

The PLANTING *and*
MAINTENANCE *of* LAWNS



**AGRICULTURAL EXPERIMENT STATION
of the ALABAMA POLYTECHNIC INSTITUTE**

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Auburn, Alabama

CONTENTS

	Page
SELECTION OF GRASSES AND GROUND COVER	3
Summer Grasses	3
Winter Lawn Plants	9
Ground Cover Plants	11
Grasses for Special Purposes	13
PREPARATION OF THE AREA FOR A LAWN	13
PLANTING WITH SOD	14
PLANTING WITH SEED	18
SODDING OLD BERMUDA GRASS LAWNS WITH NEW GRASS	18
CARE AND MAINTENANCE	18
PESTS	20
Weeds	20
Insects	22

The PLANTING and MAINTENANCE of LAWNS

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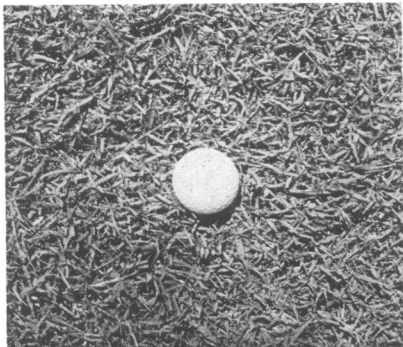
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A LAWN PROVIDES the most desirable setting or base for landscape development and offers many practical benefits. It prevents the washing away of soil and reduces the amount of dirt getting into the building in the form of dust and mud. A lawn provides a cooler and more comfortable setting for a building, since it reduces glare and absorbs and reflects less heat of the sun's rays than does bare ground.

Most everyone desires a beautiful lawn around the home, but too few expend the effort and care necessary to develop one. In Alabama it is more difficult to establish lawns than in sections farther north, since certain growing conditions are not as favorable and the grasses that will grow are not always satisfactory for lawn purposes. Despite these handicaps, some good lawns can be found in all sections of the State. Unfortunately these lawns are in the minority, but the fact that some exist indicates that more good lawns can be developed.

SELECTION of GRASSES and GROUND COVER

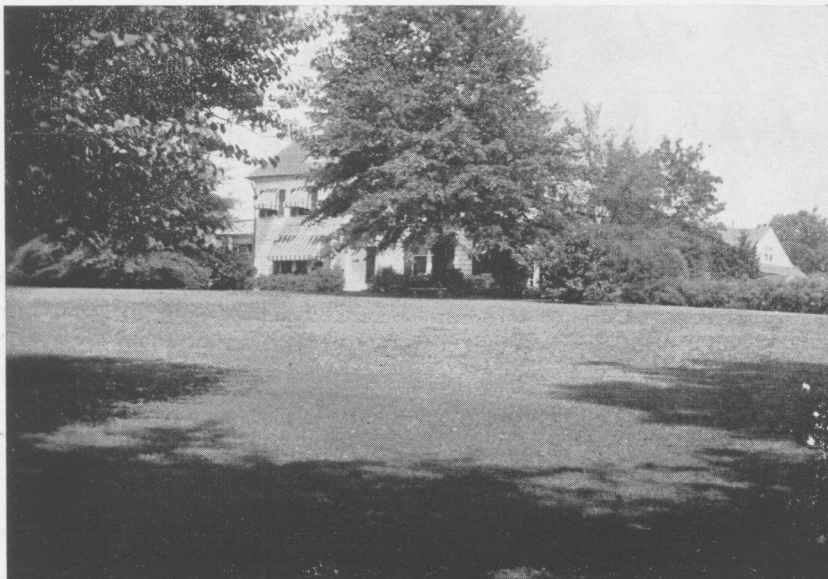
The following plants are used for lawns in various places in the State: (1) common Bermuda, (2) fine-leaved Bermuda, (3) Kentucky bluegrass, (4) St. Augustine, (5) centipede, (6) carpet grass, (7) Zoysia matrella grass, and (8) ground cover plants. Other grasses are used with varying degrees of success. In the northern part of the State, mixtures of grasses often prove satisfactory.



Close-up of common Bermuda grass sod.

Summer Grasses

COMMON BERMUDA GRASS, *Cynodon dactylon*, is the most



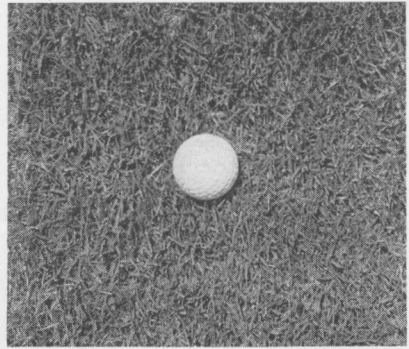
A Bermuda grass lawn. This grass does not grow in the shade.

common lawn grass used throughout the State. Some objections to this grass are: It dies down in winter, gets weedy easily, turns brown in hot dry weather, does not thrive in shade, and if not controlled it will spread to cultivated areas. Among the advantages of common Bermuda are its hardiness, general availability, and rapidity in becoming established. Common Bermuda can be started by sod, sprigs, or seed.

