NOT FOR PUBLICATION

1963 TURFGRASS RESEARCH REPORT

By

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The turfgrass variety and management studies initiated in the summer of 1962 are continuing as part of a five year study. The following is a progress report of the results to-date. The final evaluation and conclusions cannot be made for three more years.

I. TURGRASS VARIETY AND STRAIN EVALUATIONS

A. BLUEGRASSES

Table 1. 1963 Bluegrass Variety Evaluations. Planted July 26, 1962, East Lansing.

Entry	Variety	Quality Rating (1-best, 9-poorest) Ave. of 5 ratings.	Helminthosporium Lesion Rating 6/5/63 (1-none, 9-severe)	Density 10/5/63 (Shoots per 12.5 sq. in.)	1962 Establishment Rating (1-best, 9-poorest)
1	K 5(47)	2.0	2.7	182	2.4
2	Prato	2.2	6.3	219	2.3
3	Merion	2.2	1.3	175	4.2
4	Newport	2.3	4.0	151	3.2
5	C-1	2.4	4.3	167	3.9
6	ZWB	2.4	6.0	191	3.4
7	CB	2.8	6.8	166	2.4
8	PNW	2.8	7.0	153	3.2
9	Campus	3.0	5.3	142	2.3
10	Brabantia	3.4	5.7	183	3.3
11	Park	3.5	6.3	149	1.9
12	Delta	4.0	7.7	140	1.8
13	Common	4.7	7.7	109	2.9

The Penn State selection K 5(47) has been outstanding. Although a few Helminthosporium lesions were noted the footrot and thinning stage did not develop. K 5(47) is superior to Merion in rate of establishment.

Prato has a leaf width similar to common Kentucky but has twice the density (Table 1). The Helminthosporium susceptability is somewhat uncertain at this time. Numerous lesions were observed on Prato but no significant leaf thinning occurred in 1963. Prato shows good establishment vigor.

Newport and C-1 are still performing similarly. All data to date indicate that C-1 is not significantly different from Newport.

Newport has ranked similar to Merion during the initial two years. The next two years will be critical for Newport because data from Rutgers and several other states show a severe deterioration and thinning in the third year and subsequent years.

Although Park and Delta were as severely thinned by Helminthosporium as common Kentucky bluegrass their rate of recovery from thinning was superior as indicated by the fall density counts. During 1963 rust has not been a problem in East Lansing.

Common Kentucky ranks highest in both spring and fall color. The first heavy frost in the fall of 1963 produced considerable temporary yellowing and discoloration of Park, Delta, and Prato.

First year data from the northern bluegrass variety tests at Traverse City (91% sand) planted May 15, 1963, show Park and Delta to be outstanding on the sandy site.

Prato, C.B., Newport and ZWB were found to contain objectionable amounts of Poa annua seed.

B. RED FESCUES

Table 2. 1963 Red Fescue Variety Evaluations at East Lansing and Traverse City.

Entry	Variety	Turfgrass Quality Rating		Density 10/15/63 (Shoots per 12.5 sq. inches)	Spring Greenup 4/16/63 (1-best, 9-poorest)
		East Lansing Planted 6/11/62 Ave. of 4 ratings (1-best,9-poorest)	Traverse City Planted 5/15/63 Ave. of 4 ratings (1-best,9-poorest)		
1	S-59	2.1	------	247	3.7
2	Golfrood	2.7	------	349	5.7
3	MSU-47-Fr	2.9	4.8	231	4.7
4	Syn A	3.0	5.0	138	5.7
5	Syn B	3.1	5.1	165	5.7
6	Highlight	3.2	2.5	164	4.3
7	Duraturf	3.2	4.4	144	3.7
8	S.L. 3	3.4	------	117	5.3
9	Rainer	3.7	3.7	145	3.3
10	Pennlawn	3.7	3.7	140	4.3
11	Grand Prairie	3.9	------	143	4.7
12	Common Creeping	4.1	5.3	127	3.3
13	Ilahee	4.2	3.4	168	4.3
14	Oase	4.6	------	214	3.7
15	Common Chewings	4.6	2.6	119	3.7
16	Olds	4.8	4.6	109	3.3

