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Rept 1965

Turf Bulletin

Better Turf Through Research and Education

Massachusetts Turf and Lawn Grass Council, Incorporated

TURF BULLETIN

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TURF BULLETIN

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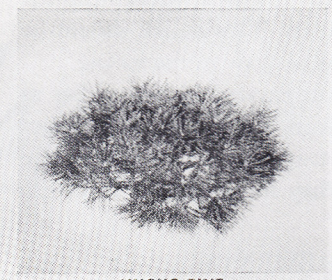
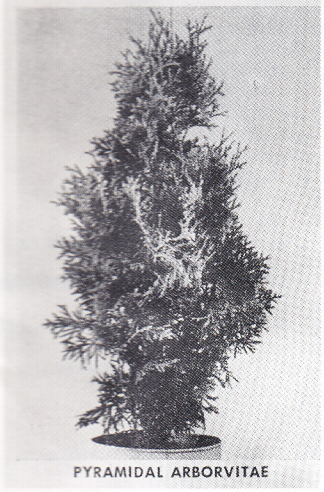
More detailed information on the subjects discussed here can often be found in bulletins and circulars or may be had through correspondence.


POTTED HEMLOCK


BLUE PFITZER


MUGHO PINE


GLOBE ARBORVITAE


PYRAMIDAL ARBORVITAE

The Planting And Care Of Evergreens


NORWAY SPRUCE

TRANSPLANTING

Evergreens demand great care when being transplanted as their leaves are giving off moisture all of the time. It is necessary, therefore, for the roots to absorb water from the soil winter and summer. Otherwise, the leaves would lose their moisture by transpiration and turn brown.

To prevent as much as possible, the drying of the roots, the evergreens are transplanted with a solid ball of earth about the roots, which is kept in place by a burlap wrapping. The wrapping should not be removed. The nursery company will also have the branches securely tied to prevent injury, and they should remain in this fashion until the tree is planted.

It is advisable to plant evergreens as soon as they are received. If this is not possible, soak the earth ball (burlap and all) in a tub of water for five minutes, or longer if the earth is dry. Then stand the tree in a sheltered place away from sun and wind.

The evergreen tree should be placed in a hole that is deep enough to permit the top of the ball to rest two inches below the ground level. This will guarantee the roots enough covering after the ground has settled to prevent their becoming dried out and will provide a basin for the collection of water during the first year. The hole should also be large enough in diameter to allow at least one foot of newly packed soil, rich in decayed vegetable matter, to be placed about the ball on all sides. This extra effort will help the roots to spread and will make the ground more capable of holding water for the newly transplanted tree.

When planting, leave the burlap around the ball and tamp the loose earth used for refilling about it firmly with your foot. When the hole is two-thirds filled, flood with water, and then continue filling the hole. If there is too much burlap about the base of the trunk, the string may be cut and the burlap folded back so that it will be flattened under an inch or two of soil.

Immediately after planting allow a slow trickle of water to settle the dirt still more firmly about the roots and then place some dry soil on top to hold the water and bring the ground level to the proper height. The large upright trees should then be firmly staked, or guyed, to prevent their swaying back and forth.

CULTIVATION

It is best to keep the ground cultivated from the trunk to one foot beyond the branches for at least two years. This will hold the moisture in the ground and prevent weeds from growing. Peat moss worked into the soil will also help to hold the moisture but does not eliminate the need for cultivation. A heavy mulch of peat moss will prevent the normal rainfall from penetrating the soil very far, which may cause the roots to grow close to the surface of the ground. If this should happen, the roots would be severely injured by the heat of sumemr and cold of winter if the protective blanket was ever raked away.

If the trees are planted in the spring, they should be watered for several hours every 10 days, or every week in extremely dry weather. If they are planted in the fall, they should be watered until the ground freezes. FEW EVERGREENS PLANTED ABOUT THE HOME GROUNDS DIE FROM TOO MUCH WATER. After the ground freezes, cover the cultivated area with a mulch of well-rotted straw (but not manured straw), hay, or leaves and wet the mulch, or cover with boards, to prevent it from blowing away. This mulch could be 10 inches deep but should not come in contact with the branches, or trunk. A

(Continued on Page 4)

EVERGREENS *(Continued)*

mulch of this kind holds the frost in check, preventing the ground from being frozen too deep. This mulch should be removed when the ground begins to thaw in the spring.

Evergreen trees may be transplanted in September as soon as th fall rains begin and from then through October. In the spring the trees may be transplanted as soon as the soil is workable, but not after they have started their new season's growth.

SOIL REQUIREMENTS

A loose, sandy loam that is well-drained gives the best results for most cone-bearing evergreens. A very stiff clay soil should be mixed with a generous supply of sand and peat moss to make it porous enough for easy root growth and to provide drainage. If this is not practical, low-growing forms may have their roots underlain by two feet of gravel to supply drainage. Care must be taken that a pool of water will not collect about the roots of the plant because the clay is so heavy that the water trickling through the loser soil filled around the ball cannot seep away. With the exception of a few species like the larch and abor-vitae, evergreens will not grow when the ground is wet, soggy, or poorly drained.

The beauty of most of the tall upright evergreens lies in the whorls of branches that radiate like spokes in a wheel, tier above tier, and in their tapering symmetry. If the wide sweeping lower branches are removed, the beautiful tapering effect is lost and the chief beauty of the tree is gone. Therefore, no entire branch is removed from an upright evergreen unless it is dead, or diseased, in order to preserve the natural form. If a branch needs to be shortened, as may happen if the tree is one-sided, the branch should be cut only in the early spring and should include one or two years' growth. If the branch is cut below the foliage line, it will seldom suceed in forming new growth and it is better to leave a margin of safety.

The informal type of juniper, whether it has a spreading or upright habit of growth, frequently needs judicious branch pruning to keep it within bounds. If this is necessary, cut the long branches just above a vigorous side shoot on the second or third year wood, but at the same time avoid having all of the branches the same length, which would destroy the irregular, informal outline.

Small specimens of the pines, firs, and spruces may be made denser and more uniform in appearance by removing the terminal buds of the stronger branches. This will force the side buds to grow and also help the weaker shoots to make an additional growth. The buds should be removed in early spring before the new growth has started. Mugho pines, especially, may be kept dense and within bounds by this method of pruning.

The softer foliage trees, like the yews, arbor-vitaes, and junipers, may be sheared to form an even growth, or to create a more definite shape. Shearing is done just as the new growth appears and by clipping the tips of the branches with a sharp pair of hedge shears. This method is primarily used when the trees are being used in formal gardens, or other formal developments, and for making young trees denser. If an informal shape is desired, the tree should not be sheared more than twice and then when it is small.

TREES FOR SPECIAL PURPOSES

SPECIMENS FOR FOUNDATION PLANTING

American Globe Arbor-vitae—*Thuja occidentalis globosa*
Douglas Pyramidal Arbor-vitae—
Thuja occidentialis Douglasii pyramidalis
Thuja occidentalis Ellwageriana
Red Cedar—*Juniperus virginiana*
Cannart Red Cedar—*Juniperus virginiana Canaertii*
Silver Red Cedar—*Juniperus virginiana glauca*
Chinese Juniper—*Juniperus chinensis*
Pfizer Juniper—*Juniperus chinensis Pfitzeriana*
Prostrate Juniper—*Juniperus communis depressa*
Savin Juniper—*Juniperus Sabina*
Mugho Pine—*Pinus mugo mughus*
Dwarf Japanese Yew—*Taxus cuspidata nana*
Hybrid Yews

ROCK GARDENS

Fountain Red Cedar—*Juniperus virginiana tripartila*
Koster Red Cedar—*Juniperus virgiaiana Kosteri*
Creeping Juniper—*Juniperus horizontalis*
Meyer Juniper—*Junperus squamata Meyeri*
Prostrate Juniper—*Juniperus communis depressa*
Sargent Juniper—*Juniperus chinensis Sargenti*
Tamarix Savin—*Juniperus Sabina tamarisfolia*
Dwarf Alberta Spruce—*Picea glauca conica*
Maxwell Spruce—*Picea Abies Maxwellii*
Remont Spruce—*Picea Abies Remontii*

FOR FORMAL ACCENTS

American Globe Arbor-vitae—*Thuja occidentalis globosa*
American Pyramidal Arbor-vitae—
Thuja occidentalis fastigiata
Douglas Pyramidal Arbor-vitae—
Thuja occidentalis Douglasii pyramidalis
Conical Chinese Juniper—*Juniperus chinensis mas*
Juniperus chinensis pyramidalis
Irish Juniper—*Juniperus communis hibernica*
Swedish Juniper—*Juniperus communis suecica*
Mugho Pine—*Pinus mugo mughus*
Japanese Umbrella Pine—*Pinus densiflora umbraculifera*
Dwarf Alberta Spruce—*Picea glauca conica*
Koster Blue Spruce—*Picea pungens argentea*
Arrowhead Norway Spruce—*Picea Abies conica*
Upright Japenese Yew—*Taxus cuspidata capitata*
Hybrid Yews

FOR A GROUND COVER

Creeping Juniper—*Juniperus horizontalis*
Sargent Juniper—*Juniperus chinensis Sargenti*
Tamarix Savin Juniper—*Juniperus Sabina tamariscifolia*
Juniperus squamata
Waukegan Juniper—*Juniperus horizontalis Douglasii*
American Arbor-vitae—*Thuja occidentalis*
Douglas Fir—*Pseudotsuga taxifolia*
Nikko Fir—*Abies homolepis*
White Fir—*Abies concolor*
Europeon Larch—*Larix decidua*
Japanese Larch—*Iarix Kaempferi*
Austrian Pine—*Pinus nigra*
Red Pine—*Pinus resinosa*
Swiss Stone Pine—*Pinus Cembra*
Alberta Spruce—*Picea glauca albertiana*
Colorado Spruce—*Picea pungens*
Norway Spruce—*Picea Abies*
Serbian Spruce—*Picea omorika*
White Spruce—*Picea glauca*

FOR WINDBREAKS

American Arbor-vitae—*Thuja occidentalis*
Red Cedar—*Juniperus virginiana*
Douglas Fir—*Pseudotsuga taxifolia*
Red Pine—*Pinus resinosa*
Scots Pine—*Pinus sylvestris*
White Pine—*Pinus strobus*
Norway Spruce—*Picea Abies*
White Spruce—*Picea glauca*

FOR HIGH HEDGES

American Arbor-vitae—*Thuja occidentalis*
Red Cedar—*Juniperous virginiana*
Douglas Fir—*Pseudotsuga taxifolia*
Canada Hemlock—*Tsuga canadensis*
White Pine—*Pinus strobus*
Norway Spruce—*Picea Abies*
White Spruce—*Picea glauca*

FOR MEDIUM HEDGES

American Pyramidal Arbor-vitae—
Thuja occidentalis fastigiata
Cannart Red Cedar—*Juniperus virginiana Canaertii*
Upright Japanese Yew—*Taxus cuspidata capitala*

FOR LOW HEDGES

American Globe Arbor-vitae—*Thuja occidentalis globosa*
Dwarf Japanese Yew—*Taxus cuspidata nana*

Courtesy, Michigan Extension Extension Service

EDITOR'S APOLOGY:

In the last issue of the **Turf Bulletin** an advertisement for Sawtelle Brothers appeared in which Mr. Ken Turner and Mr. Chester Sawtelle's names appeared in the upper left-hand corner of the ad. We goofed. Actually, Mr. Ken Turner's name was supposed to be shown as a **new member** of Sawtelle's **sales force** and not as what might have been construed as a new partnership.

