year period

Months	Years		13 Year Avg.
	1979-80	1980-81	
inches			
September	6.6	3.2	4.7
October	2.4	1.9	3.7
November	4.3	3.5	3.8
December	5.1	1.5	3.3
January	3.6	1.0	4.0
February	2.6	2.8	3.3
March	2.6	2.8	4.1
April	4.3	2.0	4.7
May	6.1	7.8	3.9
June	2.1	4.7	4.0
July	1.3	5.4	2.9
August	0.9	0.7	1.9

Table 4. Red Clovers Grown on a Prepared Seedbed. Overton, TX 1979-80

Entry	Harvest Date				Total
	3-21-80	4-10-80	4-29-80	5-27-80	
	-----lbs DM/A-----				
Chesapeake	583	548	1163	3006	5300 a ^{1/}
Redmor	278	469	1327	3219	5293 a
Kenland	240	592	1176	3223	5231 a
Arlington	189	391	1325	3310	5215 a
Prosper I	140	505	1289	3069	5003 ab
Kuhn	391	514	1150	2810	4865 abc
Redman	293	475	1345	2745	4858 abc
Kenstar	277	522	1216	2720	4735 abc
Florex	69	317	1327	3011	4724 abc
K4-184	340	535	1247	2551	4673 abc
Lakeland	168	515	1349	2639	4671 abc
Redland II	212	527	1369	2441	4549 abc
Ottawa	170	465	1377	2509	4521 abc
K4-183	266	522	1340	2344	4472 abc
Pennscott	255	667	1210	2331	4463 abc
Tensas	263	421	932	2784	4400 abc
Florie	0	299	1155	2634	4088 bc
Norlac	0	239	1150	2561	3950 c

C.V. = 11.4%

^{1/}Numbers within a column not followed by the same letter differ (P<.05) according to the Duncan's Multiple Range test.

Table 5. Red Clovers Grown on a Prepared Seedbed. Overton, TX 1980-81

Entry	Harvest Date			Total
	5-28-81	6-18-81	7-20-81	
	-----lbs DM/A-----			
Lakeland	1179	1048	1234	3461 a ^{1/}
Redland	1270	1006	1147	3423 a
Kuhn	1285	973	1067	3325 a
Ottawa	1106	1041	1129	3276 a
K4-184	1177	1045	1017	3239 a
Arlington	1149	1014	1075	3238 a
Florie	1111	1036	1049	3196 ab
Kenstar	1120	978	1081	3179 ab
Chesapeake	1242	924	1008	3174 ab
Flare	1137	1015	1009	3161 ab
Redman	1153	907	1100	3160 ab
K4-183	1111	1023	1016	3150 ab
Florex	1049	939	1160	3148 ab
Redland II	1118	1031	995	3144 ab
Pennscott	1118	829	1123	3070 ab
Redmor	1092	970	997	3059 ab
Tensas	1073	961	986	3020 ab
Prosper I	961	930	1114	3005 ab
Kenland	1047	913	1009	2969 ab
Norlac	798	794	1043	2635 b

C. V. = 10.5%

^{1/}Numbers within a column not followed by the same letter differ (P<.05) according to the Duncan's Multiple Range test.