1965 TURFGRASS RESEARCH REPORT

for the NCR-10 Meetings

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A. TURFGRASS DEVELOPMENT AND BREEDING

Bluegrass, red fescue, tall fescue, ryegrass (cut 1 1/2 inches) and bentgrass (cut 1/4 inch) evaluations have been in progress 3.5 years at East Lansing, Michigan, and three years at Traverse City on 91% sand. Specific data will be present for the 1964 year plus general observation for 1965. James B. Beard

A1. BLUEGRASS VARIETY EVALUATIONS

Twenty varieties in 5' x 9' plots. A severe leafspot attack occurred the second week of May, 1965. Thinning was apparent in Common, Park and Delta. For the first time in four years Prato, Newport and C-1 have shown some thinning due to leafspot (Helminthosporium sp.)

1964 BLUEGRASS VARIETY PERFORMANCE

Variety	Quality Rating* (1-best; 9-poorest)	Density Counts 10/8/64 (Shoots per square inch)	Leafspot Thinning (1-least; 9-most)
K 5(47)**	1.5	12.8	1.3
Merion	1.6	13.0	1.7
Couger	1.8	12.7	3.0
Prato	1.9	17.4	4.3
Newport	2.1	12.4	3.7
Park	2.6	10.5	4.7
Delta	2.7	12.0	5.0
C.B. **	2.8	9.0	4.0
Campus**	2.9	10.9	3.8
Brabantia **	3.3	17.2	6.3
Common	3.6	9.6	6.7

*Average of monthly seasonal ratings.
**Experimental selection

Penn State selection K5(47) continues to rank on top through 1964. Of the commercially available varieties, Merion ranks highest, provided it receives a higher maintenance level. Park and Delta continue to show leafspot susceptability; but are able to recover from the thinning more rapidly than Common.

Prato has slipped in ranking compared to previous years, due primarily to some susceptability to leafspot which first occurred in 1964. Those showing good establishment vigor are Park, Delta, Prato and K 5(47). Common ranks best in spring green-up and late fall color.

A2. RED FESCUE VARIETY EVALUATIONS

Twenty-two varieties in 5' x 9' plots. Leafspot thinning occured in Mid-June, a month earlier than any attack in the previous four years.

1964 RED FESCUE VARIETY PERFORMANCE

Variety	Density Count 9/8/64 (Shoots per sq. inch)	Quality Rating** (1-best; 9-poorest)	Multiple Comparison Test (Based On Quality)
Golfrood*	24.2	1.3	a
MSU-18-Fr*	16.2	1.4	a
S-59*	23.0	1.4	a
Highlight*	16.2	1.6	ab
Syn A*	12.0	1.8	ab
Pennlawn	13.6	2.0	abc
Syn B *	12.0	2.2	abc
Oase *	17.2	2.2	abc
Grand Prairie	17.4	2.5	bcd
Rainier	13.0	2.5	bcd
Olds	10.0	2.9	cde
Duraturf	13.8	2.9	cde
Illahee	9.0	3.3	de
Common Chewings	12.0	3.4	de
Common Creeping	10.2	3.7	e

*Experimental selections
**Average of monthly season ratings.

Of the commercial varieties, Pennlawn and Rainier rank slightly higher in 1964. For the first time in three years Chewings is ranking higher than Common Creeping. The four experimental selections, Golfrood and Highlight from the Netherlands, MSU-18-Fr from Michigan State, and S-59 from England, all rank considerably higher than Pennlawn in turf quality and density.

A3 & 4. RYEGRASS AND TALL FESCUE VARIETY EVALUATIONS

Twenty-one varieties in 5' x 9' plots. Norlea, a dark green selection from Canada, continues to out-perform Common perennial ryegrass in seasonal quality, density, and winter hardiness. Norlea has a slightly improved mowing characteristic, but is susceptible to rust. The experimental selection MSU-15-Lp is promising.

1964 RYEGRASS AND TALL FESCUE VARIETY PERFORMANCE

Variety	Density Counts 9/10/64 (Shoots per square inch)	Percent Winterkill	Quality Rating** (1-best; 9-poorest)	Multiple Comparison Test (Based on Quality)
		Perennial Ryegrass		
MSU-15 Lp*	11.8	15	1.4	a
MSU-8-Lp*	13.8	40	1.4	a
Norlea	13.4	8	1.7	b
S-23*	17.4	45	2.4	b
Pelo*	14.8	32	2.9	bc
Common	10.0	35	5.2	c
		Tall Fescue		
MSU-3-Fe*	13.0	16	1.3	a
MSU-5-Fe*	10.6	16	1.4	ab
Syn A*	9.6		1.4	ab
Kentucky 31	6.8	16	2.3	bc
Alta	5.6	15	2.5	c

* Experimental selections.
** Average of monthly seasonal ratings.

