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# COOL SEASON PERENNIAL GRASS SPECIES FOR FORAGE IN ALABAMA

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# Cool Season Perennial Grass Species for Forage in Alabama

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COOL SEASON PERENNIAL grasses are grown in Alabama to furnish grazing in winter and early spring when warm season perennial species like bermuda, bahia, and dallisgrass are dormant and unproductive. Although less productive in midwinter than rye or wheat on prepared land, cool season perennial grasses have several desirable features: (1) cheap to grow since they do not have to be established annually, (2) dense sod to resist punching by cattle hooves under wet conditions, and (3) permanent sod to prevent erosion on slopes.

Alabama cattlemen have been planting more cool season perennial grasses in recent years to furnish grazing mainly for beef brood cow herds. At present there are over 770,000 acres of tall fescue and 25,000 acres of orchardgrass in Alabama. Although winter carrying capacity of presently available grasses is not high, these grasses may eliminate or sharply reduce winter hay feeding.

Growing of cool season perennial grasses in central and southern Alabama may be difficult because of lack of adapted varieties. Hot and wet summer periods, late spring and autumn droughts, insects and diseases, and severe competition by summer pasture grasses and weeds all create problems not encountered in cool season perennial grass areas farther north in the United States. All present varieties were selected or bred in these northern areas where a prime consideration is winter survival. These varieties are generally winter dormant in Alabama, making little or no growth during the season when forage is badly needed and when soil moisture and temperatures may be favorable for growth.

This publication summarizes research in Alabama on adaptation of cool season perennial grasses. Results reported are based on observational grass nurseries during 1951-54 and forage yield trials from 1955 to 1969. The yield trials were conducted at 12 locations, using 5- × 20-foot plots replicated four times, and clipped at 4- to 8-week intervals when forage was available. Harvesting was done using a sicklebar mower or a flail harvester, Figure 1. Generally, no harvests were made during midsummer. Lime, phosphorous, and potassium were applied according to soil tests. Nitrogen rates varied from 80 to 200 pounds per acre annually, depending on location. No irrigation was used. All forage yields are reported as oven dry forage per acre.

## DESCRIPTION OF GRASSES

### Tall Fescue

Tall fescue (*Festuca arundinacea*) was introduced from Europe into the United States over a century ago but received little attention as a pasture grass until the 1930's. This long-lived bunch grass has shiny, dark green, ribbed leaves, and forms a dense sod after the first year. Seedstalks are 2 to 4 feet tall. Accumulated

**FIG. 1. Cool season perennial grass plots were harvested with this flail harvester, and forage from each plot was weighed for yield comparisons.**

foliage tolerates more cold than other grasses with less destruction of leaves.

Summer survival of tall fescue in Alabama is better than other cool season perennial grasses. It is well adapted to wet soils and areas subject to flooding. Leaves become tough and much less palatable to livestock in late spring and summer. In central and southern Alabama the plants may make little or no growth in summer. Intermediate white or ladino clovers are often planted with tall fescue but it is difficult to maintain clover stands longer than 2 to 3 years.

Cattle grazing tall fescue over extended periods without feed supplements sometime develop a physiological disorder known as "fescue foot." The occurrence and severity of the disorder is greater in states north of Alabama. Poor animal performance may occur without obvious symptoms. Concentration of the alkaloid suspected of causing the toxicity is lower in more mature forage and in Goar or Alta varieties than in Kentucky 31 or Kenwell.[1] Varieties are as follows:

1. Alta – developed by the Oregon Agricultural Experiment Station and released in 1940; recommended in Alabama.
2. Goar – plant introduction from Hungary reselected at California Agricultural Experiment Station and released in 1946; recommended in Alabama.
3. Kentucky 31 – seed increase by Kentucky Agricultural Experiment Station in 1931 from pasture on William Suiter farm dating back to 1887; recommended in Alabama.
4. Kenwell – selected for improved palatability and disease resistance and released by Kentucky Agricultural Experiment Station in 1965.

### Orchardgrass

Orchardgrass (*Dactylis glomerata*), called cocksfoot in its native Europe, was introduced into Virginia in 1760. It is a bunch grass with dense, folded, dull green leaf blades. The clustered heads are borne on seedstalks 18 to 40 inches tall. Orchardgrass is more difficult to grow than tall fescue. It requires high soil fertility and good soil moisture, but does not tolerate poor drainage. Forage quality is high and no toxicity problems are encountered as with tall fescue. White clover persists well in association

[1] GENTRY, C. E., R. A. CHAPMAN, L. HENSON, AND R. C. BUCKNER. 1969. Factors Affecting the Alkaloid Content of Tall Fescue (*Festuca arundinacea* Schreb.). Agron. J. 61:313-316.

with the less aggressive orchardgrass. Varieties include the following:

1. Akaroa – a late-maturing plant introduction from New Zealand, released in 1953 by the California Agricultural Experiment Station and the Soil Conservation Service.
2. Boone – bred for high yield and persistence, released in 1961 by the Kentucky Agricultural Experiment Station; recommended in Alabama.
3. Jackson – a late-maturing variety bred for higher production, released in 1969 by the Virginia Agricultural Experiment Station.
4. Latar – selection of a late-maturing plant introduction from the Soviet Union, released in 1957 by the Washington Agricultural Experiment Station and the Soil Conservation Service.
5. Masshardy – selection from a Finnish variety, released by the Massachusetts Agricultural Experiment Station.
6. Palestine – increase of plant introduction from Palestine by the California Agricultural Experiment Station.
7. Pennlate – a late-maturing variety bred from Finnish and Swedish introductions at the Pennsylvania Agricultural Experiment Station, released in 1957.
8. Pennmead – an earlier maturing variety than Pennlate, released in 1963 by the Pennsylvania Agricultural Experiment Station from plants collected in New York, Pennsylvania, Maryland, and Denmark.
9. Potomac – mass selection variety from persistent plants collected in old pastures of Maryland, Virginia, West Virginia, and Pennsylvania, released in 1954 by Crops Research Division, A.R.S., USDA; recommended in Alabama.
10. Sterling – synthetic variety developed for winter hardiness and high seed yields from plants collected in central Iowa, released in 1960 by the Iowa Agricultural Experiment Station.

### Reed Canarygrass

Reed canary (*Phalaris arundinacea*) is a native of North America as well as other continents. A coarse bunch grass 2 to 6 feet tall with stout leafy stems, its leaves are wide, smooth, and light green in color. It spreads by short, scaly, underground rootstocks. The seed, gray to black-brown in color, mature from the top of the seedhead downward and shatter easily after ripening. Seedlings are very weak and stand establishment is slow and uncertain. Once established, it is vigorous and competes well with other

species. It is well adapted to very wet conditions and makes good fall and late spring growth. Low palatability may be a problem. Varieties are as follows:

1. Auburn – selection from highly persistent plants of local and introduced strains, released by Auburn University Agricultural Experiment Station in 1952.

2. Ioreed – synthetic variety developed for high forage and seed yields by Iowa Agricultural Experiment Station, released in 1946.

### Other Phalaris Species

Native to the Mediterranean area, these grasses are now classified as *Phalaris aquatica.* In the past they were known as harding-grass (*Phalaris tuberosa* var. stenoptera) and koleagrass (*Phalaris tuberosa* var. hirtiglumis)[2].

Hardinggrass, a native of North Africa, is a bunchgrass growing 2 to 4 feet tall. It resembles reed canary but has a more compact seedhead and is more palatable to livestock. Hardinggrass is a seed increase by the Soil Conservation Service from plants in an old pasture in California, the original seed coming from Australia. The variety was certified by the California Crop Improvement Association in 1946.

Kolea is an increase by the California Agricultural Experiment Station of a plant introduction from Morocco. It resembles hardinggrass, but has round bulblike enlargements at base of the plant. The Soil Conservation Service in California increased another plant introduction (P.I. 202480) similar to koleagrass, and named it Perla. This extremely vigorous plant resembles hardinggrass, but has better seedling vigor and more winter forage production. Successful production of this grass in Alabama requires especially good management.

Ronphagrass, a sterile hybrid of hardinggrass and reed canary, was developed in South Africa. It is a vigorous grass having the high winter production of hardinggrass and the low palatability of reed canarygrass.

### Smooth Bromegrass

Smooth brome (*Bromus inermis*) was introduced from Hungary in 1884. It is a sod-forming grass with flat smooth leaves

[2] HANSON, A. A. 1965. Grass Varieties in the United States. Agriculture Handbook No. 170. A.R.S., USDA, Washington, D.C.

that spread by underground rhizomes. The light chaffy seeds are borne in open panicles on seedstalks 2 to 4 feet tall. Smooth brome requires well-drained soils of high fertility. Severe leaf diseases often occur on smooth brome in Alabama. Varieties are listed below:

1. Achenbach – selected from a Kansas field dating back to 1895.
2. Lincoln – a local selection released by the Nebraska Agricultural Experiment Station in 1942.
3. Manchar – selection from a Chinese plant introduction, released by the Soil Conservation Service and Idaho and Washington agricultural experiment stations in 1946.
4. Southland – a synthetic variety developed for higher yield and leaf disease resistance, released by the Oklahoma Agricultural Experiment Station in 1953.

### Kentucky Bluegrass

Brought from Europe with the early colonists, Kentucky bluegrass (*Poa pratensis*) is one of the most widely distributed grasses in the United States. It spreads slowly by short rhizomes, forming a dense sod of basal leaves that seldom grow over 8 to 10 inches high. Seedstalks reach a height of 18 to 24 inches. This palatable grass tolerates close grazing better than many other pasture grasses.