The seed should be planted in March or April at the rate of about $\frac{1}{4}$ pound per 100 square feet. For best results hulled seed should be used. Studies at Auburn by the Alabama Agricultural Experiment Station show that there is little possibility of success in establishing a lawn if seed are planted at any time other than in early spring or during a prolonged period of rains, unless an ample supply of water is available for regular and thorough watering. If the soil is kept moist by frequent watering, the seed may be planted any time from April to August. September or October planting is too late for the grass to become established sufficiently to live over the winter.

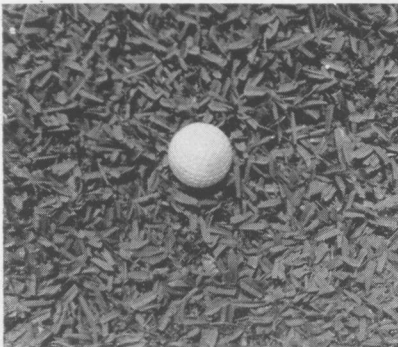
FINE-LEAVED BERMUDA GRASS, *Cynodon transvaalensis*, sometimes called African Bermuda grass, was introduced from Transvaal, South Africa. It grows only 2 or 3 inches high, has very fine

leaves, produces a dense sod, spreads very rapidly, and will form a sod as quickly as common Bermuda. Fine-leaved Bermuda has the same weaknesses as common Bermuda, and, in addition, it does not seem to be as tolerant to adverse conditions. The principal advantage of this grass over common Bermuda is that it is much finer leaved. Since seed are not available, fine-leaved Bermuda must be established by sodding or by sprigging.



Close-up of fine-leaved Bermuda grass sod.

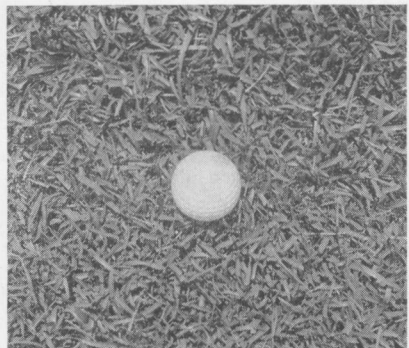
KENTUCKY BLUEGRASS, *Poa pratensis*, is discussed in the section on winter grasses, page 9.



Close-up of St. Augustine grass sod. Note the coarse leaves.

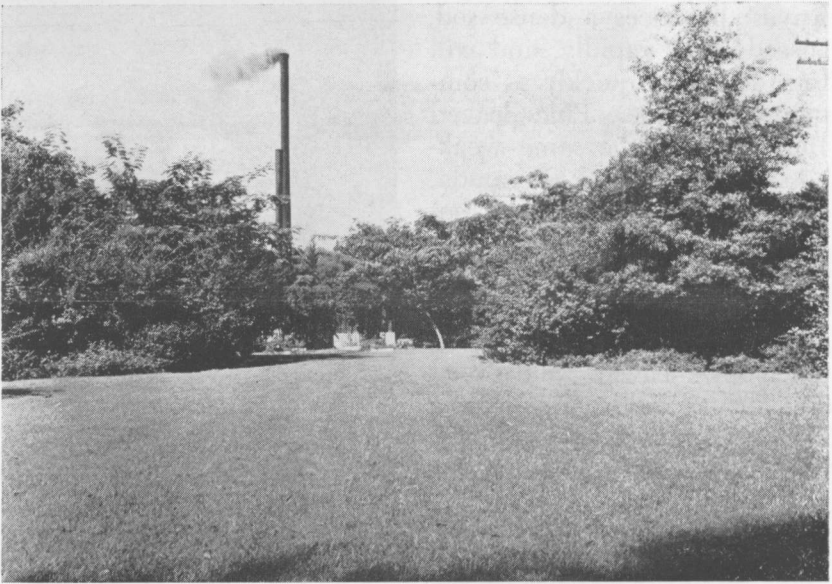
ST. AUGUSTINE GRASS, *Stenotaphrum secundatum*, is suited to shaded and open lawns in the southern part of the State, but it is not winter-hardy and should not be grown farther north than Montgomery. It is broad-leaved, generally light-green or yellow-green in color, forms a comparatively dense sod, and usually crowds out other grasses and weeds. St. Augustine grass grows best on

moist sandy soils, but will thrive on soils that are too dry for carpet grass. This grass is usually established by sod or sprigs, since seed are rarely available. In setting sod or sprigs, care should be taken to not cover the plants with soil. St. Augustine grass is subject to chinch bugs.



Close-up of centipede grass sod. Note the dense sod.

CENTIPEDE GRASS, *Eremochloa ophiuroides*, was introduced



A centipede grass lawn. This grass is especially valuable for planting on borders of flower beds.

by the United States Department of Agriculture from China. It is a creeping plant with a medium-width leaf of light-green color, and produces a dense sod that crowds out most other plants. This grass grows to a height of 3 or 4 inches and does not have to be mowed often to maintain a good appearance. Centipede grass will tolerate more shade than Bermuda grass, but it cannot stand dense shade. In general, it will thrive in practically all of Alabama and under more adverse conditions than Bermuda grass, growing well on dry sandy areas and on banks and fills that are difficult to maintain in other grasses.

