

BETTER LAWN - - HARVESTS

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ANNUAL MEETING AFTERGLOW

Reports to the annual meeting, and decisions made there, were detailed in the last issue of Harvests. We are pleased to see that announcements on the election of officers and board members, sent widely to the trade press, has so far been picked up liberally. Announcements have been noted in Seed World, Lawn Care Industry, Seedsman's Digest, and Golf Course Management among others.

ANNOUNCEMENTS AND POT POURRI - President Jacklin has confirmed a proposed arrangement whereby membership mailings to a second address within the same company would be available at half membership cost to anyone wishing this added service.

The Variety Review Board wishes to welcome into full participation beginning with this quarter, the firm of Peterson Forage Seed, Division of Pioneer Hi-Bred International, Inc., Savage, Minnesota, sponsor of Prominent creeping bentgrass.

One or two non-proprietary members have failed to renew their membership. This will be the last mailing going to addresses not up-to-date, although we hate to shut off contact with individuals outside of the industry.

Dr. Jerry Pepin chaired the Thursday morning session of the C-5 Turfgrass Section of the Crop Science Society, at the Agronomy meetings in Ft. Collins, Colorado, August 9. The Institute was also represented by its director at the buffet dinner for society officers and the press, on Monday evening, an annual affair organized by ASTA and chaired by Harold Loden. Papers presented to the turfgrass section during the agronomy meetings, and the turfgrass tour, are summarized in greater detail in the technical section of this Harvests.

Foreign interest seems picking up. Dr. Pepin indicates that he will be accompanying a team to China, looking towards turfgrass markets and exchanges in Asia. Ed Mangelsdorf has briefed us on correspondence with clients in Argentina, anxious to obtain information and literature from the USA. Several exchanges of correspondence with Costa Rica have erupted. Apparently there is some usage of cool season grasses at the higher elevations in Central America. With frequent overseeding, temperate species such as the perennial ryegrasses might prove feasible in the highlands.

While Dr. Schery was attending the agronomy meetings, Mrs. Scheiderer received a request for photographs to illustrate a PK article. They were for the garden section of The Community Paper (Elizabeth, New Jersey). Mrs. Scheiderer selected

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ANNOUNCEMENTS AND POT POURRI - Continued

four "how-to" shots, and a tear sheet was sent to Mrs. Scheiderer with a nice "thank-you".

The weather has been "news" in Ohio. August was the wettest on record, the rain more constant than in occasional downpours. The ground became so thoroughly soaked that sensitive plants, including a number of shrubs and rhubarb, "drowned". Mowing schedules were impossible to keep. In spite of all the moisture no unusual upsurges of disease were noted. But weeds grew unrestrainedly; on many parts of the grounds crabgrass was rampant, where none had been seen for the last twenty years.

PARKS AND RECREATION STORY READIED

A story has been prepared for Parks and Recreation magazine, official monthly publication of the National Recreation and Park Association. The story has tentatively been entitled "Crystal Balling Turfgrass Tending". The story opens with surmises as to what the future may hold, of which economic consideration would certainly seem important. How lawn tending shapes up, and is likely to trend in the future, is discussed in light of the "new cultivar revolution". Variety Review Board cultivars are characterized in a separate box for emphasis.

STORY APPEARS IN LAWN CARE INDUSTRY

"New Lawngrass Cultivars Available" was the title of an Institute story appearing in a summer issue of Lawn Care Industry (Vol. 3, No. 6). This attempted to give a resume of the rise of the new cultivar industry, while providing a handy summary of Variety Review Board cultivars for those in the lawn service business.

The story opens with a general discussion about what "improved" varieties signifies. Merion, Fylking, and the breeding work at Rutgers are cited as milestones along this road. Probable trends into the future are suggested.

The main body of the story epitomizes each of the Variety Review Board cultivars, listed alphabetically under the species (for which a brief summarization is given). Kentucky bluegrasses, perennial ryegrasses and fine fescues are discussed at some length, with Highland Colonial bentgrass, Emerald creeping bentgrass, and Sabre rough bluegrass grouped as speciality species.

The linear layout in Lawn Care Industry was condensed into a one-page (two sides) reprint. Some crowding resulted, but nonetheless the reprint serves as a handy summarization of Institute cultivars.

STORY APPEARS IN HORTICULTURE

A story (retitled by the editors, "Rx For Damaged Turf") appeared in the July issue of Horticulture magazine. Staff artists drew progressive spread of a bluegrass plant, utilizing some of Scotts material as his model.

The story was designed to discuss beleaguered lawns as they emerged from winter, but didn't get into the early spring issues. However, much lawn "damage", such as from wear, poor mowing, and attack by pests, is not seasonal in nature. Common sense approaches for these and other problems are given.

The story includes a "Table of Representative Lawngrass Cultivars". The Lawn Institute Variety Review Board is given, the traits of the major species (Kentucky bluegrass, perennial ryegrass, fine fescue, bentgrass and rough bluegrass) are cited, and the VRB "approvals" listed by cultivar name. -2-

AUTUMN STORY APPEARS

"Tips for Autumn Lawn Care" was the title of a story appearing in the August-September issue of American Horticulturist, official journal of the American Horticultural Society. This story was reprinted and distributed to the members for their information and possible use.

The story opens naming the major lawngrasses, with a map of the United States showing where they are best adapted. Then the methods for planting lawns are reviewed, fertilization is stressed, weed control, thatch, and soil grubs discussed. Mowing is briefly touched upon (there was more, but editors cut this to fit space). Perhaps most of interest to members is the box entitled "Cool Season Lawngrasses", in which the attributes of the species are given, followed by the naming and brief characterization of the Variety Review Board cultivars.

INSTITUTE ON TV

On Thursday, September 6, Dr. Schery appeared as guest, representing the Institute, on Cleveland ABC affiliate WEWS-TV. This is the popular "Morning Exchange" program on which the Institute has been featured other years.