### Perennial Ryegrass

A native of Europe, perennial ryegrass (*Lolium perenne*) closely resembles Italian or annual ryegrass, having glossy dark green foliage. Plants of perennial ryegrass are reddish at the base, in contrast to the yellow-green of Italian ryegrass. In Alabama it does not act as a perennial, rarely surviving to the second year, and makes less winter growth and total yield than Italian ryegrass.

### Timothy

Timothy (*Phleum pratense*) is one of the major hay and pasture grasses of the northern United States. Native to northern Europe, it is a bunch grass that produces a dense, spikelike flowering head and an enlarged corm at the stem base. It does not tolerate extended drought or high temperatures.

The variety Clair is a naturalized, early-maturing farm strain with good recovery growth. It was released by the Kentucky Agricultural Experiment Station in 1958.

## EXPERIMENTAL RESULTS

### Preliminary Tests

Varieties of cool season perennial grasses were planted in nursery rows at 10 locations in Alabama during the fall of 1951. Observational rows were replicated twice at each location and clipped monthly during the growing season over a 3-year period. Survival after 3 years is recorded in Table 1.

TABLE 1. SURVIVAL OF ROD-ROWS OF COOL SEASON PERENNIAL GRASSES AFTER 3 YEARS WHEN MOWED MONTHLY DURING GROWING SEASON, 10 LOCATIONS, 1951-54

| Grass variety | Stand at end of 3 years | | |
|---|---|---|---|
| | Northern Alabama[1] | Central Alabama[2] | Southern Alabama[3] |
| | *Pct.* | *Pct.* | *Pct.* |
| ORCHARDGRASS | | | |
| Akaroa | 78 | 56 | 0 |
| Avon | 68 | 30 | 0 |
| Commercial | 92 | 44 | 0 |
| Latar | 45 | 42 | 0 |
| Palestine | 68 | 64 | 0 |
| Potomac | 91 | 60 | 0 |
| Wisconsin 52 | 80 | 30 | 0 |
| AVERAGE | 74 | 46 | 0 |
| TALL FESCUE | | | |
| Alta | 100 | 99 | 83 |
| Goar | 100 | 96 | 82 |
| Kentucky 31 | 100 | 100 | 82 |
| AVERAGE | 100 | 98 | 82 |
| REED CANARYGRASS | | | |
| Auburn | 92 | 93 | 83 |
| Commercial | 70 | 66 | 40 |
| Ioreed | 27 | 71 | 55 |
| AVERAGE | 63 | 77 | 59 |
| PERENNIAL RYEGRASS | | | |
| Commercial | 37 | 5 | 3 |
| KENTUCKY BLUEGRASS | | | |
| Commercial | 93 | 72 | 40 |
| SMOOTH BROMEGRASS | | | |
| Achenbach | 84 | 57 | 42 |
| Lincoln | 82 | 61 | 33 |
| Manchar | 78 | 24 | 30 |
| Southland | 83 | 60 | 57 |
| AVERAGE | 82 | 50 | 40 |

[1] Upper Coastal Plain Substation, Tennessee Valley Substation, and Piedmont Substation.

[2] Plant Breeding Unit, Prattville Experiment Field, Agronomy Farm, Auburn, and Tuskegee Experiment Field.

[3] Wiregrass Substation, Brewton Experiment Field, and Gulf Coast Substation.

Cool season grasses performed better in northern Alabama and in the Piedmont area than in other parts of the State. Higher elevation and soil conditions make the Piedmont area more like northern than central Alabama. Certain varieties of orchardgrass, tall fescue, bromegrass, and reed canarygrass were quite vigorous in northern Alabama. Ioreed reed canary persistence was poor at two northern Alabama locations. The Auburn strain of reed canarygrass was somewhat more productive than other species during the fall. Bromegrass was less vigorous than other leading species during winter and early spring. Leaf diseases were severe on bromegrass. Although Kentucky bluegrass persisted well, it was less productive than the best strains of tall fescue, orchardgrass, or reed canarygrass.

Tall fescue persisted better than other cool season species in central Alabama, but surviving plants of Auburn reed canarygrass appeared more vigorous. Although the performance of each cool season species was poorer in central than in northern Alabama, orchardgrass and Kentucky bluegrass showed the greatest decline in survival and growth. Orchardgrass stands deteriorated rapidly under mowing in central Alabama.

Tall fescue and Auburn reed canary were the only grasses that persisted satisfactorily under mowing at the Gulf Coast Substation. Only tall fescue and Auburn reed canarygrass survived more than 1 year on sandy soil at Brewton.

