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MANAGING GREENS FOR HOT WEATHER SURVIVAL

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All golf course superintendents in California are poignantly aware that the months of August and September are the critical period when large areas of grass on greens may die seemingly overnight. Emerging as we are freshly singed from the annual holocaust, the time is propitious to analyze the problem of hot weather failure of grass on putting greens and make plans for survival in next year's onslaught.

When large areas of grass on a putting green die within a period of one or two days, it is usually observed that annual bluegrass, *Poa annua,* is the principal grass species. Frequently a considerable amount of bent dies, too. One of several diseases is often present but it often appears that disease is a contributary rather than a primary cause of the sudden collapse.

It should be borne in mind that *Poa annua* and the bents are cool season grasses and hence in the hot months of August and September they are at the low ebb of vigor. Since certain greens of bent survive quite satisfactorily in our hot weather it is also apparent that the environmental conditions are not necessarily overwhelming during August and September. *Poa annua*, being shallow-rooted, is vulnerable to desiccation and to the probable deleterious effects of high root zone temperatures. Undoubtedly contributory to hot weather failure of greens is the heavy play experienced in the hot weather.

Where large infestations of annual bluegrass occur, frequent irrigation is necessary during warm weather because of its shallow rooting. On the other hand, the common observation that failure occurs where greens are very wet and/or high humidity prevails suggests that drainage conditions in the soil either directly contribute to grass failure or influence the development of disease. There is no doubt, furthermore, that soil physical conditions influence rooting depth and it is certainly more difficult to hold grass which is rooted to a depth of one inch than grass rooted to depths of four inches or more.

The foregoing considerations indicate that soil management practices have a direct bearing on hot weather survival of putting green grass. Indeed, a number of management practices to be discussed below have a direct bearing on hot weather survival.

1. Managing greens to disfavor Poa annua.

There is at present no effective selective control for *Poa annua.* There are a number of management practices which tend to disfavor *Poa annua* and one or more of these may be feasible. Greens badly infested with *Poa unnua* are of course vulnerable ***to*** sudden disaster and in such cases removal, fumigation and replanting of the green may be the prudent course. This also provides the opportunity to use an improved strain of bent, rebuild or recontour the green or redesign the traps. If care is taken to establish a dense stand of bent, reinvasion of *Poa annua* will be slow. With good care of the green, the chances are good that the green may be reasonably free of *Poa annua* for five years or more.

The selection of a well-adapted, vigorous, disease-tolerant strain of bentgrass is of primary importance in the replanting or rebuilding of a green. Congressional, Old-Orchard and Cohansey are recommended vegetatively-propagated strains for the West and Southwest. A mixture of Congressional with the Arlington strain also produces a quality turf. The new Penn-Cross is a seed-propagated strain superior to the old Seaside strain and should be used whenever establishment by seed is preferred to the vegetative method.

Since *Poa annua* thrives in shade the pruning or removal of trees near greens is helpful.

Because it has a more shallow root system than bentgrass, *Poa annua* can be discouraged by watering heavily but infrequently at certain times of the year. This is most advantageously done in the fall and in the spring. Allowing the irrigation interval to go until the bent shows slight signs of being dry will tend to discourage the Poa.

The establishment and maintenance of soil conditions which permit high infiltration rates is probably one of the best tools at the disposal of the superintendent for *Poa* control since *Poa* thrives under wet soil conditions. High infiltration rates are aided by proper soil mixture, namely, a high content of sand (See S. Calif. Turfgrass Bul. 6(3):1-4) in the soil mixture and cultivation.

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2. Cultivation techniques and the- maintenance of high infiltration rates.

As mentioned above, managing soil conditions so as to maintain high infiltration rates tends to disfavor *Poa annua* and aids in maintaining deep roots on bent. Fundamental to maintaining high infiltration rates is the use of soil mixes which will maintain high infiltration races in spire of compaction. The use of sand contents in the range of about 85% and of a desirable particle size distribution has been discussed previously in this publication. Additionally, a regular program of cultivation and thatch removal is necessary to maintain high infiltration rates.