The program opened with a series of slides indicating the importance of seeding at this time of year, and a discussion about the breeding superior cultivars. Telephone inquiries were then fielded, answers given on camera.

WEWS-TV kindly announced, both verbally and by means of a printed sign, offering seasonally pertinent literature to any viewer sending in a stamped envelope to the Marysville office. About 80 requests were received during the next two weeks.

APPEARANCE IN "HOME" MAGAZINE

We are pleased to have had tear sheets of the "Outdoor Gardening" section from Home (Home Info. Distributing Limited, Scarborough, Ontario), authored by George R. Blais, a syndicated broadcaster in Canada. In his write-ups, "Everything You Need to Know, to Grow a Perfect Lawn", Blais used Institute information and photographs. On page eighteen, for example, appear two photos with this caption: "Above, the compact, low-growing turf typical of many of the new bluegrass cultivars, three of which are compared with common Kentucky bluegrass below. The photos courtesy of the Lawn Institute".

NEW EDITION DOUBLEDAY BOOK PLANNED

Doubleday publisher's prominent gardening book, 10,000 Garden Questions Answered, is being reviewed for a new edition. Dr. Schery and the Lawn Institute contributed the lawn section to the last edition, and senior editor Dietz writes, "I hope that we can count on you as a Contributing Editor again for the Lawns section". This is a useful publication in which to mention the latest cultivars.

COX ARBORETUM PRESENTATION

On Saturday, July 28, Dr. Schery was invited speaker for a presentation at the Cox Arboretum, south of Dayton, Ohio, concerning lawns and lawn problems. The program was split into an opening review, a series of slides, and a general discussion entertaining questions from the audience. As in the past great enthusiasm is shown by homeowners of the area, who bring in samples and are brimming over with questions. Three reprints were made available, "Lawn Basics", "New Lawngrass Cultivars Available", "How To Handle Your Lawn in the Summer", of which over a hundred copies of each were distributed.

WHY WEEDS CAN BE SO PERSISTENT

Homeowners tending lawns often wonder why the weed problem is so persistent. Even after years of weed control, weeds continue to crop up. Of course lightweight weed seed such as dandelion, thistle and milkweed is carried abundantly by the breeze, and will always recur. But even weeds that do not move about so freely can be quite a problem, simply because of their abundance in the soil. In Minnesota, a soil infested with velvetleaf contained 53 million seeds to the acre (about 23 bushels) according to the Weed Science Society Newsletter. In a test this ground was plowed twice a year for weed control, over a period of 5 years, and still contained about 4 million seeds to the acre at the end of the test. It's no wonder that crabgrass, for example, can be a recurring problem for many years even though it is assiduously controlled annually.

SEEDED RACETRACK

The "Winter 1979" issue of California Turfgrass Culture details, as one of its items, the story of Bay Meadows Race Course at San Mateo, California, planted to a combination of Manhattan perennial ryegrass and bluegrass. A specially-engineered sand base (fortified with fir bark and fertilizer) was designed, with automatic pop-up irrigation. The initial planting was 50-50 ryegrass and bluegrass, but resulted in a stand about 80% rye (expected to gradually change to favor the bluegrass in time). It will be of considerable interest to see how this turf stands up over the long haul under the pounding from race horses. Similar courses are planned for Toronto and elsewhere.

NOVEL APPROACH TO WATERING LAWNS

With water becoming more expensive, sometimes unobtainable in western states, the Water Resources Department of the city of Albuquerque, New Mexico, adopted an interesting approach this summer.

The May 8 issue of Albuquerque Journal carried a full page "Albuquerque Soils Map", in which the city was divided into three zones based upon soil type. It was noted that the first soil type was capable of holding one inch of water, the second 1.5 inches and the third 2 inches. Working from this base, normal evapotranspiration, and need for replacement moisture, sprinkling schedules were suggested for each of the three soil types.

Sprinkling was estimated to be necessary every second day in August for soil # 1, every third day for # 2 and every fourth day for # 3. For September, the figures were respectively 3, 4 1/2, and 6.

The program was not obligatory, but is an excellent example of an attempt to educate the consumer about conservative watering. It is designed for replacement of water consumed by the grass, without unnecessary wastage. More of this sort of thing can be anticipated in arid regions.

OCCUPATIONAL BRIEFS

During the quarter the Institute reviewed for Chronicle Guidance publication, two "occupational briefs" designed for career definition and encouragement in landscape gardening. Upon publication the Institute will be supplied complimentary copies.

TECHNICAL

TURFGRASS PRESENTATIONS AT AGRONOMY MEETINGS

Members may be interested in a quick review of papers formally presented to the turfgrass division (C-5) at this years Agronomy Meetings, held in Ft. Collins, Colorado, in early August. These days about equally as much research is accorded southern grasses as northern ones, but since the latter are more of interest to our membership papers concerning them will be summarized first.

Northern Grasses

A Penn State report by Brede described measurement of Kentucky bluegrass tillers, as these might be affected by seeding rate and cultivar. Duell, Rutgers, investigated turfgrass performance under high levels of shade (most grasses survived 92% light exclusion, and bluegrass was about as shade-tolerant as fescue).

King, Arkansas, gave perhaps the most complete comparison of cultivars, from side-by-side plantings made in the three years 1976-8. He reported that Manhattan, Derby and Yorktown II generally ranked highest, but Regal, Diplomat, Citation, Pennfine and Yorktown performed well also. Regal survived summer heat best; Lynn, NK-200 and Pelo were generally the worst performers. King notes "differences among the perennial ryegrass cultivars were generally small, except for Regal's better heat tolerance". Under Arkansas conditions green turf is produced on nearly a year-around basis using perennial ryegrasses.