Signed,

Editor

MASS. TURF COUNCIL CONTRIBUTES — Jack Smith, Secretary-Treasurer of the MTLGC, presents check for $500 to Dr. Joseph Troll, Turf Specialist, at University of Massachusetts to help aid research in fine turf. Also pictured from left to right, Richard Blake, President MTLGC; Ken Turner and Dean Squier, research and education division, MTLGC.

Maintenance Of Bentgrass For Private Putting Greens And Lawns

Many people having a small private putting green do not have the technical literature available nor extensive experience to guide them in its detailed care. This attempts to provide a basic core of suggestions. Anyone having a putting green must realize that there are many local variations in weather, nutrition and plant responses, which preclude the exact projecting of any schedule. For bentgrass lawns similar work, but less frequency would be needed.

MOWING

Mow putting green three to five times a week. If in doubt, cut. More frequent cutting favors better putting, more uniform turf survival and better density. Keep the mower sharp; keep the bedknife adjusted. To check turn the reel by hand. Does it scissor-off the grass? Look at the turf after mowing. Are some long blades left chewed and bruised? Use a hand file to sharpen the front lip of the bedknife every week or month. Have the machine lapped twice a year by back-grinding. Talk to your local golf course manager, or mower maintenance houses.

Cutting heights of ¼" — measure bedknife lip above hard surface — are standard with a range of 3/16 to ⅜". For lawns, cut ⅜ to ¾" high and 2-3 times a week. Catch clippings also to improve neatness and reduce disease.

FERTILIZING

Vigorous grass makes better putting greens. Fertilizers should be applied to produce growth when wanted. Monthly applications would be minimal; weekly applications maximum. Develop a system you trust and stay with it. Over-fertilizing is easy to do. Standard rates per application would be 1 pound actual nitrogen for each 1,000 sq. ft. in cool weather; ¼ pound is enough in hot weather. See topic 8-9 in Lawn Bulletin for suggestions.

One easy way is to broadcast pelletted fertilizer in early morning when dew is present so your pattern of application shows; then set the sprinkler immediately to water in this material. The dew also helps to dissolve the fertilizer and protects the grass from burn.

Get a soil test every two years. Phosphorus accumulates readily, but keep adding potassium. Consider a 4: 1:2 ratio. Four pounds nitrogen per 1,000 square feet each year is minimal; 6-8 pounds ample; 10 pounds maximum. Popular fertilizer analyses include 18-4-6, 35-5-15, 12-4-8, 10-3-7, and 16-8-8. For lawns, 3 pounds nitrogen for each 1,000 square feet would be minimal; 4-6 pounds would be ample.

WATERING

Bentgrass loves water, so frequent application to replace moisture loss is desired. Water heavily, then lightly until the soil is drier underneath. Is is easy to over-water,

(Continued on Page 8)

PUTTING GREENS *(Continued)*

so, just re-wet the soil. Hand-rinsing during the hot parts of the day through the summer may be helpful to keep grass cooler and reduce wilting. Several easily installed underground plastic pipe and permanent sprinkler systems are available for custom or homeowner installation. Some also utilize time-clocks for automatic time of watering.

Watering favors disease, so as a principle keep the leaves as dry as possible to reduce disease. Avoid keeping the leaves wet for long extended periods, which favors disease buildup.

DISEASE CONTROL

Snowmold shows only in early spring. Dollarspot may show from mid-May and until late October. Brownpatch and leafspot may show from early June until early September. Pythium may show in July and August. Several other diseases may sometime affect bentgrass. Extended humid, hot periods favor disease development. Often a change in weather will stop disease activity. Poor circulation, as often found around homes and shrubs, tends to increase disease attacks.

Generally wait in the spring until dollarspot is first noticed, maybe mid-May, then apply fungicides every 2 weeks. Leave spray on foliage to dry and use extra applications whenever diseases are rampant. Broad-spectrum fungicides that act against several diseases are suggested. In northern areas, where snowmold is severe, it can be prevented by early winter spray protection. Work out a system for your sprayer. Have your materials weighed up in batches ahead of time. When you see a leaf turning brown it's too late to save that leaf, so protect early.

For lawns less disease is expected and with higher cut more can be tolerated. Dollarspot may be the worst problem. It is easily controlled, but reoccurs; therefore, one application monthly may be adequate for disease control except during adverse periods. Generally some fungicide use should be planned.

Midwest Turf News

Velsicol Herbicide

Phenoxy herbicides have long been of economic importance for post emergence control of many broadleaf weeds in turf. The phenoxy family of herbicides is undoubtedly the best known group of weed killers presently on the market.

With the advancement in strains of grass and increased problems in turf from weeds not controlled by the phenoxy group, the demand for new herbicides has increased. For example, greater soil compaction from the use of larger equipment and electric golf carts has increased the population of knotweed in turf. Also, clover, sometimes considered a desirable plant, has become undesirable in many areas.

New herbicides are also in demand for other reasons. Many weeds, such as chickweed, grow when temperatures are between 45-50°. It is important to control these weeds in their early state so the desirable grasses will have less competition.

Velsicol introduced BANVEL D 4-S to the Turf Market to meet this demand. This chemical has given excellent control of weeds in turf that were previously hard to control without injury to desirable grasses.

BANVEL D 4-S (four pounds 3, 6-dichloro-o-anisic acid per gallon) is a water soluble material for ease of dilution in sprayers. It is a dark colored liquid in formulation and is stable at temperatures to –5°F. Any increased density at lower temperatures will decrease as the temperatures increase and the chemical will return to its original soluble state without heating or agitation, as temperature rises. Also, BANVEL D 4-S will remain stable in direct sunlight.

Control of knotweed, chickweed, white clover, sheep sorrel, curly dock and dog fennel, can be obtained any time the weed is actively growing in centipede grass, bluegrass, Bermudagrass, St. Augustine, or bentgrass with BANVEL D 4-S at rates from ½ to one pound per acre. Promising results have been obtained in many areas on control of dandelions, creeping charlie, and henbit.

Desirable grass seed may also be sown one month before or after application of BANVEL D 4-S. This allows you to seed the previously weed infested areas during the same growing season.

Another cultural practice that has grown rapidly in the past few years is pre-emergence control of crabgrass. Because of the thousands of seeds produced by one crabgrass plant, this problem needs constant attention.

BANDANE , a pre-emergence herbicide developed by Velsicol Chemical Corporation, is available to turf growers in granular form. BANDANE combines excellent crabgrass control, insect control, safety to desirable grasses into one chemical for better turf.

BANDANE (polychloroodicyclopentadiene isomers) is a chlorinated hydrocarbon chemical which is used as the active ingredient in many granular pre-emergence crabgrass formulations. BANDANE applied at rates of 30-35 pounds actual BANDANE per acre has given excellent crabgrass control without injury to grasses, such as bentgrass, bluegrass, bermuda, Zoysia, St. Augustine, and centipede.

BANDANE has little or no post-emergence activity, therefore, it must be applied before crabgrass germinates. An application of BANDANE for crabgrass control will control many soil insects.

These two chemicals are relatively new products to meet the increasing problems in turf maintenance. Both chemicals have been thoroughly tested and play important roles in good turf maintenance programs.

Reprinted from the AGRONOMY JOURNAL
Vol. 56:221–223, 1964.

Kentucky bluegrass	75-80% Germ.	136,080 Seeds
Rough bluegrass (Poa trivialis)	75-85% Germ.	158,760 Seeds
Fine Fescues	85-90% Germ.	34,120 Seeds
Bentgrass — Highland (Upright Type)	80-90% Germ.	567,000 Seeds
— Astoria (Upright Type)	80-90% Germ.	341,560 Seeds
— Seaside (Creeping Type)	80-90% Germ.	487,521 Seeds
Ryegrasses	90-95% Germ.	14,175 Seeds
Tall fescues	85-90% Germ.	14,175 Seeds
Meadow fescue	85-90% Germ.	14,175 Seeds
Timothy	90-95% Germ.	23,117 Seeds
Red Top	85-90% Germ.	311,850 Seeds
White Clover	85-90% Germ. including) Hard Seeds)	42,525 Seeds

Draining Turfgrass Areas

By Roy Goss

Normally, we think that the prevailing climate is the chief cause of drainage problems in our local areas. This is only one part of the problem, when we consider the equally important factor of soils.

When we think of soils, we should consider such things as texture, that is, are the soils heavy or light, clayey or sandy. Another important point, is the structure. Are these soils well aggregated or do they have no structure? Are they puddled and compacted, so that water will have a difficult time of entering and percolating through? Topography, of course, is always a must to consider in the problem of drainage. The problem of topography is one that quite often we cannot change, but we must follow the contours of the land.

The chemical properties of the soil are reasonably important in any drainage problem. In the arid sections of the United States, it is not uncommon to find soils with high amounts of sodium or potassium carbonates. These high percentages will bring about a loss in soil structure, thereby causing severe drainage problems if the condition is not relieved.

Mechanical effects on the soil are most important, especially in the surface few inches. Heavy equipment working on these areas will cause compaction down to a few inches and will render drainage tiles, that have been previously placed, in a useless condition. Soils that are worked in wet conditions lose their structure, and hence, it will compact and will not allow good drainage.

BENEFITS OF PROPER DRAINAGE

Many benefits are evident from proper drainage, and a few of those can be outlined as follows:

1. It deepens the effective profile for root penetration.
2. It conserves the soil since more water will percolate through the soil and less will run off if good drainage is provided.
3. It lengthens the season that the area can be used, that is, areas can be used earlier in the spring.
4. It raises the soil temperature. Dry soil is much warmer than wet soil. Due to the latent heat of water, it actually takes five times as much heat to raise water one degree as it does to raise an equal volume of soil one degree.
5. It permits uniform use of the area. Mowing around these wet spots on turf areas is a nuisance, as well as the fact that problems arise because this grass gets too long before the areas dry up so it can be mowed.

WHERE IS DRAINAGE NEEDED?