Unless a regular program of thatch removal is practiced a thatch-mat of organic matter will develop in putting greens. Should the thatch become dry between irrigations, it often effectively sheds water, particularly on slopes, so that a uniform irrigation is difficult to achieve. Even when it remains moist, which is the usual case, it is a poor conductor of water. The moist, dead organic matter in thatch is believed to provide favorable conditions for the incubation of disease organisms at certain times. Thatch removal is most readily accomplished by vertical mowing. This can be done safely at any time of the year except during critical periods of hot or humid weather. Usually about three to six verticle mowings per year is sufficient for thatch control. Regular brushing before mowing except during the hot weather season will also aid the control of thatch.

There are several machines available for cultivation of greens. Perforation of greens with holes about 3 or 4 inches deep (aerification) in the spring and fall is desirable to cultivate the green. This cultivation breaks up compaction layers near the surface, and mixes up layers of organic matter or discrete layers of top dressing material which may be developing. In most of California the best time for cultivation of greens is in the Fall from about October 15 to December 1, and in Spring during the months of March, April or May - periods in which the cool season bents are growing vigorously. The number of aerifications required will depend upon the condition of the green and the type of machine used as some machines remove more cores per sq. ft. than others. A badly compacted or layered green may require several while one in good condition will need only one in the fall and one in the spring.

A device which helps maintain infiltration rates without removal of as much turf as is done in aerification is the spiker. These machines cut a thin slit in the soil about one inch deep and do little damage to the turf. After the green has been mowed it is difficult to tell it has been treated. These machines may be advantageously used any time prior to the onset of of the hottest weather and help maintain infiltration rates. If a green is aerified about the end of May the use of a power spiker in July would help maintain infiltration rates in the months of August and September. However, the spiker is only a supplementary tool to, and not a substitute for, the aerification machine.

3. The influence of green contours on turf failure.

It is nor uncommon to see greens containing low places where water accumulates. Indeed, some greens are actually dish-shaped because traps are higher than the level of the green. Such greens are more difficult to manage and are vulnerable to loss of turf because of the tendency for the low areas to be very wet unless infiltration rates are high. The contours of a properly constructed green may vary but the center should be slightly high and a cross-sectional profile should be slightly convex so that as much water as is feasible is removed from the sides of the green.

4. Irrigation practices.

Careful watering ***is*** the most important means of maintaining grass in critical periods.

It has been observed many times that putting green grass will wilt on hot days even though the soil may be quite moist. In such cases a light syringing about every two hours during the heat of the day will often save a green which would otherwise be lost. The amount of water applied should be only enough to wet the grass and not the soil. The object is to reduce the water lost thtough the blades by transpiration, not to further wet the soil. This practice, if used intermittently for a period of about a month, will inevitably lead to a salinity condition which will also weaken the grass. Therefore greenskeepers who have to resort to light, frequent sprinkling for periods of several weeks should water heavily once or twice at the first opportunity, namely, cool weather when vigor is improving in the grass.

As mentioned above, infrequent water in the late spring will help discourage the ***Poa annua***

Fixed rules for irrigation of putting greens are impossible to give but in the opinions of the writers most greens are watered too frequently.

5. Mowing ***practices.***

The normal mowing height for putting green turf is from 1/16ths to 14/th inch. During July, August and September it is recommended that mowing be at the higher level. As the weather becomes cooler in the fall greens may be given a vertical mowing and the height lowered to 3/16ths of an inch if desired.

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The higher cut may be made less objectionable to the golfer if the greens are brushed and cross mowed during periods of cooler weather to prevent the development of "grain" and to make the greens play faster.

