AN EXAMPLE BERMUDAGRASS LAWN CARE CALENDAR

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Bermudagrass is maintained in many residential landscapes in Tennessee. In full sun with fertile, well-drained soil, healthy plants grow rapidly and produce a dense, traffic-tolerant, low-growing turf during late spring, summer and early fall. Plants within the species (*Cynodon*), which is native to Africa, are usually dormant in winter. Leaves and stems become straw-brown as plants enter dormancy each fall. Many of the "turf-type" bermudagrasses are hybrids of the two *Cynodon* species, *C. dactylon* (L) Pers. and *C. transvaalensis* Burtt-Davy.

Mowing

A cutting height of 3/4 to 1 1/2 inch usually works well during the growing season when managing vegetatively established hybrid bermudagrass varieties such as 'Celebration', 'Latitude 36', 'Northbridge', 'Patriot', 'Tahoma 31', 'TifGrand', 'TifTuf', and 'Tifway'. Improved, seeded types including 'Arden 15', 'Jackpot', 'Mirage2', 'Monaco', 'Pyramid', 'Riviera', 'Sunsport', 'Transcontinental', and 'Yukon' often perform best at a slightly higher height of cut (for example, 1 ¼ to 2-plus inches). Raising the height of cut by 1/2 inch or more in mid- September, before the first "heavy" frost, can result in greater insulation and deeper rooting.

Bermudagrass grows best in areas of the landscape receiving full sun with fertile, well-drained soil.

This helps prepare bermudagrass plants for severe low temperatures and drought during winter. Mow frequently so that no more than one-third of the aerial shoots are removed as the lawn is mowed. Mowing in several directions often creates an aesthetically pleasing pattern. In addition to tearing turfgrass leaves, mowing the lawn with a mower with a dull blade or blades, reel, and bedknife invites disease. Mower blades should be sharpened or replaced at least once each year. Similarly, the cutting edges of a reel mower reel should be sharpened and the bedknife should be ground annually.

Watering

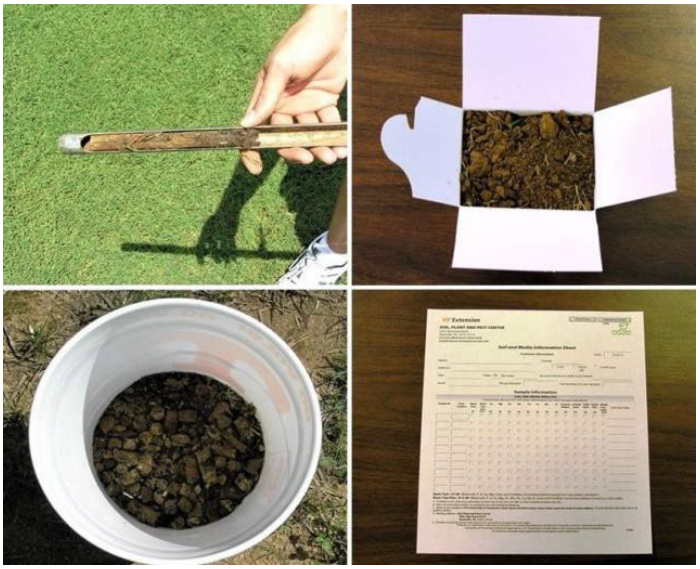
If irrigation is available, watering with up to 1 inch of water each week during favorable growing conditions is advisable. Try to irrigate with 1/2 inch of water no more than twice each week to moisten the soil to a depth of at least 6 inches each time. To maintain active bermudagrass growth and prevent wilt as air temperatures rise in late spring and summer, it may be necessary to irrigate three times a week applying 1/3 inch of water each time the lawn is irrigated.

Liming

Soil testing every three years will help monitor the phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg) and acidity levels. If the soil has become acidic, pulverized or pelletized lime can be applied to neutralize the soil acid. Lime should only be applied according to the soil test report. Both dolomitic lime and agricultural (Ag) lime will raise the soil pH. Because dolomitic lime contains more Mg than Ag lime, and this essential mineral is a component of chlorophyll (a molecule that affects plant color), dolomitic lime is often preferred.
Although lime can be applied whenever weather and soil conditions permit, fall is an excellent time to spread lime. Lime should be uniformly applied. Push-type or pull-behind rotary spreaders are commonly used to broadcast pelletized, or granular, lime. Due to the very fine particle size, drop spreaders are recommended when applying pulverized lime.

Fertilizing

Since bermudagrass grows best at air temperatures from 80 to 95 degrees Fahrenheit, fertilizers should be applied to support the growth of plants as they recover from winter dormancy in the spring, continue growth as a result of warm temperatures throughout the summer, and prepare for dormancy each fall.



Soil testing is recommended every three or four years to monitor the availability of essential mineral nutrients and the level of acidity or alkalinity.

If the soil has become acidic, pulverized or pelletized lime can be applied according to soil test result recommendations, to neutralize soil acids and increase the soil pH.

The following fertilization plan is intended to meet the annual nutrient requirements of an irrigated bermudagrass lawn managed at a high intensity level, and to preserve existing levels of P and K in the soil. Four fertilizations per year are scheduled throughout the growing season. When bermudagrass lawns are maintained at medium or low levels of management intensity, and with no irrigation, nitrogen (N), P and K are usually applied less often, and at lower rates.