On very fertile soils or when large amounts of nitrogen are applied, centipede grass grows thick and dense for 1 year, but during the second year practically all of it will die. The exact reason for this is not known. This grass is especially well suited for lawns if ordinary care is given or on poor dry soils. Centipede is one of the most desirable grasses for use on school lawns that are not played on too much.

Centipede grass begins growth earlier in the spring than does Bermuda grass, but it is about as susceptible to frost. It is more drought resistant than Bermuda and if mixed with other grasses, it will crowd them out in a few years.

Centipede grass is usually propagated by sod and sprigs. Care should be taken in sodding not to cover the leaves with soil. Centipede grass may be propagated by sowing seed. The seed should be planted at the rate of 2 ounces per 100 square feet, and preferably in early March or April.

CARPET GRASS, *Axonopus compressus*, is used for lawns on moist sandy soils in the southern part of the State. It can be grown with some success under suitable soil conditions in the central and northern parts of Alabama. This grass, like St. Augustine, is broad-leaved and creeping in its habits of growth, and is usually light-green in color. It grows well in the shade if the soil is moist.

Carpet grass produces an abundance of seed stems that are 8 to 10 inches in height and have two- or three-branched panicles that somewhat resemble those of crab grass. St. Augustine, by comparison, has few seed stems, which are flattened unbranched spikes. Seed stems of carpet grass are difficult to cut by mowing. Therefore, a lawn of this grass usually has a somewhat rough or "ragged" appearance.

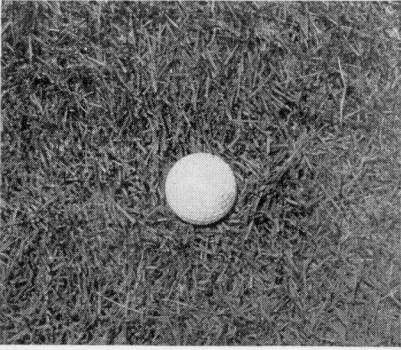
Carpet grass can be started from sod, sprigs, and seed. Seed sowed at the rate of $\frac{1}{4}$ pound per 100 square feet will usually



A carpet grass lawn. Note how this grass will grow in limited shade near the pine tree.

give satisfactory results. These seed may be planted in the fall, winter, or early spring.

ZOYSIA, *Zoysia matrella* 13521, commonly called Zoysia or Manilla grass, was introduced from the Orient by the United States Department of Agriculture. It is probably the best grass that has been found for Alabama, provided the lawn is well cared for. As far as is known, it is suited for use in all parts of the State.

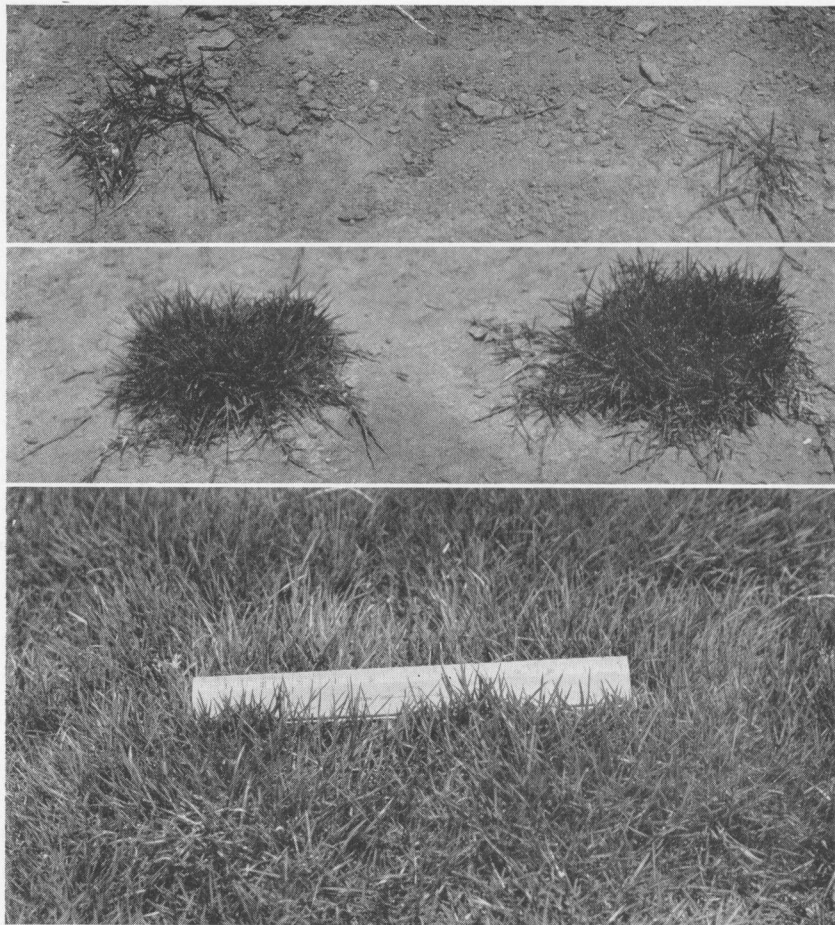


Close-up of *Zoysia matrella* sod. Note fine leaves and dense sod.