Actually, there are only about three general areas where drainage is required and they are as follows:

1. Where water stands for more than 24 hours after heavy rainfall.
2. Where high water tables exist at all times, or during certain seasons.
3. Where clay subsoils exist.

The exception to the rules above would be on such specialized areas as putting greens, where rapid drainage would be necessary and would not hold true to the 24 hour factor as listed above. In this case, we are limited by the type of soils that we have, which again points out that the sandiest soils would be preferable for putting green construction in the wetter areas.

PLANNING THE DRAINAGE SYSTEM

It is needless to say, that the main line is used only for carrying water from the source of pick-up to the source of exit. The mains, of course should be as straight as possible, and where curves are necessary, make them as gentle and gradual as possible. Also, avoid grades that are too flat and those that are too steep. And, of course, perhaps the most important factor, is to use adequate pipe size. The laterals are the actual working mechanism of any drainage system; they are the lines that regulate the water table, even though the mains do intercept and carry away some drainage water on their own. The lateral pattern is regulated by topography and soil type, for the most part.

There are a number of lateral systems that can be used in drainage work for turf areas, but the natural or random system, is probably the one most used by turf people, since it is most adaptable to sloping and rolling terrain. For some of the more specialized areas, a herringbone system or the gridiron system, is the one that would be most logical to use. The gridiron system, of course, works very satisfactorily on playfields and football fields.

DESIGN OF THE SYSTEM

The depth and spacing of laterals is governed by the characteristic of the soil and whether it is on fairway, which would represent all lawn type turf, or on putting greens. Since deeper mats of grass are encountered on the lawn type turf, and they do not usually become soft and soggy as on putting greens, the depth in spacing of laterals can be increased over that on putting greens. On lawn type turf, such as fairways, the laterals should not be any more than 40 to 50 feet apart for adequate drainage. However, for most home lawns it would be suggested that this is all related to the characteristic of the soil. In putting greens the spacing of laterals should not be any greater than 10 to 15 feet apart, *if maximum* drainage is desired.

The depth of placement of laterals on lawn type turf (such as parks, cemeteries, and playfields) should be only deep enough to allow maximum penetration and development of the root system. The tiles should also be deep enough to avoid damage from freezing and heavy equipment. The optimum placement for tile in turf areas, as indicated above, is approximately 16 inches to 2 feet deep. On putting greens, where the immediate surface is the one that takes the greatest beating from play, compaction, and wetness, and also since the grass roots are extremely shallow on most putting greens, then the immediate surface is the most important to consider when laying drainage tile. These tiles should not be layed to any depth greater than 16 to 18 inches in the putting green, and unless the soil is extremely sandy, the drains should not be layed any deeper than 12 to 14 inches.

(Continued on Page 10)

DRAINAGE *(Continued)*

TILE SIZE AND SLOPE

It is recommended that for most drainage conditions no tile smaller than 4 inches be used under any circumstances, and 5 inch tile as a minumum is generally better. The reason for this arbitrary lower limit on size is that 5 inch tile carries nearly twice as much water as 4 inch on the same grade or slope and is much likely to become silted or clogged. In fact, because of its additional capacity, it can lose some capacity by silting and still serve the area for which it was layed. The amount of area that the tile must serve is the primary consideration in governing the size of that to be used.

One bit of information that may save some of you a lot of money, is to consider that the farther the tile line extends from the outlet, the smaller the size can become due to less area of service. At the head of the water shed, the tile may be no larger than the laterals themselves, since only a small area is being serviced.

The fall, slope, or gradient of the tile line is also an important factor. The greater the fall, the smaller the tile may be to carry the water from any given area. It is possible to have too much fall just as it is possible to have too little. Too much fall tends toward extremely high velocities, whcih are often responsible for causing blow holes and for washing out entire lines of tile.

Another important factor is how fast the water must be carried away. It has been generally agreed that tile drainage systems must be capable of disposing of from ¼ to ⅜ inch of percolated rainfall in 24 hours. All figures estimated on the ⅜ drainage co-efficient are generally safe for any locality that is encountered. A simple formula for determining the amount of area that a tile line will have to drain is as follows: Multiply the distance between tile lines times the number of feet long the tile lines are and divide this product by 43,560 sq. ft. (per acre) and this will give you the number of acres in the drainage area.

The closer the lateral lines are spaced, the more quickly the area will drain, However, the important factor here is the cost of installing additional lines. In order to save some money, it is possible to lay the main line and a minumum number of laterals. If the desired drainage is not achieved, more laterals can be placed at a later date. It should be kept in mind, that while closer spacing will remove excess water a little more quickly, the chief advantage to be gained by closer spacing, is that the water table will be more nearly flat and at a more uniform depth than at wider spacings.

Installing surface inlets is an important factor in tile drainage. Actually, wider spacing of tile lines can be used if surface inlets are freely used. Surface inlets can be installed in lower areas and allow much faster drainage of these impounded waters.

LAYING THE DRAIN TILE

At the end of the day, whenever the job is not completed, always block up each end of the tile so that small animals or unexpected cave-ins or washing, will not fill the tile and clog them. As soon as the tiles are placed in the trenches a few inches of earth should be back filled to hold them in place until the final back filling is done. In muck and sand, cradling of the tile is often necessary to assure maintenance of the grade. Wherever cradling is necessary, the board and cleat method is perhaps the best system. Simply nail small cleats on each side of a flat board and the tile can be laid so that it does not touch the bottom of the board and is supported on those cleats. This will lend more support to the tile and keep the tile from shifting or losing its position or grade.

The distance between any two tiles is determined by the type of soil. If the tile is being layed in water sand, the snuggest fit possible should be obtained to prevent their admitting sand. In other soils, the space between tiles should be between 1/16 and ⅛ inches apart.

A layer of gravel or other porous material over the joints of the tile before back filling will prevent a great amount of silting. Complete coverage of the tile line with gravel is not necessary. Only a small amount of gravel over the crack will generally prevent much silting.

Two last important points should be mentioned:

1. Inspection or clean out points along the tile drains. These permit easy access and easy clean out if they become cloged with silt or roots.
2. Make an accurate map of all the areas, so these lines can be located after you are gone.

Northwest Turfgrass Topics—
Published By Northwest Turf Association

"The codfish lays ten thousand eggs,

The homely hen lays one,

The codfish never cackles

To tell you what she's done —

And so we scorn the codfish

While the humble hen we prize.

It only goes to show you

That it pays to advertise!"

—Anonymous

Effect Of Pre-Emergence Crabgrass Herbicides On Rhizome Development In Kentucky Bluegrass

T. A. GASKIN[1]

SYNOPSIS. Kentucky bluegrass plants treated with crabgrass herbicides showed reduction of rhizone number and length and number of tillers. Zytron, Decthal, and Trifluralin produced the greatest reduction at 1½ times the standard rate. Bandane and Chlordane reduced rhizome development only at 1½ times the standard rate. Crab-e-rad reduced the number of tillers and length of rhizones.

The use of pre-emergence herbicides for crabgrass *(Digitaria spp.)* control has increased in resent years. New materials have come on the market which are over 90% effective. However, some of the materials in use have damaged turf at times. This injury has ranged from discoloration of the leaves to compete loss of cover. Mower and Cornman[2] reported thinning of a Kentucky bluegrass *(Poa pratensis* L.), red fescue *(Festuca rubra* L.), and bentgrass *(Agrostis spp.)* turf in May after a March application of Zytron in New York. Fescue and bentgrass were injured most. Ahrens et al.[3] reported in Commecticut that some herbicides applied to a bluegrass-colonial bent-chewings fescue mixture in April had thinned the turf by July. For example, Chlordane at 70 pounds per acre had 0% thinning,Dacthal at 7.5 pounds had 5% and at 15 pounds had 30% thinning, and Zytron at 15 pounds had no injury and at 30 pounds had 12% thinning. By September there was no thinning in any treatment except Dacthal at 15 pounds where there was 5% thinning. Bandane in another experiment had no thinning effect at a July or August reading. Also in Connecticut, Peters et al.[4] reported thinning in Kentucky bluegrass turf in October following a June application of Zytron at 15 pounds per acre and Dacthal at 10 pounds per acre. There was less injury with the latter chemical. Workers in New Jersey[5] and Delaware[6] reported no injury after herbicide application. Switzer[7] in Ontario noted that in addition to slight thinning of a predominantly bluegrass turf after a May application of 30 pounds of Zytron per acre, a stimulation of the bluegrass in all Zytron plots was observed.

Thus, the response of turf to these herbicides has varied. Despite the many observations that turf thinning has occured, no one has determined the effect of these chemicals on the growth and development of the grass plants. This report covers the effect of pre-emergence crabgrass herbicides on the growth of Kentucky bluegrass.

MATERIALS AND METHODS

Forty-eight tillers of similar size Merion Kentucky were prepared and after the plants began to grow, 2 flats each were treated on July 1, 1962 as follows:

Chemical & Manufacturer	*Active ingredient lb./A.*
Zytron (0-(2,4 dichlorophynal) 0-methyl isopropyl-phosphoramidothiolate), granular, Dow Chemical Co.	15 22.5
Dacthal (Dimethyl-tetrachlorotere phthalate), wettable powder, Diamond Alkali Co.	10 15
Bandane (Polychlorodicyclopentadiene isomers), liquid emulsion, Velsicol Chemical Co.	40 60
Chlordane (Octachloro-hexahydro-methanoindene), liquid California Spray-Chemical Co.	60 90
Crab-e-rad (Calcium acid methyl arsonate), liquid Vineland Chemical Co.	2.1 3.3
Check	None

The first four herbicides are pre-emergent while the last is post-emergent in action. The lower rate is the standard recommended rate in all instances,

The plants were given good maintenance with fertilization of 4 pounds of N per 1000 square feet and adequate water (1 inch per week), but were not mowed. On October 1, 1962, Actidione was applied to control stem rust. The flats were kept out of doors. The soil consisted of a mixture of ½ sand and ½ clay-loam with a pH of 6.6.

On October 13-15, 1962, each of 20 plants from the center area of each flat were removed and observed for the following: number of rhizomes, total length of all rhizomes, average length of all rhizomes, and number of tillers.

In order to determine if another variety or selection of Kentucky bluegrass would react in a similar manner to these crabgrass herbicides, the Dwarf selection of Kentucky bluegrass was used in a second experiment in the greenhouse. This selection is a low-growing type with fewer tillers than Merion and it produces a much less dense turf.[8] Individual plants were established in pots of the same soil used previously and on December 13, 1962, five plants each were treated with the low rate of the pre-emergent crabgrass herbicides used before. Trifluralin (N, N-di-n-propyl-dinitro-methyl-laniline) emulsifiable concentrate, Eli Lilly Co. at 1.5 pounds per acre, a preemergent, was used, replacing Crab-e-rad. The plants were maintained as before and on April 25, 1963, the plants were removed from the pots and the same measurements taken as before. In addition, the number of green leaves was counted.