At East Lansing the commercially available creeping red fescues (Rainer, Pennlawn, Common Creeping and Ilahee) have performed similar during the initial two years (Table 2) with common chewings being slightly inferior especially in density. However, at Traverse City on 91% sand, common chewings red fescue has been the outstanding perennial grass during the initial establishment year.

S-59, Golfrood, and MSU 47-Fr were superior to the commercially available red fescue varieties in overall seasonal quality and density. MSU-47-Fr is similar to Pennlawn in the initial establishment year but developes an outstanding turf in the second year. It has an excellent dark green color and has a minimum susceptability to leafspot. An improved polycross from MSU-47-Fr was sent to Oregon in the fall of 1963 for seed increase.

C. BENTGRASSES

Table 3. 1963 Bentgrass Variety Evaluation for Use as Putting Green Turf. Dormant Planting in Late Fall of 1961 in East Lansing.

Entry	Variety	Quality Rating (1-best, 9-poorest) Ave. of 4 ratings	Density 10/12/63 (leaves per 2 sq. inches)	Yellow Tuffs (1-least, 9-most)	Thatching (puffing) (1-least 4-poorest)	Spring Greenup 4/2/63 (1-best, 9-poorest)
1	Cohansey (C-7)	1.6	206	1.0	1.3	2.2
2	Congressional C-19)	1.9	204	1.0	1.0	3.8
3	Toronto (C-15)	2.2	237	2.0	2.7	2.2
4	Penncross	2.5	186	6.3	1.3	3.2
5	Pennlu	2.6	217	2.7	3.0	5.0
6	Iogreen 445	3.2	214	8.3	3.3	4.8
7	Seaside	3.4	188	2.7	1.3	5.5
8	C-1 & C-19	3.6	165	2.0	1.7	5.3
9	Arlington	3.7	213	3.7	1.0	6.0
10	Evansville	3.8	226	4.3	2.7	6.0
11	Old Orchard	4.3	171	5.7	2.3	5.8
12	Washington	5.2	149	3.0	1.0	6.5
13	Astoria	5.4	183	3.7	1.0	5.3
14	Nimisilla	6.1	---	1.5	2.7	5.0

Cohansey, Congressional, and Toronto rank as the best vegetative bentgrasses through the initial two years (Table 3). If not managed properly Toronto will have a tendency to thatch and become puffy. Penncross ranks as the outstanding seeded bentgrass.

Evansville, a new release from Purdue, proved highly susceptable to snow mold as did Seaside and Cohansey with Penncross, Iogreen 445 and Old Orchard intermediate in susceptability. Nimisilla, a private selection from Ohio, was severely thinned by an unidentified soil pathogen in June, 1963, and was not in acceptable playing condition. Prior to the incidence of disease Nimisilla had ranked with Cohansey and Toronto. Brown patch and dollar spots were no problem in 1963.

D. PERENNIAL RYEGRASSES

Norlea, a dark green selection from Canada, has out-performed common perennial ryegrass both in seasonal quality, density and winter survival. Common perennial exhibited 97% winterkill while Norlea had only 30% winterkill. Norlea retains the difficult mowing characteristics of common perennial ryegrass and is susceptable to rust.

Table 4. 1963 Ryegrass and Tall Fescue Evaluation. Planted July 10, 1962, at East Lansing.