Zoysia has a fine leaf, is dark-green in color, produces a dense sod that feels like a rug, and does not get as weedy as does Bermuda grass. It is one of the earliest grasses to begin growth in the spring, and is one of the last to die in the fall, remaining green much longer than Bermuda (9 to 10 months of the year in central Alabama). Zoysia grows only 3 or 4 inches tall, does not have to be mowed often, and will grow very satisfactorily either under trees or in direct sunlight. It has stood more dense shade than any other grass tested at the Alabama Agricultural Experiment Station.

The two major faults to be found with Zoysia are that it grows very slowly and there is no source of seed at present. It requires about 2 years to establish a good lawn, using 2-inch square pieces of sod spaced 12 inches apart. Under the same conditions, Bermuda grass would produce one in 2 months. A lawn of Zoysia needs to be well fertilized and watered for best results. The soil should not be allowed to become too acid. Results of studies at Auburn have shown that when the soil becomes as acid as pH 4.5, the grass dies.

CAUTION: *Zoysia matrella* is not the same grass as the one sold under the name of Japanese or Korean lawn grass, *Zoysia japonica*, the seed of which are available.



Zoysia plants. Top—2 months after planting with small sprigs. Center—2 months after planting with 2-inch blocks of sod. Bottom—sod 18 months after setting; right, sprigs; left 2-inch blocks of sod. Note both have covered the ground equally well.

Winter Lawn Plants

The appearance of a Bermuda grass lawn in winter can be decidedly improved by planting a winter grass in the Bermuda sod. The plants discussed in this section are often used for this purpose as well as for planting alone for lawns.

KENTUCKY BLUEGRASS, *Poa pratensis*, is an evergreen grass but it tends to die out in central and southern Alabama. It has a



A Kentucky bluegrass lawn in Auburn, Alabama. Note how well this grass thrives in the shade when the soil is properly treated.

dark-green color and small leaves, is not as harmful to Bermuda grass as is Italian rye, and is, therefore, more desirable for winter lawns on areas that are well kept and are in a good state of fertility. Bluegrass grows especially well in the shade, and thrives

on moist alkaline soils that are rich in phosphate. An application of basic slag at the rate of 5 to 10 pounds and a 6-8-4 fertilizer at the rate of 2 pounds per 100 square feet should be made at the time of seeding bluegrass.



Close-up of Kentucky bluegrass sod. Note the fine leaves and dense sod.

For winter lawns the seed should be planted in October or November. They may be sown in January or February when a winter lawn is not desired. The rate of seeding should be $\frac{1}{8}$ to $\frac{1}{4}$ pound of seed per 100 square feet. Even under growing conditions favorable for this grass, it may be necessary to reseed the lawn from time to time.

ITALIAN RYEGRASS, *Lolium multiflorum*, is an annual grass that grows in the winter and dies in the spring. It is especially well suited to shade. Italian ryegrass should be seeded in October or November at the rate of $\frac{1}{2}$ pound of seed per 100 square feet of area. The seed may be worked lightly into the soil, although this is not essential. On established lawns, it is advisable not to disturb the existing sod when planting Italian ryegrass. A light raking of the lawn to settle the seed to the ground, together with rolling and watering, will result in quicker and better germination of the seed.

Italian ryegrass is not recommended on lawns established in grass other than Bermuda grass. There is some objection to use of Italian ryegrass on permanent Bermuda grass lawns because of damage to the permanent sod. However, such damage is reduced if regular mowing is done throughout winter and spring and the general fertilizer schedule is started immediately after the ryegrass dies in the spring.



Close-up of Italian ryegrass sod.

WHITE DUTCH CLOVER, *Trifolium repens*, is sometimes planted for a winter lawn and also in a mixture with other plants. White clover requires a nearly neutral soil and should have applications of phosphate for best results. An application of 5 to 10 pounds of basic slag per 100 square feet at the time the seed are sown will usually supply sufficient lime and phosphate. About $\frac{1}{10}$ pound of seed per 100 square feet should be sown in September or October; the seed should be inoculated.

Ground Cover Plants

Vines and other low-growing plants can often be used to good advantage as ground covers on areas where it is difficult to establish and maintain a satisfactory lawn. Steep banks, terraces, and densely shaded areas under trees can often be more satisfactorily maintained in a ground cover than in a grass. There are a number of plants suitable for use as ground covers. How-

ever, for supplementing lawn grass in Alabama, English ivy, common periwinkle, Ophiopogon or Japanese snakebeard, and partridgeberry are probably the most desirable.

ENGLISH IVY, *Hedera helix*, is a very satisfactory vine for use around trees and on banks. It thrives best in areas that are at least partially shaded. Under some conditions, it may be necessary to prune and thin English ivy to prevent it from becoming too high and matted.