### Species Comparisons

Cool season perennial grasses are generally best adapted to northern Alabama, so yield trials were conducted in this area. Total annual yields of 2½ to 4 tons per acre dry forage were obtained from the most productive grasses, with tall fescue being the highest producer, Table 2. Next highest yielder was orchardgrass, but it had yields reduced to a greater extent on droughty soils. At the Tennessee Valley Substation on droughty Humphries silt loam, orchardgrass yielded only 67 per cent as much forage as tall fescue over a 3-year period. On Dewey clay loam, however, it yielded only slightly less than tall fescue. Late winter and early spring production of tall fescue was generally greater than for orchardgrass. Total yields of smooth brome and reed canary were approximately the same as tall fescue on Dewey clay loam and much lower on Humphries silt loam. Late winter and spring production of brome was approximately the same as orchardgrass

TABLE 2. FORAGE YIELDS OF COOL SEASON PERENNIAL GRASSES, FIVE LOCATIONS, NORTHERN ALABAMA

| Grass | Per acre yield of dry forage | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | TVA, Muscle Shoals, Sango sil[1] | | Tennessee Valley Sub. | | | | Alexandria Field, Taft sil | | Piedmont Substation, Louisa cl | |
| | | | Dewey cl | | Humphries sil | | | | | |
| | Winter | Total | Winter | Total | Winter | Total | Winter | Total | Winter | Total |
| | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* |
| Kentucky 31 tall fescue | 2,570 | 6,700 | 3,190 | 7,320 | 3,460 | 8,040 | 1,000 | 5,420 | 1,060 | 4,450 |
| Commercial orchard | 3,020 | 6,750 | 2,440 | 6,480 | 2,380 | 5,400 | 1,223 | 4,380 | 880 | 3,250 |
| Southland smooth brome | ------ | ------ | 2,270 | 6,420 | 2,140 | 4,880 | ------ | ------ | ------ | ------ |
| Auburn reed canary | ------ | ------ | 2,600 | 6,400 | 1,490 | 4,780 | ------ | ------ | 690 | 3,280 |
| Kentucky bluegrass | ------ | ------ | 1,100 | 4,020 | 1,340 | 3,260 | ------ | ------ | 730 | 2,420 |
| Clair timothy | 3,130 | 4,780 | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ |
| Hardinggrass | ------ | ------ | ------ | ------ | ------ | ------ | 810 | 3,990 | ------ | ------ |
| *Years of test* | *1964-68* | | *1955-58* | | *1955-58* | | *1964-68* | | *1955-58* | |
| *Nitrogen/acre/yr.* | *200 lb.* | | *160 lb.* | | *160 lb.* | | *150 lb.* | | *150 lb.* | |
| *Winter period* | *Jan.-late Apr.* | | *Jan.-mid-Apr.* | | *Jan.-mid-Apr.* | | *Jan.-early Apr.* | | *Jan.-late Mar.* | |

[1] Abbreviations: sil = silt loam; cl = clay loam.

on both soils. Reed canary produced less than tall fescue in late winter and early spring on both soils.

Kentucky bluegrass was unsatisfactory. It made less total and late winter-spring production than other grasses on both soils at the Tennessee Valley Substation. At the Piedmont Substation, bluegrass yields declined each year of the test, finishing with a 3-year average yield about half that of tall fescue.

Timothy was grown only at Muscle Shoals. Even with excellent soil moisture conditions and high fertility, timothy stands declined each year of the test and yield dropped to one-third that of tall fescue by the third year.

Hardinggrass and Koleagrass were planted at Muscle Shoals but stands winterkilled the first year. At Alexandria, hardinggrass yields equalled or exceeded those of orchardgrass the second and third years, but were less over a 4-year period.

Since the preliminary nursery tests indicated that only tall fescue and *Phalaris* species survived satisfactorily in central and southern Alabama, only these grasses were included in yield trials in that area.

## Tall Fescue Varieties

Tall fescue is the only cool season perennial grass adapted over the entire State. At present, Kentucky 31 makes up virtually all the fescue acreage although there has been a recent increase in plantings of the Goar variety. In these tests, tall fescue annual yields ranged from 1 to over 3½ tons per acre of dry forage, Table 3. Yields were generally highest in northern Alabama, although droughty soils like the Decatur clay at Alexandria yielded as low or lower than in southern Alabama. Very low production was obtained on Boswell loam and Eutaw clay in the Black Belt area. Yields of only 1¼ tons per acre were made on Magnolia fine sandy loam and Marlboro fine sandy loam in southern Alabama.

Total annual forage yields of Kentucky 31, Goar, and Alta were similar, but Kenwell was slightly less productive. However, production in the critical winter and early spring period is more important than total annual yield in evaluating tall fescue varieties. The Goar variety made the most winter and early spring growth, 22 to 90 per cent more than Kentucky 31, Table 3 and Figure 2.

Winter-early spring production of Alta is slightly higher than Kentucky 31, but much less than that of Goar, Table 3. Kenwell growth at this season is slightly less than Kentucky 31, making it undesirable for planting in Alabama.

