CALIFORNIA TURFGRASS CULTURE
FORMERLY, SOUTHERN CALIFORNIA TURFGRASS CULTURE

VOLUME 21, NO. 1 JANUARY, 1971

KIKUYUGRASS-ITS MANAGEMENT AND CONTROL

By V. B. Youngner, W. W. Wright and E. Zimmerman

Kikuyugrass, ***Pennisetum clandestinum,*** is an increasing problem in California despite continued research and increased effort to control it. In 1958 we reported (3) that its distribution seemed to be confined to the coastal region of California from the San Francisco Bay area to the Mexican border. Observations since then show that it is distributed much more widely than thought at that time and that it is continuing to spread.

Two types, the male sterile and the fully fertile, are present in California (Fig. 1 & 2). From investigations of the oldest known stands it appears that the early introductions were largely of the male sterile type which normally produces no seed. However, most new stands are fertile, producing abundant seed, indicating that spread into new areas is largely by seed rather than by vegetative methods. Apparently, enough fertile individuals were present in the original plantings to provide pollen for many male sterile plants around them as well as for themselves. Some reversion from sterility to fertility may have occured but there is no evidence that this is a common event.

Kikuyugrass is extremely aggressive, spreading by rhizomes and stolons as well as by seed (2). It forms a dense turf that eliminates nearly all other grasses and weeds. Mowing stimulates lateral branching of the stolons, thereby increasing density and flowering. Unclipped stands produce few seeds as flowering is very rare. These are the characteristics that give the plant its most undesirable qualities of invasiveness and toughness.

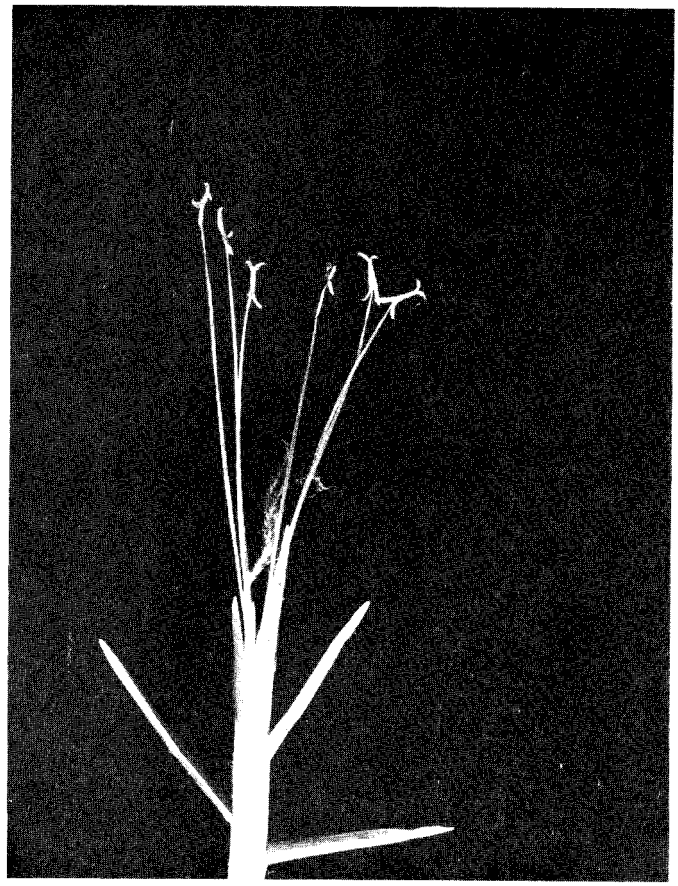
A satisfactory turf can be produced by Kikuyugrass if properly maintained as it has some good characteristics as well as the bad. High density and great toughness are desirable in turfs subjected to very heavy and constant use such as in parks and playgrounds. Although Kikuyugrass is readily killed by prolonged exposure to freezing temperature, it will tolerate moderate cold better than other warm season grasses. Leaves remain green during **cool** weather long after common bermudagrass is dormant and straw-colored. Winter-long green turf can be expected from Kikuyugrass in many parts of Southern California. Its drought tolerance and a generally low fertility requirement are also important assets for many kinds of turf. Serious disease and insect pests do not exist in California.

For these reasons we believe that where several acres or more consist of kikuyugrass the wisest course often may be to accept it and manage it to produce the best possible turf. Eradication may be too costly and difficult to warrant consideration except for very high value turfs.