6. Fertilization programs.

Sound fertilization programs are conducive to survival in hot weather since they help to establish healthy turf. There are many possible fertilization programs, but a few generalizations can be made. In California a total of about 18 pounds of nitrogen per 1000 square feet per year is required. The chances are the phosphorus is in adequate supply since it leaches slowly and is often present in nitrogen fertlizers such as Milorganite. Potassium fertilizer should be included notwithstanding the fact that Southern California soils are usually high in potassium since the heavy cropping on a green may deplete the potassium supply in a few years. About 3 pounds of potash per 1000 square feet per year split into three applications should keep potassium supplies up in most situations.

The writers believe there is considerable merit to the use of a combination of soluble and insoluble nitrogen sources on putting greens. Soluble sources are cheaper than the insoluble sources and when used in small quantities frequently there is no doubt as to the availability of the nitrogen. The rate of release of insoluble sources, on the other hand, is dependent somewhat on soil conditions including temperature. They do provide a reservoir to keep nitrogen supply more nearly steady during much of the year. In selecting a soluble nitrogen source, urea has the advantage of being much safer from the hazard of burn than other materials such as ammonium sulfate or calcium nitrate. Properly applied at the rates suggested it will present no hazard from burning. Any soluble fertilizer should be watered in lightly. The following schedule may be used as a sound starting point and do a good job on high sand content greens. The interval between fertilizations may be increased on greens containing larger contents of silt and clay. Iron sulfate at the rate of 2 ounces per 1000 sq. ft. may occasionally be included to improve color.

SUGGESTED FERTILIZATION PROGRAM

DATE	AMOUNTS PER 1000 SQUARE FEET
October 15 (If hot weather is past)	25 lbs. of activated sewage sludge or 10 Ibs. of urea-formaldehyde, 10 pounds of gypsum and 2 pounds of potassium sulfate. If the pH is below 5.5 add about 10 lbs. of dolomitic limestone.
November 15	One-half pound of actual nitrogen from soluble source (urea, calcium nitrate, ammonium nitrate or ammonium sulfate.)
December 1	25 pounds of activated sewage sludge or 10 pounds of urea-formaldehyde.
January 1	One-half pound of actual nitrogen from soluble source.
January 15	One-half pound of actual nitrogen from soluble source.
February 1	One-half pound of actual nitrogen from soluble source.
February 15	One-half pound of actual nitrogen from soluble source.
March 1	25 pounds of activated sewage sludge or 10 pounds of urea-formaldeyde and 2 pounds of potassium sulfate.
April 1	One-half pound of actual nitrogen from soluble source.
April 15	One-half pound of actual nitrogen from soluble source.
May 1	25 pounds of activated sewage sludge ot 10 pounds of urea-formaldehyde and 10 lbs. of gypsum.
June 1	One-half pound of actual nitrogen from soluble source.
June 15	One-half pound of actual nitrogen from soluble source.
July I	25 lbs. of activated sewage sludge or 10 lbs. of urea-formaldehyde and 2 lbs. of potassium sulfate.
August 1	One-third pound of actual nitrogen from soluble source.
August 15	One-third pound of actual nitrogen from soluble source.
September 1	One-third pound of actual nitrogen from soluble source.
September 15	One-third pound of actual nitrogen from soluble source.
October 1	One-half pound of actual nitrogen from soluble source.

7. ***Disease control.***

Many superintendents are now adopting a preventative fungicide spray program for the summer months using weekly or bi-weekly applications of phenyl mercuric acetate, thiram, Kromad or Acti-dione at the rates recommended by the manufacturers. While this is a wise practice it must be remembered that a strict adherence to the management practices discussed above is also necessary to prevent the development of disease.

Summary

Management of putting greens, indeed any turf, for hot weather survival is not a seasonal practice but rather one extending throughout the year. A green which enters the summer season in any but the best possible condition will have its chances of survival correspondingly reduced. Therefore, the superintendent must follow management practices during the fall, winter and spring seasons which will give him healthy, vigorous turf on all greens by the time the less favorable weather returns.