Some diseases are found on tall fescue in Alabama. In late spring it is common to find considerable leaf spot (*Helminthospo-*

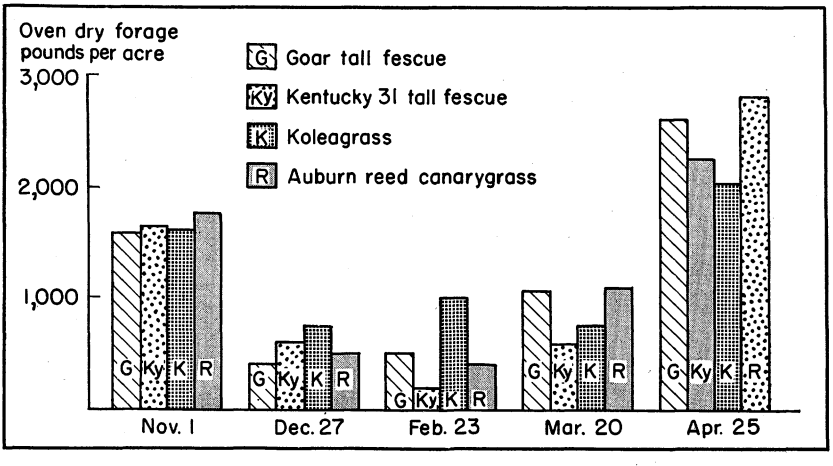


**FIG. 2. Seasonal forage distribution of four grasses during the cool season at the Plant Breeding Unit, Tallassee, is shown for the 1966-67 test year. All grasses in the plots were clipped in mid-September and the residues discarded.**

TABLE 3. FORAGE PRODUCTION OF TALL FESCUE VARIETIES, 10 ALABAMA LOCATIONS

| Location and soil type | Years | Nitrogen per acre per year | Winter period | Per acre yield of dry forage | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Goar | | Kentucky 31 | | Alta | | Kenwell | |
| | | | | Winter | Total | Winter | Total | Winter | Total | Winter | Total |
| | | *Lb.* | | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* |
| **Northern Alabama** | | | | | | | | | | | |
| TVA, Muscle Shoals, Sango silt loam | 1964-68 | 200 | Jan.-late Apr. | 3,220 | 7,710 | 2,570 | 6,700 | 2,830 | 7,080 | 2,120 | 5,870 |
| Tennessee Valley Substation, Decatur clay | 1963-67 | 120 | Jan.-mid-Apr. | 1,380 | 4,810 | 1,020 | 5,150 | 1,110 | 4,970 | 960 | 4,430 |
| Alexandria Exp. Field, Decatur clay | 1960-63 | 120 | Jan.-early Apr. | 1,800 | 3,540 | 950 | 2,760 | 1,150 | 2,930 | ---- | ---- |
| Alexandria Exp. Field, Taft silt loam | 1964-68 | 150 | Jan.-early Apr. | 1,510 | 5,520 | 1,000 | 5,420 | ---- | ---- | ---- | ---- |
| **Central Alabama** | | | | | | | | | | | |
| Tuskegee Exp. Field, Boswell loam | 1963-66 | 120 | Jan.-Mar. | 740 | 3,230 | 250 | 3,470 | 620 | 3,400 | 180 | 2,940 |
| Plant Breeding Unit, Cahaba fine sandy loam | 1964-68 | 160 | Nov.-Feb. | 1,230 | 5,620 | 890 | 4,800 | ---- | ---- | ---- | ---- |
| Black Belt Substation, Eutaw clay | 1963-67 | 100 | Jan.-Mar. | 650 | 3,040 | 440 | 3,500 | 490 | 3,180 | 480 | 3,160 |
| **Southern Alabama** | | | | | | | | | | | |
| Monroeville Exp. Field, Magnolia fine sandy loam | 1963-65 | 80 | Jan.-early Mar. | 1,300 | 2,670 | 840 | 2,490 | 1,170 | 2,660 | 730 | 2,000 |
| Brewton Exp. Field, Kalmia fine sandy loam | 1967-69 | 160 | Nov.-Feb. | 1,280 | 4,970 | 990 | 4,740 | ---- | ---- | ---- | ---- |
| Gulf Coast Substation, Marlboro fine sandy loam | 1967-68 | 160 | Jan.-Mar. | 840 | 2,320 | 580 | 2,600 | ---- | ---- | ---- | ---- |

*rium* sp.) and rust (*Puccinia* sp.) on the Goar variety. Other varieties are affected to only a limited extent. The diseases appear to be more serious in southern than in northern Alabama. Since the forage is generally not affected until late spring and summer, seriousness of the disease remains in question. Forage yields of Goar have been high and stands have not been affected, but it is likely that quality is reduced by the diseases. Breeding is now underway at the Auburn University Agricultural Experiment Station to incorporate disease resistance in Goar.

## Orchardgrass Varieties

Since orchardgrass has not been successful in central and southern areas of the State, variety trials were restricted to three northern Alabama locations, Table 4. Boone was generally the highest yielding variety, although Potomac, Pennmead, and Jackson were only slightly less productive. Commercial seed performed well in the tests but this type may vary considerably, depending on origin of seed.