University of California (Riverside) researchers also investigated several perennial ryegrass cultivars. They reported that low mowing (about 3/4 inch) resulted in greater densities at all times of year, and under all types of management, than did higher mowing (about an inch and half). Increasing nitrogen fertilization did not result in greater density, and it resulted in a lower non-structural carbohydrate concentration.

In Nebraska, Riordan and colleagues evaluated Kentucky bluegrass under low maintenance. Top ranking cultivars were Nugget, Plush, Victa, Adelphi, A-34, Arboretum, Park and Vantage. Lowest ranking were South Dakota common, Bristol, Cougar and Galaxy. In most cases the same cultivars that rated well under low maintenance were those rating well under high maintenance (exceptions were Park, Vantage, Bristol and Galaxy).

Schmidt, reporting Virginia research, showed phosphorus and potassium fertilization to enhance bluegrass recovery from summer drought, although the influence of the phosphorus was affected by nitrogen fertilization (recovery was inhibited under high nitrogen if soil phosphorus was low). With higher phosphorus fertilization, nitrogen helped recovery. Best proportionment was 2/3 of the nitrogen applied in the autumn, worst proportionment when 2/3 of the nitrogen was applied in spring.

Sheffer, reporting Missouri research, checked drought tolerance of tall fescue, Kentucky bluegrass and perennial ryegrass under controlled conditions. The ryegrass used more water than either the fescue or the bluegrass. Under moisture stress the lower leaves of both the fescue and ryegrass died though bluegrass remained green. The research concludes that tall fescues, lauded for better drought tolerance in the field, must attain this from factors other than the water relations studied, since nothing could be found to mark fescue superiority.

TURFGRASS PRESENTATIONS AT AGRONOMY MEETINGS - Continued

In fertilizer studies at the Connecticut Agricultural Experiment Station, utilizing tracer-tagged ammonium sulphate in the third year of applications, it was concluded that the nitrogen in turfgrass came about equally from soil organic nitrogen, fertilizer nitrogen, and from clippings returned to the soil (1/3 of this from the current year's addition).

Tests of grass establishment in Alaska, including under severe pipeline conditions at Prudhoe Bay, showed mulches to have some advantage, but a clear plastic film to be most effective (presumably because it raised soil temperature as well as conserving moisture). All mulches improved seed germination, but sawdust retarded later growth. Jute netting, straw, and peat moss were other materials tried.

At the University of Vermont, Wood et al explored different means for screening cold hardiness of perennial ryegrasses. Leaving them planted outdoors was not satisfactory, since all died if the snow cover was removed, and there was too little weather severity if the snow was left on. They conclude that artificially freezing the grasses was the most consistently meaningful procedure for determining cold hardiness. Manhattan proved most hardy, followed by Omega, with Pennfine and Citation intermediate.

Much research now concerns itself with measurements and statistics rather than direct observation of grass performance. At Rhode Island carbohydrate fractions were measured in root leaf and stem tissues of turfgrass by utilizing enzymatic techniques. At Penn State thermocouple wires were inserted into bluegrass tillers for constant recording of soil, thatch, plant and canopy temperatures. Perhaps the ultimate in data recording is the proposed functioning of the rhizotron at Ohio State University, reported upon by Karnok, in which extensive (and expensive) instrumentation is being installed in underground facilities.

Christians, when at Ohio State (now at Iowa), investigated calcareous sands for golf green construction. Somewhat confusing interaction of nutrients was noted, with tissue production increasing in response to potassium at low levels of nitrogen but just the opposite at high levels. The two nutrients seem to affect micronutrients, perhaps manganese, such that under high nitrogen further additions of potassium repressed growth. In tests at Rutgers University involving copper, under hydroponic conditions, toxicity appeared as a severe chlorosis of the grass leaves.

Interest in thatch continues at the University of Illinois. Cation exchange capacity of thatch increased as pH increased, and there was no difference between undisturbed thatch or that pulverized. Cation exchange capacity decreased somewhat when soil (as from coring) was incorporated if measured on a weight basis, but increased if measured on a bulk basis.

At Nebraska, a "grass-paver" system was investigated for heavily trafficed areas, utilizing blocks with cavities into which the grass is planted. The grass-paver did improve tolerance to wear and recuperation (except for Merion), with Merion bluegrass, Manhattan ryegrass and Kentucky 31 tall fescue being the most tolerant of wear among the grasses tested. Least tolerant were fairway crested wheatgrass and Dawson creeping red fescue.

In Virginia, renovation of golf greens utilizing glyphosate showed perforated clear plastic to help establishment in the autumn (but raised temperature too much in the spring). An acceptable putting quality was achieved most rapidly utilizing a mixture

TURFGRASS PRESENTATIONS AT AGRONOMY MEETINGS - Continued

of fine fescue and creeping bentgrass in the autumn, creeping bentgrass alone in the spring. The techniques gave excellent conversion, with significant reduction of annual bluegrass.

At Rhode Island, components of metabolism in roots of Baron Kentucky bluegrass were measured. At Nebraska efforts were made to inoculate Park Kentucky bluegrass with nitrogen-fixing organisms, and some success seems to be indicated with Klebsiella pneumoniae, but not with other bacteria. At Rutgers University, utilizing enzyme isoelectric techniques, Chewings fescue cultivars could be pretty well identified by the banding patterns. Penncross creeping bentgrass grown in pots in the greenhouse at North Carolina received varying metal treatments (copper, zinc, manganese salts at varying rates); the addition of gypsum decreased metal uptake, and increased dry weight of the bentgrass.

In Nebraska soluble nitrogen sources "burned" the grass but UF did not (however UF clogged the nozzles in the liquid applications utilized). At Clemson, Penncross bentgrass was planted to a sandy medium one part of which contained 10% clay loam. Nitrifying bacteria were initially much higher in the mixture containing soil, and showed less fluctuations. Establishment of the bentgrass was most rapid in the soil mixture.