Early to Mid-May

Nitrogen is the primary nutrient required in greatest amounts by bermudagrass. The K level in bermudagrass plant tissue is second to N, and P ranks third. Apply a granular fertilizer containing N, phosphate (P2O5) and potash (K20) at a rate providing 1 pound of N per 1,000 square feet. Fertilizers with a 2-1-1, 3-1-2, or 4-1-3 N-P2O5-K20 ratio, and a minimum of 30 percent extended-release N are preferred. A fertilizer with a 3-1-2 ratio contains one-and-one-half times as much N as K2O and three times more N than P2O5. The application of too much highly water-soluble N may result in very rapid leaf growth or fertilizer burn. If, according to soil test results, either P or K levels are very high, there is no advantage, or need, to apply a fertilizer containing the essential nutrient testing in the very high range. Spreading fertilizers and lime in a crisscross pattern at one-half the recommended rate per pass may improve application uniformity.

Late June

Apply a granular N-containing fertilizer to provide 1 pound of N per 1,000 square feet. Fertilizers containing at least 30 percent extended-release N rather than 100 percent highly water-soluble, quick-release N, are preferred. The application of a fertilizer containing at least 30 percent of the total N content in extended-release form results in consistent and uniform growth of bermudagrass leaves, stems and roots.

Late July

Apply a granular N-containing fertilizer at the rate of 1 pound of N per 1,000 square feet.
Fertilizers with 30 percent or more of the N in extended-release form are preferred.

Mid- to Late September

Apply a winterizer-type, complete fertilizer (for example, a 1-2-1 or 1-2-2 N-P2O5-K2O ratio) to provide 1/2 to 3/4 pound of N per 1,000 square feet. When K is applied in combination with N at this time of year, the low-temperature hardiness of bermudagrass may improve. The phosphorus may help improve the energy level of the bermudagrass as plants resume growth in the spring. This will be the final fertilization for the year. If the soil tests very high (VH) in phosphorus or potassium, no additional application of the essential nutrient testing in the VH soil test range is recommended.

Dethatching

Actively growing bermudagrass plants produce thatch at the soil surface. Thatch is made up of dead and decomposing plant leaves, stems and roots intermixed with live plant tissue. Short clippings, returned to the lawn as it is mowed, do not generally cause a

When bermudagrass is actively growing, fertilizers containing more N than either P_2O_5 or K_2O, and more K_2O than P_2O_5 (for example, a 3-1-2 or 4-1-3 N-P_2O_5-K_2O ratio) and at least 30 percent extended-release N are preferred.

major thatch buildup. Clippings usually contain more than 70 percent water and decompose quickly. A thin layer (for example, less than 1/2 inch) of thatch is beneficial. It limits weed growth, conserves soil moisture, and helps protect bermudagrass crowns from high- and low-temperature extremes. Thatch is also resilient and capable of absorbing shock, providing a cushioning effect that helps reduce injuries during outdoor sports and recreational activities. A thatch layer of more than 1/2 inch is considered excessive. A thick layer of thatch can restrict the movement of air and water into the soil, and will eventually weaken the lawn. Hand-held dethatching rakes work well when dethatching small lawns.

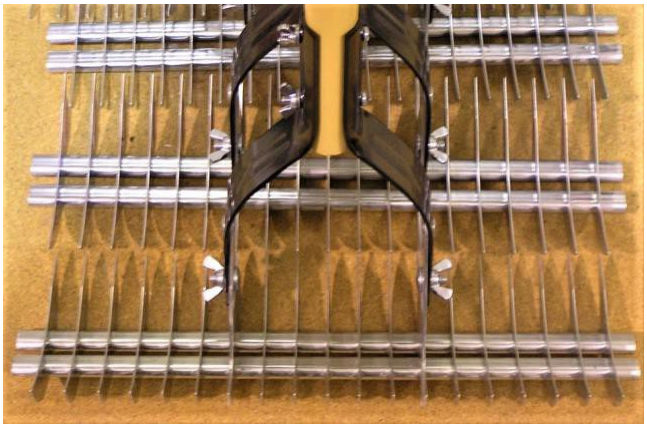
Walk-behind, gasoline-powered dethatchers are commonly used in larger landscapes. Both types slice vertically into the aerial shoots, lifting and depositing a portion of the thatch on the lawn surface where it can be removed. Dethatching in late May, June or early July is recommended so that plants damaged as the dethatcher moves across the lawn can rapidly recover.

Core Aerifying

If the soil becomes compacted, and as a result, bermudagrass roots are shallow, core aerifying will help improve the oxygen level within the bermudagrass rootzone. Core aerifiers, often referred to as aerators, are engineered to remove small (for example, 1/2 to 5/8 inch in diameter, and 2 inches long) plugs with both soil and plants, and create aeration "channels." A drag-mat can be used after core aerifying to break up the soil cores on the lawn surface.

Fertilizing immediately after aerifying (and dragging) in early to midsummer helps speed bermudagrass growth. Mowing and/or irrigation can also help mix the soil from the aeration cores back into the thatch. When soil is mixed with thatch, the rate at which water moves from the surface into the soil usually increases.

Thatch accumulates on the soil surface. It is made up of dead and decomposing plant leaves, stems and roots, intermixed with living plant tissue.