Entry	Variety	Quality Rating (1-best, 9-poorest)	Density 10/10/63 (Shoots per 12.5 sq. in.)	Percent Winter Survival
		Perennial Ryegrasses		
1	Norlea	1.6	103	70
2	Brabantia	3.9	93	38
3	Pelo	4.2	119	9
4	S-23	4.3	96	4
5	Common	6.4	77	3
6	A-2272	7.0	86	1
		Annual Ryegrasses		
1	MSU-3-Lm	2.0	58	
2	E 1506	2.0	57	
3	MSU-2-Lm	2.0	52	
4	Common	2.5	52	
		Tall Fescues		
1	Syn A	1.5	80	96
2	Kentucky 31	2.3	68	85
3	Alta	2.8	59	80
4	Traveler	4.3	43	67
5	S-170	4.8	52	70

A number of MSU perennial ryegrass selections have been outstanding in turf quality, winter survival, and rust resistance. Several of these have now been combined in a polycross. Even in these improved selections the difficult mowing characteristics are retained.

E. TALL FESCUE

Kentucky 31 and Alta have performed similarly in 1962-63. Fifteen percent winterkill occurred in Kentucky 31 and 20% in Alta. Syn A from Canada shows good winter survival and promise. Traveler was found to contain a high percentage of off types.

F. WARM SEASON GRASSES

Sixteen bermudagrasses and two zoysias were established in 1962. They were evaluated for winter survival under the severe conditions of 1962-63. Only two bermudas, Z-2 from Kansas and MSU-23-cd, and the two zoysias, Meyer and Midwest, survived. Burning Tree plus the Kansas selection B-1, E-1, E-5, F-7, G-11, K1-51, O-8, P-16, R-8, T-4, and Z-17 were completely killed under both unmulched and mulched conditions.

II. TURFGRASS MIXTURE STUDIES.

A. NON SHADE TURF ECOLOGY STUDY

Data from two year old sods show mixtures of Merion Kentucky bluegrass and red fescue or tall fescue to be superior in quality to mixtures of common Kentucky bluegrass and red fescue or tall fescue. However, no significant differences were found in density. Whenever ryegrass or redtop was included in the mixture the second year quality was considerably reduced as was the density.

B. SHADE TURF ECOLOGY STUDY

This study was initiated in 1961 to investigate the relative degree and mechanisms of shade adaptation. Eighteen mixtures were evaluated under heavy natural shade (5% of incident light) without supplemental irrigation. Results have shown that disease and not light competition has been the major factor influencing grass shade adaptation.

Powdery mildew attacks on Merion and common Kentucky bluegrasses in 1962 resulted in almost 100% loss of stand with no recovery in the subsequent year. Pennlawn and Chewings red fescue had 90 to 95% thinning by Helminthosporium sativum in the summer of 1962 but did recover remarkably in the spring of 1963. However, severe leafspot incidence and thinning occurred again during the summer of 1963.

Through May, 1963, roughstalk bluegrass exhibited by far the best shade adaptation. This was particularly interesting since this was a relatively dry site. However, during the third week of June, 1963, considerable thinning of the roughstalk bluegrass occurred due to a disease which has not yet been positively identified.

III. TURFGRASS MANAGEMENT STUDIES

A. MERION THATCH INVESTIGATIONS

An indication of the amount of thatch that can accumulate in one year on an irrigated Merion bluegrass turf is shown in Table 5 which summarizes the 1963 data at East Lansing. Clipping removal can reduce the rate of thatch accumulation.

Table 5. The Amount (expressed on a dry weight basis) of Thatch Removed From an Irrigated Merion Bluegrass Turf One Year After Planting When Maintained Under Four Different Management Systems.

Cutting Height	Pounds per acre of thatch removed when	
	Clippings Removed	Clippings Returned
1"	209	975
2"	485	1,135

B. GRASS ESTABLISHMENT AND SOIL STABILIZATION ON HIGHWAY SLOPES

Under limited moisture conditions, the only satisfactory mulch was found to be straw (2 tons per acre) and asphalt (100 gal/acre). The asphalt functioned to stabilized the straw from blowing by wind. Several mulches gave adequate soil erosion control but only straw provided the proper moisture micro-environment for seed germination and establishment. Mulches which did not retain adequate moisture for germination included jute net, soil-set, erosion net, and Troyturf. In ditch bottoms having high velocity water flow either sod or jute net provided the best erosion control.