RESULTS

Merion Kentucky bluegrass. Zytron had two effects on Kentucky bluegrass at the higher rate (Table 1). One was the reduction of rhizone number and length. There was also a definite alteration in the gross appearance of the plants. Plants were darker green in color, more vigorous in appearance, and had fewer lateral rhizomes. Those rhizomes present appeared to have originated from the

(Continued on Page 12)

PRE-EMERGENCE *(Continued)*

center of the plant and grown downward at first, then horizontally. The check plants had rhizomes from many tillers and these grew laterally at first. The net effect of the chemical at the high rate was to give the appearance of a bunch grass rather than a rhizomatous plant. The lower rate of Zytron had similar but less pronounced effect. Dacthal showed the greatest reduction in both number and length of rhizome and number of tillers. Despite this reduction, the plants did not show the distinct alteration characteristic of Zytron treated plants. Bandane and Chlordane did not show any change except a suppression of rhizome number and length at the high rate. Crab-e-rad, differing from the others in being a postemergent herbicide, showed injury in the reduction of tiller number and some reduction in rhizome length.

The effects of the herbicides were similar in general in the Dwarf selection to those of Merion (Table 2). Zytron treated plants did not show the gross changes of the Merion variety. Both Zytron and Dacthal had a more severe effect on rhizomes on the Dwarf selection than on Merion variety while the tiller number was more adversely effected in Merion by Dacthal and in Dwarf by Zytron. Trifluralin also affected the rhizome length and tiller number in a manner similar to Dacthal and Zytron. Chlordane treated plants showed an increase in almost all measurements as compared to the check. This was apparently due to control of a uniform infestation of root aphid in the greenhouse. The effect of the aphids on the other treatments was not determined.

DISCUSSION

The results of this study confirm those of other workers that injury to bluegrass results from applications of Zytron Dacthal, and Trifluralin, especially at the higher rates. Bandane and Chlordane showed injury only at the higher rates. This injury resulted in less rhizome and tiller development and explains the thinning of turf observed by other workers. Turf appearance is related to turf density and some of the factors responsible for density are rhizome development and tiller number. Another effect of Zytron on turf is the striking dark green color and bunch grass appearance of treated plants. These changes have been observed previously.[3], [7]

Since some of these reductions in development were of a large magnitude after applying 1½ times the standard rate of Zytron and Dacthal, which are considered amoung the mast effective crabgrass herbicides, care should be taken ard rate will result in applying twice the rate of these herbto prevent injury to turf. Just as important is information on why some applications produce injury and others not. Until the factors responsible for this variation are understood, application of these chemicals will have the possibility of injury.

SUMMARY

The response of Merion Kentucky bluegrass as expressed by rhizome development and tiller number at 2 rates of Zytron, Dacthal, Bandane, Chlordane, and Crab-e-rad (calcium acid methyl arsonate) was determined. Zytron at 22.5 pounds per acre greatly reduced rhizome length and number. At the 15 pound rate (standard) the reduction was less Dacthal at 10 (standard) and 15 pounds per acre reduced rhizome number and length as well as tiller number. Bandane at 40 pounds (standard) and Chlordane at 60 pounds (standard) did not cause injury showed some reduction in rhizome number and length. greatly reduced the number of tillers and length of rhizomes and only at the 3.3 rate was there a reduction of rhizome number.

The Dwarf selection, tested with the standard rate of Zytron, Dacthal, Bandane, Chlordane, and Trifluralin (1.5 pounds per acre), showed that Zytron and Dacthal reduced both number and length of rhizomes and number of tillers. Zytron also reduced the number of leaves. Trifluralin produced reduction in rhizomes and number of tillers. Bandane and Chlordane showed no injury.

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[1] Research Department, Warren Turf Nursery, Palos Park, Illinois.

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Aerification And Spiking

One should not confuse the terms Aerification and Spiking. These two operations involve different principles, different results, and different machines. Since these two operations involve differences in principles, result's and machines, then one should determine his objectives and use the machine that will correct the problem. Suppose we analyze each operation, listing the basic principles involved, the results that can be expected, and the machines that should be used.

Aerification means the mechanical manipulation of the soil to renew soil structure. A core or plug of soil is physically removed and deposited on the surface of the turfgrass area. This operation leaves a hole in the sod which serves many·functions for the well being of the grass plants.

Let's study this hole. When turfgrass areas are walked upon, driven over with mowing equipment, and gencrally

(Continued on Page 19)

Weed Control In Fairways, Tees And Greens

by
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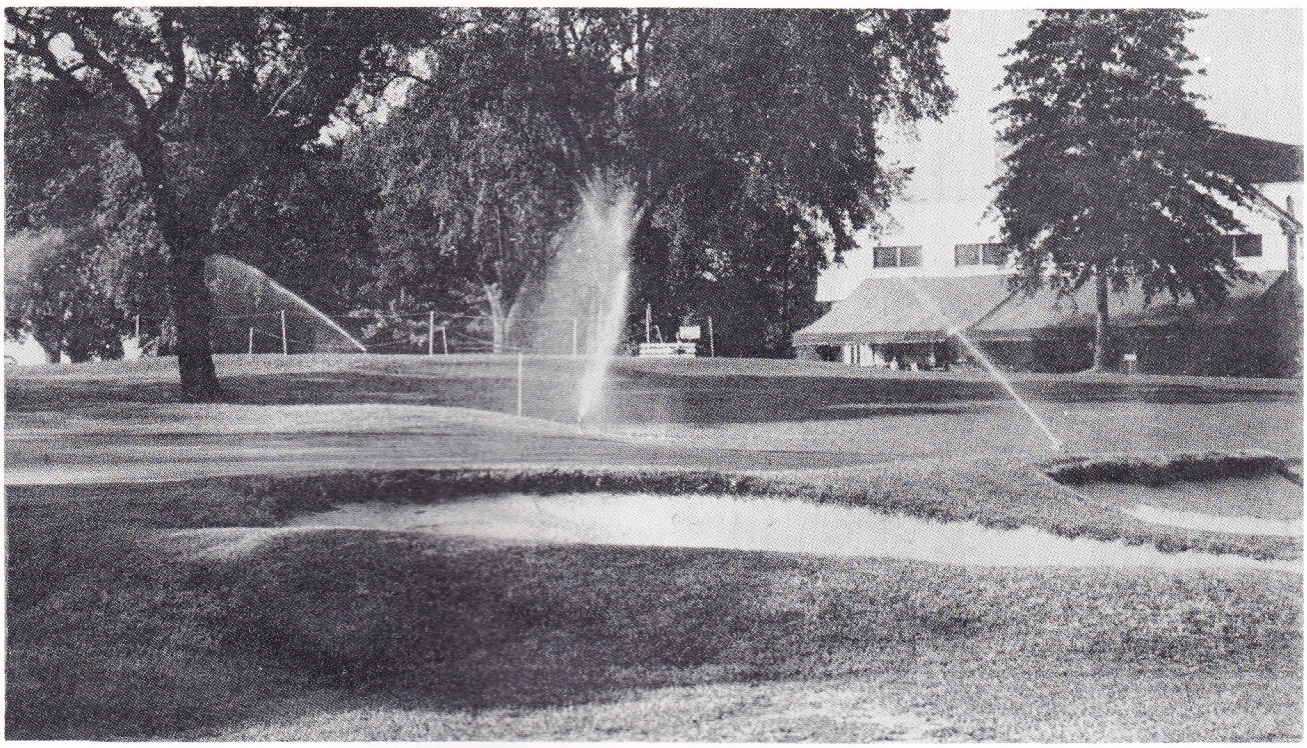


It is always difficult to know just where to start when discussing weed control because good weed control is a combination of many things generally grouped under the heading "GOOD MANAGEMENT", and as you know, good management can mean almost anything. Naturally you are expecting me to write about chemical weed control since I do work for a company which derives its income from the sales of chemicals. However, I feel that in absolute fairness to everyone I should go considerably further back and start with weed control as a practice, which, of course, then presents the dilemma of which came first, the hen or the egg.

Weed control started, of course, when someone decided that certain plant species were more desirable and therefore should be given greater consideration than other species which were less desirable or even so undesirable as to be unwanted. Such unwanted plants have since been defined as weeds.

Control of weeds has taken such varied forms as hand-weeding, mechanical cultivation, mowing and grazing, but in recent years due to the high cost and unsatisfactory results obtained from most of the foregoing methods, chemical weed control has come to the fore through as you are possibly quite aware, even chemical weed control is not without its hazards and shortcomings. Later I will discuss a few of the hazards of chemical weed control, some of which are rather humorous while others, of course, are not so funny.

I think, however, it is worth a few moments to ponder the underlying causes for continuous weed seed control, considering the fact that most of you have possibly been fighting weeds for as long as you can remember and in some cases even on the same piece of turf which despite hard work and careful attention, still manages to produce weeds almost as if from nowhere. If we accept that provision seems to have made for the survival of a species and this provision manifests itself in many weird and wonderful ways, then we should have little difficulty in accepting that weed control is a never ending practice thrust upon us by one of the forces of nature in sheer defiance of man.

Weed seeds are constantly subjected to tremendously adverse conditions and yet, unlike the more cultivated plants, have an inherent ability to survive even the most ardous and unfavorable conditions. It is a known fact that many weed seeds can live in the soil for as long as 100 years and still grow perfectly well when given the correct environment. For example, the mustard family endowed its seed with a very tough and almost impervious outer skin which can kee p the seed in perfect condition deep down in the soil and which will only allow germination after the seed has maved closer to the surface by either erosion, cultivation or even by burrowing insects or animals and even when the seed has reached a level in which it can germinate, it still may require some form of scarification to allow moisture to penetrate the tough outer surface. Such scarification can

(Continued on Page 14)

WEED CONTROL *(Continued)*

be caused by a tractor wheel, a human foot, or even the bounce of a golf ball all of which tend to cause particles of soil to be rubber against the seed thus scratching the tough outer surface. Many weed seeds fall into the same category as the mustard family, therefore it is easy to see that unusual weeds can appear on a fairway which has been in existance for possibly 40 or 50 years, and by unusual weeds, I mean weeds which have not been seen on the fairway for many years. Of course, not all weed seeds manifest themselves in this fashion

As you know, some weed seeds can travel many miles on snow while other weed seeds can travel even greater distances when carried by birds or when carried by careless human beings. These seeds often find their way into streams and rivers and are then pumped onto the golf course by the irrigation system where the system relies on such sources. You might think that perhaps one or two weed seeds disbursed by birds or animals could not cause a problem, but when it is considered that one seed can develop into a plant capable of producing anywhere from 30,000 to 50,000 viable seeds in one season, and when it is further considered that an optimum stand of field corn has only 18,000 plants per acre it does not take more than two seasons for one weed seed to develop into a real weed infestation covering a very wide area. This all means, then, that constant attention must be paid to weed control and that lack of vigilance can result in a weed infestation in very little time. The odd weed left in the green, the odd weed left on the tee and the few odd weeds left in the rough can very soon reach problem proportions.