THE CONTROL OF CRABGRASS IN ESTABLISHED TURFGRASSES

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Crabgrass, in spire of the efforts in recent *years* to develop better herbicides, remains the number one weed pest in established turfgrass. Both hairy crabgrass, ***Digitaria sanguinalis,*** and smooth crabgrass, ***D. chaumum,*** are common in California. However, both species appear to be equally susceptible to the various crabgrass herbicides so separate control measures are not necessary.

Hairy and smooth crabgrass are annual grasses completing their life cycle during the warm season. Generally, crabgrass seeds will germinate in late February in many parts of Southern California and continue through the summer into the fall. In regions of colder winters the time of germination will be correspondingly later. The period of heaviest germination is during the spring and early summer in all regions. Crabgrass seed buried in the soil too deep for germination may remain viable for many years, germinating only when the soil is worked sufficiently to bring the seed to the surface.

The crabgrass seedlings develop rapidly during the warm weather, spreading to make large flat clumps which crowd and shade out rhe desirable turfgrasses. The plants often root at the nodes of the prostrate shoots. Flowering commences generally in late August, continuing until cold weather in the fall. As daily minimum temperatures drop in the fall the plants generally assume a red or purple color. Most of the plants will become brown and die in late fall or early winter, leaving large thin or bare spots in the turf. In areas of mild winters a few plants, perhaps from late germinating seed, will survive and actually produce seed throughout the winter.

There are three general methods of crabgrass control. (1) Management practices, (2) Pre-emergence herbicides, (3) Foliage-applied herbicides. The first method may not by itself eliminate crabgrass from the turf but will materially reduce the population and should always be used in conjunction with either of the latter methods.

Management Practices

The first consideration in any crabgrass control program is to grow a healthy vigorous turf of adapted varieties by proper fertilization, watering, mowing and insect and disease control. Frequent light waterings will aid the establishment of the young crabgrass seedlings and can be harmful to the deep-rooted turfgrasses. The practice of watering deeply and infrequently should generally be the rule. At the approach of the crabgrass season, raising the mowing height to 1½ to 2 inches on all lawns and general purpose turf will be effective in shading out the young crabgrass plants. An extra application of nitrogen fertilizer should always follow the use of any of the recommended crabgrass herbicides. Often a thorough aerification at this time will also be of benefit.

Pre-emergence Herbicides

Pre-emergence herbicides are those which are applied to the soil in established turf before the crabgrass seed germinates. Their effect is primarily that of killing the young seedling at time of germination. Since crabgrass seeds germinate over a long period of time, the length of time of effectiveness of these herbicides is an important consideration. A herbicide which remains effective in the soil only a short period of time may require applications at too frequent intervals to be economical.

A large number of pre-emergence crabgrass killers were tested during 1958 at UCLA. Because of the mild winter weather crabgrass seed germinated in early February, some seedlings being evident February 11, when the herbicide applications were made. This early germination, obviously, was reflected by lower control estimates than otherwise would have been obtained. Nevertheless, excellent control was achieved with several materials. In order to obtain a better estimate of the effectiveness of these pre-emergence materials, half of each block was sprayed with Disodium methyl arsenate to eliminate the young seedlings. The second half was treated with the pre-emergence herbicide only. The area used for the tests was composed primarily of bermudagrass which had received no fertilizer for many years. The whole area had been heavily contaminated with crabgrass the previous year. All treatments were replicated three times.

Standard lead arsenate at 10 and 15 pounds per 1000 sq. ft. and calcium arsenate at 12 and 15 pounds per 1000 sq. ft. gave nearly 100% control in both the disodium methyl arsenate treated portion of the blocks and the untreated. No injury to the established turfgrass was observed in any of these treatments. Improved color of the turf was noted in the calcium arsenate blocks.

Good control was also obtained with Natrin 80s at 4 lbs. per acre and 3Y9 in two applications of 20 lbs. per 1000 sq. ft. without the disodium methyl arsenate, however, the combination of the two treatments improved the degree of control. The Eptam, liquid

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formulation, was satisfactory either when used alone or in combination.