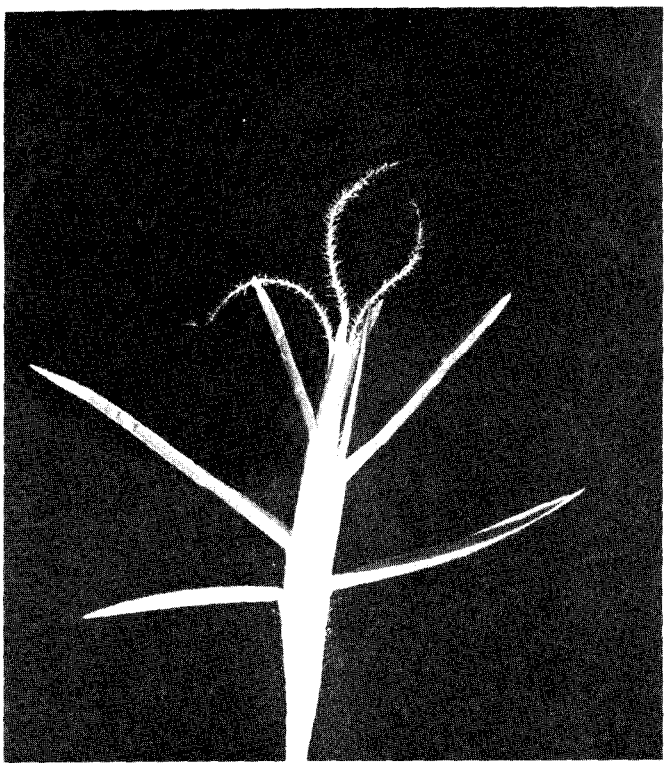
Maintenance of Kikuyugrass turf requires that certain practices be adhered to but it is not necessarily difficult. Mowing must be frequent during the warm season and should be at approximately one-half inch for most uses. Vertical mowing before excessive thatch develops will prevent the need to dispose of large quantities of material at one time. Regular aerification will also aid in thatch control. In many situations both practices should be performed several times during the period between April 1 and October 1. Heavy well-powered maintenance equipment is required because of the toughness of a kikuyugrass sod.

Although these practices necessitate a fairly high outlay in equipment and labor this is at least partially compensated for by essentially no need for fertilization and pest control (including weed control). Because of its deep root system water needs are moderate providing further savings.

Fertilizer should rarely be used during the warm season



Flower of fertile strain of kikuyugrass. Stamens and stigmas are both evident. Anthers are borne on long delicate filaments which usually wither by mid-day.



Flower of male-sterile strain. Only the stigmas are exserted. Stamens are rudimentary, devoid of pollen and never exserted from the sheath of leaves.

as it stimulates top growth leading to increased mowing and thatch control. A few light applications of nitrogen during the fall and winter will maintain better color during cool weather. Readily available materials such as urea or ammonium nitrate should be used. Natural or synthetic organic materials will not be available when the soil is cold but will become available with the onset of warm spring weather, at a time when nitrogen fertilization is undesirable. The light green color can be improved with an occasional application of iron sulfate.

Invasion of shrubbery, flower beds, roadways and similar areas can be controlled by chemical edging. Cacodylic acid or Paraquat are useful herbicides for this purpose. Applications should be sufficiently frequent that the runners do not become too well rooted between treatments.

Kikuyugrass can be controlled and even completely eradicated from an area. However the task is not easy and usually requires considerable time. Where new turf developments are being established on areas contaminated with kikuyu a clean cultivation approach during the dry season can be successful if sufficient time is available. The procedure is as follows: Cultivate or disk several times allowing the soil to dry out thoroughly. Irrigate to bring up seedlings and new growth from dormant rhizomes. Repeat the disking-drying process until no live kikuyu is noted for several weeks after an irrigation. Although this method is time consumming it can be less expensive, safer and as effective as any chemical treatment.

Methyl bromide fumigation under a plastic tarpaulin is the most rapid satisfactory control method for smaller infestations in either open ground or in turf. Cultivation to break up thatch and the surface soil prior to fumigation will assure better penetration of the gas and consequently better kill of the plants. The soil should be moist at the time of treatment. Often two pounds of methyl bromide per 100 sq. ft. of area, twice the normal rate, is used to provide deeper and more thorough fumigation. The plastic should remain in place for at least seven days after treatment.

Most turf managers faced with a kikuyugrass problem are looking for a method of selective control. This is the most difficult to accomplish and few herbicides, safe on other turfgrasses, are sufficiently toxic to kikuyugrass to be of value. During the last two years all available herbicides with any likelihood of being effective have been tested at various rates. Only the organic arsenic compounds, AMA, DSMA and MSMA, consistantly showed a satisfactory level of selective toxicity. Of these, MSMA seems to be the best.

Rates of MSMA as low as 4 lbs. active ingredient per acre have been successful. However, a single application is of little value. Control can be achieved only by repeated applications approximately three weeks apart. Applications must be continued until no new growth is observed for three weeks after a treatment. Even then it is necessary to continue observing the treated area for a numbr of weeks for any signs of new growth. As bermudagrass is very tolerant of MSMA it will often spread into an area under treatment as the kikuyugrass is killed.

We believe that the effectiveness of MSMA can be improved by the development of more exact programs. The time of initial applications in respect to stage of growth and season may be especially important. The relationship of time of application to other management practices may be another important consideration. Present studies are directed along these lines.

Dalapon, a general grass killer is widely used for kikuyugrass control (4). However all turfgrasses are also killed so it can be used only for spot treatment necessitating a constantly discolored area during the treatment period. Dalapon rates of 5 Ibs. active ingredient per acre have been as satisfactory as higher rates, but again, repeated applications as new growth appears is required.

Reported failures with either MSMA or dalapon can usually be traced to poor application programs. Unless treatments are maintained on a consistant schedule the grass is able to recover between applications and complete destruction is never achieved.

