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PASPALUM VAGINATUM 'ADALAYD' AND 'FUTURF'

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Two new warm-season turfgrasses- 'Adalayd' and 'Futurf'-show good potential for use in southern California's landscape. Both have been evaluated recently in observation plots at the University of California South Coast Field Station near Santa Ana. Although neither variety is likely to replace currently popular ones, both possess characteristics that warrant their inclusion in listings of warm-season turfgrasses suitable for southern California conditions and turf management practices.

Establishment

'Futurf' and 'Adalayd' are both selections of *Paspalum vaginatum* that were found in Australia during the 1970s by Hugh Whiting. *Paspalum vaginatum,* native to tropical and subtropical America, is used today mainly in the United States, South Africa, Australia, and New Zealand as a salt-tolerant'turf or for soil erosion control. It is not able to withstand subfreezing temperatures long. *Paspalum vaginatum* spreads mainly by thick stolons and to a lesser degree by dense networks of smaller rhizomes.

Observation plots were established at the South Coast Field Station in October 1976. 'Futurf' and 'Adalayd' plus 'Santa Ana' hybrid bermudagrass were stolonized in separate 12- by 40-foot plots at the rate of 3 bushels per 1,000 square feet. Five pounds of ammonium phosphate per 1,000 square feet were incorporated into the top 2 inches of soil in each plot. A light topdressing of soil was spread over the stolons before they were pressed into the soil with a planting roller. The plots were kept uniformly moist by sprinkler irrigation. They were fertilized monthly with ammonium sulfate (1 pound of actual nitrogen per 1,000 square feet) until the grasses completely covered their individual plot areas.

Although the two *Paspalum* varieties showed quicker greening after planting, the 'Santa Ana' hybrid bermudagrass totally covered its designated plot area before they did: it took 4 months for full establishment of 'Santa Ana' and almost 5 months for the *Paspalum* varieties. If planted in the spring or summer, properly maintained *Paspalum* plantings would be expected to become fully established within 2 or 3 months.

Treatments

Two objectives of the evaluation were to determine whether 'Futurf' and 'Adalayd' were better suited to low or high mowing and to establish generally the amount of nitrogen fertilizer they require each year to maintain quality turf. Mowing heights were 1/2 and 1 1/4 inches; annual nitrogen treatments totaled 2,4, 6, and 8 pounds of nitrogen per 1,000 square feet. Both treatments started in February 1977.

The low-cut strips in the plots were mowed twice weekly and the high-cut ones once a week. Front throw reel-type mowers were used. Clippings were removed from the plots at the time of mowing.

Table 1 shows the fertilizer application schedule for each of the four rates used in the study. Each application was made at the rate of 1 pound of actual nitrogen using ammonium sulfate.

Measurements

Regular monthly turf quality evaluations began in August 1977. A 0 to 10 rating system was used: 0 represented totally dead turf; 1 to 3, unacceptable and

TABLE 1. SCHEDULE OF NITROGEN APPLICATIONS, BY MONTH

Schedule at following nitrogen rates (lb N/1,000 sq ft/yr)			
2	4	6	8
	March	March	February March
May	May	May	May
		June	June
		August	August
September	September	September	September
	November	November	November
			December

*Farm Advisor, Orange County; Environmental Horticulturist, Cooperative Extension, University of California, Riverside; and Agronomist, and Staff Research Associate, Botany and Plant Sciences Department, University of California, Riverside, respectively.

TABLE 2. MEAN TURF QUALITY SCORES FOR 15 MONTHS FOR THREE GRASSES MOWED AT 1/2-AND 1 1/4-INCH CUTTING HEIGHTS

	Quality at following cutting heights*†	
Grass	High	Low
'Adalayd'	6.4	6.4
'Futurf'	6.6	6.5
'Santa Ana'	6.6	6.5

*0 to 10 rating scale: 10 = best quality

†None of scores in comparisons between high and low within a grass variety was significantly different from the other at the 5 percent level of probability.

TABLE 3. MEAN TURF QUALITY SCORES FOR 15 MONTHS FOR GRASSES TREATED WITH FOUR NITROGEN FERTILITY LEVELS

	Quality at following nitrogen rates (lb N/1,000 sq ft/yr)*†			
Grass	2	4	6	8
'Adalayd'	6.0a	6.3b	6.5c	6.9d
'Futurf'	5.6k	6.5e	7.0m	7.lm
'Santa Ana'	6.1x	6.5y	6.8z	6.9z

● O to 10 rating scale: 10 = best quality.