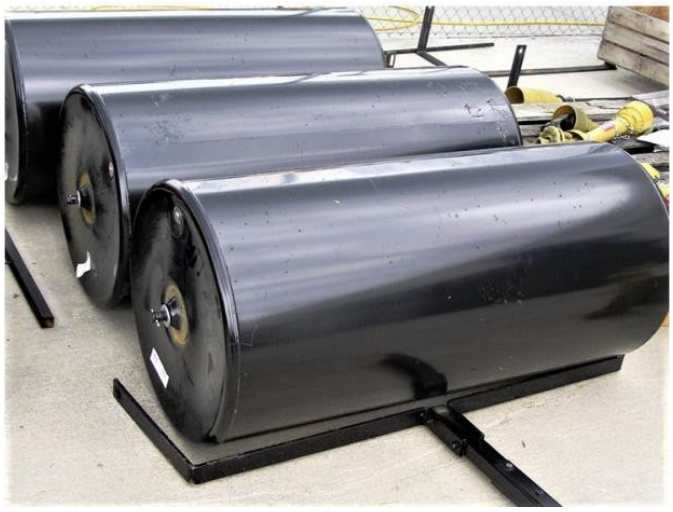
Hand-held dethatching rakes work well in small lawns.

Walk-behind mechanical dethatchers are engineered to slice into the lawn and lift thatch.

Walk-behind, rotary-motion core aerifiers fitted with hollow coring tines selectively cultivate the lawn by removing soil and plant cores and depositing them on the lawn surface.

Rolling

The soil surface may become uneven as a result of freezing and thawing during winter. Rolling the lawn after core aerifying can help smooth the surface and correct minor surface irregularities. Rolling at this time should not cause major soil compaction since soil can move into the vertical aeration channels created by the core aerifier rather than compressing. For best results, the soil should be moist but not saturated when the lawn is rolled. Water can be added as needed to some drum rollers to increase weight.



Rolling the lawn after core aerifying can help correct minor surface irregularities.

Weed Control

Preemergence Crabgrass/Goosegrass

Early to Mid-March

Granular fertilizer plus preemergence herbicide combinations are formulated to supply bermudagrass with essential nutrients, in addition to preventing crabgrass and goosegrass seedlings from emerging from the soil. Since bermudagrass is usually dormant in March, the granular fertilizer in this combination product should contain very little, if any, N. If no such combination product is available, the application of a crabgrass/goosegrass preventer such as prodiamine (for example, Barricade), dithiopyr (for example, Dimension), pendimethalin (for example, Pendulum) or benefin (for example, Balan) is highly recommended. In addition to crabgrass and goosegrass, these herbicides provide preemergence control of many other species of grassy weeds, as well as broadleaf weeds.

Mid- to Late May

Apply a preemergence herbicide plus “complete” (w/N+P2O5+K2O) fertilizer combination containing much more N than that used in March. Making two applications of a preemergence herbicide, one in early to mid-March and the second in mid- to late May, should improve and extend the control of summer annual weedy grasses during the growing season. When applied at label rates, in addition to preventing many summer annual broadleaf weeds and grassy weeds from establishing, these combination products promote bermudagrass growth. An appropriate preemergence herbicide may be applied alone, if the lawn has been fertilized using a product containing no herbicide.

Smooth crabgrass (Digitaria ischaemum), goosegrass (Eleusine indica), and foxtails (Alopecurus spp.) pictured here clockwise from top to bottom, are summer annual grassy weeds.

Postemergence Crabgrass/Goosegrass

July and/or August

A postemergence herbicide can be applied if annual grassy weeds emerge during summer.

A fertilizer and herbicide mixture can be used to apply a crabgrass preventer when fertilizing.

The herbicide quinclorac (for example, Drive XLR8) is labelled for the control of crabgrass and several other annual weedy grasses and broadleaf weeds in bermudagrass lawns.

Multiple applications may be recommended depending on the targeted weed species and stage of growth.

Preemergence Annual Bluegrass

Early September

Annual bluegrass, a very common grassy weed in bermudagrass lawns in Tennessee, is especially noticeable when bermudagrass is dormant. If this winter annual weed species becomes a problem, an appropriate preemergence herbicide can be applied before seeds begin to germinate. Many of the herbicides labelled for preemergence control of crabgrass in bermudagrass lawns also provide preemergence control of annual bluegrass when applied in late summer.

Granular, winterizer-type fertilizer + preemergence herbicide formulations are intended to help prepare bermudagrass plants for dormancy in addition to controlling annual bluegrass and several other weeds before they emerge.

Annual bluegrass (Poa annua) is a very common winter annual grassy weed of bermudagrass lawns.

Postemergence Broadleaves

Although granular preemergence herbicides are often very effective when applied before weed seeds germinate, sprayable formulations of postemergence herbicides may outperform granular postemergence formulations. For enhanced weed control, the herbicide label may advise adding an appropriate surfactant to the spray solution along with the postemergence herbicide. As with preemergence herbicides, postemergence herbicides must be applied uniformly and at the proper rate. Thorough coverage of foliage of the targeted weed species is also very important.