Investigations are also directed at the use of growth regulators to control its rate of growth and spread. Kikuyugrass might be a much more acceptable turfgrass if its growth could be retarded easily and inexpensively, thus reducing mowing, edging and dethatching. Control may be easier if flowering and seed production in existing stands is reduced or eliminated. Some growth regulators (1) are known to do this but if flowering can be prevented economically still remains a question. Several new growth regulators have been developed sice the last tests conducted on kikuyugrass. These are being investigated now. The most effective ones on grasses are CCC, maleic hydrazide and MBR 6033.

One of the most difficult aspects of kikuyugrass control is the destruction of seeds buried in the soil. The

seed has an extremely hard coat highly resistant to penetration of water. Therefore germination is very eratic and seeds may lie in the soil for years before germinating. The dormant seed is not killed by most of the common herbicides. Preemergence herbicides generally affect seed only when they are in the stages of germination or early seedling growth.

Thus, although chemicals such as Dacthal, Siduron and Bensulide may be expected to kill germinating seed they will have no affect on the large numbers of dormant seeds. These may not germinate until long after the herbicide has been degradd in the soil. If some chemical or practice could be found that would stimulate all the seeds to germinate at once a great advancement in kikuyugrass control will have been made.

LITERATURE CITED

1. Goodin, J. R. 1959. Chemical control of flowering of Pennisetum *clandestinum,* Kikuyugrass. So. Calif. Turf Culture 9(3):17-18.
2. Youngner, V. B. 1958. Kikuyugrass, *Pennisetum clandestinum* and its control. So. Calif. Turf Culture 8(1) :1-4.
3. Youngner, V. B. 1961. Observations on the ecology and morphology of ***Pennisetum clandestinum.*** Phyton 16:77-84.
4. Youngner, V. B. and J. R. Goodin. 1961. Control of Pennisetum ckmdestinum, Kikuyugrass. Weeds 9:238-242.

PHYTOTOXICITY OF PREEMERGENCE HERBICIDES*

By F. V. Juska, A. A. Hanson and A. W. Hovin

Crabgrass and annual bluegrass *(Poa annua L.)* are serious weeds which invade putting green turf. Of the two weeds, annual bluegrass is the most difficult to eradicate. Annual bluegrass is a prolific seed producer that can produce seed under putting green height of cut. Annual bluegrass is the main grass component in some putting greens because it persists under many putting green management programs.

H. B. Sprague and Glenn W. Burton (3) were among the first researchers to observe that lead arsenate was slightly toxic to annual bluegrass. Lead arsenate has been used to control annual bluegrass on putting greens for many years with a fair degree of success when applied at the right time and at the right amounts. Calcium arsenate is used to some extent for annual bluegrass control, but control has been somewhat erratic. Injury from calcium arsenate can result from high application rates, excessive buildup of soil toxicity levels, and from applications made during hot weather. V. B. Youngner (4) states that calcium arsenate is not safe to use on greens under their conditions in the West.

Although several preemergence herbicides give excellent control of crabgrass, there is justifiable concern over potential injury to bentgrass greens. There is also the possibility of injury from preemergence herbicides applied for annual bluegrass control. Holman M. Griffin (1) reported good control of crabgrass with DCPA (Dacthal) on bentgrass. His findings are supported by field experience that shows this herbicide to have a high degree of safety on all but Cohansey bentgrass greens. A. T. Perkins (2) reported bensulide as a promising herbicide to eradicate annual bluegrass without injury to 16 bentgrass selections.

The purpose of this study was to determine the phytotoxicity of six preemergence herbicides on several bentgrass varieties.

Bentgrasses and Herbicides

The experiment was set up in 1965 on bentgrass plots sprigged or seeded in 1957. The experimental area included four replications of 5 feet by 10 feet plots planted to the following creeping bentgrass varieties: Arlington, Congressional, Cohansey, Collins, C-52 (Old Orchard), Metropolitan, Penncross, Pennlu, Seaside, Washington, and a mixture of Arlington and Congressional (Fig. 1.). Herbicide treatments were applied across the replications in 16 main plots measuring 2 1/2 feet wide and 55 feet long. Three of six herbicides were applied on two of the four bentgrass replications. The bentgrass variety subplots within herbicide treatments were 21/2 feet by 5 feet.

LIST OF HERBICIDES REFERRED TO IN THIS PUBLICATION

Common name	Chemical name	Trade name	Manufacturer's name
DMPA	0-(2,4-dichlorophenyll O-methyl Isopropylphosphoramidothioate	*Zytron	*Dow Chemical
siduron	1-(2-methylcyclohexyl)-3-phenylurea	*Tupersan	*E. I. duPont
DCPA	dimethyl tetrachlorotereph-thalate	*Dacthal	*Diamond Shamrock
bensulide	O,O-diisopropyl phosphorodithioate S-ester with N-(2-mercaptoethyl) benzenesulfonamide	*Betasan	*Stauffer
calcium arsenate	calcium arsenate	several names	various companies
lead arsenate	lead arsenate	several names	various companies

* Mention of trade names, proprietary products, or company names does not constitute a guarantee or warranty of the product by the U.S. Department of Agriculture, and does not imply its approval to the exclusion of other products that may also be suitable.