There was a time when, of course, weeds could be taken care of by hand, but as I mentioned last year, the high cost of such work has finally eliminated this practice and we have been left with the alternative of cut and cut again or use a chemical. I mentioned a little earlier that it was difficult to know just where to start on weed control and by that was meant how does one define the difference between weed prevention and weed control, since to prevent the establishment of weeds is, of course, to control weeds, therefore I think that possibly we should take a look at what can be done to prevent weeds rather than what must be done to control weeds once they have become established.

Prevention of weeds is extremely difficult and calls for extreme care and alertness on the part of the turf superintendent. Weeds normally appear to move in when turf moves out hence possiby the saying that nature abhors a vacuum. Weed prevention then seems to start with the maintenance of good healthy turf and any weakening of turf is an invitation for weeds to rapidly gain a foothold which has been known on many occasions to develop into complete dominance of an area by weeds. Disease control can then be classed to a degree as a part of weed control which all too often leads to absence of turf and the inevitable incursion of weeds. Snowmold in particular should be avoided at all costs so that turf can get away to a very vigorous start in the spring, thus overcoming to a great extent the weeds which would normally germinate a little later in the season or which, perhaps, rely upon strong surface heating to germinate, which latter is naturally denied the weed seed where a dense turf is present. An example of such a weed, of course, is crabgrass.

There are many other diseases equally as devastating and therefore equally capable of producing good weed growing conditions in turf. Dollar Spot and Brown Patch can soon kill grass leaving ideal weed growing conditions. Prevention if disease should be considered as perhaps one of the first elements necessary in the prevention of weeds. A second important ingredient for healthy turf is to ensure a good soil composition in which the turf can produce a strong root structure and therefore offer stiff competition to any weed seen with the temerity to germinate in its midst. A poor soil structure with the ability to produce drought conditions or highly compact conditions is detrimental to the growth of good turf, but seems to favour the incursion of certain weeds. For example, in drought conditions we often see sandbur whilst in compact conditions all too often we see Prostrate Knotweed or, as it is sometime locally known iron weed or wire weed. A wet and shady condition may well produce a very favourable environment for Creeping Charlie. It is important to have good drainage in heavier soils that tend to be a little on the wet side and it is also very important to correct any soil conditions and deficiencies as soon as possible in an attempt to avoid unthrifty turf subsequently avoiding a weed infestation. The second part of weed control then appears to be the maintenance of good soil structure and correct drainage.

It is a known fact that all plants must take in given quantities of plant food if they are to remain alive and healthy. Most soils, although originally endowed with fairly lavish quantities of materials which were readily broken down by soil microflora or which were present in a soluble state, making them available as plant food, have however, through constant cultivation of the soil and the growing of various crops, and here turf should be regarded as a crop been depleted to a great extent, of natural plant food. It is true that dead and decaying vegetation does replenish the stock of food in the soil, but where turf is maintained at a fairly low cutting level and cut with great regularity, and in many instances the cuttings removed, the return to the soil is far below the needs of the plants growing in the soil. It is therefore necessary to augment the food supply by other means which, as you know, is the application of a chemical generally known as a chemical fertilizer. I do not propose to go into the ramifications of chemical fertilizers other than to say that it extremely important to have soil tested at regular intervals and apply sufficient fertilizer of the correct analysis to produce optimum growing conditions. Such soil tests and information are available from various companies producing fertilizers and from the Department of Agriculture or State Colleges.

The use of plant food in chemical form can be regarded as yet another method of weed prevention. I mentioned earlier that weed seeds were carried on snow. All too often I have seen vacant lots adjacent to golf courses, perhaps they the wood lots or areas of extreme rough near the greens and generally in such areas weeds grow with absolute abandon, and as was mentioned earlier, if left to mature these weeds can produce up to 50,000 seeds per plant which means in effect that one plant can produce in one season sufficient seed to allow one seed per square foot over an area of an

(Continued on Page 15)

WEED CONTROL *(Continued)*

acre and still leave some seeds to spare, in other words, five Lambsquarter plants or five Ragweed plants could turn a fairway into a jungle in one season through the expedient of having the seeds dispersed on snow. It is of utmost importance to cut or remove all weeds growing adjacent to or within the bounds of a fine turf area to eliminate the danger of complete infestation.

We have now discussed several methods of weed prevention which when grouped boil down to good management practice. However, there are many sources of weed supply completely beyond the control of the turf superintendent which are often termed good breeding stock and are constantly replenishing the parking lots, etc., beyond the reach of the superintendent. At the invasion of weed seeds from these sources beyond your control must mean that the work that you have done is of no avail and it would appear that possibly such a gloomy view has been quite substained in many cases as you will see from the colour slides in a few moments.

Weed prevention and weed control are not exclusive to the turf growing industry, but have been a constant cause for concern in agriculture and have perhaps accounted for the largest single loss to the agricultural industry of any of the hazards presented to agriculture.

Estimates of losses to weeds in agriculture have been many and varied, but it is generally agreed that the average loss to weeds throughout Canada averages 937½ million dollars. Naturally the loss of such an astronomical amount of money is cause for great concern and it is this concern which has provided the impetus for research into the many possibilities of controlling weeds by the use of hormone type chemicals. Chemical weed control dates back to the period before the first world war when copper sulphate was used as a contact herbicide. Later developments included such chemicals as sulphuric acid and organic compounds containing the dinitro group, but the most important advance took place in the early 1940's with the discovery of the growth regulator types of selective weedkillers which included MCPA and 2,4-D. MCPA is still widely used today as an agricultural herbicide as is 2,4-D, but 2,4-D is also being used very widely to control weeds in turf. 2,4-D is possibly the most widely used turf herbicide today and whilst it is very effective against weeds such as dandelion and plantain and is highly recommended for control of such weeds in turf grass areas where bent grass is not present, nevertheless still falls far short of being the perfect weedkiller as was hoped in the early years of its development and, as you will see in a few moments, 2,4-D is now forming part of a more complex weedkiller which is capable of controlling a far wider range of weeds than ever before.

The amine form of 2,4-D is the most recommended form and is generally applied by means of a low volume boom type sprayer capable of applying 5 or 6 gallons of liquid per acre. The amine form of 2,4-D is non-volatile, non-corrosive and under normal conditions of use presents no undue hazard to the health of the operator or other persons coming into contact with the sprayed area. 2,4-D is safe to use on most blue grass and fescue species, but does cause injury, in some instances quite severe injury, to seedling grasses and to bent grasses. Therefore 2,4-D is certainly not recommended for weed control on greens, or on tees where bent grass is prevalent or on fairways where bent grass is also prevalent. As was mentioned a few moments ago, though 2,4-D is an excellent chemical giving outstanding control of weeds such as dandelion and plantain, it nevertheless has not proven so successful in controlling such weeds as black medick, clover, knotweed and chickweeds and with the elimination of dandelion and plan? tains such other weeds were able to flourish due to the absence of competition from the 2,4-D susceptible weeds. Thus, the pattern of weeds in turf areas gradually changes envoking comment such as "2,4-D seems to have lost its strength, or 2,4-D has lost its effectiveness because somehow it does not seem to be killing weeds anymore". This, of course, is perfectly true, and is no reflection upon the effectiveness of 2,4-D since it is still doing its job just as well as it did when first discovered, but due to constant use of 2,4-D over a relatively long period of time the 2,4-D susceptible weeds are fewer in number, hence the effect of spraying an area with 2,4-D is not nearly so drastic as it was some ten years ago.

The need for a herbicide to take care of the 2,4-D resistant weeds became more and more pronounced not only in the turf world, but also in the agricultural world, and the product 'Compitox' was developed by May & Baker to fill the need created by the increase in the population of the 2,4-D resistant weeds. 'Compitox' was first tried in Canada in 1958, and in 1959 was used commercially for the first time on the London Hunt Club in Ontario which was then under construction and which suffered a severe infestation of mouse-ear chickweed and wild white clover. The fairways of this particular golf course rapidly took control presenting a very formidable problem in that we had not only seedling grass, but seedling bent grass and to spray under such circumstances was hitherto impossible.

The officials of this particular golf course were justifiably concerned since the expense had reached rather generous proportions and they were somewhat between the devil and the deep blue sea knowing that the weeds would certainly preclude the establishment of good bent grass fairways and not yet knowing the capabilities of the then new weedkiller 'Compitox'. I must confess that at this particular juncture I had rather stuck my neck out and made the claim that 'Compitox' would in fact solve their problem and as I look back I wonder whether I would do the same thing again. To cut a long story short we did spray several fairways with 'Compitox' and as some of you are quite aware, 'Compitox', being rather slow in action again gave cause for concern in that it appeared that the weeds were not going to die, however, there was one consolation, that being the bent grass did not appear to be harmed. After a period of approximately three weeks the weeds, including clover and mouse-ear chickweed were practically all dead and the bent grass was flourishing. The whole course was subsequently sprayed. Even the greens were sprayed though they were seeded to seaside bent grass and once again the results were astonishingly good. The

(Continued on Page 16)

WEED CONTROL *(Continued)*

use of 'Compitox' increased rapidly and today 'Compitox' is known and used from coast to coast.

With the advent of other makes of similar material a common name had to be found for this material and today all material containing the same active ingredient is known as mecoprop. Mecoprop, however, had disadvantages in that it did not give very good control of established dandelion and plantain so at this time many green superintendents used mecoprop in spring and early summer and 2,4-D in the fall, but this necessitated two spraying operations. It was only a matter of time before common sense took over and mecoprop was mixed with 2,4-D and sprayed at the same time. The results were excellent in that practically all common weeds were effectively controlled, but as you can well imagine the mixture lost some of its safety factor and could not be used on seedling grasses or bent grasses with any degree of safety. Such is the state of things at the present time with the straight mecoprop being recommended for the control of weeds in greens and areas where bent grass is desired. Whilst the mixture of mecoprop and 2,4-D, which is presently being sold under the trade name 'Compitox' Plus, is recommended for weed control in turf areas where bent grasses and seedling grasses are not present and, of course, 2,4-D and brush kill mixtures which are a mixture of 2,4-D and 2,4,5-T are recommended for broadleaved weed control in fairways and rough areas where control of clover, mouse-ear, chickweed and black medick is not required or where such weeds are not present.

Brush kill is recommended for weed control in rough and in areas where small brush may become a problem. The recommended rate is 2-3 pints per acre in 100 gallons of water per acre. The low volatile types of brush kill should be used otherwise there is a danger of injury or death to desirable trees and shrubs from the vapour drift of the brush kill father than from actual drift during the spraying operation. Do not spray under high pressure.