Several materials, as can be seen in the table, were effective when followed by the disodium methyl arsenate application but were not as satisfactory when used alone. This result may indicate that these materials are effective only on the seed as it germinates and are harmless to the young seedling once it is established.

PRE-EMERGENCE CRABGRASS HERBICIDE TEST · 1958

MATERIAL	NO. OF APPLICATIONS	RATE PER APPLICATION	PERCENTCONTROL	
			PRE-EMERGENCE ONLY	PRE-EMERGENCE + DISODIUM METHYL ARSENATE
Eptam granular	1	2½ lbs. per acre	20.6	82.6
Eptam granular	2	2½ lbs. per acre	54.0	82.0
Eptam granular	1	5 lbs. per acre	**46.0**	**63.3**
Eptam liquid	2	2½ lbs. per acre	**67.3**	**56.6**
Vegedex	1	2 qts. per acre	**26.0**	**64.6**
Vegedex	1	**3 qts.** per acre	13.3	**75.3**
Randox	1	**4** qts. per acre	14.0	**60.0**
Randox	1	**6** qts. per acre	28.0	**64.0**
Neburon	1	**3** lbs. per acre	**43.3**	**66.0**
Neburon	2	**3** lbs. per acre	**49.3**	**80.0**
Neburon	1	**6** lbs. per acre	11.3	**83.3**
Alanap 3	**2**	30.1 lbs. per acre	**35.3**	**79.3**
Alanap 3	**3**	30.1 lbs. per acre	**39.3**	**73.3**
Natrin 80S	1	**3** lbs. per acre	**33.3**	**88.8**
Natrin 80S	1	**4** lbs. per acre	77.0	89.0
Simaten	1	**1/4** lb. per acre	31.3	**64.6**
Standard lead arsenate	1	10 lbs. per 1000 sq. ft.	**97.3**	**96.6**
Standard lead arsenate	1	15 lbs. per 1000 sq. ft.	**99.3**	**99.3**
3Y9	**2**	20 lbs. per 1000 sq. ft.	70.0	81.3
Calcium arsenate	1	12 lbs. per 1000 sq. ft.	**98.6**	**98.6**
Calcium arsenate	1	15 lbs. per 1000 sq. ft.	98.0	**96.0**
Check - no treatment				14.0

Foliage-applied Herbicides

Crabgrass killers of this type fall into two groups; contact materials, that is, those which kill the crabgrass plant by burning the top growth and translocated materials which are absorbed into the crabgrass plant and kill by upsetting the physiological activity within the plant.

Only one contact material is used extensively today, Sodium arsenite. Many golf courses are using sodium arsenite with excellent results on fairways, roughs, and tees. The material is applied in late summer as a spray. Generally, three applications, ten days apart, are required for control. The first application is at the rate of 2-3 lbs. per acre while the second and third applications are at 3 to 4 lbs. per acre. Following either the second or third application, a high nitrogen fertilizer should be used.

Sodium arsenite should never be used on bentgrass greens or other tender turfgrasses. Some injury to bermudagrass, bluegrass, etc., may result, but the injury is temporary and these perennial grasses quickly recover. Some other annual grasses and weeds will also be destroyed by this method.

Disodium methyl arsenate is one of the best translocated crabgrass killers. It is available in a number of granular and liquid formulations under various brand names. It is safe to use on bentgrass greens and dichondra lawns. Temperatures should be moderate (75-80 F.), the soil moist and the grass blades dry at the time of application. Two to three applications about seven days apart are generally required. It should be applied with only enough water to uniformly wet the grass blades.

Phenyl mercuric acetate may be used on golf greens and most turfgrasses to destroy young crabgrass plants. It is not effective on well-established, branched plants. Phenyl mercuric acetate has the added advantage of being an excellent fungicide for Curvularia and some other turf diseases.

A new crabgrass herbicide AMA (octyl dodecyl ammonium methyl arsenate) has not been tested adequately in the west so far. However, it appears to be very promising and may be better than disodium methyl arsenate for some uses. It may not be safe to use on bentgrass greens or dichondra lawns.