* ***Reprinted from USGA Green Section Record, Sept. 1970.***

Herbicides and rates applied were: 1) bensulide, 15 pounds per acre; 2) DMPA, 15 pounds per acre; 3) siduron wettable powder, 12 pounds per acre; 4) DCPA wettable powder, 10 pounds per acre; 5) lead arsenate 96 per cent, five pounds per 1,000 square feet; 6) calcium arsenate 69 per cent, five pounds per 1,000 square feet; and 7) the control plot. Rates of all herbicides were based on active ingredients per acre except lead arsenate and calcium arsenate. All herbicides were applied with a knapsack sprayer, each in one gallon water, except for lead arsenate and calcium arsenate which were mixed with sand and applied with a fertilizer spreader.

Herbicides were applied to the same plots in May for five consecutive years, from 1965 to 1969. Visual phytotoxicity notes were taken in July or August of each year. Injury scores were not obtained in 1968 because of a severe attack of disease just before ratings were to be taken. Injury to the bentgrasses was not evident in 1969.

Results

The amount of injury to bentgrass varieties, averaged over three years, is listed in Table 1. Of the six herbicides used in this study, bensulide was the only one that did not appear to injure any of the bentgrasses tested. A trace of injury was observed from lead arsenate in 1966. There was no obvious injury to bentgrasses from lead arsenate in the other two years.

Appreciable varietal differences are apparent among bentgrasses in reaction to herbicides, with the exception of bensulide and lead arsenate. This is seen in the absence of siduron injury on Penncross and the appreciable level of damage from this herbicide on the Washington variety. Calcium arsenate injury on C-52 was relatively severe, with only slight injury on Penncross and Washington bentgrass.

There was variation among years in the amount of herbicide injury on bentgrasses (Table 2). Injury from DCPA rated 2.3 in 1966, compared with .1 in 1965 and .8 in 1967.

DMPA rated 0 in 1965, 2.5 in 1966, and .4 in 1967 while calcium arsenate was rated 1.3 in both 1965 and 1966 but only .2 in 1967.

There was 107 per cent more injury from siduron in 1967 than in 1966. In 1965, siduron injury to Washington bentgrass was 7.5 (Fig. 2) with little or no damage to several other varieties. Poa annua largely filled in the injured areas of Washington bentgrass so that very little injury was observed during the next two years.

The higher rate of injury from calcium arsenate in 1965 was due to the susceptibility of C-52, which received an aevrage score of 5.0 (Fig. 3) and to relative high scores assigned to Metropolitan (3.5) and Seaside (3.5). In 1965, all but two bentgrass varieties were slightly injured by the calcium arsenate application.

Injury from DCPA was different from that of the other herbicides in that the turf was not scorched to form open areas. Stolons from DCPA treated plots failed to root well, the sod was less dense, and the turf had a ragged appearance (Fig. 4).

In 1968, both lead arsenate and calcium arsenate were

TABLE 1. Turf injury scores on bentgrass selections average for 1965-1967)

	HERBICIDES AND RATES					
Varieties	DMPA 15 lb/A	Calcium arsenate 5 lb/1000 sq. ft.	Siduron 12 lb/A	Lead arsenate 5 1b/1000 sq. ft.	DCPA 10 lb/A	Bensulide 15 lb/A
Pennlu	1.3	1.0	.7	.17	1.2	0
Arlington	.8	1.0	.7	.17	1.0	0
Penncross	1.2	.8	0	.3	1.2	0
Arlington Congressional	.3	.3	.8	0	1.2	0
G52 (Old Orchard)	.8	2.2	.17	0	1.0	0
Metropolitan	1.0	1.7	.8	0	1.0	0
Washington	1.3	.3	3.3	0	1.7	0
Congressional	.3	.7	.3	0	.8	0
Cohansey	.7	.7	.17	.3	1.8	0
Collins	.8	.17	1.3	0	1.2	0
Seaside	1.3	1.2	1.7	.3	1.5	0

Scores: 0 = (no apparent injury) to 10 = (severe injury)

TABLE 2. Injury to bentgrasses from herbicides as it varied from year to year (average for all bentgrass varieties)

	1965	1966	1967
Siduron	.7	.6	1.3
DMPA	.0	2.5	.4
Calcium arsenate 69% ai	1.3	1.3	.2
Lead arsenate 96% ai	0.	.3	.0
DCPA	.1	2.3	.8
Bensulide	.0	.0	.0

Scores: .O (no apparent injury) to 10 (severe injury)

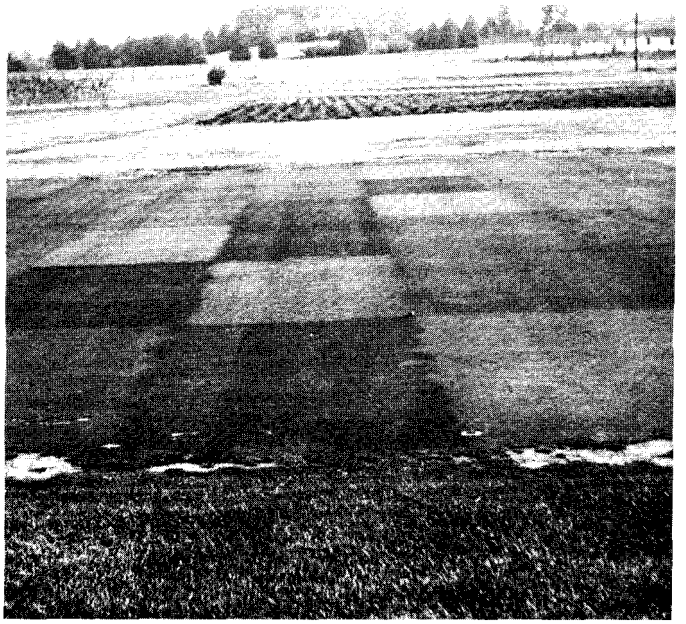


FIG. 1. Bentgrass varieties used in this study. Individual plots are 5 x 10 feet.