Sodding with muck soils should be avoided under limited moisture situations where irrigation is not possible such as on roadside banks. Replicated studies show upland (clay-loam) sods to survive better than muck sods under these droughty conditions.

IV. TURFGRASS PHYSIOLOGY STUDIES

A. EFFECTS OF EXCESSIVE NITROGEN FEEDING ON THE CARBOHYDRATE FRACTIONS OF GRASSES.

Investigations by David Green as part of his masters thesis involved characterization of the soluble carbohydrates occurring in Merion and common Kentucky bluegrass, Toronto creeping bentgrass, and Pennlawn red fescue. Merion was the only species which contained significant levels of fructosan in the leaf tissue. An oligosaccharide was the dominant sugar fraction in all four species. The disaccharide, sucrose, and the two monosaccharides, glucose and fructose, were found to be unaffected by nitrogen feeding rates as high as 12# of nitrogen per 1,000 sq. ft. in either one application or six seasonal fractions.

Effects attributable to nitrogen treatments were only observed in the oligasaccharide and polysaccharide fractions of leaf tissue but conditions such as summer dormancy in common Kentucky bluegrass and Pennlawn red fescue which produced critical decreases in the mono- and disaccharide fractions resulted in corresponding increases in the polysaccharides.

Thus, nitrogen feeding rates as high as 12# of nitrogen per 1,000 sq. ft. in either one single application or six seasonal fractions failed to deplete the carbohydrate level of leaf tissue in the four grasses studied. Much data is available showing the decrease in root production and root carbohydrate levels at higher nitrogen feeding rates. Since these results indicate that the leaf is capable of photosynthesizing sufficient carbohydrates it is possible that a blockage or defect is occurring in the transport of carbohydrates to the root system.

B. CAUSAL FACTORS IN WINTER INJURY OF TURFGRASSES

In the fall of 1962 studies were initiated to determine the actual cause or causes of winterkill. Three species were utilized in the experiment: Common Kentucky bluegrass, Toronto creeping bentgrass, and Poa annua. All vegetative materials were allowed to harden naturally in the field. On November 26, 1962, (soil temperature 34° F.) four-inch plugs were taken for use in the experiment. The following treatments were applied: (1) flooding then freezing, (2) freezing then applying thin ice layers, (3) freezing then applying a snow layer followed by an ice layer, (4) placing in a limited atmosphere and freezing, (5) freeze in an ice block, (6) no treatment, and (7) submerging in water at 35° F. All treatments were held at 25° F. except for number 7. At fifteen-day intervals, replicated samples from each variety and treatment were removed from the low temperature chamber, thawed, and placed in a 70° growth chamber.

The total length of the experiment was ninety days. Observations made included percent top survival, moisture content, microscopic crown examination, and yield. Results of this study showed that during the 90-day period winter injury by oxygen suffocation, toxic accumulations, cellular leaching, or outward water diffusion in ice were of no significant importance. No injury occurred in bentgrass while a small degree of injury was observed in Kentucky bluegrass. Annual bluegrass was intermediate between the two. These results cast doubt on the importance of suffocation, toxic accumulations, or leaching in the winter injury of these three grasses associated with ice covers. None of these treatments produced symptoms of lower crown injury of the type which was observed in the spring of 1962 in the Detroit area.

Significant injury was produced where the grass plugs were frozen in an ice block. The block freezing in ice was different from the three ice layering treatments in that the plants were held in water for 14 days during complete freezing with the resultant increase in tissue hydration. In addition, the type of ice formation exerted hydrostatic pressures on the plant. These results suggest that certain combinations of freezing and thawing especially in association with high tissue moisture contents during the thawing of ice covers may be of more importance in winter injury of turfgrasses than the more direct effects of ice sheets such as oxygen suffocation or toxic accumulations.