In order that the information in our publications may be more intelligible, it is sometimes necessary to use trade names of products or equipment, rather than complicated descriptive or chemical identifications. In so doing it is unavoidable in some cases that similar products which are on the market under other trade names may not be cited. No endorsement of named products is intended, nor is criticism implied of similar products which are not mentioned.

STANDARDIZED WEAR INDEX FOR TURFGRASSES

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The question has many times been asked: "Which is the toughest grass to plant?" or "What grass should I plant in a football field to give the greatest amount of wear with the least maintenance?"

A full answer to these questions has never been possible because no criteria have existed for comparing the "Traffic tolerance" of one grass with another. All the information obtainable was based on the visual observation of playing fields and other turfgrass areas under actual use. While this may appear at first to be the best possible way to evaluate turf for this characteristic, a little further thought will make it clear that in no case would all the factors, including the amount and type of wear, be the same and therefore the ratings could not be legitimately compared.

In the spring of 1958 when the first plans were made for the annual Southern California Turfgrass Institute, sponsored by the Southern California Turfgrass Council and the University of California, the theme of "Turfgrass Traffic Tolerance" was adopted. As the plans for the event developed it soon became apparent that very little concrete information was available. M. H. Kimball, Extension Ornamental Horticulturist of the University of California, raised the question of why would not a standardized wear machine similar to one used for rugs, shoe soles or floor coverings be useful for testing turfgrass toughness. As a result, he constructed a simple one-paddle machine shown in Fig. 1. When this elementary device looked promising, he brought the problem of developing a testing machine to the Engineering Department on the UCLA campus. With suggestions from John Stark, Los Angeles County Farm Advisor, Victor B. Youngner, of the Department of Floriculture and Ornamental Horticulture, and Kimball, and with help from the Engineering Department staff the mechanized unit shown in Figures 2 and 3 was built.

FIG. 1. SIMPLE ONE-PADDLE WEAR-TESTING MACHINE BUILT AS AN EXPERIMENTAL MODEL

The unit travels in a circle around a verticle axis mounted on a base staked to the ground. It rolls on two 16-inch pneumatic wheels at a 35-inch radius, and makes eight revolutions per minute around the axis. One of the wheels is driven by a small gasoline engine. The other idles, but is intentionally mounted at an angle to simulate a golf cart wheel under severe conditions.

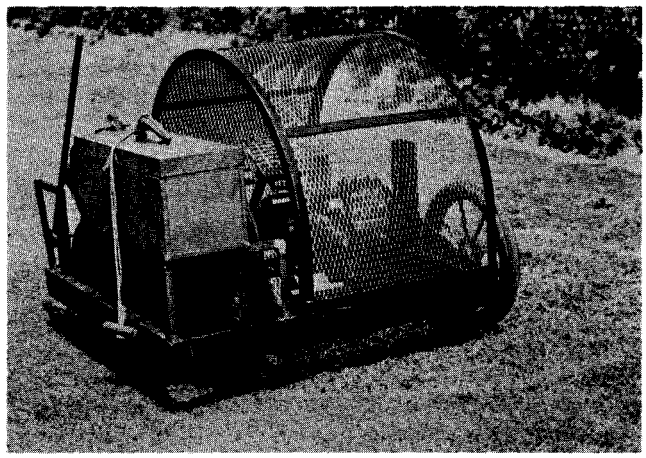

FIG. 2. FRONT VIEW OF THE COMPLETED MECHANIZED TURFGRASS WEAR TESTER.