COMMON PERIWINKLE, *Vinca minor*, is a hardy trailing evergreen plant that has blue flowers and dark-green foliage. However, there are a number of varieties of *Vinca minor* having various colored flowers and foliage. The common periwinkle will usually be most satisfactory, since it forms a dense mat and tends to shade out weeds and grasses. Periwinkle does not develop as dense and heavy a mat as English ivy, and, therefore, does not harbor snakes. It grows best under moist, half-shaded conditions, but will grow satisfactorily under dry conditions and in dense shade. It is propagated by division or cuttings and can be planted practically the year-round in this State. Summer plantings must be watered.

OPHIPOGON OR JAPANESE SNAKEBEARD, *Ophiopogon japonicus*, is a member of the lily family and is perennial, bearing violet-purple to white flowers. This is a good plant for use under trees and it will grow in poor soil and will tolerate drought. It is propagated by division, and it should be set close enough to cover the entire area since it spreads little. Although at present it is used principally in the southern part of the State, it will probably grow throughout Alabama. Ophiopogon does not require clipping; however, some people prefer to cut it back at least once a year.

PARTRIDGEBERRY, *Mitchella repens*, is a native plant desirable for use as a ground cover under trees and on most fertile soils in other shaded areas. The evergreen leaves are small, glossy, and almost round. Partridgeberry produces pinkish-white flowers in the spring, followed by scarlet fruit in the fall and winter. These berries are often borne in pairs. The partridgeberry is propagated by division and can be collected from the banks of streams and shaded woods throughout Alabama.

Grasses for Special Purposes

Such grasses as centipede, St. Augustine, and Zoysia that form dense sod and tend to crowd out other grasses and weeds are desirable for use on walks in garden areas, for sodding center panels in gardens, and, also as buffer strips between established lawns of Bermuda grass and flower beds, vegetable gardens, and fields. These grasses can be removed easily from such areas when they spread into them and do not become a pest as does Bermuda grass. These grasses, when planted in buffer strips 1 foot or more in width, help prevent the Bermuda grass from spreading into cultivated areas.

PREPARATION of the AREA for a LAWN

Draining and Grading. Before grading and leveling the area, all trash, bricks, boards, stone, and similar material should be hauled away. If such material is buried in the area during the grading operation, the grass will turn brown and often die over such places. The area should be then drained, graded, and leveled. If the soil is poorly drained, it is desirable to put in tile drains. Lines of 4-inch tile, 25 feet apart, laid 2½ feet deep with a fall of 3 inches for every 50 feet, will take care of the average drainage problem. The use of tile drains in this State is rarely necessary if the area is graded and leveled in such a manner as to provide proper surface drainage.

Before grading the area, the topsoil should be removed to a depth of 4 to 6 inches and saved for spreading over the area after the grading is done. If the topsoil is of poor quality, it should be replaced with rich soil. The subsoil should be brought to the desired grade and roughly leveled before the topsoil is replaced.

Grading and leveling should be done in such a way as to allow the water to run away from the house. Six inches to 1 foot of fall for each 100 feet will be sufficient for proper surface drainage. It is not necessary to grade the area to a flat or uniform surface, since a rolling effect is usually more desirable. Do not leave depressions or pockets that will hold water, since water standing on the lawn for a period of time will damage the grass.

Preparation of the Soil. Deep and thorough preparation of the soil is necessary to establish a good lawn. Unless the soil is

plowed or spaded deeply, the roots of the plants will be unable to develop properly. The soil for a lawn should be as well prepared as a good vegetable garden area.

Fertilizing. Lawns are comparatively permanent plantings. For this reason the soil should not only be plowed or spaded deeply, but should also be enriched by the addition of fertilizers.

For most lawns, an application of 5 to 10 pounds of basic slag and 5 to 10 pounds of ~~6-8-4~~ fertilizer to 100 square feet will give good results. In addition, well-rotted manure may be added at the rate of 40 to 50 pounds per 100 square feet or cottonseed meal at the rate of 2 to 4 pounds per 100 square feet may be included. Phosphorus and potash should be applied and worked thoroughly into the soil at the time the lawn is being prepared.

A good procedure for applying fertilizers at the time the area is being prepared is to broadcast about one-half of the amount to be used over the area before plowing or spading, then to work the remainder into the surface of the soil by disking or by hand if the area is small. This method permits a better distribution of the fertilizers throughout the soil in which the grass roots are to grow and yet concentrates the major portion in the upper layer where most of the roots will be found.

Concentrated commercial nitrogen fertilizers tend to burn grasses when they come in direct contact with them. Because of this fact, when lawns are to be established by sodding or sprigging, the area should be watered or should have a good rain on it before the grass is set if heavy rates of nitrogen fertilizers have been used.

PLANTING with SOD

Time of Planting. Lawn grasses may be established by sodding or sprigging at any time during the growing season if moisture conditions are suitable or if water is available. The fall season has many points in its favor. Lawn grasses started during that season make considerable root growth before and during the winter; they receive the benefits of fall and winter rains, and in the early spring they are ready for immediate growth. The growth of the grass in the fall and in the spring prepares it to withstand hot dry weather during the summer. During the

spring and summer months, the lawn is used more than in the fall and winter seasons. This is another factor in favor of having the lawn established before spring or summer, since well-established lawns permit rougher use than those planted in the spring. However, lawn grasses established by sprigging and sodding in the early spring grow satisfactorily if they have sufficient time (about 2 months) to become well established before hot weather. The principal controlling factor in regard to the time of starting lawns by sprigs and sod is the moisture condition of the soil.