Boone and Potomac made slightly more early spring growth than other varieties. Several varieties, such as Sterling, Akaroa, Pennlate, Latar, and Masshardy, were highly winter dormant and made little spring growth. The poor spring growth of Masshardy is contrasted with Boone in Figure 3. Winter dormant types pro-

TABLE 4. FORAGE YIELDS OF ORCHARDGRASS VARIETIES, THREE NORTHERN ALABAMA LOCATIONS

| Variety | Per acre yield of dry forage | | | | | |
|---|---|---|---|---|---|---|
| | TVA, Muscle Shoals, Sango silt loam | | Tenn. Valley Sub., Dewey clay loam | | Alexandria Exp. Field, Taft silt loam | |
| | Winter | Total | Winter | Total | Winter | Total |
| | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* |
| Boone | 2,910 | 6,970 | 1,330 | 4,640 | 1,150 | 4,650 |
| Potomac | 3,490 | 6,430 | 1,310 | 4,490 | 1,060 | 3,780 |
| Pennmead | ------- | ------- | 1,190 | 4,470 | ------- | ------- |
| Commercial | 3,020 | 6,750 | 1,160 | 4,370 | 1,220 | 4,380 |
| Jackson | 2,540 | 6,740 | ------- | ------- | 1,000 | 4,600 |
| Sterling | ------- | ------- | 890 | 4,240 | ------- | ------- |
| Akaroa | ------- | ------- | 660 | 3,660 | ------- | ------- |
| Pennlate | ------- | ------- | 610 | 4,050 | ------- | ------- |
| Latar | ------- | ------- | 480 | 3,370 | ------- | ------- |
| Masshardy | ------- | ------- | 240 | 2,500 | ------- | ------- |
| *Years of test* | *1964-68* | | *1961-64* | | *1964-68* | |
| *Nitrogen/acre/year* | *200 lb.* | | *160 lb.* | | *150 lb.* | |
| *Winter period* | *Jan.-May 1* | | *Jan.-mid-Apr.* | | *Jan.-early Apr.* | |


**FIG. 3. This April 12 photograph at the Tennessee Valley Substation, Belle Mina, compares early spring growth of adapted and non-adapted varieties of orchardgrass. Boone variety is at left and Masshardy variety at right.**

duce little until May and June when high temperatures may retard growth.

## Phalaris Species

The need for adapted cool season perennial grasses in central and southern Alabama has encouraged research with exotic species. The excellent persistence of reed canary in this area suggested that related *Phalaris* species should be tried. Over 160 plant introductions of *Phalaris tuberosa,* mainly from the Mediterranean area, have been tested. Although many of these grasses are like commercial hardinggrass and do not persist well over a number of years, some show promise.

Total annual forage yield of the *Phalaris* species in central and southern Alabama was equal or superior to that of tall fescue, Tables 3 and 5. With favorable moisture and high rates of nitrogen (160 pounds per acre N), *Phalaris tuberosa* yields have reached 3 to over 4 tons per acre some years. With lower rates of nitrogen,

TABLE 5. FORAGE YIELD OF *Phalaris* SPECIES, CENTRAL AND SOUTHERN ALABAMA

| Grass | Per acre yield of dry forage | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Plant Breeding Unit, Cahaba fine sandy loam | | | | Tuskegee Field, Boswell loam | | Black Belt Substation, Eutaw clay | | Brewton Exp. Field, Kalmia fine sandy loam | | Gulf Coast Substation, Marlboro fine sandy loam | |
| | Winter | Total | Winter | Total | Winter | Total | Winter | Total | Winter | Total | Winter | Total |
| | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* |
| Kolea | 1,380 | 4,080 | 1,650 | 4,700 | 340 | 2,740 | 430 | 2,080 | 2,540 | 4,925[1] | 2,820 | 4,690[1] |
| Harding | 920 | 4,230 | 1,250 | 4,740 | 270 | 2,670 | 400 | 2,340 | 1,290 | 4,010 | 1,840 | 4,510 |
| Auburn reed canary | 450 | 2,990 | 750 | 5,120 | 120 | 2,250 | 380 | 3,350 | -------- | -------- | -------- | -------- |
| Ronpha | 1,170 | 4,730 | -------- | -------- | ------ | -------- | ------ | -------- | -------- | -------- | -------- | -------- |
| *Years of test* | *1959-62* | | *1963-68* | | *1963-66* | | *1963-67* | | *1967-69* | | *1967-68* | |
| *Nitrogen/acre/yr.* | *160 lb.* | | *160 lb.* | | *120 lb.* | | *100 lb.* | | *160 lb.* | | *160 lb.* | |
| *Winter period* | *Dec.-Feb.* | | *Nov.-Feb.* | | *Jan.-Mar.* | | *Jan.-Mar.* | | *Nov.-Feb.* | | *Jan.-early Mar.* | |

[1] Perla variety of koleagrass used at this location.