Annual bluegrass is the major turf species affected by winter injury. Recent results show the injury to be characterized by severe mechanical disruption of the crown tissue with no initial injury to the shoots and leaves. The resultant death of the plant is caused by desiccation due to inadequate uptake of water by the severely injured root system.

C. HIGH TEMPERATURE GROWTH INHIBITION STUDIES

Preliminary studies by masters candidate Harland Stoin have shown that high temperature growth stoppage at 95° F. can be overcome by foliar applications of the amide glutamine to both Merion Kentucky bluegrass and Toronto creeping bentgrass. This was found to be more than just a response from either the nitrogen or the carbon moiety itself, since equivalent applications of ammonium-N or sodium citrate did not give a similar response.

V. TURFGRASS PESTS

A. CLOVER CONTROL IN BENTGRASS TURF

The herbicide, 2-(2-methyl-4-chlorophenoxy) propionic acid [2-(MCPP)], is being evaluated at MSU for selective control of clover and certain broadleafs in bentgrass. Studies involving 2-(MCPP) were conducted on clover infested Washington creeping bentgrass maintained under "putting green" conditions. Results show that clover control can be obtained with 2-(MCPP) at 2 oz./ 1,000 square feet (31.5% material) with no bentgrass injury. It was found that best control can be obtained where a maximum clover leaf area exists. This can be accomplished by not mowing for 2 days prior to application and for 1 day following application.

The chemical, 2-(MCPP) has been applied to 12 varieties of bentgrass with no injury. These varieties include Arlington, Astoria, Evansville, Nimisilla, Old Orchard, Penncross, Pennlu, Seaside, Toronto and Washington. Also, 2-(MCPP) has been used on Pennlawn creeping red fescue and common perennial ryegrass with no injury to these species.

VI. TURFGRASS BREEDING AND SELECTION

Breeding and selection work on a space plant basis is continuing under Dr. Elliott on the red fescues, ryegrasses, tall fescues, and roughstalk bluegrass.

A promising red fescue polycross has been developed and has been under observation for four years. Due to problems in seed head blasting it has not been possible to get sufficient seed for regional testing. Thus, it has been sent to the West Coast for seed increase.

INVESTIGATIONS INITIATED IN 1963

1. Highway Vegetation Studies -- A three year investigation supported by a $10,500 grant from the Michigan State Highway Department. The location is a four acre area on the north side of I-96 just south of East Lansing.

2. Northern Michigan Turfgrass Investigations -- Turfgrass variety, mixture, and management studies being conducted at the Traverse City Country Club, Traverse City, Michigan. Soil on the site is 91% sand, 6% silt and 3% clay. All studies are being maintained under both irrigated and non-irrigated conditions.

3. Fairway Renovation - Improvement Study -- Located at the Cascade Country Club, Grand Rapids. Involves mechanical and chemical methods of reducing the annual bluegrass population and encouraging bentgrass sod formation when maintained under close mowing and irrigated conditions. Comparisons are being made of various methods of seed and vegetative bentgrass establishment.

4. Investigation of Factors Causing Thatch Formation -- Cooperative Study with the Department of Botany and Plant Pathology.

EXPERIMENTAL PLANS FOR 1964

1. The variety, mixture and management studies will be continued at both East Lansing and Traverse City.

2. In August of 1964 the shade ecology study will be re-initiated under irrigated conditions.

3. The highway mulch, mixture and establishment studies will be continued.

4. Additional cooperative bentgrass fairway renovation tests will be established.

5. Continuing emphasis will be placed on winter injury causal factors, metabolic mechanisms in high temperature growth stoppage and thatch formation.

6. The turfgrass breeding and weed control studies will continue under Dr. Elliott and Dr. Meggitt, respectively.