†Values followed by the same letter (within grass variety row) are not significantly different at the 5 percent level of probability.

unrecoverable turf; 4 to 6, unacceptable but recoverable turf with proper maintenance; and 7 to 10, acceptable turf quality. The scores were the average of at least two observers' monthly ratings.

Previous experience with 'Futurf' showed much seed head production in the spring. All plots were rated for seed head production during April, May, June, and August. The percentage of each subplot covered with seed heads was estimated by visual observation. All readings were taken 3 days after mowing.

Suddenly during August 1977, the three grasses became severely scalped. This was attributed to a tropical storm that deposited 2 inches of rain over southern California and caused rapid grass growth. The following summer, however, scalping again began to show up in late July. All plots were evaluated specifically for scalping injury in July, August, and September 1978. Scalping injury percentages were noted for each plot, and the 0 to 10 rating scale was used to quantify these observations. Zero equaled no damage; 10 represented total removal of all green leaf area from the turf plot.

Twenty-two months after establishment, thatch production of the three grasses was measured quantitatively. Four-inch circular samples were taken with a tool designed specifically for this purpose. Three cores were removed from each of the 72 subplots in the study. The thatch was cut from the soil cores, and the green plant material was trimmed off their tops, leaving only the thatch layer. The thatch was compressed and measured for thickness.

The root system of a turfgrass plant can tell something about the plant's drought tolerance and its vigor. When the plots were 26 months old (January 1979), a 5-foot-deep observation pit was dug between the 'Santa Ana' and 'Futurf' plots. After visual readings were completed, soil core samples were taken at various depths with a soil profile tool. These cores were measured carefully to determine root density at various soil depths. Three 2-inch cores were taken at the soil surface and at 6-inch, l-foot, 2-foot, 3-foot, 4-foot, and 5-foot depths in the high- and low-mowing-height areas of the 'Santa Ana' hybrid bermudagrass and 'Futurf' plots. Each core was washed carefully with water to remove soil from roots. The roots were caught on cheesecloth, dried at 110 F for 7 days, and then weighed.

Results

Overall turf quality scores averaged over the first 15 months of the study showed that the three grasses under study produced an acceptable turf.

Mowing height did not affect turf quality during the first 15 months (table 2). Reports from Australia indicate P. vaginatum performs well at cutting heights as low as 1/4 inch.

Nitrogen fertilization enhanced the turf quality of all three grasses (table 3). The 2-pound nitrogen treatment resulted in significantly lower turf quality scores for all grasses than the higher rate treatments. A suitable yearly nitrogen fertilizer rate appears to fall within the 4- to 6-pound range. Results from this study indicate the need to look more closely at the timing of nitrogen applications, because the higher (6- and 8-pound) rates included fertilizer applications during the summer on the plots most troubled by scalping injury in late summer. A new study is now under way to obtain information on timing applications throughout the year.

Seed head production was markedly reduced during the evaluation period at the higher nitrogen levels. Visual observations indicated that the *Paspalum* varieties are less prone to unsightly seed head produc-

TABLE 4. SEED HEAD PRODUCTION ON THE THREE GRASSES TREATED WITH FOUR NITROGEN FERTILITY LEVELS
Data taken May 1978

Grass	Seed heads at following nitrogen rates (lb N/1,000 sq ft/yr)*†			
	2	4	6	8
'Adalayd'	2.8a	2.8a	2.0a	0.3b
'Futurf'	5.2k	2.2e	1.7e	0.8m
'Santa Ana'	6.2x	4.7y	4.5y	2.7y

*0 to 10 rating scale: 10 = most seed heads.

†Values followed by the same letter (within grass variety row) are not significantly different at the 5 percent level of probability.

tion when regularly mowed than is the 'Santa Ana' hybrid bermudagrass (table 4).

Seed head production in the *Paspalum* varieties differs somewhat from that of the 'Santa Ana' hybrid bermudagrass. *Paspalum vaginatum* seed heads are held in their surrounding sheath at or below the mowing height. Because of this growth habit, *Paspalum* seed head production is not nearly as objectionable as is that of bermudagrass.