Kentucky 31 tall fescue continues to rank slightly better than Alta in turf quality and density. Several Michigan State selections plus Syn A from Canada are ranking much higher than the commercially available varieties.

A5. BENTGRASS VARIETY EVALUATIONS

Fourteen varieties in 10' x 16' plots maintained under putting green conditions. North 1/2 of each plot receives 4# of nitrogen per 1,000 sq. ft. per year and the south 1/2 receives 7#.

1964 BENTGRASS VARIETY PERFORMANCE

	Density Count 10/6/64 (Shoots per square inch)	Typhula Snow Mold (Number Of Spots) 3/16/64	Quality Rating* (1-best, 9-poorest)	Multiple Comparison Test (Based on Quality)
Congressional (C-19)	100	0	1.4	a
Cohansey (C-7)	89	60	1.5	a
Toronto (C-15)	88	0	2.1	ab
Penncross	81	2	2.5	abc
Pennlu	101	0	2.6	abc
Lagreen	96	4	2.8	abcd
Seaside	87	88	3.5	bcd
Old Orchard (C-52)	72	11	3.6	cd
Evansville	136	90	4.0	d
Arlington (C-1)	78	0	4.1	d
Astoria	60	0	5.8	e
Washington (C-50)	55	0	6.2	e
Nimisilla	57	0	6.7	e

*Average of monthly seasonal ratings.

Congressional, Cohansey, and Toronto continue to rank as the best vegetative bentgrasses through the first three years. Penncross ranks as the top seeded bentgrass. Toronto does have a tendency to thatch, due to its vigorous growth habit, which could become a problem if not properly managed.

The severity of yellow tuffs is greatly reduced in comparison to the initial three seasons. Evansville, Seaside, and Cohansey proved to be much more susceptible to snow mold (Typhula sp.). Congressional, Toronto, and Washington were the most resistant to snow mold.

Evansville and Lagreen show an excessive tendency to thatch. Cohansey, Toronto, and Penncross ranked best in spring green-up.

BENTGRASS STRAINS EVALUATIONS

Thirty-six experimental selections in 4' x 4' plots are being evaluated for potential commercial use. Holfiar, a seeded, colonial bent from the Netherlands, shows promise. Others to note are MSU-28-Ap from Michigan State, NJ-55-4 from Rutgers, Exeter from Rhode Island, K(42)3 from Penn State, and Springfield from Kansas State. Roughstalk bluegrass and creeping red fescue under $\frac{1}{4}$ inch mowing are holding up surprisingly well.

A6. BLUEGRASS BLENDS

Nine blends in 5' x 9' plots. This is a long term study to determine the possible advantages of blending bluegrass varieties to reduce disease problems. The blends containing Merion have ranked highest.

1964 PERFORMANCE OF NINE BLUEGRASS BLENDS

Percent Composition					Density Count 9/14/64 (Shoots per square inch)	Quality Rating* (1-best; 9-poorest)	Multiple Comparison Test (Based On Quality
Merion	Common	Delta	Park	Newport			
50		50			14.8	1.3	a
50				50	18.2	1.3	a
76	6	6	6	6	16.0	1.4	a
50	50				15.6	1.5	ab
33		33		33	17.8	1.6	abc
20	20	20	20	20	17.4	1.8	abc
10	90				16.6	2.0	bc
		50		50	16.8	2.1	c
	33	33	33		17.8	3.1	d

*Average of monthly season ratings.

B1. COMPARISON OF NITROGEN APPLICATION METHODS

Ammonium nitrate was applied June 25 at rates of 0, 1, 2, 4 and 6 pounds of nitrogen per 1,000 square feet on established Merion and Common Kentucky Bluegrass plots 6' x 7 1/3' in size. Application methods were dry, dry followed 1 1/2 inches of water, and spray application. The spray was applied at the rate of 1/2 gallon per plot or about 500 gallons per acre. The first evaluations were made June 28.

Percent of leaves affected (burned) by fertilizer application. Observations made 3 days after application.

N rate (1,000 sq ft)	Merion			Common		
	Dry	Watered	Spray	Dry	Watered	Spray
Check	0	0		0	0	
1	10	0	40	5	0	50
2	35	0	70	30	0	75
4	20	2	90	30	0	95
6	50	0	100	45	0	100

The spray applications resulted in a high percentage of burned leaves even at lower rates of application. This burning effect, in most cases, occured on the tips of the leaves with healthy crowns remaining; while the dry application without water showed crowns which were injured on some plants while other plants were unaffected. Rates of soluble nitrogen up to 6 pounds were found to cause little or no follar burning if properly watered following application.
Paul Rieke, Robert Lucas and James Beard

C1. SNOW MOLD FUNGICIDE-FERTILITY INTERACTION STUDIES

Seventeen snow mold fungicides under evaluation. Results in 1964-65 showed granular Calo-clor to give good Typhula control. Dyrene and Tersan-OM did not give adequate control. Time of application studies indicate a 60-70% reduction in control when a fall application is missed and only mid-winter and spring applications practiced. The effect of six fertility regimes were compared. The only positive response was from super-phosphate. James Beard.