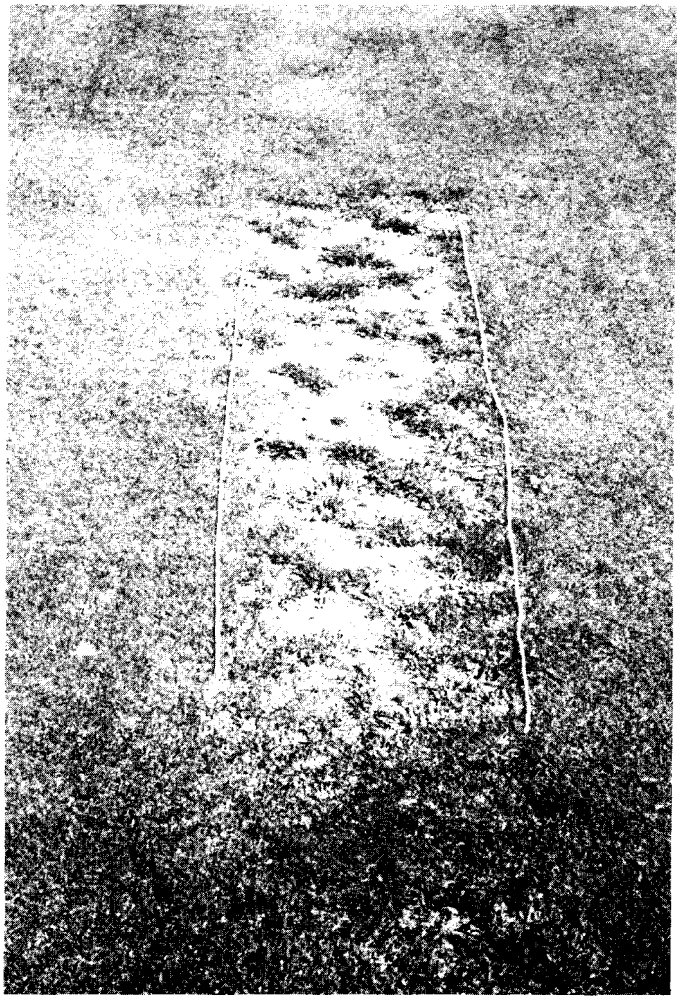


FIG. 2 Turf injury to Washington bentgmss from siduron applied at 12 pounds ai per acre.