Table 5 gives the values for scalping injury observed in September 1978. Scalping injury rose in the grasses as the nitrogen fertility rate increased. Particularly noticeable was the tendency of the *Paspalum* varieties to show more scalping injury when subjected to summer nitrogen fertilization (6 and 8 pounds per year). Results from this study strongly indicate that timing nitrogen applications to avoid summer growth can greatly reduce scalping during the summer.

Paspalum varieties produced approximately 30 percent less thatch than the 'Santa Ana' hybrid bermudagrass (table 6). This finding indicates that the *Paspalum* varieties require less thatch removal, a costly and time-consuming maintenance practice, and also have less tendency to lose vigor, restrict water penetration, and harbor the insect pests and fungus pathogens that are often associated with heavy thatch accumulations.

Neither mowing height nor nitrogen rate resulted in any significant difference in thatch accumulation for the three grasses (tables 7 and 8). Normally, one would expect thatch to increase as nitrogen levels increased.

Rooting, measured in January 1979, was visibly greater under 'Santa Ana' hybrid bermudagrass than that in the upper 6 inches of soil under 'Futurf'. Both the *Paspalum* and hybrid bermudagrass produced roots

TABLE 5. SCALPING INJURY OF THREE GRASSES TREATED WITH FOUR NITROGEN FERTILITY LEVELS
Data taken September 1978

Grass	Injury at following nitrogen rates (lb N/1,000 sq ft/yr)*†			
	2	4	8	8
'Adalayd'	1.0a	2.0b	3.5c	5.5c
'Futurf'	0.0k	1.7e	4.0n	2.8m
'Santa Ana'	0.8x	4.2y	5.8z	4.0y

*0 to 10 rating scale: 10 = most scalping.

†Values followed by the same letter (within grass variety row) are not significantly different at the 5 percent level of probability.

TABLE 6. AVERAGE THATCH ACCUMULATION UNDER THREE GRASSES
Data taken October 1978

Grass	Thatch depth
	(cm)
'Adalayd'	1.34
'Futurf'	1.36
'Santa Ana'	1.91

TABLE 7. AVERAGE THATCH ACCUMULATION UNDER TWO CUTTING HEIGHTS
Data taken October 1978

Cutting height	Thatch depth
in	cm
1/2	1.54 N.S.'
1 1/4	1.53

● N.S.-not significantly different at 5 percent level of probability.

TABLE 8. THATCH ACCUMULATION UNDER THREE GRASSES WITH FOUR NITROGEN FERTILITY TREATMENTS
Data taken October 1978

Grass	Thatch depth at following nitrogen rates (lb N/1,000 sq ftlyr)			
	2	4	6	8
	cm	cm	cm	cm
'Adalayd'	1.4	1.2	1.4	1.3 N.S.'
'Futurf'	1.3	1.5	1.3	1.4 N.S.
'Santa Ana'	1.9	1.9	1.9	2.0 N.S.

'NS-not significantly different at the 5 percent level of probability.

down to and beyond a 5-foot depth. The three grasses were completely dormant (brown) when roots were measured. It appeared that the *Paspalum* root system also was dormant. The roots were brown and weak, not white and vigorous as were the bermudagrass roots. Based on these very preliminary observations, future root studies with the *Paspalum* varieties are warranted.

Salinity tolerance

A characteristic of *P. vaginaturn* is its high tolerance of soil salinity. Field observations at two sites in Orange County give some indication of the degree of salinity tolerance this species exhibits.

Electroconductivity readings from one site containing small plots of 'Adalayd' and 'Futurf' at Huntington Beach showed that both varieties were doing well in soil with an ECe of 25 mmho/cm. 'Santa Ana' hybrid bermudagrass had weakened or died out there.

At the other site, a golf course fairway in San Clemente, 'Futurf' was growing in soils with ECe readings ranging from 40 to 45 mmho/cm. Soil samples taken previously had shown that 'Futurf' could not tolerate soils with ECe readings in the 50- to 60-mmho/cm range.

Both sites were well maintained and irrigated, so that soil moisture was never allowed to drop to low levels.