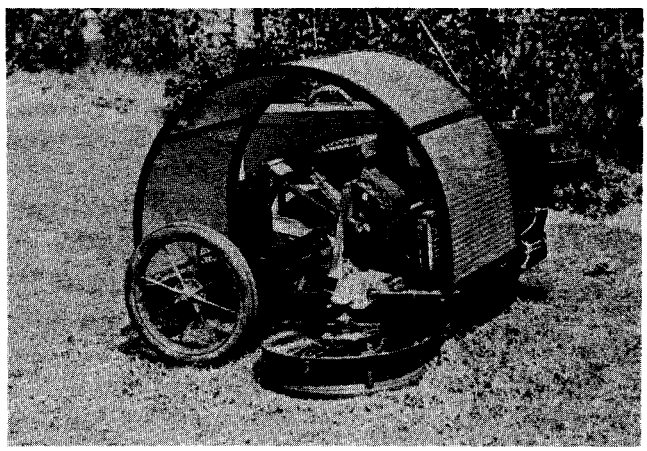

FIG. 3. SIDE VIEW OF WEAR TESTER SHOWING THE TWO DIFFERENT SETS OF BEATER FEET.

The frame carries a horizontal shaft on which two more wear elements are mounted rotating at 100 r.p.m. One of these consists of four corrugated wooden feet, which successively strike the turf and are dragged across it. The other carries two rollers covered with golf shoe spikes. Additional types of wearing shoes are being devised and efforts will be made to relate the mechanical wear to that produced by various types of turf usage.

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This wear machine has been used in preliminary tests by the staff members responsible for its development and several members of the University Agricultural Extension Service. Numerous studies using this beater are planned by staff members of the Department of Floriculture and Ornamental Horticulture.

Preliminary tests on nine varieties of bermudagrass showed differences in wear varying from 45 revolutions of the machine, about 6 minutes of operation, to as high as 285 revolutions, requiring nearly 40 minutes. One test on Kikuyugrass with an inch and a half of thatch required 230 revolutions while another where the thatch was two and a half inches required 450 revolutions. In contrast in one trial on a seaside bent putting green the grass was completely gone in four revolutions.

Perhaps the most important use of this machine will be to study the effects of various management practices, soil conditions, irrigation practices, climatic and weather conditions and other factors on the grasses' ability to withstand wear. Observations of the preliminary tests indicate that all of these may be of great importance. Recovery rate of various grasses and the factors effecting recovery are also important features of wear tolerance which can be studied since a uniform degree and type of wear can be given with this machine.

It is believed that this is the first such mechanical wear machine ever applied to turf. Studies using this machine are expected to make a significant contribution to better turfgrass culture.

KIKUYUGRASS, PENNISETUM CLANDESTINUM, AND ITS CONTROL

A Progress Report (1)

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As the search for promising methods and materials for its control continues, Kikuyugrass is rapidly spreading in many parts of Southern and Central California. Man himself appears to be the greatest factor in this rapid spread. Incorrect identification or lack of information about the grass has resulted in many deliberate plantings of Kikuyugrass and even the marketing of it by nurseries as a lawn grass. Many observations indicate that seeds or sprigs are carried from one area to another by equipment, golf shoes and similar agents. The dry shoots and stems containing the seed may be carried a considerable distance by wind or running water.

There is no positive control method available for Kikuyu at this time. Continued observation of the plots established at the Riviera Country Club in 1957 has shown no residual control by most of the herbicides at the rates they were used. Atlacide and Chlorea are the only materials that continue *to* show fair control but because they are long-lasting soil sterilants their use is limited. Methyl bromide is the most effective chemical available at the present but the hazards involved in its application limit its use.

Since this grass becomes most serious as a weed pest on home lawns where the equipment is too light to handle it a study is underway to devise means of replacing it with the ground cover, Dichondra. The general plan is *to* quickly kill as much of the existing growth and seeds with a chemical such as Vapam and as soon as the soil is free of the herbicide plant the area to Dichondra. Dichondra is quite competitive when properly managed and is also tolerant of Dalapon. Therefore it may be possible to control any spots of new Kikuyu growth with Dalapon as soon as they appear without harming the Dichondra. This program may require several years before the Kikuyugrass has been eliminated but at the same time an acceptable turf may be had with the Dichondra. Once the Kikuyugrass has been completely destroyed the Dichondra can be readily killed with 2, 4-D and the lawn seeded to a grass if that is preferred.