In Colorado, a circle of varying watering intensity (high towards the center, fading to little towards the periphery) was used to demonstrate how well various turfgrasses could withstand limitations on watering (becoming quite important in Colorado). At Michigan State special X-ray measurements determined density influences from turfgrass coring (density was greatest one to two millimeters away from the core hole). Generally density increased with moisture content increase, and tine size had only minor influence.

A survey conducted out of the University of Maryland (questionnaires sent) checked on efforts being expended on turfgrass in the various states, and found that on the whole expectations are good.

Southern Grasses

Statistical analyses are the "in" thing at Texas A & M. With tall fescues, in a warm-humid climate, recordings were made of carbohydrate level, shoot density, etc. Shoot density was highest in February, decreasing to about only a third as much through summer, then increasing again as cool weather arrived. Nitrogen fertilization helped with density. In other Texas investigations, aimed towards suppressing bermudagrass in st. augustine sod production, it was found that certain asulam and glyphosate treatments helped, but atrazine was not effective; low nitrogen gave the st. augustine competitive advantage.

Burns, Georgia, found that heavier wintergrass seeding of bermudagrass was superior early, but lighter rates superior for better spring transition; heavier rates also helped suppress weeds better. Busey, Florida, has made an extensive investigation of bahiagrass and st. augustinegrass germplasm. A much clearer perspective on st. augustinegrass breeding is now to be had from his collections and data.

St. Augustine root growth has been a matter for investigation at Texas (Beard's rhizotron). DiPaola reported root growth decrease as soil temperatures decline in autumn, down to 10° C. soil temperature. Dudeck, Florida, subjected bermudagrass

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TURFGRASS PRESENTATIONS AT AGRONOMY MEETINGS - Continued

cultivars to differing salt levels, and surprisingly root growth increased for a while (although top growth declined) at the lower concentrations.

Dunn, Missouri, found that lower mowing (about 3/4 inch) and lighter fertilization resulted in less thatch build-up with zoysia than higher mowing at heavier fertilization. Winter injury was most severe at high mowing given no de-thatching.

Benefin proved to be the best pre-emergence herbicide for establishing bluegrama grass in Nebraska (weeds are mostly the familiar complement of eastern lawns led by crabgrass: 2,4-D products are OK). At Oklahoma oxadiazon and siduron were quite toxic to seeded bermudagrass, but metribuzin and terbutrin were relatively non-toxic at the appropriate rates, and useful in aiding bermudagrass establishment.

In New Mexico efforts were made to segregate bermudagrasses that would be satisfactory at lower maintenance levels; Ormond and Texturf seemed best, with common poorest at an equivalent fertility level. Some cultivars seemed to do equally well at half normal nitrogen rate, indicating room for selection. At Texas, it was shown that stomata are not the dominant regulators of transpiration in st. augustinegrass.

Johnson, Georgia, has investigated control of winter annual weeds in bermudagrass. Glyphosate gives satisfactory control of everything except annual bluegrass. There were varying results with combinations containing 2,4-D, mecoprop and dicamba, but paraquat and atrazine controlled all weeds. In Nebraska establishment of buffalograss was good with simazine used pre-emergence (but the herbicide significantly reduced the intital development of the buffalograss at higher rates). In Arkansas MSMA gave excellent post emergent crabgrass control, but poorer goosegrass control in bermudagrass (metribuzin and DSMA together are suggested for grassy weeds: DCPA and oxadiazon as pre-emergence controls).

Other reports concern the establishment of microplots (Florida), screening of bermuda-grasses for tolerance to low iron (New Mexico ; Santa Ana, Texturf-10 and a Florida experimental were best), and the effect of carbohydrates on callus initiation in st. augustinegrass.

KENTUCKY BLUEGRASS DROUGHT RESISTANCE

Research by Dernoeden and Butler, Colorado, is reported in the August issue of HortScience. Previous research, in which restricted watering influenced browning of the grass, indicated several cultivars (mostly of the "common" type, but including Merion and Arboretum) to be drought tolerant, while others were more noticeably drought-susceptible (including Fylking and A-34). An intermediate group included Baron, A-20, Sydsport, and Windsor. In this study characteristics linked to the drought tolerance were sought, but little or no correlation could be found. Considering bluegrasses in general, nearly three times as many stomata could be found on the upper leaf surface as on the lower, and among the drought resistant cultivars the stomata were somewhat larger on the lower surface than on the upper.

BLEUGRASS SEED INDUCTION

Turner et al, Oregon State, reported to the Seed Production and Technology section at the Agronomy Meetings on response of bluegrass cultivars to differing environmental conditions. Cultivars did differ, and for maximum seed production proper location should be chosen for maximum induction (length of induction exposure increases panicle number).

As is customary, Parks Maintenance magazine issues as its July number an annual review of turfgrass research. In recent years this has been farmed out to responsible technical people, with improved results over its handling by the magazine alone (there are still a number of typographical mistakes, however). This year John Harper of Penn State discussed the Northeast, Phil Busey of Florida the South, Jack Butler of Colorado the West, and David Martin of Ohio the Midwest. With the importance that turfgrass research has now attained, even an issue devoted entirely to the subject cannot achieve a full summarization, and we can merely point up a few of the highlights here.

Starting with the Northeast, Harper mentions that the turfgrass industry contributes \$650,000,000 annually to the agricultural economy of Pennsylvania alone. He notes slowing down in release of pest controls due to EPA requirements. Among noteworthy herbicides of recent vintage are bentazon for nutsedge control, and good luck has been had with oxadiazon both for crabgrass and goosegrass repression. A combination of DCPA plus mecoprop has controlled Veronica filiformis and white clover in Pennsylvania. It has also been found that both crabgrass and dandelion encroachment can be reduced by adequate phosphorus fertilization.