Winter color

The 1977 and 1978 winters were relatively mild at the South Coast Field Station. The 'Santa Ana' hybrid bermudagrass and *Paspalum* varieties held moderately good green color throughout both of them. The winter of 1979 was considerably colder and included two periods of subfreezing night temperatures. The *Paspalum* varieties went totally dormant about 3 weeks before the 'Santa Ana' hybrid bermudagrass. The grasses did not fully green up until late March 1979. The *Paspalum* varieties lagged slightly behind the 'Santa Ana'.

Pest activity

No disease problems or insect damage have been observed to date in the *P. vaginatum* plots. Light to moderate *Poa annua* invasion has been noticed, along with some broadleaf weeds during the winter months. The *Paspalum* varieties seem to be able to compete well enough to prevent any serious weed invasion.

Based on the results from this study, *P. vaginatum* 'Futurf' and 'Adalayd' have proved to be suited to southern California turf maintenance practices. Like all turfgrass species and varieties, they have their advantages and disadvantages in specific situations.

Work is continuing with *P. vaginatum* 'Adalayd' to determine ideal timing of fertilizer applications using various nitrogen fertilizers.

MEETING THE CHALLENGE OF INFLATION AND PROPOSITION 13

Forrest Cress and Victor A. Gibeault *

Creativity and innovation are helping many California turf and landscape managers to offset the debilitating effects of accelerating inflation and Proposition 13 in their maintenance operations. Several examples of major cost savings in turf and landscape maintenance were reported at the Turf and Landscape Institute in April at Anaheim. Challenges for the industry in the 1980s also were forecast.

Background for the current cost squeeze confronting both the public and private sectors of the industry was given by Henry Agonia, director of Parks and Recreation for the City of Glendale. Proposition 13 has made it necessary for his agency to eliminate some administrative and field staff and to reduce time spent in the field to maintain facilities. His present concern as Parks and Recreation Director, he said, focuses on four major areas for increased efficiency and productivity:

- The ratio of work to idle time. Past research on leisure time on the job shows that 50 to 60 percent of an employee's time is spent on work; the rest is idle time.

- Maintenance practices. Many can be streamlined, if not eliminated.

- Planning, controlling, and evaluation of work. First-line supervisors and managers should be planning work schedules and controlling and evaluating the work for which they are responsible. They need to attend

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educational programs where they can learn how to do their jobs more effectively.

- Innovation. Existing facilities must be evaluated. Computer technology must be adopted where feasible to increase efficiency and productivity. Available expertise must be identified, developed, and then used.

Glendale Park Superintendent Robert McFall, speaking on park maintenance under Proposition 13, also stressed the need for innovative management and the development of more efficient maintenance programs. In addition, rapport with users of park facilities must be developed.

Establishment of an efficient maintenance program entails, first, the adherence to principles of sound turf management. "I'm not saving money by having poorly maintained, unhealthy turf," McFall said. "Also, one must compare what one is trying to maintain with what the available resources are when developing a comprehensive and efficient maintenance program."

A turfgrass manager must be involved in many phases of a maintenance program, McFall pointed out, in-&ding the initial design of a maintenance facility. Lighting and turf drainage designs, for example, can cause maintenance problems.

"Personnel can make or break you," the park superintendent said. "They must be given clear instructions, be properly trained, and know precisely what is expected of them. Any maintenance operation that has to be repeated destroys efforts to increase efficiency." McFall urged superintendents and managers to involve their personnel in maintenance planning. "Many ideas come out of the field," he said. "Involving them improves their morale."

Also, a constant search must be made for new products, such as new irrigation equipment that can improve efficiency. "It won't be long," McFall said, "before we have irrigation systems that are virtually maintenance-free as far as control is concerned." He cited weed eaters as an example of new products tried. He has switched to electrically operated commercial weed eaters that use four-cycle, four-stroke generators, reducing equipment maintenance.

Organized sports associations must be included in developing a more efficient maintenance program, according to McFall. These organizations can provide financial backing, and they have manpower available for routine and special maintenance programs.

Faced with an increased workload and less help after Proposition 13 was passed, Mark Hodnick, Supervisor of Grounds at Chaffey College, Alta Loma, started mechanizing ground maintenance and searching for alternative methods of operation. Large campus areas had been mowed with a five-gang, tractor-drawn mower, and smaller areas with four smaller, riding rotary mowers that consumed 110 man-hours per week for mowing and clipping on an every-7-day schedule. A new, higher capacity machine equipped with a vacuum unit was purchased. (Because of its many trees and adjacent vegetation, the campus must be swept almost daily.) "By purchasing this machine," Hodnick said, "we more or less got two for the price of one. This single machine reduced our mowing and clipping-removal man-hour time from 110 to roughly 16 hours per week."