C3. EFFECT OF PRE-EMERGENCE HERBICIDES ON DESIRABLE TURFGRASS SPECIES

Ten pre-emergence herbicides were applied to two year old sods of Merion Kentucky bluegrass, common Kentucky bluegrass and Pennlawn creeping red fescue in May, 1964. In 1965 a second treatment was applied to those treated in 1964 and additional plots were established to provide single treatments in 1965. The objective of this study is to evaluate the effects of these herbicides on desirable grasses. These studies will include treatments made in a single year as well as repeated applications in subsequent years. Of concern is the immediate effects of these materials, and the ultimate effect on density of desirable species.

In 1964 initial injury to the turf was noted from Zytron, Bandane and Trifluralin None of the other materials produced observable injury. The injury was manifested as a browning or yellowing of the turf. Pennlawn creeping red fescue was most susceptible to those herbicides producing injury. Some injury was noted on the Kentucky bluegrass while Merion bluegrass did not show injury from any of the herbicides used. Density counts taken in the fall of 1964 did not show any appreciable differences in turf density. Trifluralin was dropped from this study in 1965. W. F. Meggitt and J. B. Beard.

D1. MOWER INVESTIGATIONS

Reel and rotary mowers are being compared under four heights of cut: 1/2, 1, 1 1/2 and 2 inches. The study was initiated in the fall of 1962. Visual differences have been observed for three years with the rotary mowed plots having a browned appearance for 3 to 4 days after each mowing. To date no differences have been found in density. This is a joint study with Ohio State University. James Beard.

D2. WINTERKILL INVESTIGATIONS

Causal factors in winter injury are being studied in detail. Results will not be discussed as this data can be found in four recent papers in Crop Science and the Agronomy Journal. Recently the low temperature hardiness of 19 commonly used turfgrasses were evaluated. Of particular note was the outstanding hardiness of the creeping bentgrasses and roughstalk bluegrass plus the surprising lack of hardiness in red fescue, annual bluegrass and Astoria bentgrass. These results are to be published within a month in the Michigan Experiment Station Quarterly. Management factors effecting winterkill are now under investigation. James Beard.

D3. SHADE STUDIES

Mechanisms of shade adaptation of turfgrass are under continued study. A paper on the early work was published in the Agronomy Journal Vol. 57 (1965). Current research indicates differential responses of some turfgrasses to light quality. James Beard.

D4. SOD PRODUCTION ON ORGANIC SOILS

Merion bluegrass was seeded May 5, 1965 on Houghton Muck, receiving blanket applications of phosphorus and potassium. Nitrogen, as ammonium nitrate was applied at rates of 0, 15, 30 and 60 pounds of nitrogen per acre per month beginning June 14. A variable nitrogen rate which averaged slightly more than 15 pounds per month was also employed.

A mechanism was devised to test the weight required to tear a piece of sod cut freshly from the plot. The sod strips were 16 inches wide and about 3 feet long. Table 1 shows data obtained on September 20. All data from this experiment are averages of four replications.

Table 1 Weight in pounds required to tear Merion bluegrass sod cut on Sept. 20.

Monthly N rate/A	Pounds to Tear Sod
0	37.9
15	30.7
30	18.8
60	18.0
Variable	40.3

Table 2. Effect of N rate on Rootsand Rhizomes contained in a 4 inch plug removed on September 15.

Monthly N rate/A	Roots	Rhizomes	Total
	gm	gm	gm
0	37.7	71.9	109.6
15	53.4	68.6	122.0
30	41.1	46.5	87.6
60	33.7	51.1	84.8
Variable	55.3	72.7	128.0

The higher nitrogen rates reduced the strength of sod consistently as shown in Table 1. A very similar reduction in rhizome formation occurred at the higher nitrogen rates as data in Table 2 show, but root weights were apparently not affected.

Table 3. Effect of N rate on total available carbohydrates.

Monthly N rate/A	August 13	September 21	October 15*
0	3.82	6.45	3.04
15	3.34	5.99	2.25
30	3.08	5.46	2.10
60	2.86	5.67	1.55
Variable	3.44	5.93	2.92

* Incomplete analyses

The higher nitrogen rates had a marked effect on reducing the total available carbohydrates as shown in Table 3. Analyses are incomplete for the October 15 sampling date, but similar trends are indicated.

An experiment involving 3 heights of cut, mowed three times a week at 3/4, 1 1/2, and 2 1/4 inch heights, was superimposed on a nitrogen level experiment. The plots were seeded May 5, 1965 to Merion bluegrass. Nitrogen rates were 0, 165, and 330 pounds nitrogen per acre were used. These high nitrogen rates were applied inadvertantly and, therefore, are not as meaningful as was planned.