Search continues at Pennsylvania State to determine what conditions precisely bring on disease outbreaks, so that some system of forecasting may prove possible. At several locations investigations of diseases and fungicides continues unabated. Smiley, N.Y., has adopted an ecological approach (particularly with Fusarium) in which he believes that disease is ever present, usually useful, but that pathogenicity arises when "things get out of balance" (and Fusarium actually may not be the primary cause of "Fusarium disease"). A new insecticide, isophenthos, has given excellent results with Tashiro, N.Y., particularly for grubs. Isophenthos (commercial names such as Oftanol, Amaze) has a long residual in contrast to most insecticides these days, one application being said to suffice for the season.

Mention is made of comparisons of new cultivars at various locations, most of which are well known. A number have been added to the "recommended lists" in several states. Duell, at Rutgers, has found grass coverage with various species to be adequate down to about 1/4th normal daylight, but deterioration sets in with further shading. He has also found Kentucky bluegrass to be the equal of fescues in shade. In New York, A-20, Adelphi, Bonnieblue and Touchdown received the best overall disease tolerance ratings.

At Rhode Island research continues concerning the use of charcoal for deactivation of herbicide residues. In several locations efforts to improve growth regulator performance continue (so far results have not been very encouraging). At Rhode Island it was shown that (with overseeding in grooves) broadleaf herbicides may be safely used just prior to or following seeding. Most grasses showed damage from roadside salting.

In the southland Busey reports that Georgia turf had fewer weeds when the clippings were not removed, and in Tennessee fewer weeds where grass was reel-mowed rather than rotary-mowed turf. As would be expected, fewer weeds occur in fertilized bermuda-grass than in unfertilized. In Maryland close mowing reduced chinchbug populations in red fescue. And there was an instance where Fusarium blight seemed to reduce nematode abundance!

In Florida, soil treatments tried were seldom advantageous. New cultivar breeding has intensified throughout the South. Hardier and more resistant strains of various grasses are being sought, as is a low-maintenance bahiagrass. In Maryland tall fescue

1979 TURF RESEARCH AND IRRIGATION ANNUAL - Continued

and Kentucky bluegrasses have been screened for tolerance to acidity. Perennial ryegrass cultivars are being given close look for winterseeding value, and cultivars of tall fescue superior to Kentucky 31 seem to be shaping up.

Asulam in combination with atrazine has proved a good herbicide in st. augustine-grass, and effect of herbicides on root growth is still being explored. Increased insect resistance to insecticides has been noted, especially with Florida chinchbug. A November application of benomyl has prevented spring dead spots on bermudagrass in North Carolina. Considerable attention is given the potentiality of irrigation and fertigation utilizing waste water.

In Maryland the very bluegrass cultivars that were rated best under normal care, also rated best under low maintenance. Autumn fertilization of Midiron bermudagrass in northerly areas was not harmful if potassium levels were adequate. Autumn and early winter fertilization was better for bentgrass in Virginia than was spring feeding.

In the West, Butler calls attention to the regional variety trials at several locations. In Moscow, Idaho, Adelphi, Aquilla, Baron, Belturf, Bonnieblue, Continental, Galaxy, Glade, Majestic, Nugget, Sodco, Sydsport, and Victa are commended for good summer color, and it is noted that the perennial ryegrasses do exceptionally well in the area. In California IS-28, Parade and Rugby are listed as the three best performers during the cooler part of the year, with Majestic added for the warm season; Derby, Pennfine, and Manhattan were rated the top three perennial ryegrasses year-around. Zoysias are being selected for specific purposes in California. In Colorado Paspalum did not prove cold hardy, but a few bermudagrasses did.

In Washington, sulphur is still found to be quite helpful in restraining Poa annua and disease. Various techniques and help from herbicides give promise of conquering Poa annua. In New Mexico strains of bermudagrass adapted to low maintenance are being sought. Adelphi, Windsor, Sodco, Sydsport and a couple of blends exhibited resistance to chlorosis. Irrigation commands much attention in the West. A California report lists zoysia, bermuda, st. augustine, tall fescue, sheeps fescue and red fescue, in declining order, as the most drought resistant turfgrasses. Also Santa Ana and Tifway seemed more drought resistant than did Tifgreen and Tifdwarf bermudagrasses.

In Colorado measurement of grass canopy temperature was more accurate as an indicator for irrigation need than was evapotranspiration measurement. In Montana it was noted that greatest soil compaction on trampled areas occurred at the 2-4 inch depth, and trampling increased compaction seriously (from 1.2 density in untrampled soil to 1.8 density in heavily trampled areas, at the 2-4 inch depth).

Martin is overwhelmed by the turfgrass industry in the Midwest, - nearly four thousand golf courses, multi-million dollar lawn services, and turfgrass maintenance expenditures approaching two billion. He comments upon the research in support of this industry, particularly at the State Universities.

A regional effort is underway to determine the advantages of late autumn fertilization, which have shown some favorable results as far north as Minnesota. At Nebraska, thatch increased tolerance to wear up to a certain point, after which additional thatch decreased it. A new fungicide, Chipco 26019, has given good disease control of a number of familiar diseases in Michigan, Minnesota and Ohio. Diazinon treatments at time of spirea bloom are recommended for control of ataenius beetles (preventing their egg-laying.). Billbugs and greenbugs have become increasingly troublesome, and the former has shown resistance to insecticides.

TURFGRASS TOUR

In conjunction with the Agronomy Meetings at Ft. Collins, Colorado, the customary all-day "Turfgrass Tour" was scheduled on August 8, to the University research grounds, and to various installations near Denver. Colorado is excellent "bluegrass country" provided irrigation is possible, but with foreseeable water shortages and higher prices for irrigation there is increasing interest in drought-tolerant prairie grasses. It is said that costs can run as much as \$50,000 annually to keep an 18 hole golf course watered, and water is not always of the highest quality. Soils are alkaline, salt content high, fertilizer needs and weed problems less manifest than in other parts of the country.