TABLE 6. DRY MATTER DIGESTIBILITY OF SEVERAL COOL SEASON PERENNIAL GRASSES, PLANT BREEDING UNIT, 1967

| Grass | Dry matter digestibility of forage[1] | | |
|---|---|---|---|
| | February 23 | March 20 | April 25 |
| | *Pct.* | *Pct.* | *Pct.* |
| Kolea | 78 | 74 | 67 |
| Hardinggrass | 77 | 74 | 67 |
| Auburn reed canary | 79 | 76 | 63 |
| Kentucky 31 tall fescue | 73 | 74 | 58 |
| Goar tall fescue | 74 | 71 | 49 |

[1] In-vivo determinations were made by placing nylon bags of coarsely ground forage in fistulated steers for 24 hours. Dry matter digestibility of standard comparison forages made at the same time was Coastal bermuda 58 and alfalfa hay 74 per cent.

yields over several years have averaged 2 tons per acre, except on less productive, very wet soils.

The major advantage of koleagrass over reed canary or tall fescue is higher production in winter, Figure 2 and Table 5. Ronphagrass, also highly productive in winter, is less palatable. It does not produce viable seed so must be planted from vegetative material.

Another advantage of koleagrass is high forage quality. Crude protein content has averaged 19 to 23 per cent during late winter and spring. Digestible dry matter, a good measure of forage quality, has been high throughout winter and spring, Table 6. Kolea and hardinggrass were more digestible than tall fescue in late April.

Palatability of hardinggrass was much higher than for reed canarygrass, but was affected less by nitrogen fertilizer. In a grazing experiment at Tuskegee Experiment Field in central Alabama[3], applying high rates of nitrogen improved consumption of reed canarygrass, but had little effect on hardinggrass where grazing consumption was already at a much higher level, Table 7. Although palatability differences exist, they may have little practical importance when cattle are confined to one grass species.[4]

None of the *Phalaris* species are presently recommended in Alabama, although they are potentially desirable for extending the range of cool season perennial grasses. Reed canary has the

[3] ANDREWS, O. N., JR., AND C. S. HOVELAND. 1965. Apparent Palatability of Reed Canarygrass and Hardinggrass as Affected by Nitrogen. Agron. J. 57:315-316.

[4] MARTEN, G. C. AND J. D. DONKER. 1968. Determinants of Pasture Value of *Phalaris arundinacea* L. vs. *Bromus inermis* Leyss. Agron. J. 60:703-705.

TABLE 7. EFFECT OF NITROGEN FERTILIZATION ON CONSUMPTION OF REED CANARY AND HARDINGGRASS PASTURE BY BEEF COWS, TUSKEGEE EXPERIMENT FIELD

| N applied per acre, lb. | Dry forage per acre | | | | | |
|---|---|---|---|---|---|---|
| | Reed canarygrass | | | Hardinggrass | | |
| | Available | Consumed | Consumed | Available | Consumed | Consumed |
| | *Lb.* | *Lb.* | *Pct.* | *Lb.* | *Lb.* | *Pct.* |
| 0 | 280 | 45 | 12 | 515 | 390 | 77 |
| 45 | 670 | 240 | 32 | 1,100 | 820 | 74 |
| 90 | 1,060 | 430 | 39 | 1,590 | 1,130 | 70 |
| 135 | 1,340 | 650 | 48 | 1,980 | 1,370 | 69 |

handicaps of poor seedling vigor, low winter production, and low palatability. Commercial hardinggrass does not persist well under intensive grazing or cutting. Kolea has excellent seedling vigor, good winter production, and high forage quality, but requires careful management at heading to maintain productivity.

## Grass-Legume Mixtures

Ladino clover and alfalfa have been tested in association with cool season perennial grasses, Table 8. Alfalfa has two serious

TABLE 8. FORAGE YIELD OF COOL SEASON GRASS-LEGUME MIXTURES, SIX ALABAMA LOCATIONS

| Mixture[1] | Dry forage yield per acre | | | | | |
|---|---|---|---|---|---|---|
| | Tenn. Valley Sub. | | Piedmont Sub., Louisa cl | Auburn DRU, Appling sl | Plant Breeding Unit, Cahaba fsl | Lower Coastal Plain Sub., Leaf sl |
| | Dewey cl[2] | Humphries sil | | | | |
| | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* | *Lb.* |
| Tall fescue-ladino | 4,060 | 4,760 | 3,220 | 2,640 | 4,100 | 5,040 |
| Tall fescue-alfalfa | ---- | ---- | 3,900 | 2,080 | 4,100 | 5,700 |
| Orchardgrass-ladino | 3,760 | 3,220 | 2,560 | 2,420 | 3,470 | 4,560 |
| Orchardgrass-alfalfa | 3,840 | 3,980 | 3,960 | 1,700 | 3,060 | 5,020 |
| Orchard-dallis-ladino | ---- | ---- | 2,310 | ---- | ---- | 6,270 |
| Reed canary-ladino | 4,480 | 3,740 | ---- | 3,240 | 2,930 | 4,920 |
| Reed canary-alfalfa | 1,260 | 4,000 | 4,000 | 2,120 | 3,130 | 5,230 |
| Bromegrass-alfalfa | 3,060 | 3,540 | ---- | ---- | ---- | ---- |
| Ky. bluegrass-ladino | 3,040 | 2,960 | ---- | ---- | ---- | ---- |
| Years | 1955-58 | 1955-58 | 1955-58 | 1955-58 | 1954-56 | 1954-56 |

[1] No nitrogen fertilizer was applied to any of these mixtures.