Amount of Grass Required for Sprigging Lawn Areas. Exact figures cannot be given for all work of this type due to the variation in quality of grass available, different methods of handling the sod, and other factors. However, the following rates will give a basis for estimating the amount of grass needed for various size lawn areas. Sod is measured by the bushel or by the square yard. One bushel of stolons or plants will be required to set 400 square feet of area, using 2-inch squares of grass spaced 12 inches apart. One square yard of sod will be required for each 324 square feet when set at that spacing. If small sprigs of grass are used, 1 square yard of sod will set 3,000 to 4,000 square feet of Zoysia or Bermuda grass, or 1,000 square feet of centipede or St. Augustine grass, when spaced 12 inches apart in squares.

Sodding Solid. Solid blocks of sod can be used very effectively in establishing lawns. When sufficient grass is available, blocks about 1 foot wide and as long as can be handled conveniently may be placed on the area after the soil is carefully prepared and fertilized. The sod should be rolled to settle the blocks into place. Such treatment is often advisable on banks and terrace slopes, though solid sodding may not be practical on the entire lawn area. If it is not practical to cover the entire bank or terrace slope with blocks of sod, the blocks should be cut about 6 inches wide and set in solid rows across the slope. Thick blocks of sod should be dug, leaving as much soil as possible on the roots.

Sprigging. Planting sprigs of grass in rows about 1 foot apart and spaced about the same distance between rows is a practical and effective method for establishing grass. Also, it can be planted in solid rows about 1 foot apart. By this procedure, the grass will quickly cover the entire area. When this method is used on sloping areas, the rows should be run across the slope.



Sodding an area solid with blocks of Bermuda grass sod. On the right, are the blocks of sod, while at the left the area has been sodded solid by putting the blocks in place.



Upper left—2-inch block of Zoysia sod. Upper right—small sprig of Zoysia. Lower left and right—2-inch piece of sod and sprig properly set. Note the leaves must not be covered.

Sprigs of Bermuda grass may be placed in a furrow and completely covered. Sprigs of Zoysia, centipede, St. Augustine, and carpet grass should always be set carefully to leave the tip ends exposed, since these grasses are killed when they are completely covered with soil. The sprigs should be firmly set and the area rolled and watered. A good rolling is very helpful in getting grass established and in eliminating ridges and high places in the lawn.

Sprigging Followed by Seeding. When a lawn is started with sprigs, seed of some other plant may be sown to give a quick sod to prevent the soil from washing while the sprigs are becoming established. If sprigging is done in the fall, Italian ryegrass, Kentucky bluegrass, or white Dutch clover may be used. If sprigging is done in the spring, common lespedeza may be used. This sometimes results in killing the grass set by sprigs. If Zoysia is treated in this manner, the pieces of sod used for sprigging should be at least 2 inches square. Tests at Auburn have usually resulted in a failure with Zoysia when small sprigs were used in this manner. However, if 2-inch pieces of sod were used, the Zoysia always succeeded.



An area was strip sodded with Bermuda grass. Note the rows run on the contour to check washing.

Care of Sod. After sod is dug, it should be kept moist and in the shade as much as possible until set.

PLANTING with SEED

When grass is to be started by seed, the soil should be carefully prepared and should be in a moist condition. The rate of seeding is discussed under each plant. For lawns of average size, broadcasting by hand is the most practical and efficient method of sowing seed. In seeding either by hand or by machines, the quantity of seed should be divided into equal amounts. One half of the seed should be distributed in one direction and the remainder at right angles to the first application. After the seed have been sown, the area should be raked very lightly and rolled with a light roller to aid in germination. Watering with a fine spray will help germination, but care should be taken to avoid washing.

SODDING OLD BERMUDA GRASS LAWNS with NEW GRASS

It is sometimes desirable to sod a Bermuda grass lawn to another grass, such as Zoysia or centipede, without first killing the Bermuda. Experiments conducted at Auburn show that this may be done provided pieces of sod at least 2 inches square are used. When small sprigs were used, tests with Zoysia always failed, while some tests with centipede proved successful. Holes should be dug in the lawn and the sod inserted and carefully packed with soil. The holes should be spaced about 12 inches apart.

CARE and MAINTENANCE

Mowing. After the lawn is established, the grass should be allowed to grow to a height of about 3 inches. After this it is desirable to mow the lawn regularly with the mower set high. It is not best to clip the grass low even after it is well established. If the mower is set to a height of 1½ to 2 inches, spreading and root development will not be retarded. Mowing should be started as early in the spring as necessary, and should be continued until the grass stops growing in the fall. If mowing is done regularly, the clippings should be left on the lawn. The lawn may be

brushed with a broom or raked to settle the clippings around the grass. Clippings have a mulching effect on the lawn and help keep the soil moist.

Watering. It is often necessary to water lawns in this State to keep them attractive during the hot summer months. Proper preparation of the soil and correct practices in watering will reduce the frequency of waterings necessary to keep the grass in good condition.