Perhaps the majority of home lawns are now sodded rather than seeded, bluegrass blends generally being used. A commercial sod growing operation was visited, efficiently run and highly automated. Slabs 6 feet by 18 inches are cut and palleted, selling for 11-17¢ per square foot. Some regrowth occurs from shallowly cut sod for another crop, but to guarantee full density seed is also planted (in slits made in the ground), generally about 15 pounds to the acre (10 pounds is said to suffice on a good soilbed). Production is generally on a one year cycle. Of course sod must be irrigated (a variety of means are used), and in the installation visited it was fertilized about each two weeks. Mowing is approximately every one and a half days, by an ingenious reel mower that lifts surface irrigation pipes and mows beneath.

University test facilities are both on the campus, and at a research farm about eight miles northeast of the campus. One of the chief problems is chlorosis, due to high alkalinity and consequent iron deficiency. Extensive cultivar comparisons are being made, especially with the campus plantings. There was not time to make detailed comparisons, but the general impression was that almost all cultivars looked very good.

In cold hardiness tests of southern grasses, Brooking bermudagrass is reported the most hardy, with Santa Ana, La Junta and Tifway the least tolerant of cold. Paspalum, also being given a "look over", did not tolerate cold as well as bermudagrass. An experimental golf green, fertilizer trials, evapotranspiration research, and other technical studies are also carried on on the campus grounds. Typical evapotranspiration is about 6 mm. per day. The ability of Kentucky bluegrass to recover from drought is lauded, and is said to be something often overlooked in the region.

Growing conditions are more difficult at the turf farm (poorly drained soil, often considerable soil drifting from wind, high salinity, and poor quality irrigation water). Various investigations underway include tall fescue plantings, creeping bentgrass (its major problem is winter desiccation, especially where not topdressed), chlorosis control (Fylking is more susceptible than Merion), influence of clippings left or collected, cultivar tolerance of iron deficiency (Ram I, Touchdown, Victa and K9-116 have impressed favorably), herbicide testing, grass mixture comparisons, and various management practices.

Many of the planted areas are just now maturing for future experimentation. Fults alkaligrass has been tried as a golf green cover, but is unsatisfactory during seeding season. In the perennial ryegrass trials there has been no difficulty so far due to lack of winter hardiness, and Dr. Butler feels that maybe they require slightly less care than does bluegrass (Citation, Yorktown, Derby and Pennfine are cited as performing well). A tall fescue clone that produces rhizomes is being propagated, discovered in a wheatgrass planting. Several "minimum-care" turfgrass selections are under observation. Bromegrass is being investigated, advantageous for drought resistance. A study of seeding rates (using Merion bluegrass) indicates that about 1 pound of seed to the 1,000 sq. ft. seems ample.

OHIO TURFGRASS FIELD DAY

The Field Day, displaying research conducted at Ohio State University, was held in Columbus, Tuesday, July 31. Attendance seemed to be on the slim side, what with threatening weather, and the slowing down of new research projects by the Turfgrass Department (largely because so many of the personnel have left to join ChemLawn lawn service). Here are some of the ongoing projects that were reviewed:

Interaction of Fertilizer Elements. Special plantings, on sand, loam and clay over lysimeters, indicate interactions between nitrogen and potassium, but no apparent influence from phosphorus. Some interactions may involve minor elements, but this needs further investigation. Too much nitrogen was detrimental. Moderate applications of potassium increased turf quality.

New cultivar study. The plantings from previous years were not labeled and on display, although a number of older cultivars were included with those newly planted last autumn. This has been a good bluegrass year, and almost all entrees looked good, the chief difference being whether the cultivar was a dark green or a light color (many European entrees are of a lighter shade). Sydsport and Baron, among Institute cultivars, were a little shaggy. The ratings given out ("rate of establishment") are rather meaningless, since they would vary with seed lot and other conditions and are not necessarily linked to the cultivar. For what it is worth, considering Variety Review Board cultivars only, Glade was fastest establishing, followed by Fylking, Enmundi, Adelphi, Touchdown, etc. Rugby was equally as fast as Glade, both being slightly behind AG463 and Columbia; Parade ranked with Fylking and Enmundi.

Only a few perennial ryegrasses were marked for observation, and unexpectedly were not in perfect condition, seeming to be "spotted" (dollarspot?). On the sheets handed out, quality ratings given for this 1975 seeding showed Citation first, followed by Pennfine, Derby, Game, Omega, Yorktown, Velona and NK-200 in that order. The fine fescues were not displayed, but the "quality" rating sheet showed Erika to rank first, followed closely by Banner and Endarky.

It was explained that with the shade plantings, depending upon the time of year you visited the plots results would vary dramatically. The tree shade is not necessarily uniform for all plots, (it is from deciduous trees, thus more light through the winter season). Poa trivalis had least disease on the rating sheet, but Glade and Birk bluegrasses were almost as good, Nugget and others not far behind. As to quality rating (plots established in 1975), A-29-10 rated first, followed by A-20-6, then Nugget, Birk, Bristol, Poa trivalis, Glade, and others (Merion and Victa were poorest).

Pythium Blight. This has not been a "good" year for pythium (little infection), and Larsen has been making special plastic "tents" to encourage the disease (need more heat). Koban and Tersan SP are helpful in controlling pythium, but the residual life is only a few days. Some newer fungicides (Previcur N and Subdue) are also specific for pythium, but seem to have a long residual (possibly 2-3 weeks, certainly more than 10 days in Larsen's tests).