The most commonly used form of 2,4-D is the amine form and incidentally, perhaps this is the cheapest form of weed control in terms of cost per acre. 2,4-D is generally recommended at the rate of 16 ozs. of acid in 5 to 20 gallons of water per acre which would normally cost $1.00 to $1.25 per acre for the actual material.

'Compitox' Plus is a mixture containing 16 ozs. of 2,4-D and 16 ozs. of mecoprop per Imperial gallon. The recommended rate for this mixture is from 6 to 8 pints per acre (5 pints is sufficient) in 30 to 40 gallons of water per acre. Application should be made when the weeds are young and growing vigorously since resistance of weeds generally increases with age. Such a mixture would cost approximately $4.00 to $4.50 per acre which, of course, is quite a bit more than 2,4-D, but as you will see in a few moments can prove to be quite a bit cheaper in the long run.

'Compitox' or mecoprop, which is general reserved for use in areas of bent grass or seedling grass, is recommended at the rate of 4 to 6 pints per acre in 20-30 gallons per acre and costs approximately $3.75 to $4.50 for the material. Again, an increase over the cost of 2,4-D, but highly justifiable considering the safety factor and the type

(Continued on Page 17)

WEED CONTROL *(Continued)*

of weed control obtained.

It has often been argued that many herbicides are far too expensive if they cost more than $2.00 per acre so I would like at this juncture to consider just how this cost could be related, say, to use of 2,4-D or the use of a mower. I think you will agree that clover is possibly the least wanted of all fairway weeds though it has been argued that if clover were eradicated the course would be completely bare, which argument has been disproved on many occasions. However, the fact remains that a heavy clover infestation in a fairway makes it extremely difficult for the golfer to find his ball even in the middle of the fairway. This makes tempers soar in direct proportion to the time taken to find the ball which results in a reduction in revenue, since people just do not visit the courses as frequently as they would if they could find their balls in the middle of the fairway.

In an effort to rid themselves of this particular weed problem, many superintendents attempt to keep the clover flowers cut which requires daily cutting and much to the surprise and chagrin of the superintendent no matter how much gangmowers are lowered, clover flowers seen to flourish even lower. The net result of this exercise is, scalped fairways, ruined equipment and a highly frustrated greens superintendent. Clover is not a good plant to have on any fairway and should be eliminated wherever possible because it is extremely capable of crowding grass completely out if left to its own devices. It is sometimes argued that clover provides nitrogen which in itself is quite accurate, but it so happens clover is quite selfish and keeps the nitrogen for itself, therefore the grass still remain undernourished and crowded.

The cost of mowing an acre of fairway has been calculated at $2.00 per acre which does not appear to be unreasonable, though perhaps a little on the low side. However, $2.00 is a nice round sum and easy to calculate. Let us assume then that a superintendent decides to cut his fairways rather than spray in an attempt to rid himself of clover and is ibliged to cut daily. With the exception of Sunday he will incur a cutting cost of $12.00 an acre per week and if we further assume that cover flowers are a problem for a period of approximately four weeks which again is on the low side, it is easy to see that a cost of $48.00 per acre has been incurred to say nothing of the damage to the machinery where the units were lowered to the extent that they began to scalp.

Had the clover been sprayed rather than mowed the cost of the spraying would have been approximately $5.00 per acre, including labour and equipment and mowing frequency would have been reduced to three times a week at the most, thus in the course of a month the total cost of mowing and clover elimination by spraying would be $29.00 and the fairways would still be cut at one inch and there would be grass on them which is a distinct advantage to better golfers, whereas, the fairway which was cut down to ½ inch or less would, during a period of dry weather, and denied irrigation, have turned completely brown and possibly died.

(Continued on Page 18)

WEED CONTROL *(Continued)*

It is easy to see then that spraying is not only much more economical than mowing, but it also helps retain a healthy turf which in itself is a deterent to the incursion of weeds and in the case of a scalped fairway the weeds could well include crabgrass which is possibly the most undesirable weed on any golf course and once established in the greens is more than difficult to eradicate. The saving per acre by spraying rather than mowing is $19.00 per acre which averages out at $950.00 for an average 9 hole course — quite a slice of budget.

A reference was made a few minutes ago that 2,4-D was a fairway herbicide, and whilst 2,4-D is certainly the most economical of all herbicides for control of weeds such as dandelion and plantain, it is not terribly effective in eliminating clover and though the clover may be temporarily discoloured or even set back, it is by no means eliminated making 2,4-D not the most recommended for clover control and not very economical where clover is present.

The most desirable and most effective chemical for controlling of fairway weeds is a mixture containing 16 oz. of 2,4-D and 16 oz. active mecoprop. Applied by an efficient spray machine capable of applying 20 to 30 gallons of water per acre, it is inadvisable to mix proprietory brands of 2,4-D with straight mecoprop unless compatability has been first checked with the manufacturer. However, the mixture is available as a proprietory brand thus eliminating any undesirable results with a homemade mix.

The 2,4-D mecoprop mixture is, of course, not recommended where bent grasses are present and desirable. When bent grass is required, mecoprop alone should be used and should be applied when the weeds are in the young plant stage and growing vigorously, resistance of weeds generally increases with age. Straight mecoprop is also recommended when seedling grasses are present because provided the seedling grasses are up an inch or more they are quite tolerant to the recommended dose of mecoprop. Established grasses other than bent grasses are quite tolerant to both mecoprop and the mecoprop 2,4-D mixture. Tees can be treated in exactly the same manner as fairways except of course where they contain bent grasses, again spraying should be carried out when the weeds are young and growing vigorously.

Greens generally present a somewhat more complex problem than tees and fairways, but even weeds in greens are no longer the headache they used to be. Weeds commonly found in greens include clover, black medick, mouse-ear chickweed, plantain and dandelion, all of which are readily controlled by an application of mecoprop at the rate of 2 to 3 fl. oz. per 100 sq. ft. Greens should be sprayed when the weeds again are young and growing vigorously with caution being taken not to spray in excessively hot weather or in drought conditions, otherwise turf grass may be injured.

Grass type weeds present a somewhat different problem with crabgrass possibly being the wort possible weed to have around a golf course. Crabgrass in fairways can now be fairly well controlled with Dacthal 50 W, or with Zytron. I hesitate to give exact details upon rates, etc., and would advise that you carefully read the label for complete application details. Crabgrass in greens must be treated with great caution and if the infestation is not too severe then weeding is still by far the best method. However, if the infestation is so severe that hand-weeding is ruled out then PMA is the only material left. PMA will have to be applied every 10 to 14 days throughout the period in which crabgrass seeds germinate which may extend from May through to August.

You have all possibly heard the old saying that a chain is only as strong as its weakest link and that saying is especially true with chemical weeed control. Even the finest chemical will not work unless it is applied carefully and correct application begins by carefully reading the label. If after having read the label, doubt still exists, it is always best to seek highly professional advice which is available from Universities and extension offices or can be obtained direct from the manufacturer. The next most important item of course is the actual spray application which means using an up-to-date and accurate spray machine. There are many makes of good spray machines presently on the market, however, in passing it is possibly worthwhile noting that a piston type pump is by far the best since it will handle wettable powders, etc. without undue wear and for certain applications will pump at extremely high pressures. To handle modern chemicals, a pump must be capable of producing 10 gallons per minute at 40 lbs. per square inch pressure and the spray tank should be equipped with a mechanical agitator to ensure a homogenous mix. It is always advisable to check all hoses and hose connections to the booms to make sure that they are of sufficiently large calibre to supply all the tips without a drop in the pressure towards the end of the boom. The best type of tip is the pressure valve type tip which cuts off cleanly at around 10 lbs. per square inch, thus elminating the dead strips often seen on a fairway where the operator stopped the spray machine to make an adjustment or clean a tip thus allowing the tips to dribble for several minutes.

Much work has been carried out at leading Universities from which it has been established that spray tips wear very quickly and that a very poor and uneven spray pattern soon develops as a result of such wear. Tips should be replaced after every 500 acres if best results are to be obtained. Tip screens should be cleaned very frequently otherwise a drop in volume could occur without a drop in pressure and though the spray pattern from the tips may look to be correct the volume could be considerably decreased with resultant unsatisfactory weed control which is invariably blamed on the material rather than the machine. Forward speed of any spray machine should not exceed 6 miles per hour, though 4 miles per hour, which is a good brisk walk, is more preferable. At high speeds the boom tends to bounce and oscillate thus producing a very uneven spray pattern and, of course, an uneven weed kill which is terribly unsatisfactory. Pressure should not exceed 40 lbs. per square inch, otherwise a serious drift problem may arise in that nearby trees and shrubs can be seriously damaged. Before starting any work the spray machine should be thoroughly cleaned with a solvent or detergent and then

(Continued on Page 19)

WEED CONTROL *(Continued)*

rinsed with clean water. All tips and tip screens should be taken out and thoroughly cleaned and the boom flushed to remove any sediment which may have settled there. The sprayer should then be carefully calibrated using clear water after which the spray material should be used according to the label directions. When spraying has been completed the machine should again be thoroughly washed out and prior to winter storage should have fuel oil pumped through the system to prevent corrosion. Tips and screens are best removed from the boom and should be stored in a jar of fuel oil or kerosene. All spray materials should be stored in a locked building away from the reach of children, preferably stored off the ground and, during the winter not exposed to frost. It is a good idea to have one person delegated to handle all sprays and to be held responsible for the application of sprays this eliminating the all too often heard expression "But I thought so-and-so had already taken care of that".

Spraying greens for weed control is a very exacting business and should never be attempted without first-class equipment. The best and safest method is to use a boom set up exactly like the boom on a spray machine. The operator then walks briskly across the green applying an even spray pattern. The boom should have a shut-off valve and be fitted with the no drip tips to avoid dribbling after pressure is cut off. The hand boom should be connected to the spray machine by hose so that the pressure control valve is controlling the boom pressure making the application as accurate as possible.

AERIFICATION *(Continued)*

abused, the soil becomes compacted. The pore spaces in the soil are greatly reduced. A severely compacted soil cannot support plant life. When such soils are aerified, the holes become spaces for the surrounding soil to expand into. Alternate wetting and drying causes soils to expand and contract. These holes eventually close up or become filled from the soil surrounding the holes. In other words, a ½" diameter hole in the soil can relieve compaction in an area of about 2" around the hole itself. Stating this more simply, the soil in a two inch circle around this hole can now expand, filling the hole, thereby relieving compaction. Hole spacing, therefore, should be approximately 4" apart in any direction to relieve compaction. Any closer can remove so much soil that the holes cave in, resulting in an uneven surface.

A hole in the sod, properly made and spaced, will first of all relieve compaction. Relieving compaction in a soil under sod starts a chain of events all beneficial to the grass plant and particularly its root system.