The lawn should be watered in the late afternoon, at night, or very early in the morning. Watering during the hot part of the day wastes a high percentage of the water by evaporation and may scald the grass. It is much better to water the lawn thoroughly once or twice a week than to sprinkle it lightly every day. A light watering every day will cause the roots to develop near the surface of the ground where they are most subject to damage by drought and cold. It will require 62 gallons of water per 100 square feet to apply 1 inch of water over the area. One inch of water will wet soil 3 to 4 inches deep. With average city pressure, using the average hose without a nozzle, it will require about 15 minutes to wet 100 square feet 3 to 4 inches deep; or if a spray is used, it will require 30 to 60 minutes.

Fertilizing. Probably more lawns are in poor condition due to a lack of proper fertilization than to any other one thing. A program of fertilizing the lawn, starting in the spring with an application of such a fertilizer as 6-8-4 at the rate of 1 pound per 100 square feet and repeating this at intervals of 4 to 6 weeks, will produce a good lawn. Cottonseed meal at the rate of 2 to 4 pounds or nitrate of soda at the rate of one-half pound per 100 square feet may be substituted for the 6-8-4 fertilizer for some of the applications.

In applying nitrate of soda, sulfate of ammonia, or other sources of readily available nitrogen, or a complete fertilizer such as 6-8-4, care should be taken to prevent burning the grass. This may be accomplished by watering the lawn to wash the fertilizer off the grass, or by applying the fertilizer while the grass is dry and raking or brushing the lawn so that the fertilizer will settle on the ground around the grass plants. There is no danger of burning the grass by the use of cotton-seed meal or peanut meal.

CAUTION: Centipede grass should not be fertilized with the nitrogen fertilizer as described above. (See page 6).

Kentucky bluegrass lawns should receive several applications of fertilizer containing phosphate. A mixed fertilizer, such as 6-8-4 is excellent for this purpose.

An application once or twice a year of about one-fourth inch layer of good composted soil or good topsoil as a top-dressing for lawns is one of the best practices for maintaining a good sod. This soil should be uniformly distributed over the lawn and should be settled to the ground by watering or raking. On lawns of centipede, St. Augustine, and Zoysia grasses, it is particularly important not to cover the plants.

Reworking Old Lawns. Many old lawns that are in poor condition can be re-established as good lawns by following the above practices in regard to mowing, watering, and fertilizing together with reseeding and sprigging or sodding sections where the grass has died. Where lawns are in too poor a condition to be reworked in this manner, the same general procedure should be followed as recommended for starting new lawns.

PESTS

The three most common pests of lawns are weeds, insects, and diseases.

Weeds are often one of the most difficult problems encountered in maintaining a lawn. When conditions are made favorable for sod-forming plants, most weeds are kept in check.

The weeds found on lawns in the South may be divided into two groups—winter weeds and summer weeds.

Winter Weeds. Winter weeds come up in the fall, grow through the winter and early spring, reproduce, and die. Some of the more common winter weeds are: chickweed, cranes-bill, evening primrose, cudweed, bur clover, Carolina clover, hop clover, hen-bit, plantain, and toadflax. All of these may be controlled by hand weeding if sufficient care is used in digging. They may also be controlled by treating the lawn with calcium cyanamid.

Calcium cyanamid is a common source of commercial nitrogen having herbicidal properties. It will kill weeds and supply all nitrogen needed by the lawn the following year. It should be

broadcast uniformly over the area in January or early February at the rate of 5 pounds per 100 square feet.

CAUTION: Treatment with cyanamid should be confined to Bermuda grass lawns, and should not be applied to bluegrass or other lawns. When applied to the soil, cyanamid will not injure shrubbery, but it should not touch the foliage. It should not be used around vines or other plants that require an acid soil. Long-haired dogs should not be allowed to play on the lawn until after a rain has washed the cyanamid off the grass.

Most of the winter weeds can be controlled by spraying with 2,4-D. This material should be used carefully, since it will seriously damage roses and other flowers if it touches them. In treating lawns with 2,4-D, use only the non-volatile kind, such as amine or sodium salt, and follow carefully the instructions of the manufacturer. Be very careful not to allow the spray to blow on plants that are sensitive to the material.

WILD ONION OR GARLIC is one of the worst lawn pests in the South. It can be controlled by carefully digging up the entire plant, including bulbs. In Bermuda grass it has been controlled by spraying with a mixture of 9 parts kerosene and 1 part creosote in late January or early February. Wild onions also may be controlled by spraying with 2,4-D. The same precautions as just previously mentioned should be followed.

Summer Weeds. The worst summer weeds are crab grass, Dallis grass, and crowfoot or goose grass. Dallis and crowfoot should be removed by hand weeding. Crab grass can be controlled by hand weeding or by treating with lead arsenate or calcium arsenate at the rate of 1 pound per 100 square feet of area. The arsenate should be applied in late February or early March, and may be dusted on or mixed with soil and scattered over the lawn as a top-dressing.

CAUTION: Arsenates are very poisonous; livestock should not be allowed to eat the treated grass.