June and/or July

A postemergence herbicide such as 2,4-D amine, or a postemergence herbicide combination such as sulfentrazone + imazethapyr (for example, Dismiss South) or 2-4-D + MCPP + dicamba (for example, Trimec Southern) can be applied in early to midsummer to control emerged broadleaf weeds. In order to limit the potential for volatilization of certain herbicides, early

Prostrate knotweed (Polygonum aviculare), Virginia pepperweed (Lepidium virginicum), and prostrate spurge (Chamaesyce maculata), pictured here from top to bottom, are summer annual broadleaf weeds.

November, December, February

If necessary, repeat applications of a postemergence herbicide or postemergence herbicide combination in late fall and late winter will help control actively growing winter annual and perennial broadleaf weeds.

More information regarding turfgrass weeds and their control is available online at: tennesseeturfgrassweeds.org.

Common chickweed (Stellaria media), henbit (Lamium amplexicaule), and corn speedwell (Veronica arvensis), pictured here from top to bottom, are winter annual broadleaf weeds.

Broadleaf plantain (Plantago major), wild violet (Viola spp.) and ground ivy (Puccinia glechomatis), pictured here from top to bottom, are perennial broadleaf weeds.

Disease Control

The majority of fungi in soils are very beneficial. However, a few are turfgrass pathogens capable of causing disease. Common diseases of bermudagrass lawns include dollar spot, caused by Clarireedia fungi; large patch, caused by Rhizoctonia

Warm days, cool nights, and heavy dew favor the development of dollar spot disease.

Large patch during cool, wet weather in the spring.

solani; microdochium patch, caused by Microdochium nivale; and spring dead spot, caused by fungi in the genus Ophiosphaerella. Dollar spot may appear at temperatures from 60 to 90 degrees Fahrenheit. In addition to warm days, disease development is favored by cool nights and heavy dew. Whitish-gray, cotton-like strands, referred to as mycelium, are often visible on the aerial shoots of infected plants in the early morning hours when dew is present. If conditions remain favorable for disease development over an extended period of time, the brown spots coalesce
(merge), forming larger areas of infected turf. Cool, wet weather in the spring, during or very soon after greenup, favors the development of large patch. Improper mowing, a heavy thatch accumulation, poor soil drainage, and excessive N fertility may also lead to outbreaks of this disease. Fungal activity can occur in fall and resume in early spring, but is suppressed by soil temperatures above 85 degrees Fahrenheit. Microdochium patch usually occurs on semi-dormant bermudagrass in shaded or poorly drained locations, and in alkaline soils. The disease first appears as small blighted spots. The spots may expand, creating patches with white mycelium sometimes visible at the edges.

Excessive N levels may predispose bermudagrass to Microdochium patch. As its name implies, the disease spring dead spot results in diseased spots that, as a result of fungal activity during spring or the previous fall, do not greenup as bermudagrass transitions from winter dormancy. Affected areas often appear sunken, and may expand for three or four years before disappearing. Excessive thatch and high levels of N fertility are linked to severe cases of spring dead spot.

More specific information regarding turfgrass disease control is available online at ag.tennessee.edu/EPP/Redbook/41-Turf%20Disease.pdf.

Microdochium patch on semi-dormant bermudagrass.

Spring dead spot disease after greenup (seeds of summer annual weeds often germinate, and perennial plants may emerge in the diseased patches before bermudagrass plants recover and resume growth).

Insect Control

Several species of insects are capable of injuring bermudagrass lawns. Some, including fall armyworm (Spodoptera frugiperda) damage leaves and stems, while others, including white grubs (the larvae of Scarab beetles), feed on plant roots. Each year, fall armyworm moths migrate to Tennessee from the southernmost United States and Central America. Female moths are noticeable mostly at night, and deposit eggs in masses or clusters in the lawn or on fence posts and other vertical structures. Fall armyworm larvae may be pinkish, yellowish, greenish or dark gray.

They are easily identified by the cream- colored upside-down Y on the fronts of their head capsules. A complete generation from egg to adult usually lasts from 30 to 50 days. The name armyworm is indicative of the large-scale, invasive behavior of this insect in late summer and early fall. White grubs are larvae of a group of beetles in the family Scarabaeidae, referred to as scarabs or scarab beetles. Species found in Tennessee include green June beetle (Cotinus notida), May/June beetle (Phyllophaga spp.), northern (Cyclocephala lurida) and southern (Cyclocephala borealis) masked chafers, Japanese beetle (Popillia japonica), oriental beetle (Anomala orientalis), and black turfgrass ataenius (Ataenius spretulus).

May/June beetles have a multi-year life cycle while green June beetles, European chafers, southern and northern masked chafers, Japanese beetles, and oriental beetles have an annual life cycle. Their larvae injure bermudagrass lawns as they feed on plant roots. Although most white grubs have three pairs of legs, and are whitish or grayish with brownish or blackish heads, the arrangement of bristles and hairs on the underside of the tip of the abdomen, referred to as the raster, varies among species. Early detection of an insect problem, and correct insect pest identification, is a key to successful control.

Threshold levels or targets have been established for individual white grub species.

The application of an appropriate insecticide is usually warranted once the white grub population reaches the threshold target. For example, a population of the annual white grub species European chafer, Japanese beetle, and oriental beetle of 5 to 10 per square foot is the economic threshold target. The threshold target of green June beetle is 6 to 8 grubs per square foot, while that of masked chafer is 15 to 20 grubs per square foot. The threshold target of the black turfgrass ataenius, a species capable of producing several generations of small grubs each year, ranges from 30 to 50 grubs per square foot. The threshold target of the much larger May/June beetle larva is only 3 to 8 grubs per square foot.