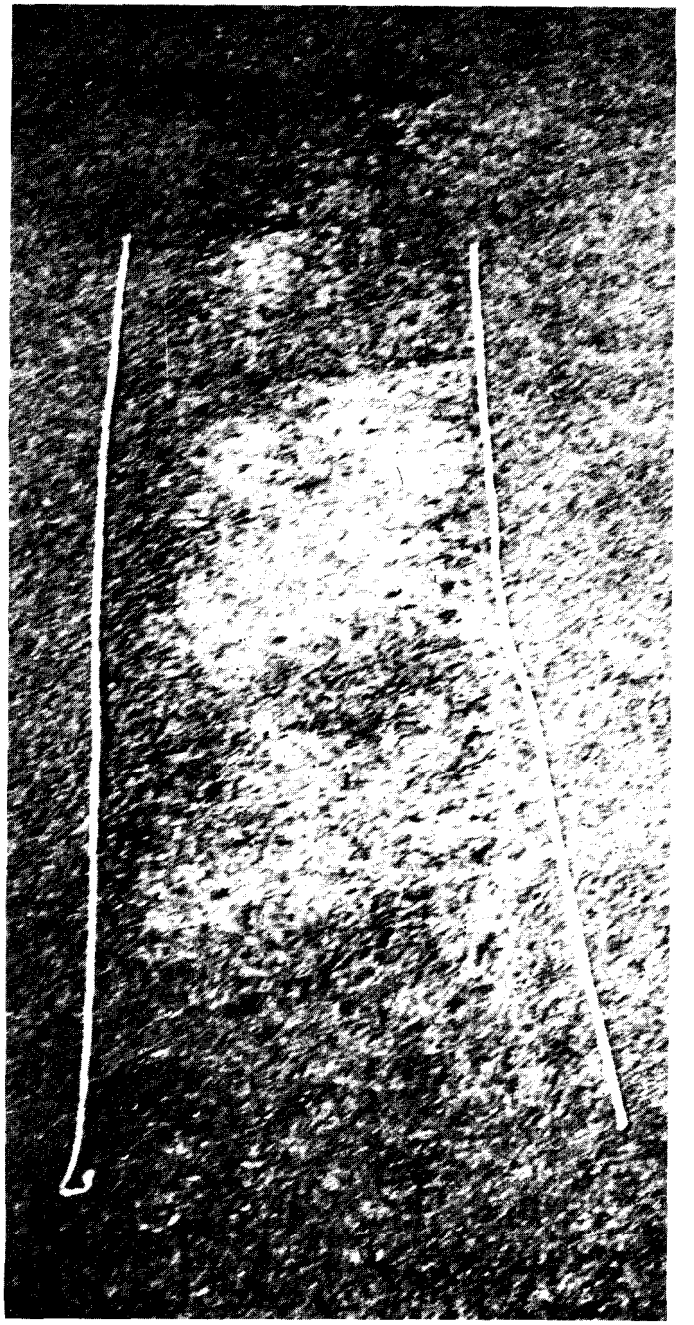


FIG. 3. Turf injury to Old Orchard bentgmss from calcium arsenate applied at 215 pounds per acre.

applied in water with a knapsack sprayer. Within a day or two the calcium arsenate plots showed considerable scorching which disappeared in approximately two to three weeks.

The lack of injury to bentgrass from application of bensulide confirms the findings reported by Perkins. Control of Poa annua with bensulide may require annual applications for two or three years to prevent seed germination. Established *Poa annua* may remain in the greens for a number of years because of the favorable conditions for *Poa annua* growth found in most putting green management programs.

Date of preemergence herbicide application may be an important factor in amount of injury that may occur. Applications made in the Mid-Atlantic States in May,

when temperatures are high, may be responsible for more severe injury to the bentgrasses, particularly from DCPA and calcium arsenate. Preemergence herbicide treatments for control of crabgrass and annual bluegrass can create problems in reseeding damaged greens. Residues from treatments can reduce the successful establishment of bentgrass seedlings. If herbicide injury is a problem, damaged areas should be sodded rather than seeded.

Summary

Phytotoxicity of 6 herbicides on 11 bentgrass varieties was observed in the field from 1965-1969. Herbicides were applied in strips 21/2 feet wide and 55 feet long across plots of the 11 bentgrass varieties.

Washington bentgrass was severely injured in 1965 by an application of siduron, but there was only a trace of injury on two other selections. DMPA did not cause any injury in 1965 but quite severe injury occurred in 1966. Old Orchard, Seaside, and Metropolitan were most sensitive to calcium arsenate injury in 1965. There was some injury from calcium arsenate on all but two strains in 1966. Bentgrasses were discolored in 1968 when calcium arsenate was applied in liquid form. Injury from lead arsenate was negligible. Bentgrass stolons failed to root readily from applications of DCPA. Bensulide caused no noticeable injury.

THE AUTHORS

This article is a contribution from the Crops Research Division, Agricultural Research Service of the United States Department of Agriculture, Beltsville, Md. Dr. Hanson is the Agricultural Administrator, and Dr. Juska and Dr. Hovin are Research Agronomists with the Department of Agriculture.

REFERENCES

1. Griffin, H. M. 1969. "Management Basis for Bent Greens in Southern Areas." USGA Green Section Record, vol. 7, no. 1, p. 10-13.
2. Perkins, A. T. 1968. "Effective Turfgrass Weed Control." USGA Green Section Record, vol. 6, no. 1, P. 11-15.
3. Sprague, H. B., and G. W. Burton, 1937. "Annual Bluegrass (Poa annual L.) and its Requirements for Growth." N. J. Agr. Sta. Bull 630.
4. Youngner, V. B. 1969. "Poa annua: Viewpoints on Control Methods and Precautions in the West." Proc. 40th Annual Int. Turfgrass Conf. and Show, G.C.S.A.A. p. 74-75.