Table 4. Effect of height of cut on the weight required to tear Merion bluegrass sod cut on September 25.

N rate/A	Height of Cut, Inches			
	3/4	1 1/2	2 1/4	Mean
	lbs.	lbs.	lbs.	lbs.
0	69	64	55	63
165	41	40	32	38
330	42	34	28	34
Mean	51	46	38	

All clippings were removed. Data shown are averages of four replications. Variability was quite high as might be expected. However, some interesting trends develop as shown in Table 4. Higher nitrogen rates again reduce the apparent sod strength, although these nitrogen rates were extremely high. When the sod was cut at 1 1/2 inches or less it appeared that a stronger sod developed.

Table 5. Effect of height of cut on several measurements of Merion bluegrass sod

	Height of Cut, Inches			
	3/4	1 1/2	2 1/4	Mean
	cm	cm	cm	cm
"Stretchability" cm	57	51	42	50.0
Total length of rhizomes in a 4 inch plug, cm.	94	77	68	79.7
No. of rhyzomes in a 4 inch plug	37	29	25	30.3

Other data obtained from sod taken from these plots are shown in Table 5. The variability was quite high but definite trends have developed. Paul Rieke.

OTHER TURFGRASS RESEARCH CURRENTLY IN PROGRESS

A. Turfgrass Breeding - Red fescue, tall fescue, and ryegrass selection and breeding for improved varieties. Fred Elliott.

B1. Movement of nitrogen, phosphorus, and potassium from surface applications are being studied over a period of years in the field and greenhouse. Paul Rieke.

B2. Fertilizer Placement in Relation to Turf Establishment - Placement of fertilizer relative to seed placement is being studied in terms of germination, seedling growth and root development in the greenhouse and field. Paul Rieke.

B3. Nitrogen-Potassium Fertility Studies - Nitrogen rates of 0, 4, 8, 12 and 16 pounds per 1000 sq. ft. per year and potassium rates of 0, 2, 4, 6 and 8 pounds were applied in all combinations to Toronto bentgrass and Kentucky bluegrass. The objectives of this study are to evaluate the effects of these treatments on low temperature survival, turf wear, and turf quality. Paul Rieke and James Beard.

B4. Nitrogen carrier, rate and frequency of application studies on 91% sand (Traverse City, Michigan). Included are both irrigated and non-irrigated conditions, plus three grasses: Pennlawn red fescue, Merion and common Kentucky bluegrass. Paul Rieke and James Beard.

B5. Plant nutrient removal study on Pennlawn red fescue, common Kentucky bluegrass and Toronto Creeping bentgrass. James Beard and Paul Rieke.

D1. Causal Factors in High Temperatures Growth Stoppage - Two phases of this study are now underway: a. Investigation of photosynthetic and respiration rates in bentgrass at supra-optimal temperatures and the relationship of these rates to plant carbohydrate levels. b. Effect of high temperatures on nitrogen metabolic pathways. Specifically included are the keto-acids and amino acids such as glutamic acid, aspartic acid, and arginine. James Beard.

D2. Drought Studies - A wind tunnel technique has been developed to distinguish heat stress from moisture stress thus permitting the characterizing of factors causing drought or summer dormancy in turfgrass. Creeping bentgrass, Kentucky bluegrass, red fescue and annual bluegrass are being studied. James Beard, Robert Olien and Earl Erickson.

D3. Soil mixtures for greens. Continuation of study on plots now established. The importance of the size range of sand will be studied in the laboratory. Paul Rieke.

D4. Management requirements of new MSU Red Fescue selection. Paul Rieke.

D5. 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. James Beard.

D6. Thatch Investigations - Study of the factors involved in thatch formation plus potential chemical means of control. James Beard.

D7. Sod Production on Organic Soils. N, P, and K requirements in relation to development of sod. Frequency and rate of nitrogen application, and the height of cut-nitrogen interaction will be continued. Other investigations include grass mixtures for sod, seed quality, and a comparison of soil removal under sod versus cropping effects on subsidence. Paul Rieke, James Beard and Robert Lucas.

D8. Mineral Sod Production. N rates and frequency of application on sod development. Paul Rieke.

D9. Northern Michigan Turfgrass Investigations - Bentgrass, bluegrass, red fescue, ryegrass and tall fescue variety moisture, and management studies. Plus nitrogen rate, carrier and frequency of application 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 irrigated and non-irrigated conditions. James Beard and Paul Rieke.

E. Highway Vegetation Studies - A three year investigation of mulches, grass mixtures, seeding rates and dates, and establishment procedures. 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. Four papers on this work will be published in the MSU Quarterly in the next six months. James Beard.