More information regarding insect control in bermudagrass lawns is available online at: extension.tennessee.edu/publications/documents/pb1158.pdf.

Preventing Pesticide Resistance

Mowing frequently at the proper cutting height, fertilizing to promote plant growth during favorable weather, removing excessive thatch, and core aerifying before soils become severely compacted, should result in healthy bermudagrass. Healthy plants are often able to resist or recover from fugal pathogen and disease activity. The best defense against weeds is a dense, actively growing lawn.

Applying the same pesticide year after year to control a specific weed, disease or insect pest may lead to pesticide resistance within the target pest population. The judicious and timely use of pesticides in the lawn are fundamental principles of pesticide resistance management. The more frequently pesticides with the same mode of action are used, the more likely resistance will occur. Applying a mixture of two or more pesticides with different modes of action may delay the onset of, or help alleviate, existing pest resistance.

Fall armyworm larvae vary in color from pinkish, yellowish, greenish or dark gray, and have a cream- colored, upside-down Y on the front of their head capsules.

Larvae of masked chafers have brown head capsules and legs, dark stripes on their backs, and a completely random placement of hairs on their rasters.

Fungicides

In 1981, plant pathologists formed the Fungicide Resistance Action Committee, or FRAC, in an effort to limit pathogen resistance to chemical control measures. This committee publishes an annual report listing current active ingredients by their mode of action (MoA), target site, group name, chemical or biological (CoB) group, common name, and FRAC group number. For example, azoxystrobin, FRAC Code 11, is a member of the methoxy-acrylates CoB. Myclobutanil, propiconazole and triadimefon, FRAC Code 3, are members of the triazoles CoB. The FRAC code number of thiophanate-methyl, a member of the thiophanates COB group, is 1.

Insecticides

The Insecticide Resistance Action Committee, or IRAC, was formed in 1984 in an effort to limit the development of insect resistance to insecticides. An IRAC MoA classification scheme was developed to serve as a guide for selecting insecticides for use in an effective and sustainable Insecticide Resistance Management, or IRM, strategy. Insecticides are classified into two types of MoA groups:

1) numbered groups, the members of which are known or thought to act at specific target sites, and 2) groups of undefined/unknown (UN) MoA. Carbaryl, initially registered in 1959 for use in the United States on cotton, is a member of main group 1, and sub-group 1A (carbamates). Trichlorfon, also a main group 1 insecticide, is a member of subgroup 1B (organophosphates). Bifenthrin, cyfluthrin, beta-cyfluthrin, lambda-cyhalothrin, and gamma-cyhalothrin are members of main group 3, and sub-group 3A (pyrethroids/pyrethrins). Imidacloprid, a member of main group 4, is a member of sub group 4A, the neonicotinoids. Spinosad, produced by fermenting the soil bacterium Saccharopolyspora spinosa, is a member of main group 5, and the spinosyns sub-group, while chlorantraniliprole is a member of main group 28, and the diamides sub-group.

Green June beetle larvae move through the soil with their legs pointing up, and usually come to the soil surface every night, where they prefer to crawl on their backs.

Herbicides

Herbicide resistance, the ability of a weed to survive the application of a specific herbicide that, under normal circumstances, would kill the plant, is different than weed tolerance.

Weed tolerance to a particular herbicide is the inherent ability of a plant to survive and reproduce after herbicide treatment. In an effort to reduce the potential for weed species to develop resistance to herbicides, both the

Weed Science Society of America (WSSA) and the global Herbicide Resistance Action Committee (HRAC) provide MoA, and site of action classifications for both preemergence and postemergence herbicides registered for use in turfgrass. For example, the WSSA/HRAC code for the postemergence herbicide sulfentrazone is 14. Sulfentrazone is a member of the N-phenyl-triazolinones chemical family. Imazethapyr, another herbicide primarily used to control emerged broadleaf weeds in turfgrass, has a WSSA / HRAC code of 2, and is a member of the imidazolinones chemical family. Dicamba, 2,4-D amine, and mecoprop are all members of the phenoxy-carboxylates chemical family and have a WSSA/HRAC code of 4. The WSSA/HRAC code of the preemergence herbicides benefin, pendimethalin and prodiamine, is 3. These herbicides are members of the dinitroanalins chemical family. Although a member of the pyridines chemical family, the preemergence herbicide dithiopyr also has a WSSA/HRAC code of 3. Benefin, pendimethalin, prodiamine and dithiopyr share the same site of action inside plants.

Bermudagrass Lawn Maintenance Practices by Month.