Greenbug Aphid. Niemczyk is alarmed with the spread of this aphid, which seems to have resistance to conventional insecticides. It especially attacks bluegrass, sucking juices from the phloem, and is generally lethal because of toxins injected. Lawn service companies report increasing incidence of the pests, and investigations concerning it are really just beginning.

Spring renovation. Tests were run using glyphosate (Roundup) and a pre-emergence crabgrass preventer (siduron or Tupersan). Test areas were first treated with the

OHIO TURFGRASS FIELD DAY - Continued

glyphosate on March 27, and were then dethatched and overseeded on April 16, utilizing the crabgrass preventer on some of the test plots. Overseeding was ineffective unless control was obtained both from the Roundup and Tupersan. Roundup, only, resulted in 100% crabgrass infestation. Less than full strength Tupersan allowed considerable crabgrass, and even at full strength there was some crabgrass. The implication would seem that a homeowner had best await autumn to change over his lawn population with a renovation program.

The new underground rhizotron established for Dr. Karnok was open for inspection, but is only beginning to function. Many automatic controls, some of them computerized (temperature, humidity, etc.), are maintained for the soil system, and glass viewing plates allow inspection of root development. Some research is underway on root growth of bentgrasses and Poa annua, but this expensive project is not yet into full swing and its usefulness is still to be determined (it is said to be the only such installation in the world for northern turfgrasses). Graduate student Kucharski mentioned that unexpectedly wide variations have been found in soil temperature, even at considerable depths.

FUSARIUM ON BLUEGRASS

The American Phytopathological Society has dropped publication of its Plant Disease Reporter, and inaugurated a new magazine entitled Plant Disease in its stead, complementary to the professional journal Phytopathology. The initial issue of the new journal was attractive and contained several articles at least indirectly relating to turfgrass pathology.

Of particular interest was a report by Smiley, Craven and Bruhn, Cornell, entitled, "Fusarium Blight and Physical, Chemical and Microbial Properties of Kentucky Bluegrass Sod". The authors point up how complicated onset of either of the two species of Fusarium disease is, being related to a multiplicity of factors, some of them apparently having little to do with the pathogen. For example, abundance of pathogen propagules seemed to have no influence upon disease incidence, but extraneous factors such as decomposition of thatch did.

The authors find that bluegrass (a mixture of Merion, Fylking and Pennstar was used in the tests) is more attacked by Fusarium when moderately "forced" by watering and fertilization than when neglected. Alternate periods of moistening, which hasten thatch decomposition, also spur Fusarium eruption. Whether this is coincidental, or whether there are products produced by decomposing thatch that either incite the disease, or alternatively are toxic and predispose the grass to it, is difficult to say. In any event, Fusarium, along with other familiar pathogens, is abundant on senescent leaf tissues.

Fusarium outbreak invariably occurs after major rainstorms, in which the thatch becomes temporarily anaerobic. It is less severe where coring improves aerobic conditions. The authors conclude, " - - - the cause of Fusarium Blight of Kentucky bluegrass may be abiotic. The possibility that phytotoxic substances from decomposing thatch are responsible for the disease must be studied".

GRASS RESPONSE TO MOISTURE

A paper by S. P. Heinisch, University of Nebraska, presented before the ecology section of the AIBS meeting at Oklahoma State University, confirmed the subtle response of grasses to soils and positions. In this study a dune ridge contained about 14% silt-clay and only a little over 8 cm. of water in the top 120 cm. of soil; on the other hand bottom depressions contained nearly 21% silt-clay, with nearly 24 cm. of water available in the upper 120 cm. The ridges are populated by Calamovilfa-Koeleria-Andropogon while the bottoms are colonized by wheatgrass (Agropyron smithii). At intermediate levels Bouteloua-Stipa dominated the plant communities. While this is a study of natural vegetation, it serves as documentation of the principal that also involves differential grass survival in lawns and along roadsides, depending upon soil and position.

ANNUAL BLUEGRASS CONTROL IN BERMUDAGRASS

Bingham and Shaver, Virginia, report in the July Weed Science on tests with various herbicides designed to free bermudagrass from Poa annua in winter (and other annuals in summer). Oxadiazon in late August was very effective in stopping annual bluegrass (treatments earlier in the summer were not so effective). Benefin, prosulfalin and butralin generally provided adequate control, too.

SOME HERBICIDES AFFECT TRANSPLANTED SOD OF BLUEGRASS

Shearman et al report upon the "Herbicide Effects on Sod Transplant Rooting of Three Kentucky Bluegrass Cultivars" in the June issue of HortScience. In most cases residual effects in the soil were not statistically significant for a number of chemicals, including familiar pre-emergence ones. Exceptions were bensulide (which seriously restricted rooting of all three test grasses, - Park, Merion and Baron), and to some extent prosulfalin and benefin. Dicamba and DCPA in particular offered no inhibition. Bensulide sprayed onto the turf was likewise seriously damaging to the rooting of the sod, as were most of the chemicals on Baron. In general Baron had a significantly lower transplant rooting strength of the sod compared to either Merion or Park.

SPENTGRASS DECOMPOSITION

Vossbrinck et al, Colorado, report upon litter decomposition in shortgrass prairie in the April issue of Ecology. Some of the conclusions applying to grass leaf litter in the prairie probably pertain to lawn thatch as well, under similar environmental circumstances. About 15% of the litter was decomposed by microbes within 9 months, and additional nearly 15% by larger organisms. Even when microbial decomposition was prevented about 7% of the litter disappeared within 7 months. Carbohydrates decreased with time, and carbon-nitrogen ratio was lowered. Certain mite families were most active in summer in facilitating decomposition, others in winter.