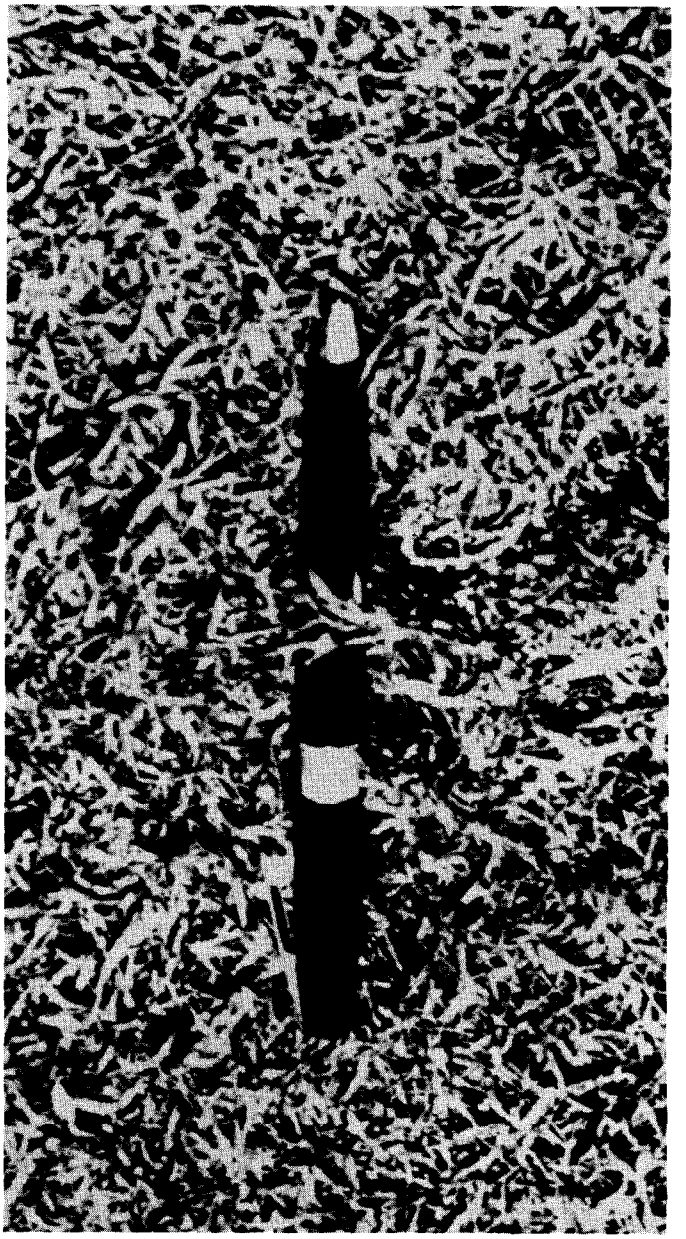


FIG. 4. Congressional bentgrass stolons failing to mot properly. DCPA applied at 10 pounds ai per acre.

COLOR THE GOLF COURSE LANDSCAPE

By Richard G. Maire

Golf course superintendents do an excellent job in most cases of maintaining a beautiful turf both on the fairways and especially on the greens, but too few take advantage of other forms of landscape plants to enhance the beauty of their clubhouses and courses.

Why not some color in the parking lots and around entrances to the clubhouse? This adds an aesthetic quality. A wide variety of annual flowering plants are available from nurseries that put color in the landscape without adding a great burden to the maintenance program.

How do you go about selecting the best variety for the location? First one must keep in mind that flowers must fit into the total landscape. They should supply the accent without dominating the picture. Consideration must be given to the area to be planted — will it be a bed or a border? A bed must be planned as a complete unit to stand alone, while a border is planted in front of shrubs, thus only seen from one side and your selection of plants for height and color is a consideration. It would be well to keep in mind that flowers are most effective when seen against a dark background. Shrubs, trees, buildings walls ,or even large turf areas serve the purpose. Massive displays of one color and even one species are far more effective in large landscape areas, such as a golf course, than the old-fashioned garden of

many species and colors. If variety is desired, then colors and species should be grouped to give the most pleasing effect.

What species are available? Here in southern California we are forunate to be able to take advantage of these color accents the year around. The following are lists of satisfactory annuals for fall and winter color which should be planted now — also a spring and summer list.

If you prefer not to bother with the additional work of planting annuals two or three times a year, there is another alternative. Although not always as spectacular, the use of ground covers which will supply accents of color during certain periods of the year can be used.

Most ground covers are considered low maintenance plants, but like all living things will respond to good gardening practices. This holds true for annuals also. In general, most ground cover plants should be mowed or trimmed back once a year to enable the plant to make new growth and present a cleaner appearance. Low growing varieties may often be mowed with a regular lawn mower, although a rotary type mower would be better. Those too tall or woody to be mowed should be trimmed by hand; this being more of a thinning and heading back than a general cutting back.

Many drought resistant varieties are able to get along without summer watering even in the dry southwest; however, even they should receive adequate amounts of water while they are newly planted and until they may have an opportunity to become permanently established. Watering systems on steep banks should be set up so that water is applied at a slow rate to enable it to settle into the ground and not run off excessively. Bear in mind that most all plants, even desert plants, will thrive best if receiving an adequate water supply. In areas where water is on the saline side, every third irrigation should be extra heavy to attempt to carry off some of the salts that accumulate through frequent light irrigations.

Generally speaking any good lawn fertilizer is also beneficial for most ground cover plants. Liquid fertilizers are excellent and easily applied, particularly to banks; however, they should be used more frequently as they are consumed more rapidly. Fertilization in early spring and again in fall is recommended.

Some suggested ground covers to add color to the landscape are listed on the following page.

For additional help in selecting the right plant for the location, be it shade, full sun, bank or bed, the Western Sunset Garden Book is an excellent reference. Also, our commercial producers of these plants have information available and would be happy to be of assistance if questions arise.

Try some color on your course this winter. The reward will be great.

FALL AND WINTER		SPRING AND SUMMER	
African Daisy	Larkspur	Ageratum	**Coral Bells**
Alyssum	Marguerites	Alyssum	**Dahlia**
Begonia	**Pansy**	Amaranthus	Dianthus
Calendula	**Phlox**	Asters	Gaillardia
Candytuft	Primula malacoides	Balsam	Marigolds
Cineraria	Primula obconica	Begonia	Petunias
Coral Bells	Salivia	Calendula	Portulaca
Delphinium	**Snapdragon**	**Candytuft**	Salvia
Dianthus	**Stock**	**Celosia**	Zinnia
Forget-Me-Not	Verbena	**Cineraria**	Sweet William
Iceland Poppy	Viola	**Coleus**	Gloriosa Daisy

AN EVALUATION OF TURFGRASS MIXES IN THE ANTELOPE VALLEY

By Victor A. Gibeault, John Van Dam and Stanley Spaulding*

A study was conducted to evaluate the compatability of warm and cool season grasses in Courson Park, Palmdale, a high elevation desert location in the Antelope Valley. The objective was to determine an optimum species mix to produce an evergreen lawn under the environmental conditions of the area. The Antelope Valley is characteristically warm and dry in summer and on occasion experiences near zero temperatures during the moderately wet winters. The evaluation was conducted in cooperation with the Los Angeles Park and Recreation Department.