[2] Abbreviations: cl = clay loam; sil = silt loam; sl = sandy loam; fsl = fine sandy loam.

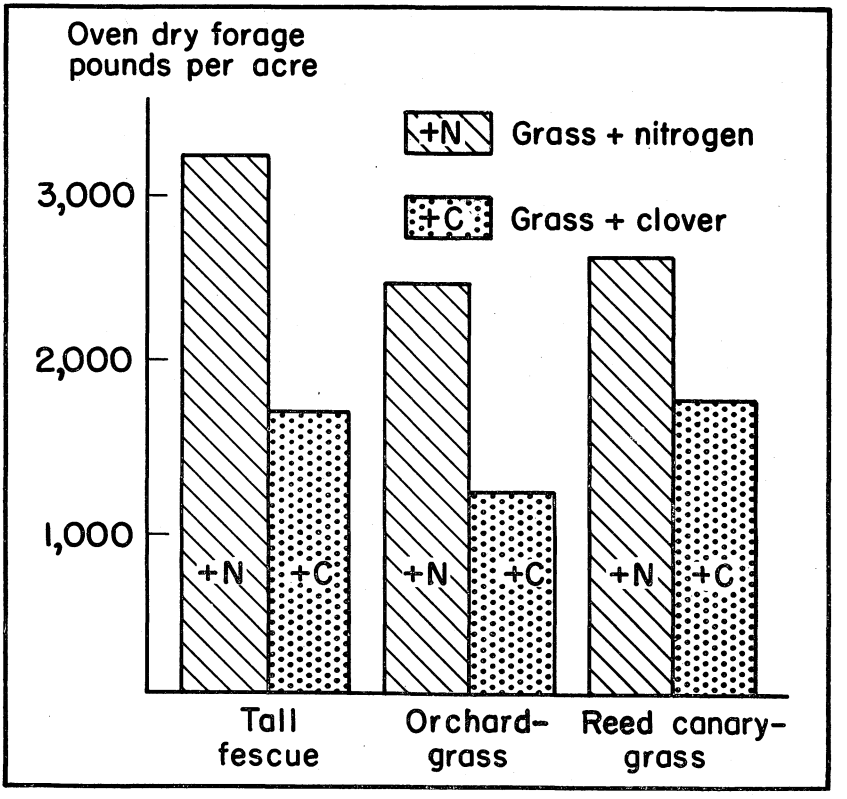


**FIG. 4. February to mid-April forage yields, shown here, were lower from clover-grass than from grass getting nitrogen fertilizer at Tennessee Valley Substation, Belle Mina. Results are 3-year averages on Dewey clay loam soil.**

handicaps which eliminate it for pasture use – it does not persist well under grazing, and control of the alfalfa weevil is difficult.

Yields of grass-ladino clover mixtures with no nitrogen have not been high, Table 8, but lack of winter growth is the most serious problem, Figure 4. Nitrogen application to the grass in fall and winter is essential if winter grazing is to be obtained. Unfortunately, ladino clover does not persist well in Kentucky 31 tall fescue that is broadcast or planted in narrow rows and fertilized with nitrogen. Planting fescue in wide rows, 18 to 24 inches, improves clover persistence, as does close grazing and lower rates of nitrogen. Reed canary is also too competitive to maintain clover. Goar tall fescue is less competitive with clover in summer, thus maintaining better clover stands. Orchardgrass permits a better grass-clover balance under pasture conditions.

## CONCLUSIONS

1. Tall fescue is the only cool season perennial grass adapted over all areas of Alabama. Forage yields of 3½ tons per acre can be expected under good fertilization in northern Alabama, but yields are lower in southern areas of the State.

2. Although Kentucky 31 is the major tall fescue grown, the Goar variety is also recommended because of its higher winter productivity. Goar is susceptible to rust and leaf spot, which may damage forage in late spring. Alta is also recommended and is similar to Kentucky 31.

3. Orchardgrass is recommended only in northern Alabama on fertile, well drained soils with good moisture relations. Forage yields on satisfactory soils will approximate tall fescue.

4. Boone and Potomac are recommended orchardgrass varieties.

5. Reed canary persists well in all areas of the State, but it is difficult to establish and has low winter production and low palatability.

6. Smooth brome was less productive than orchardgrass and is not recommended.

7. Kentucky bluegrass was the lowest yielding cool season grass tested in northern Alabama.

8. Timothy yielded well the first year, but stands did not persist beyond the second year.

9. Certain *Phalaris tuberosa* varieties, such as koleagrass, offer promise as winter-productive grasses in central and southern Alabama but are not yet recommended.