Recently several compounds for controlling crab grass have been placed on the market. Such materials as Tact-C-Lect, Stoddards solvent, and potassium cyanate have been used successfully for crab grass control. Some materials are effective only on crab grass in the seedling stage, while others are effective

on mature crab grass. Instructions of the manufacturer should be carefully followed.

Insects and Other Pests. Among the insects and other pests that sometimes damage lawns are: ants, chinch bugs, earthworms, moles, and white grubs.

ANTS often become a problem in the house and also cause trouble in the yard and garden by disfiguring lawns and transporting aphids to plants.

Chlordane is an effective insecticide against ants. The material may be used in dust or spray form containing 5 per cent chlordane. If a spray is desired, an emulsifiable concentrate containing 40 per cent chlordane should be bought and diluted with water to 5 per cent strength. Ants may be kept out of the house by covering the foundation with dust or spray. Where possible, the insecticide should be applied under the house, coating walls, pillars, and other supports with the material. Caution should be used in applying the spray to plants, since tender foliage may be burned. The dust will not injure plants.

Unightly mounds on the lawn may be treated by working one-half teacupfuls of the dust or spray into the hill. For control of mound-building fire ants, a 10 per cent dust is recommended.

A suitable ant poison may be made of the following:

1 quart of water	125 grains of arsenate of soda
1 pound of sugar	25 grains of tartaric acid

Boil until arsenate of soda has dissolved and add one tablespoon of honey. Place the mixture poison in pill boxes, waterproofed by dipping in hot parafin. Make one or more holes in top of boxes with a nail; place the boxes of poison bait near ant runways.

CHINCH BUG attacks on St. Augustine grass result in brown patches that have yellow edges. The insects will be found doing their damage in the grass that has turned yellow.

This insect may be controlled by use of 20 per cent sabadilla or 20 per cent toxaphene dust applied liberally over the lawn. Lindane spray is also highly effective. One pound of 25 per cent wettable Lindane in 50 gallons of water will make enough spray for about one-half acre. A second application may be necessary 10 days later. Repeated applications of 1 per cent rotenone dust are moderately effective against this pest.

EARTHWORMS under average conditions are considered beneficial, but in some instances they are pests. They burrow in lawns and cast up mounds of soil that interfere with mowing. This trouble also occurs on golf courses. In such cases, apply 1 ounce of bichloride of mercury in 25 gallons of water per 500 square feet of lawn, and water thoroughly to wash the material into the soil.

CAUTION: Bichloride of mercury is poisonous and should be carefully labeled and handled. All containers used for this treatment should be washed thoroughly before being used for other purposes.

MOLES may be controlled on lawn areas by persistent use of traps. The choker-type trap is most effective, but other models with tynes or spears are satisfactory if properly set. The soil in the runways should be mashed down firmly at several places late in the afternoon. Examination should be made the following morning to determine which runways are being used. The traps are then set in the active runways. Care must be taken to see that the trap is properly set so that it will be sprung as the mole passes through the tunnel.

Hydrogen cyanide gas is highly effective against moles, but the material is deadly poisonous. It should be used only by persons familiar with the dangers involved. Some pest control operators are qualified to use hydrogen cyanide for mole control.

WHITE GRUBS are larvae of a number of species of beetles commonly called "June bugs." The grubs damage grass by eating the roots. Their presence is indicated by small irregular brownish patches in the lawn. When large numbers of grubs infest a lawn, all roots may be cut, killing large sections of the grass which becomes easily pulled or raked out of the ground.

The grubs may be controlled by use of DDT, chlordane, or lead arsenate. DDT should be applied at the rate of 6 pounds of 10 per cent dust per 1,000 square feet. Chlordane should be applied at the rate of 2½ pounds of 10 per cent dust per 1,000 square feet. Lead arsenate, if used, should be applied at the rate of 10 pounds per 1,000 square feet. Equivalent amounts of these materials may be applied as sprays.

Whether applied as a spray or as a dust, the insecticide should be washed into the lawn by sprinkling, unless rain can be expected within a few days. Until the insecticide is washed into the treated area, children should not be allowed to play on the lawn, and domestic animals should not be grazed on it.

The treatment should be applied as soon as damage begins to appear, regardless of the season of the year.

Diseases. Lawn grasses are sometimes injured by a disease known as brown patch. There are two kinds of brown patch: (1) Large brown patch causes large areas of the grass leaves to die suddenly. The roots, however, are not killed by this type, and usually the grass will recover. (2) Small brown patch, or dollar brown patch, attacks small areas of about the size of a silver dollar, completely killing the grass.

Lawn grasses may turn brown due to reasons other than brown patch. However, if the brown spots appear suddenly—almost overnight—during periods of high temperature and high humidity, brown patch is probably the cause.

Both types of brown patch can be controlled by use of fungicidal sprays. Lawns should be watched carefully and if diseased spots appear, they should be treated with Tersan¹ at the rate of 2 pounds suspended in 100 gallons of water, which will treat 6,000 square feet of lawn surface. Applications should be repeated at weekly intervals as long as the disease is present.

¹ 50% tetramethyl triuramdisulfide.