Roots do not grow in the soil—they grow in the spaces between and around the soil particles. Oxygen can move freely to each root cap, allowing them to penetrate more deeply into the soil mass. Carbon dioxide given off as waste from the root system can exhaust out of the soil. Water can move more readily in the soil. This, of course, is the opposite effect of what we want in soils under turf. Compaction can only be relived with an Aerifier and not with a spiker.

A spiker that is properly designed and equipped with many thin, sharp steel knives or blades can and does produce beneficial effects upon the growth of grass plants. These sharp blades should clearly cut through thatch layers and the surface roots of grass plants.

Every blade that cuts through surface roots has a pronounced effect upon the grass plant. When grass roots are pruned or cut, new growth is produced.

An easily visible example of this growth action of the grass roots can be observed when sod is cut thin. A piece of sod cut about a half inch thick will quickly produce a solid mass of new white roots. Why do grass plants respond in this matter? Each individual grass plant is trying to survive. It will use all its reserves to produce a new root system so that it may continue to grow. If these new roots find food and moisture, the grass plant can then re-establish itself.

These same principles apply to surface spiking. Roots that are cut by the vertical blades sprout new roots and the grass plants are temporarily revived. The thinner the blades, the more cleanly the cut is made. This is important. Heavy, blunt blades do not cut, but tear the grass roots. Surface spiking or slitting, therefore, will help a turfgrass through trying periods of adverse weather and intense use.

Secondary effects of spiking are:

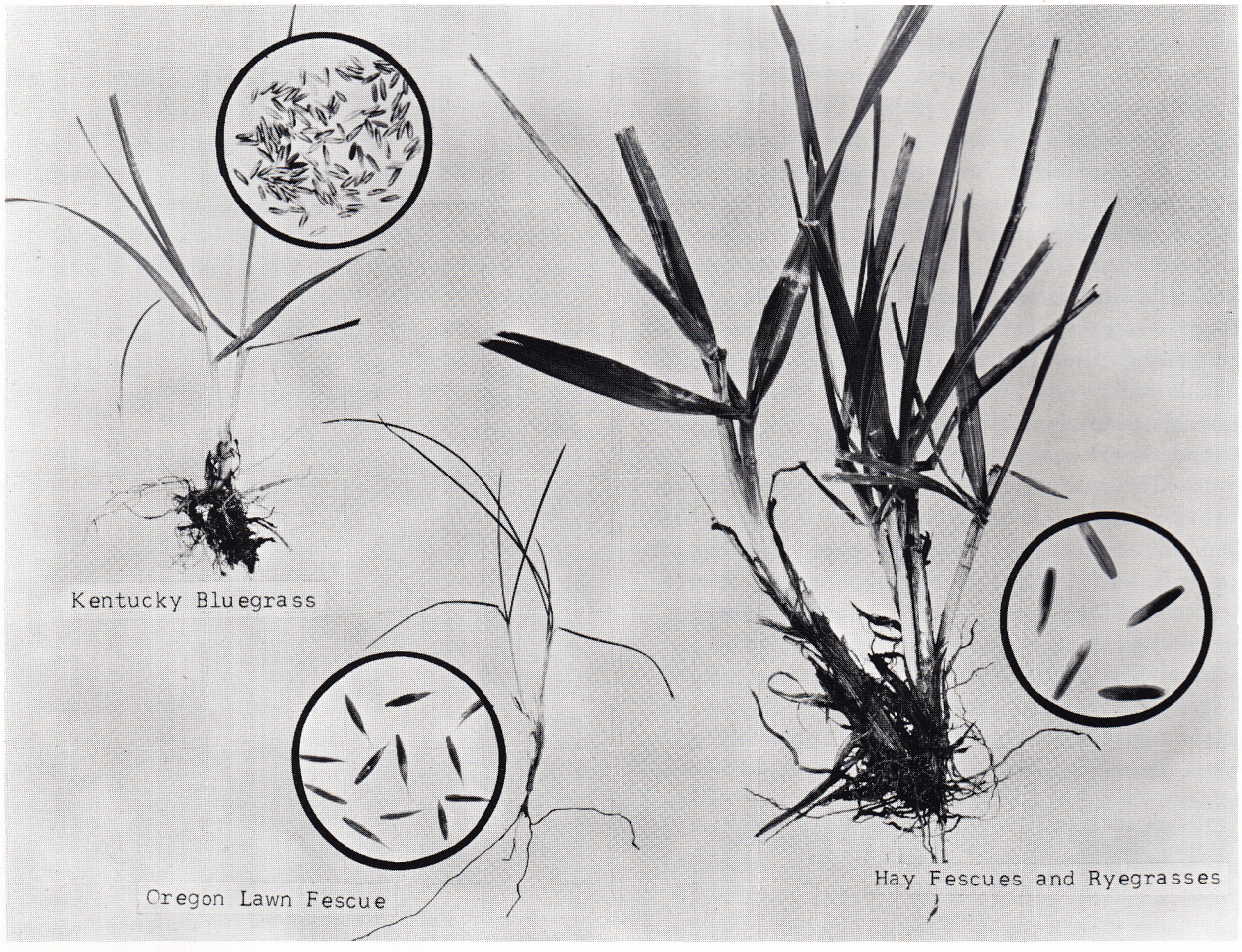
(1) Water penetration is facilitated through thatched and matted layers and through sunbaked crusts.

(2) Plant foods applied are mechanically moved by water into the slits.

(Continued on Page 22)

Suggestions For Evaluating And Choosing A Lawn Seed

Recommended by A. WARREN CLAPP,
In Charge, Seed Inspection
Commonwealth of Massachusetts



Quality grass results only from proper seed. The fine lawngrasses, Kentucky bluegrass and Oregon red fescues, contrast with the coarse tall fescues and ryegrass. Seeds pictured are proportional to their frequency per pound. Bluegrass-lawn fescue blends afford many more seeds than do cheap hay grass mixtures.

Inspections and tests of hundreds of lawnseeding mixtures offered for sale in Massachusetts have revealed that many brands contain seeds of coarse grasses that are not desirable in home lawns and that relatively few brands contain enough seeds of the fine-textured lawn grasses to provide a satisfactory turf.

The new format for labeling grass mixtures enables the homeowner to select lawn seed which will produce the type of turf he desires, even though he is not a lawn expert. The buyer can know in advance what kind of lawn he can expect by reading and understanding the analysis statement.

There are provisions in the Massachusetts Seed Law which are designed to help buyers choose lawn-seeding mixtures suited to their conditions. These provisions require that each container of a lawn-seeding mixture be labeled to indicate the kinds and variety of seed in the mixture and percentage by weight of each kind. These labels are subject to periodic checking by seed control officials through sampling and analysis to verify their accuracy.

Kinds of Grasses Included in Lawn-Seeding Mixtures and Their Uses

Choosing the right lawn-seeding mixture, then involves reading the label and selecting a mixture which contains seeds of the desirable grasses and which is free of the undesirable kinds of seeds. For the purpose of making this selection, the components of lawn-seeding mixtures are divided into "Fine Textured Grasses" and "Coarse Kinds" categories. The basic Fine-Textured Grasses for Massachusetts include the following:

Kentucky bluegrass
Creeping red fescue
Chewings fescue
Rough bluegrass *(Poa trivialis)*
Bentgrass

There are specific varieties of Kentucky bluegrass including Merion, Newport, Delta, Windsor and Park that also qualify as persistent fine-textured grasses. Pennlawn and Illahee are two improved varieties of creeping red fescue.

(Continued on Page 21)

SEEDS *(Continued)*

The backbone of a permanent fine-textured lawn in the Northeast is Kentucky bluegrass and one of the fine-leaved fescues listed above. Kentucky bluegrass is one of the most desirable grasses for good soil with an adequate moisture supply and good exposure to the sun. Fine-leaved fescues provide the best turf on dry, sandy or gravelly soils, in the dry shade of trees, on steep slopes and on otherwise poor soils.

In general, the Merion variety of Kentucy bluegrass is better than the common type in the Northeast. It is more resistant to leaf spot, more drought resistant, withstands closer cutting and has a darker color than the common type. However, Merion is more expensive, it needs a higher fertility level for best performance, it is slow to become established and it is susceptible to a rust disease which may spoil its appearance for a few weeks in the fall.

The bentgrass seed used in lawn-seeding mixtures is usually of the colonial type and is likely to be listed in the mixture as Highland bentgrass or Astoria bentgrass. Bentgrass is a fine-leaved grass which grows well during cool, wet weather but becomes brown and unsightly during the hot or dry weather of summer. It is of questionable value in a lawn-seeding mixture not only where unfavorable conditions exist, but also because it tends to crowd out the basic lawn grasses. Furthermore it is difficult, if not impossible, to eliminate once it has become established.

Creeping bentgrass can produce beautiful lawns of fine quality but this item is for the lawn perfectionist and it is not a desirable ingredient in lawn-seeding mixtures for home lawn purposes.

Rough Bluegrass (*Poa trivialis*) is a good grass for moist shady areas. For lawns where there is moist shade it is a desirable component of a lawn-seeding mixture.

The ryegrasses, Kentucky #31 or Alta tall fescue, meadow fescue and timothy are coarse grasses which may provide a satisfactory ground cover in rough areas or where a fine uniform appearance is not necessary or practical. Italian, or annual, ryegrass will not live more than a few months at most. However, perennial ryegrass will persist for two or three years and then become a coarse open turf.

Individual ryegrass plants and the tall fescues are undesirable in a Kentucky bluegrass of fine fescue lawn because of their bunch habit and more rapid rate of growth which destroys the uniformity of the lawn.

Redtop is not a basic lawn grass but its seeds germinate more quickly and offer encouragement to the homeowner who is impatient to see some results from the effort expended in planting his lawn. It is not seriously objectionable in lawns and the plants will usually disappear after a few seasons in favor of the desirable permanent turf-forming grasses.

Other Ingredients

Inert matter is composed of chaff, parts of seed, dirt etc. which is valueless. Although some of the fine-textured grasses carry more inert, a high inert content is to be avoided.

The belief that weed seeds in lawn seeding mixtures are responsible for the high weed population commonly observed in newly planted lawns is unfounded. Moist soils contain vast numbers of germinable weed seeds. When such soils are prepared for planting a lawn, ideal conditions are provided for the germination of these weed seeds and a good many weed seedlings are likely to emerge from the soil even before the grass seedlings appear. In fact, if the lawn is planted late in the spring when it is too hot and dry for grass seed to germinate, weeds are likely to be the only plants that appear in the lawn area.

Noxious weed seeds can be cleaned out so there is no need to buy mixtures containing same. Annual bluegrass *(poa annua)* is undesirable and is classified as a weed in Massachusetts. Although already present in many of our lawns, it is much unwanted and very difficult to eradicate. Buying of grass mixtures declaring a sizable count per pound of this seed should be avoided.