Trial plots, each 100 square feet, were established in March 1967 to six seed mixtures as presented in Table 1. The treatments were replicated twice. In June of the same year certain plots were plugged with zoysiagrass and an improved bermudagrass. Plug size was two inches in diameter and they were established on nine inch centers. The experimental area was mown, irrigated and fertilized similarly to normal park management standards for the valley location.

TABLE 1

Turfgrass mixes evaluated in Palmdale, California

Species and Varieties		
Kentucky Bluegrass	**Bermudagrass**	**Zoysiagrass**
Merion, Newport	common	
Arista	common	
Fylking	common	
Merion, Newport		M-5
Merion, Newport	# 291978	
Merion, Newport		CT-108

*Victor A. Gibeault, University of California, Agricultural Extension Service, Riverside.

John Van Dam, University of California, Agricultural Extension Service, Los Angeles.

Stanley Spaulding, University of California, South Coast Field Station, Santa Ana.

Results based on visual observations made in September, 1970, are presented in this report. At the time the plots were evaluated it was noted that trees bordered one side of the plot area which resulted in a differential response in individual treatments between replicates. Therefore, the results were by necessity based on individual plot performance.

It was generally noted that the mixes located in full sunlight had a predominance of common and/or improved bermudagrass whereas the Kentucky bluegrasses were most competitive under shade. It was typically found that bermudagrass accounted for 60-80% of the turfgrass stand in the former. Under shade, however, the cover consisted of 100% Kentucky bluegrass. It is known that bermudagrass is not a shade tolerant species; the results observed in this trial verify this species characteristic.

M-5 Zoysiagrass failed to establish when plugged into newly planted Kentucky bluegrass turf. CT-108 Zoysiagrass was also eliminated from the stand under shade, however, this experimental variety survived and dominated when grown in full sunlight. In this location, it produced a uniform, durable pleasing colored turfgrass sward. Plugged improved bermudagrass (#291978) tended to colonize into circular patches within the plot area. This resulted in a spotty appearance with a definitely inferior quality rating.

Plots located in the shade, where Kentucky bluegrass predominated, resulted in the highest appearance rating because of good color, density and uniformity. Quality ratings were lower where common or improved bermudagrass was a significant percentage of the stand. This was due to the colonization of the warm season grasses as previously mentioned.

In conclusion, results of this trial would indicate that a mixture of Kentucky bluegrass with warm season grasses to maintain a uniform, evergreen turfed area in the Antelope Valley is not advisable. The main disadvantage of such mixtures is the resulting bermudagrass colonization that occurs.

TURFGRASS SCIENCE MONOGRAPH AGAIN AVAILABLE

The revised printing of the book "TURFGRASS SCIENCE," first released Nov. 1969, is off the press and is ready for distribution according to A. A. Hanson and F. V. Juska, Editors. The first printing of 2,800 copies went fast. Now, with some corrections and changes made, the book once again is ready for turfgrass students, turfgrass superintendents and managers, and anyone else who wants the latest authentic book on turfgrass.

The price still is $10 to American Society of Agronomy members; $12.50 to non-members. Orders may be placed directly with

American Society of Agronomy
677 Sego Street
Madison, Wisconsin 53711

CALIFORNIA TURFGRASS CULTURE
Department of Agronomy, University of California Riverside,. Caiifornia 92502
Editors, Victo B. Youngner and Victor A. Gibeault

CALIFORNIA TURFGRASS CULTURE is sponsored by the Federated Turfgrass Council of California and is financed by the regional councils and other turfgrass organizations of the state. Subscription to this publication is through membership in one of the councils listed below.

LOS ANGELES CHAPTER
SOUTHERN CALIFORNIA TURFGRASS COUNCIL
Golf House West, 3740 Cahuenga Blvd.
Studio City, Calif. 91604

President ..... **Dave Mastroleo**
Secretary ..... **Richard Wulfing**

VENTURA-SANTA BARBARA CHAPTER
SOUTHERN CALIFORNIA TURFGRASS COUNCIL
1148 Woodland Dr., Ojai, Calif.

President ..... **Austin Cline**
Secretary ..... **Paul Ledig**

SAN DIEGO CHAPTER
SOUTHERN CALIFORNIA TURFGRASS COUNCIL
9655 Lakeview Rd., San Diego, Calif.

President ..... **Paul Faucher**
Secretary ..... **Ed Duling**

NORTHERN CALIFORNIA TURFGRASS COUNCIL
P.O. Box 268, Lafayette, Calif. 94549

President ..... **Chic Cannon**
Secretary-Treasurer ..... **Tony Ramirez**