Practice/Month	J	F	M	A	M	J	J	A	S	O	N	D
Mowing				X	X	X	X	X	X	X		
Watering					X	X	X	X	X	X		
Fertilizing					X[a]	X[a]	X[a]		X[a]			
Dethatching					X	X	X					
Core Aerifying					X	X	X					

[a] Using this schedule, an irrigated bermudagrass lawn maintained at a high level of intensity will receive a total of 4 pounds of N per 1,000 square feet annually (1 pound of N per 1,000 square feet in May, June, July and September). The application of 1 pound of N per 1,000 square feet in May, July and September should support the growth and vigor of bermudagrass maintained at a medium level of maintenance intensity. A bermudagrass lawn maintained at a relatively low level of maintenance may receive only two fertilizations each year (for example, 1 pound of N per 1,000 square feet in May and again in July). Granular fertilizers containing P_2O_5 and K_2O in addition to N (for example, 2-1-1, 3-1-1 or 4-1-2 N- P_2O_5-K_2O ratio), and a minimum of 30 percent extended-release N are recommended in May. The application of a granular, winterizer-type complete fertilizer (for example, 1-2-1 or 1-2-2 N-P_2O_5-K_2O ratio) is recommended in September unless soil test results indicate that P or K levels are in the very high range. The application of additional P or K is not recommended if the soil test level of the essential nutrient is in the very high range.

Herbicide Application Timing by Month for Weed Control in Bermudagrass Lawns.

Month	J	F	M	A	M	J	J	A	S	O	N	D
Preemergence Crabgrass/ Goosegrass Control			X[b]		X[b]							
Postemergence Crabgrass Control							X	X				
Preemergence Annual Bluegrass Control									X[c]			
Postemergence Summer Broadleaf Weed Control						X[d]	X[d]					
Postemergence Fall/Winter Broadleaf Weed Control		X[e]									X[e]	X[e]

[b] A granular fertilizer + preemergence herbicide combination is recommended in early to mid- March and again in mid- to late May for summer annual grassy weed control. The fertilizer + preemergence combination product that is applied in March should contain very little, if any, N since bermudagrass is most often dormant.

[c] Many of the herbicides labeled for preemergence control of crabgrass in bermudagrass lawns, at the time this publication was written, were also labeled for preemergence annual bluegrass control. Granular winterizer-type fertilizer + preemergence herbicide combinations are intended to help prepare bermudagrass plants for dormancy, in addition to providing preemergence control of annual bluegrass and several species of winter annual broadleaf weeds.

[d] A postemergence herbicide such as 2,4-D amine, or a postemergence herbicide combination such as sulfentrazone + imazethapyr (for example, Dismiss South) or 2-4-D + MCPP + dicamba (for example, Trimec Southern) can be applied in June or July to control emerged broadleaf weeds.

[e] Repeat applications of a postemergence herbicide or postemergence herbicide combination, on an as-needed basis in late fall and late winter, will help control actively growing winter annual and perennial broadleaf weeds.

Fungicide Application Timing by Month to Control Certain Diseases of Bermudagrass Lawns.

Month of Activity	J	F	M	A	M	J	J	A	S	O	N	D
Dollar Spot					X[f]	X[f]	X[f]	X[f]	X[f]			
Large Patch				X[g]	X[g]					X[g]	X[g]	
Microdochium Patch				X[h]	X[h]							
Spring Dead Spot				X[i]	X[i]					X[i]	X[i]	

[f] As the name implies, this fungus causes small, circular brown spots in bermudagrass. Close inspection of leaves of damaged plants reveals tan colored lesions with reddish-brown borders. The disease appears at temperatures from 60 to 90 degrees Fahrenheit, and is favored by warm days, cool nights and heavy dew. As the disease progresses, spots coalesce (merge), forming larger areas of brown turf. At the time this publication was written, fungicides commonly applied for dollar spot control in bermudagrass lawns included myclobutanil (for example, Ferti-lome F- Stop Lawn Fungicide and Monterey Lawn Fungicide Ready To Spray), propiconazole (for example, Bayer BioAdvanced Fungus Control for Lawns, Ferti-lome Liquid Systemic Fungicide II Ready To Spray, and Bonide Infuse Systemic Disease Control Lawn and Landscape Ready To Spray), thiophanate-methyl (for example, Bonide Infuse Lawn and Landscape Systemic Disease Control G, and Scotts Lawn Fungus Control) and triadimefon (for example, Bayer Bayleton 50 Turf and Ornamental Fungicide).

[g] Large patch is favored by cool, wet weather in the spring during or very soon after greenup, and again in the fall (although disease symptoms may not appear until the following spring). Several fungicides are labelled for large patch control in bermudagrass lawns including myclobutanil, propiconazole, thiophanate-methyl and triadimefon.

[h] Bermudagrass is most susceptible to Microdochium patch during wet weather at air temperatures less than 60 degrees Fahrenheit. The disease may also develop under tree leaves remaining on the lawn during extended periods of cold and wet weather. At the time this publication was written, several fungicides including azoxystrobin (for example, Scotts DiseaseEx Lawn Fungicide), myclobutanil, propiconazole, thiophanate-methyl and triadimefon were labeled for the control of Microdochium patch.

[i] Several recently released, sterile hybrid bermudagrass varieties have improved resistance to this disease. The infection and colonization of bermudagrass roots by this pathogen can occur both during spring and fall months. Fungicide application timing is of major importance, with two sequential applications often recommended in the fall once temperatures drop to 70 degrees Fahrenheit at a soil depth of 2 inches. Myclobutanil, propiconazole and thiophanate-methyl are examples of fungicides labeled for spring dead spot control in bermudagrass lawns, at the time this publication was written.

Insecticide Application Timing by Month to Control Certain Insect Pests of Bermudagrass Lawns.