Kikuyugrass is capable of withstanding very high water velocities and is therefore used by the Soil Conservation Service for planting banks of waterways and other areas where rapid water movement may be expected during storms. These plantings have all been established by vegetative propagation methods and all the plant material used appears to be of the male sterile type. This type produces no seed unless

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KIKUYUCRASS, PENNISETUM CLANDESTINUM, AND ITS CONTROL

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the male fertile type is in close proximity to it (2). The continued use of this type is recommended since it reduces the danger of contamination of fields and lawns. However, if the possibility exists that the sterile type may revert to the fertile the hazard is greatly increased. Therefore studies are now being conducted at UCLA on the inheritance of male sterility and on the effects of various temperatures, photoperiods and other environmental factors on flowering and seeding.

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1. These studies are supported in part by a grant from the Golf Course Superintendents Association of America.

2. Youngner Victor B. Kikuyugrass, Penrtisetum clandestinum, and its Control. So. Calif. Turfgrass Culture 8(1):1-4. 1958.

THE TURFGRASS SEED MAT

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The *use* of grass mats for planting lawns is not a new idea, but all past attempts to develop such a mat have met with failure for one reason or another. These mats consist of a fiber sheet into which the grass seeds are embedded. The idea being to have uniform distribution of the seed and to eliminate the problem of the seeds washing away or the soil being eroded.

Recently the Minnesota Mining and Manufacturing Company introduced a new mat which has considerable promise. This mat has been used in several test plantings by the staff of the Department of Floriculture and Ornamental Horticulture at UCLA.

The mat, which consists of a very thin sheet of synthetic fiber, comes in rolls of several widths. (Fig. 1). Planting a lawn is accomplished by merely rolling out the material over the area and wetting it as one proceeds with the job. As the material is very light it tends to blow up readily until it is wet, necessitating holding it down with handsful of soil at the corners and edges as shown in Fig. 2. However, as soon as it is moistened it clings closely to the soil and can no longer be blown or washed about. Lawns which are regular in shape with square corners can be quickly planted, but if the lawn outline is irregular the mat must be cut to fit, which is a somewhat laborious job.

Since the seed has essentially no covering over it, keeping the soil moist until the seed germinates is critical. Once germination is complete the management need be no different from that of a lawn planted in the conventional manner.

The particular advantages of the mat over direct seeding may be several. Since the seed is embedded into the fiber by machine, seeding rate and seed distribution can be precisely controlled. The seed is held quite firmly by the fibers and therefore is not subject to washing or to being eaten by birds. The mat may be especially useful for the establishment of lawns on moderate slopes where washing may be *a* problem.

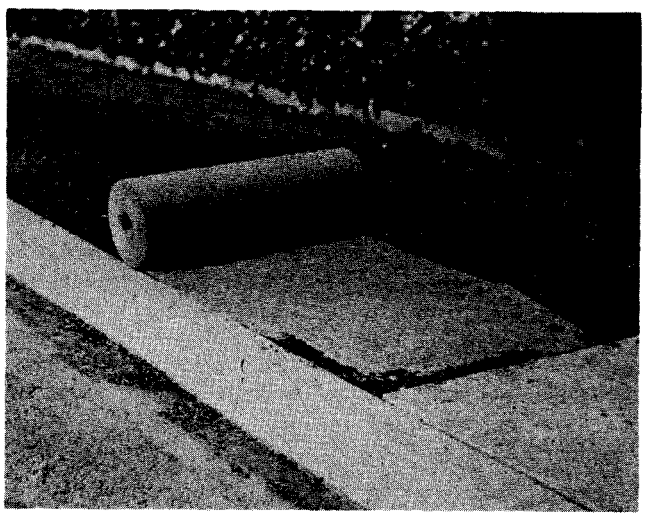

FIG. 1. THE GRASS MAT BEING UNROLLED ON THE PREPARED SEED BED.

FIG. 2. THE LAWN COMPLETELY PLANTED WITH THE GRASS MAT.