Crabgrass seeds do not occur in lawn-seeding mixtures because they are not natural contaminants of the seeds which are used in lawn-seeding mixtures.

Other crop seed is composed of seeds of other grasses, each of which is less than 5% of the mixture and is not required to be named on the tag.

General Lawn Seed Recommendations

The following recommendations provide a basis for selecting lawn-seeding mixtures adapted to specific conditions:

1. If the mixture is to be planted on reasonably rich soil with a good supply of moisture and a sunny exposure, select one which consists mainly of Kentucky bluegrass varieties such as Merion.
2. If the mixture is to planted in an area where the soil is gravelly or otherwise poor or dry (such as under maple trees or on dry banks), select one made up predominantly of red and/or Chewings fescue, preferably Pennlawn red fescue.
3. Avoid mixtures containing ryegrass, tall fescue, meadow fescue, timothy or bentgrass if a permanent fine-textured turf is the desired result.
4. If white clover is desired it should be planted separately.

Price Not a Good Basis for Selection

Seeds of the coarse grasses which are not suitable for lawns can be produced at a much lower price per pound than seeds of the basic lawn grasses. Consequently poor lawn-seeding mixtures can be sold at a lower price per pound than good ones. It is obvious that a cheap mixture containing seeds of course grasses cannot possibly produce a fine-textured lawn.

Lawn seeds vary considerably in size. A pound of Kentucky bluegrass, for instance, contains about 2,000,000 seeds. A pound of ryegrass or tall fescue contains only about 225,000 seeds. Since only one plant can come from one seed it is apparent that a pound of Kentucky bluegrass seed could produce many more plants than a pound of ryegrass or tall fescue seed. The only time a fair comparsion of the price of two brands of lawn seed can be made is when the two brands involved contain similar kinds of seed in the same proportions of the same quality.

(Continued on Page 22)

SEEDS *(Continued)*

Warning

Although good seed is necessary for good turf, it, in itself, will not automatically produce a beautiful lawn. Proper planting and care are also necessary. Time of planting is especially important. The best time to sow is early fall (August 15th to October 1st). The second best time is eary spring (March 15th to April 30th). Dormant seeding in late fall winter may be successful. Late spring and early summer seedings are usually unsuccessful. The time of seeding is more critical for the basic grasses than for coarse ones because seeds of the basic lawn grasses take longer to germinate.

The basic lawn grasses also tend to grow less rapidly than poorer grasses. For this reason, they do not require cutting as often. However, for this reason, too, it takes longer for them to establish a good turf. A lawn planted to the basic lawn grasses is likely to be thin the first year, but, with proper care, it will reach its full beauty by the end of the second year.

Basic Data for Evaluating Lawn Mixtures

On the label check for "Fine-Textured Grasses" and "Coarse Kinds" (which include clover) with the reasonable germinations for top quality seed expected, and seed count per ounce. With this in mind one can reasonably figure out the true value of mixture from the analysis:

Permanent Fine-Textured Grasses with Satisfactory Germination Percentages and Number of Seeds Per Ounce

Coarse Kinds of Temporary and Annual Grasses with Satisfactory Germination Percentages and Number of Seeds Per Ounce

Turf Management

ELWYN E. DEAL
Extension Turf Specialist, Maryland

To use or not to use tall fescue — that is the question. Because of its great range of climatic and sol adaptation, tolerance of heat, drought tolerance and ability to withstand relatively close mowing, tall fescue should be used more often in turf areas of Maryland and Virginia. Tall fescue, of course, should not be used where extremely high quality turf is expected.

There are numerous areas where tall fescue can be used to great advantage. Among them are parks, playgrounds, athletic fields, "back yard playgrounds", roadsides, slopes, rough areas such as parking lots or utility lawns and even fairway roughs.

Everyone is aware of tall fescue's broad rough leaves and tendency to become clumpy when stands are thin. If a moderately heavy rate of seeding is used and the turf is given fairly good management these two disadvantages can easily be overcome.

Four to 6 pounds of tall fescue plus 1 pound of bluegrass or red fescue per 1000 square feet or area will produce a uniformly dense stand that is not clumpy. Mowing at about 2 inches and applying about 1.5 to 2 times as much nitrogen fertilizer as is recommended for bluegrass lawns, helps to keep the stand that way.

Tall fescue is known for its drought and heat tolerance. However, an occasional heavy irrigation during extended dry periods helps keep it green all summer.

Kentucky 31 or Alta — either variety of tall fescue, can be used, but the Kentucky 31 is the preferred variety for most plantings in Maryland.

THATCH

Thatch — an accumulation of undecomposed grass stems, roots and leaf blades on the soil surface — may become a problem in lawns after several growing seasons. Thatch interferes with movement of air, water and nutrients into the soil resulting in poor root development. The thatch layer also provides an excellent breeding place for diseases and insects.

Generally, bentgrasses, bermudas and zoysias accumulate thatch faster than other grasses, but thatch can be a problem in any grass.

Topdressing with bulky organic materials such as peat moss, sawdust, manure, adds to thatch formation. These materials should be used only in the seedbed before planting.

If thatch becomes a problem, using a vertical mower ("verticutting") that slices down through the layer to the soil surface or very heavy raking to remove the material, is about the only way to get rid of it.

You can prevent thatch formation by removing clippings when the grass is growing rapidly. Another way is to keep the soil pH up to about 6.5 by liming when it is needed. The high pH helps create an environment that is favorable for micro-organisms to break down the organic material. In the case of golf course putting greens, the combination of verticutting plus topdressing with soil, is probably the best control. Topdressing lawns with soil is too expensive for homeowners.

The time to remove thatch from bluegrass and other cool-season grasses is in early spring or fall when they are growing rapidly and can recover faster. For bermudas and zoysias, remove thatch in late spring or early summer.

AERIFICATION *(Continued)*

(3) Top dressing is pressed into intimate contact with thatch for more rapid decomposition.

(4) Helps to close the surface of holes made through aerification. This would apply primarily to greens for a better putting surface.

We should realize that spiking, although beneficial in many respects, does not correct turfgrass problems. Spiking alleviates them. The process helps carry turfgrass through adverse conditions, but does little or nothing to correct the basic problem.

The basic problems are compacted soil and excess thatch. These two problems are always present where turfgrasses are heavily used and where growth is forced. A sound management program demands periodic aerification to keep soils porous and verticutting to control thatch as it forms. Spiking will then compliment these basic processes and tide us over adverse periods.

West Pointers 1964

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FROM

MASSACHUSETTS TURF AND LAWN GRASS COUNCIL INCORPORATED

81 DASCOMB ROAD, ANDOVER, MASS.

TO

TURF BULLETIN

TROLLING

2,4-D May Increase Nitrates in Plants

Does spraying certain plants with 2,4-D increase the nitrate content to hazardous levels? Sugarbeet leaves accidentally sprayed with 2,4-D have been reported to cause some livestock poisoning. But certain plants such as oats, sugarbeets, lambsquarters, pigweed, corn, sunflowers, and gumweed that have never been sprayed have also been known to accumulate lethal quantities of nitrates.

The herbicide can contribute to an increased concentration of nitrates, but it is less responsible than other factors for this accumulation, says Larry W. Mitich, agronomist of North Dakota State University.

Lambsquarters growing in nitrogen-rich soil are known to accumulate lethal quantities of nitrates without being sprayed with 2,4-D. Obviously, such areas should not be pastured, with or without spraying. Generally, nitrates accumulate in susceptible plants which are growing under stress due to adverse conditions such as drouth, prolonged hot weather, extreme competition, or frost. When spraying pastures with 2,4-D under such conditions, do not graze livestock for 10 days after treatment to allow weeds to "dry up."

Wilted foliage due to spray damage may mean that nitrates are accumulating. However, this is not always so. At the Ohio Experiment Station a plot of oats of a variety known to accumulate nitrates under certain conditions was sprayed with 4 different concentrations of dalapon. Varying degrees of wilting occurred. Then two calves and and two sheep grazed the plot without ill effects.

Although grazing 2,4-D treated pastures is not considered hazardous, Mitich recommends using care in pastured areas badly infested with nitrate-producing weeds, and when cases of nitrate poisoning are reported.

Crops and Soils

Durar Hard Fescue for Erosion Control

A new fine-leaved fescue variety named Durar *(F. ovina duriuscula)* has just been registered by the Crops Research Division, Agricultural Research Service, and the *American Society of Agronomy.*

Developed by the USDA Soil Conservation Service, Plant Materials Center, and the Washington Agricultural Experiment Station, Durar was originally collected from an experimental planting at Union, Oregon. It was propagated and tested at Pullman, Washington in comparison with many strains of creeping red, chewings, sheeps, and Idaho fescues.

Durar hard fescue provides effective ground cover on roadsides, ditchbanks, farm ponds, and skid trails as well as other sites subject to soil erosion by water. As a recreational grass for campsites, trailer parks, and rough areas, it has no equal within its area of adaptation. It is also used as a soil builder in soil-bank plantings and in mixtures with other grasses and legumes.

Durar is very competitive when seeded in equal proportions with crested wheatgrass on Chernozem soils in the Pacific Northwest. Crested wheatgrass gets started first, but in four years Durar completely suppresses crested wheatgrass and makes a dense low-growing ground cover which does not require mowing.

When used in mixtures with alfalfa, it exceeds other fine-leaved fescues in total root production. At the end of 5 years it produced 4.68 tons of air-dry roots per acre in the surface 8 inches of soil. This was 25 per cent more than with chewings fescue or creeping red fescue. It did not exceed 20 per cent grass in the alfalfa-grass hay mixture. When planted alone Durar produced 7.5 tons of air-dry roots per acre in the surface 8 inches of soil in a 5-year period. This closely approximates the weight of roots found in the native Palouse–Prairie climax vegetation.

The new variety is a moderately tall, semierect, densely tufted, fine-leaved perennial bunchgrass. It is more uniform, drouth resistant, and shade tolerant than chewings fescue. It has abundant long, narrow, lax, basal, somewhat harsh leaves. Culms are numerous and fine, and average production of seed is 700 pounds per acre. In dense plantings few heads are produced after the third year.

The superior characteristics of Durar are good seed production, disease resistance, competitive ability, durability, longevity, leafiness, and heavy production of fibrous roots.

This competitive fine-leaved fescue is well adapted to dryland areas of the west and northwest in rainfall zones of 12 to 30 inches and on well drained soil under irrigation.

Crops and Soils

People can generally make time for what they choose to do; it is not actually the time but the will that is lacking. — *Sir John Lubbock.*

The man who graduates today and stops learning tomorrow is uneducated the day after.

Great works are performed not by strength but by perseverance. — *Samuel Johnson.*