CONTROLLING UNWANTED BAHIA AND LESPEDAZA IN CENTIPEDE LAWNS

B. J. Johnson, Georgia, reporting in the May Weed Science, discusses the use of several herbicides for the control of lespedeza and bahiagrass (Paspalum notatum) in centipede turf, widely used for home lawns in the Southeast. Controlled rates of atrazine, metribuzin and methazone controlled lespedeza without injury to centipede. But repeat treatment with atrazine were generally needed for control of bahiagrass; centipedegrass showed excellent tolerance to atrazine.

GRASS QUALITY INFLUENCED BY FERTILIZER BALANCE

Christians et al, Ohio State, report in the July-August Agronomy Journal, on the influence of nutrients on Merion Kentucky bluegrass and Penncross bentgrass. Nutrients exhibited complicated interactions, with potassium being increasingly important for turf quality up to the highest level used. In general moderate nitrogen, low phosphorus, and high potassium were beneficial to quality. Possibly as potassium increased less nitrogen was required.

BLEUAGRASS HYBRIDIZATION METHODS

Researchers at the University of Nebraska reported to the Agronomy Meetings on investigations seeking an efficient means of hybridizing Kentucky bluegrass. Prospective male parents are placed at an angle on a "shaker table" above the female plants, and the shaking is activated by time clock (when the female flowers are most receptive, between 10:00 P.M. and 4:00 A.M.). The female plants are kept humidified to prevent pollen dehiscence.

DEGRADATION OF PRE-EMERGENCE HERBICIDES IN THATCH

Hurto, Turgeon, and Cole report in the March issue of Weed Science on degradation of benefin and DCPA on bluegrass turf. The herbicides broke down more quickly in thatch than in soil. The authors conclude, " - - that herbicides applied pre-emergence in turf will persist for shorter periods of time because of the carbon-enriched medium (thatch) and that higher rates or more frequent applications may be required to maintain concentrations at effective levels."

BERMUDAGRASS SUFFERING MANGANESE DEFICIENCY

Snyder et al, Florida, report in the July-August Agronomy Journal, on attempts to correct manganese deficiency in Tifgreen bermudagrass on southern soils. The deficiency shows up when alkaline water is used for irrigation. Temporary relief was achieved from manganese salts and chelates, and a longer correction when manganese sulphate was applied with a fungicidal drench (that suppressed oxidizing soil fungi). However, the most practical approach was simply to lower pH through the usage of acid-forming nitrogen fertilizers.

SOUTHERN GOLF GREEN WEED TREATMENTS

Johnson, Georgia, reviews in July 1977 Weed Science, the "Effective Herbicide Treatments on Overseeded Putting Green Turf". Nothing has proven entirely satisfactory in the sense of not injuring seeded wintergrass, yet preventing summer weeds in revived bermuda. In this research oxadiazon, butralin, methazole, and MSMA all lowered quality of the ryegrass, even though they were often effective in controlling summer weeds.

STRIPE SMUT ON MERION BLUEGRASS

A study by Hull, Jackson and Skogley, Rhode Island, concerning fertility influences on stripe smut severity with Merion Kentucky bluegrass, is reported in the July-August Agronomy Journal. With Merion (and other cultivars susceptible to stripe smut) the disease proved more severe when fertilization was unbalanced (i.e. not a complete fertilizer used), and generally under higher levels of fertility than lower (low fertility plots contain more plants than heavily fertilized plots). Thus both fertility level, and balance, seem to influence seriousness of stripe smut.

SUMMER "RASEN" APPEARS

The International Turfgrass Journal, Rasen, published by Dr. Peter Boeker in Germany was received in September (summer issue). As is customary most articles are in German, but with English and French summaries.

Hiller, Berlin, reported upon functional seed plantings on the highways. Timothy and bluegrass tended to disappear in the mixtures, sheeps fescue and red fescue to increase. Low fertility prevailed.

Adams et al, Wales, reported on "soil" composition for sportsfields. Formulae were advanced for the percentages of fines and coarser particles; rooted grasses helped stabilize the "shear" (Majestic ryegrass more than Highland bentgrass).

Other articles dealt with soil physical qualities, methods of determining grass cultivars from seedlings, and construction of a "double roller" system to simulate wear and tear on turf. Death of Edward W. Schweizer, Switzerland, was announced; Mr. Schweizer had been a great enthusiast of international turf, and was a most gracious host during the Third International Conference.

POA ANNUA LOSS IN THE PACIFIC NORTHWEST

Roy Goss, in the September Northwest Turfgrass Topics, notes serious loss of Poa annua in the Pacific Northwest this summer. He believes anthracnose (Colletotrichum graminicola) to be responsible, although pathologists have had varying opinions as to whether the disease is instrumental. Not only is summer loss a hazard, but winter demise due to desiccation affected Poa annua (not bentgrass) last winter.

SEED MAT PRODUCTION

The September issue of Nursery Business carries a story about an Iowa seed mat operation under the title "The Grass Factory". On a production line basis chopped straw is treated with adhesive, fertilizer, seed mix (this can be customized according to order), dried, cut and rolled. The resulting mats are laid out on the ground like sod, but are more easily handled since there is no living grass and not much weight. They are watered to provide the equivalent of a sodded lawn in time. How the cost compares with typical seed distribution and mulching is not touched upon, but certainly the operation must be more costly than seeding, although probably less costly than sodding. Of course, it sacrifices the advantage of an "instant lawn".

MERION AND NUGGET GROWTH RELATED TO ROOT TEMPERATURE

Aldous and Kaufmann, Michigan State, report in the July-August Agronomy Journal, on research in which Merion and Nugget Kentucky bluegrasses were subjected to increasing temperatures, but root temperatures controlled in one comparison. Nugget showed greater high temperature tolerance than did Merion. With either grass, maintaining a cool root environment enhanced survival at high foliage temperature. Soluble carbohydrate measurements are given, and it is suggested that possibly shoot growth ceases at high temperatures due to processes mediated in the roots.