A second major change was to increase reliance on chemicals. "We've gone into the use of preemergence herbicides for 30 acres of slopes in ground cover plantings. We use the normal turf herbicides, but the biggest change we've made in the use of chemicals is that of plant growth regulators. We've applied them to ivy and trimmed hedges, and so far they're working out rather well."

Fees have been initiated for use of athletic facilities at Chaffey College to help offset maintenance and labor costs. Another innovation was made in striping of the football field. During football season, the field is often used on both Friday and Saturday nights by local high school and Chaffey College teams. Previously, for back-to-back games, the field had to be prepared and striped on Friday, and then again on Saturday. It took 40 to 45 man-hours each day to stripe the field, and the pay rate for Saturday was time and one-half. This past season, the field was striped with the type of paint used on professional football fields, so that restriping was unnecessary on Saturday. Although a crew still had to return on Saturday to clean out the stadium, much overtime was eliminated.

Examples of combatting inflation in the private sector of landscape maintenance were reported by Robert Scofield of Environmental Care, Inc., Santa Ana. His company has sought to improve efficiency and thereby increase productivity and reduce costs in two areas: the operational, or "horticultural," functions; and the intangible, or human, aspects.

Upgrading of equipment has increased productivity. Newer, faster, and larger rotary mowing machines have been used on some projects without adversely affecting

the overall appearance of turf areas. Machines have been adapted to windrow grass clippings to the centers of lawns where they can be picked up and disposed of faster. A tractor-mounted curb dressing machine has been devised, which greatly increases the efficiency of edging areas, such as parkways and medians.

In many cases, working with landscape architects during initial design stages has helped to reduce maintenance costs, while still providing the necessary aesthetic qualities, according to Scofield. Also, design changes in existing landscapes have sometimes been worthwhile in reducing water, power, mowing, and other costs.

Scofield's company has found that preemergence herbicide applications to ground covers and shrub plantings can save hundreds of dollars per acre in handweeding costs. "We have found that the degree of success is largely dependent upon the knowledge of the weeds present, selection of the proper material, and the accuracy of application," he said. Another use of chemicals to consider, Scofield added, is in parks. Applying a contact herbicide around trees and obstructions and along curbs and bike paths can reduce labor costs by eliminating a major amount of hand trimming.

Although Scofield said that the cost of some plant growth regulants appears to be prohibitive, he sees a great potential value in their judicious use for some applications. The use of retardants on ivy beds, hedges, and shrubs, for example, can reduce trimming costs.

Turning to the intangible or human aspects, Scofield said that direct cost items, such as scheduling work and routing crews to maximize efficiency and save fuel, of course, should also have top priority. It is less easy to place a value on other personnel policies and practices instituted by his organization.

"With the factors of competition, expenses, and minimum acceptable profit margin in mind," Scofield noted, "the contractor decides that he must go hustle for new business. This takes people. It takes people to do the work. It takes people with ability to relieve management of the routine responsibilities of day-to-day operations."

To accomplish its objective of personnel development, Scofield's company hires graduate horticulturists whenever possible. People in middle-management positions are encouraged to avail themselves of educational programs. They also are worked into in-house programs, such as accounting and budgeting, and participate in estimating and bidding on projects. His company assists all permanent employees in attending college classes. The company pays fees and buys textbooks for an approved course; the only requirement is that the student attend on his or her own time and finish the course.

The company offers a regular biweekly seminar aimed at its unskilled workers, although open to all employees including office personnel. Among subjects presented are irrigation repair, small machinery maintenance, use of chemicals, and the operational principles of lawn mowers. The meetings are voluntary; attendance is taken only so that 2 hours of overtime pay can be added for giving up time on Saturday morning. Classes are presented in English and Spanish. In addition to providing basic information, Scofield noted, these sessions strengthen the employees' feeling that the company is interested in them and in their improving their positions within it. "This brings a certain degree of attitude improvement, especially among the gardeners," he said.