Month of Activity	J	F	M	A	M	J	J	A	S	O	N	D
Fall Armyworms							X[j]	X[j]	X[j]	X[j]		
White Grubs			X[k]	X[k]	X[k]		X[k]	X[k]	X[k]	X[k]		

[j] Mowing and lightly irrigating the lawn is recommended before treating with an appropriate insecticide. Although insecticides are often ineffective against large larvae, several are labeled for the control of smaller caterpillars in bermudagrass lawns. These include: β-cyfluthrin (for example, Bayer Advanced PowerForce Multi Insect Killer Ready-to-Spread Granules), bifenthrin (for example, Ortho Bug B Gon Max Insect Killer for Lawns Granules), chlorantraniliprole (for example, Scotts Grub Ex), cyfluthrin (for example, Bayer Advanced Vegetable and Garden Insect Spray Concentrate), gamma-cyhalothrin (for example, Spectracide Triazide Insect Killer for Lawns), imidacloprid + β-cyfluthrin (for example, Bayer Advanced Complete Insect Killer for Soil and Turf Ready to Spray, and Bayer Advanced Complete Insect Killer for Soil and Turf Ready-to-Spread Granules), propiconazole + lambda cyhalothrin (for example, Spectracide Immunox Fungus Plus Insect Control for Lawns), and spinosad (for example, Monterey Garden Insect Spray).

[k] The insecticide carbaryl (for example, GardenTech Sevin Insect Killer Lawn Granules) is labeled for control of green June beetle larvae. Several other insecticides including chlorantraniliprole (for example, Scotts GrubEx), imidacloprid (for example, Bayer Advanced Lawn Season Long Grub Control Ready-to-Spray), imidacloprid + β-cyfluthrin (for example, Bayer Advanced Complete Insect Killer for Soil and Turf Ready-to-Spray), imidacloprid + lambda-cyhalothrin (for example, Bonide DuraTurf Insect and Grub Control), and trichlorfon (for example, Bayer Advanced 24-Hour Grub Killer Plus Ready-To-Spread Granules) will control many species of white grubs, in addition to green June beetle larvae.

Questions & Answers

Q. Is mowing my dormant bermudagrass lawn very closely in early spring beneficial?

A. Sometimes. Bermudagrasses begin storing energy for reserve in rhizomes during late summer. This reserve is critically important for winter survival, and is often low by the end of the winter dormancy period. Close mowing just before bermudagrass plants resume growth in spring often results in less vegetative insulation and earlier greenup. However, actively growing bermudagrass plants may be damaged when exposed to freezing temperatures and several spring frosts. The ability of plants to recover from freeze damage depends on the amount of energy in reserve, which often depends on the duration of each freeze, and the number of times the bermudagrass plants are frozen.

A frost pattern on bermudagrass.

Q. Soil test results recommend the application of either 5 pounds of 20-10-10 N-P2O5-K2O fertilizer per 1,000 square feet, 3½ pounds of 30-15-20 N-P2O5-K2O fertilizer per 1,000 square feet, or 7 pounds of 14-7-8 N-P2O5-K2O fertilizer per 1,000 square feet in early June. I cannot find a fertilizer with any of these analyses locally.

A. Purchase a granular fertilizer with an analysis close to one of those suggested, and apply it based on the recommended rate of nitrogen. If an application of 5 pounds of 20- 10-10 N-P2O5-K2O fertilizer is recommended per 1,000 square feet, 1 pound of nitrogen is being applied per 1,000 square feet. If a fertilizer with an analysis of 25-5-15 N-P2O5- K2O is purchased, rather than 20-10-10 N- P2O5-K2O, the application of 4 pounds per 1,000 square feet, also provides 1 pound of nitrogen per 1,000 square feet.

Q. I'd prefer to fertilize the lawn with organic nutrient sources. Should I follow the suggested fertilization schedule that came with the soil test results?

A. Organic fertilizers are often applied more frequently. Fertilizers listed by the Organic Materials Review Institute, or OMRI, usually contain much less nitrogen than highly concentrated, synthetic fertilizer formulations. For example, crab meal, feather meal and fish bone meal have a N-P2O5-K2O analysis of 4- 3-0, 12-0-0 and 4-12-0, respectively. Due to the low concentration of nitrogen (or phosphate and potash) these products contain, they are usually applied more often throughout the bermudagrass growing season. The goal is to apply the same, total amount of nitrogen, phosphate and potash each year, based on the soil test results.

Q. Should a bermudagrass lawn be dethatched and aerified once each year?

A. Not necessarily. Consider measuring the thatch layer annually, in early fall. If 1/2 inch or more thatch has accumulated, plan to dethatch the lawn in late May, June or early July the following year. Heavily trafficked bermudagrass lawns maintained in clayey soils are usually more prone to compaction than lawns maintained in loamy or sandy soils receiving very little traffic. Consider core aerifying the lawn in late May, June or early July if, rather than moving through the thatch and into the turfgrass rootzone, water remains on the surface for several hours following a 1- inch rain.

Q. Is slicing or spiking an effective way to relieve soil compaction?

A. Although slicing and spiking, like core aerification, are considered selective lawn cultivation procedures and penetrate the thatch layer, their benefits are often short-term. Routine use of a heavy spiker equipped with large diameter spikes may actually increase compaction as soil particles are pressed together. Slicing or spiking the lawn before broadcasting bermudagrass seed can improve the seed contact with soil.

