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# 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, bottomland 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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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 perenniate 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-$P_2O_5$-$K_2O$, 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-$P_2O_5$-$K_2O$, 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 $N-P_2O_5-K_2O$, 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 5-5-80 | 6-12-80 | Season Total |
|---|---|---|---|
| | 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 3-20-81 | 4-13-81 | 5-21-81 | 6-12-81 | 7-16-81 | Total |
|---|---|---|---|---|---|---|
| | 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 1979-80 | 1980-81 | 13 Year Avg. |
|---|---|---|---|
| | 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 3-21-80 | 4-10-80 | 4-29-80 | 5-27-80 | Total |
|---|---|---|---|---|---|
| | 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 5-28-81 | 6-18-81 | 7-20-81 | Total |
|---|---|---|---|---|
| | 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.