Dr. L. Tim Wallace, U.C. Cooperative Extension Economist and former director of the California Department of Food and Agriculture, spoke on challenges for California in the 1980s and forecast their impact on the landscape industry: Many challenges facing the state in the coming decade will affect the landscape and turf industry. Members of the industry should think and act upon them as issues. Stands should be formulated and coalitions developed on issues such as water, energy, and environmental protection. At the same time, the industry must more actively foster a better understanding of its value to California as a whole. Its members must bear this same perspective in mind when framing and acting upon specific issues of concern to the industry.

Water is the number one critical resource use issue. California has about as much water as it will have in 1990, yet it is one of the few states projected to grow in population, particularly southern California. The U.C. economist expects increasing pressure to be put on the turf and landscape industry with respect to water quantity.

The present energy crisis is probably a short-run situation, but prices will go up. "As to using less energy, probably you won't," Dr. Wallace said. "I doubt if you can afford to cut energy use in your industry, particularly if you can pass along the price."

Increasing environmental pressure is ahead. The biggest issue, according to the U.C. economist, will be who should pay for environmental protection. "What role

will the landscape and turf industry have in sharing environmental costs, out-of-pocket costs?" If benefits are only to accrue to the industry, Dr. Wallace added, many people will oppose any such legislation or regulation solely on principle.

Agriculture, of which the turf and landscape industry is a part, is getting considerably less money for research and education than it did in the 1940s. "Your industry," Dr. Wallace said, "is gaining relatively less and less information in a time when more and more information is available and communication is becoming more critical. This is something to write about to your legislative representatives and to be thinking and doing something about within your industry itself."

In conclusion, Dr. Wallace said: "Your industry benefits many people. It's part of the system. It's part of the system affected by inflation, population, and urban and agricultural controls. As an industry, if you're going to live and prosper not only for yourself but for other people, the biggest issue, perhaps, is to get a lot of people who don't know about you to learn and understand what you do. That, I think, is the big challenge of the 1980s for you and, I believe, for all of agriculture in California."

UC TURF CORNER

*Victor A. Gibeault and Forrest D. Cress**

UC Turf Corner contains summaries of recently reported research results, abstracts of certain conference presentations, and announcements of new turf management publications. The source of each summary is given for the purpose of further reference.

SLOW-RELEASE FERTILIZERS COMPARED ON KENTUCKY BLUEGRASS

The responses of 'Merion' Kentucky bluegrass to two popular, synthetic, slow-release nitrogen fertilizer materials for turf use-IBDU and UF-have been compared in detail in an Ohio Agricultural Research and Development Center study.

Included in the research were different rates, dates, and frequencies of applications of the two slow-release nitrogen sources.

Nitrogen release by IBDU takes place through a dissolution process. Its release from UF depends on microbial activity.

Both nitrogen (N) sources were applied at 1,2, or 3 kg N/are. The 1 and 3 kg N rates were applied in April. The 2 kg N rate was applied either in April or September, split between April and September, or split among April, June, July, and September.

Treatment response was measured monthly by turf quality ratings, clipping weights, and N uptake.

The turf responses to coarse and fine IBDU were similar. Single spring applications of IBDU produced a poor initial turf response compared with that of UF. IBDU provided a much better response than UF at low temperatures, whereas there was relatively little difference in turf response to IBDU and UF during the summer months when applied at the same rate and on the same date.

Frequency of application affected turf quality response more with IBDU than with UF. Two IBDU applications were required for most uniform turf quality response. Uniformity of response improved only slightly with multiple UF applications.

("Effect of IBDU and UF Rate, Date, and Frequency of Application on Merion Kentucky Bluegrass," by J.F. Wilkinson, *Agronomy Journal*, Vol. 69, No. 4, July-August 1977)

NEW TURFGRASS TEXT

A turfgrass management laboratory manual has been made available by Burgess Publishing Co. of Minneapolis, Minnesota. The text, *Introduction to Turfgrass Science and Culture*, was compiled by J.B. Beard in association with J.D. Paola, D. Johns, and K. Karnok, of Texas A&M University. The thirteen exercises cover such topics as turfgrass growth characteristics, seed quality and identification of turfgrasses, equipment, and pest identification. All chapters are arranged for laboratory instruction.

For further information, contact: Burgess Publishing Company, 7108 Ohrns Lane, Minneapolis, Minnesota 55435.

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