Q. What does the word topdressing mean?

A. Topdressing is the uniform application of a thin layer of soil or organic material over the surface of the lawn. For example, after core aerifying, bermudagrass may be topdressed with ½ inch of mature compost to increase the soil organic matter and nutrient content within the rootzone. Routine topdressing can also help elevate the soil surface in low areas.

Q. Will my pets be exposed to pesticides if the lawn is treated with herbicides, fungicides or insecticides throughout the year?

A. It is very important to read, fully understand and follow all label instructions that come with the pesticide before it is applied. Each pesticide label contains information about how to keep both you and your pets from being exposed. A specific re- entry interval, or REI, is listed on the pesticide label. The REI (also known as restricted entry interval or re-entry time) is the minimum amount of time that must pass between the time a pesticide is applied to the lawn and the time that people can return to the area without protective clothing and equipment.

Q. Does rolling a lawn cause more soil compaction?

A. Lawn rollers are most often used to firm seed or sod to the soil surface after planting. They may also be helpful when the soil in certain areas of the lawn has heaved during winter or has been lifted by tunneling animals such as moles. However, when several major surface undulations exist, it may be best to lease a walk-behind sod cutter to lift bermudagrass plants from elevated zones, remove some of the soil below, and reinstall the sod.

Q. Can lawn insecticides kill bees and other pollinators?

A. Potentially, yes. Some manufacturers have added special bee icons on insecticide labels indicating that certain uses can be especially toxic to bees. Pollinators often visit flowers of several common lawn weeds including clover and dandelion. Maintaining a relatively weed- free lawn will make the lawn less attractive to pollinators. Routine mowing often reduces the total number of flowers in the lawn, and limits pollinatorforaging. If weeds are in bloom, the lawn should be mowed immediately before applying the insecticide.

Q. The bermudagrass in most of the areas in the lawn is doing well. However, moss has become a problem in one area. Does moss in a lawn mean that lime needs to be applied?

A. Mosses are classified as bryophytes and are not vascular plants. They produce spores rather than seeds and lack true stems, roots and leaves. Mosses do not kill bermudagrass, but they do establish in spaces among plants, often forming dense, low-growing mats.

Although mosses grow well in acid soils, their presence usually indicates that the growing environment favors mosses rather than bermudagrass. In addition to acidic soils, excessive shade or irrigation, poor drainage, compacted soil, and/or low soil fertility can be the issue(s).

Several iron-based products (for example, Lily Miller Moss Out with anhydrous ferric sulfate, and Scotts MossEx with ferrous sulfate monohydrate) are marketed for moss control. Selective tree and shrub limb pruning may help increase the amount of light reaching bermudagrass leaves. Irrigating too often leads to excessive moisture, especially in shady or poorly drained areas. Excess moisture on the soil surface contributes to a moss problem. Contouring the area to redirect the flow of surface water may be beneficial. Core aerification will help loosen soil in the bermudagrass rootzone, increase the rate of water infiltration, and lessen compaction. Rather than trying to manage bermudagrass in shade, other options include embracing the mosses and naturalizing the area, mulching (pine straw, hardwood or pine bark, ground up leaves, etc.), or planting a shade-tolerant groundcover.

Moss in a bermudagrass lawn usually indicates that the environmental conditions at this location do not favor turfgrass plant growth.

Q. What do bermudagrasses need to perform their best?

A. Trying to maintain a quality bermudagrass lawn where the species is not well adapted can be very frustrating and expensive. There are four basic requirements. 1) Light. Bermudagrass must capture light energy in order to produce compounds that can be stored in reserve for use at a later date. 2) Nutrition. In addition to carbon, hydrogen and oxygen, which are supplied by carbon dioxide in the atmosphere, and water, bermudagrass needs 14 nutrients (minerals) in order to survive and reproduce. Nitrogen, phosphorus, and potassium are the essential mineral nutrients most frequently applied to bermudagrass lawns when they are fertilized. 3) Water. In addition to supplying bermudagrass with hydrogen and oxygen, water carries essential mineral nutrients from the soil solution into roots, then to other parts of the plant. Sugars produced in leaves and stems are also transported throughout the plant in water. 4) Temperature. Bermudagrass plant growth and seed germination only occur within a specific air temperature range.

Q. I'm interested in comparing several varieties of bermudagrass before selecting one. Where can I see one or more varieties?

A. Demonstration turfgrass plots are maintained in Memphis, near the UT-TSU Shelby County Extension office, 7777 Walnut Grove Road # 21, Memphis, TN 38120 and in Jackson, at the West Tennessee AgResearch and Education Center, 605 Airways Blvd., Jackson, TN 38301. Sod producers often market more than one bermudagrass variety. In addition to "common" bermudagrass, improved, turf-type bermudagrass varieties are also managed on many athletic fields throughout the state.

Demonstration plots of warm-season turfgrasses maintained near the UT-TSU Extension Shelby County Office in Memphis, Tennessee.

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This publication contains herbicide recommendations that are subject to change at any time. The recommendations in this publication are provided only as a guide. It is always the herbicide applicator's responsibility, by law, to read and follow all current label directions for the specific herbicide being used.

The label always takes precedence over the recommendations found in this publication. Use of trade or brand names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others that may be of similar, suitable composition, nor does it guarantee or warrant the standard of the product.

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