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PERFORMANCE OF BLUEGRASS CULTIVARS UNDER A LOW MAINTENANCE PROGRAM

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Kentucky bluegrass *(Poa pratensis* L.), a dominant species in Connecticut lawns, thrives on well-drained, calcified soils. Believed to have originated in northern Europe, its seed was introduced to the New World by early travelers and settlers (Carriers and Bort, 1916). Its popular name comes from the fact that the grass had already established itself by the time homesteaders moved into Kentucky. It is also known as English bluegrass, June grass, and meadow grass.

The plant is highly rhizomiferous, forming dense sod with a vigorous root system. Most cultivars can withstand mowing heights of 1 to 2 in., and range in color from green to dark green. Bluegrass is widely adapted to cool, humid climates. Because it is apomitic and polyploid, most new cultivars have arisen vegetatively from bud sports. (Beard, 1973).

Kentucky bluegrass can be damaged severely by melting-out disease caused by *Helminthosporium vegans* Dreshl during wet springs in Connecticut (Lukens and Stoddard, 1963). Merion, an improved cultivar, is resistant to melting-out but succumbs to stripe smut *(Ustilago striiformis* (Westend.) Niessl.), dollar spot *(Sclerotinia homoecarpa* F.T. Bennett), Fusarium blight *(F. roseum* (Lk, Emend, Snyd, & Hans.) F. sp. *poae),* and powdery mildew *(Erysiphe graminis* DC) in Connecticut. Merion is also susceptible to rusts in other areas.

This bulletin presents the results of a 5-year study of new cultivars, which is part of a cooperative effort in the Northeast. By examining and measuring individual characteristics, we were able to determine the relative merits of each cultivar in Connecticut.

MATERIALS AND METHODS

The 29 cultivars and their sources are given in Table 1. Kenblue, a selection from Kentucky with

Table 1. Cultivars of *Poa pratensis* and source of introduction.

Cultivar	Source
Adelphi	New Jersey AES
Arista	Gebr. van Engelen, Netherlands
Belturf	USDA ARS, Beltsville
Birka	Weibullsholm Plant Breed. Inst., Sweden
Campus	Gebr.van Engelen, Netherlands
Cougar	Washington AES
Delta	Cent. Exp. Farm, Ottawa
Fylking	Swedish Seed Assoc.
Geary	E. Geary, Oregon
Georgetown	Rhode Island AES
Jacklin S-21	Jacklin Seed Co., Washington
Kenblue	Kentucky AES
Merion	USGA Greens Section and CRD-ARS, USDA
Minn-6	Minnesota AES
Newport	Washington and Oregon AES and SCS
NJE P-115	New Jersey AES
Nugget	Alaska AES and CRD-ARS, USDA
Palouse	
Park	Minnesota AES
Pennstar	Pennsylvania AES
Prato	P.J. van der Have, Netherlands
Primo	Weibullsholm Plant Breeding Inst., Sweden
Sodco	Indiana AES
S. Dakota Cert.	South Dakota AES
Sydsport	Weibullsholm Plant Breeding Inst., Sweden
Vantage	O.M. Scott Co., and Sons, Ohio
Warren's A-20	Warren's Turf Nursery, Illinois
Warren's A-34	Warren's Turf Nursery, Illinois
Windsor	O.M. Scott Co., and Sons, Ohio

characteristics typical of common bluegrass, and Merion, an early selection found at the Merion Country Club, Ardmore, PA, are included for comparison. Fylking and Nugget are dwarf cultivars that thrive best when cut at 1 in. or less. Sodco and Park are blends of four compatible cultivars.

The cultivars were seeded in 4 x 6 ft. plots at Mount Carmel, CT, on September 30, 1968. The plots were replicated in randomized blocks on Cheshire sandy loam of approximately pH 6.5. Seeding was at 2-lb per 1,000 ft^2. Warren's A-20 was planted as sod in October 1968. The turf was maintained at 1.5 in., and was fertilized each spring at the rate of 1-lb N per 1,000 ft^2 (10-6-4, of which 30% of the N was in slow release form). To help establish the turf, additional fertilizer was applied during the summer and fall of 1969 and 1970. The 1-lb N per 1,000 ft^2 for the remaining 3 years is low in view of the annual 3- to 6-lb N needed for aggressive performance of Merion (Beard, 1973). Dacthal, a preemergent herbicide to control crabgrass, and 2,4-D, to control broad-leaf weeds, were applied in the springs of 1969, 1970, and 1973. Irrigation was required during dry spells in 1969, 1970, and 1971.

The turf was examined monthly during the growing season. The density (surface covered) was recorded on a scale of 0-9, (0 = none, 9 = 100%). The color was recorded on a scale of 0 - 9 (0 = light green or yellow, 9 = dark green or blue-green). The fineness of leaf blade was graded on a scale of 0 - 9 (0 = coarse, 9 = fine). The area occupied by weeds and the area of bluegrass turf brown from disease were estimated on a scale of 0 - 9 (0 = none, 9 = 100%). Samples of diseased turf were examined periodically to identify the causal fungus. The prevalence of weed species was recorded in the fall of 1973 to determine the ability of the cultivars to resist invasion.

After 5 years, samples of sod (2.5 in. diameter, 3 in. deep, and 4 samples per plot) were harvested to determine thatch development and the presence of nematodes.

Thatch is the layer of organic matter that consists of stolons, roots, and debris. The thickness of a plug of thatch, severed from the root and soil, was measured by compressing it with a 1 kg weight. The thatch weight is determined by drying overnight at 70° and ashing overnight at 450°C. Thatch weight in g per cm^2 is the difference between dry and ash weights.

Parasitic nematodes were extracted by the sugar flotation method (Miller, 1957) from 100 g of soil taken from turf samples. The numbers of *Criconemoides* spp. (ring nematode), *Paratylenchus* spp. (pin nematode), *Hoplolaimus* spp. (lance nematode), *Pratylenchus penetrans* (Cobb) Chitwood and Oteifa (root lesion nematode), *Tylenchorhynchus dubius* (Butschli) Filipjev (stunt nematode), and *Ziphinema* spp. (dagger nematode) were counted under 100 X magnification.

RESULTS

Establishment. Seedling emergence was recorded 2 and 3 weeks after planting in October to determine how fast the cultivars covered the ground. Establishment at 3 weeks and turf density in the following May are given under establishment in Table 2. All data represent the area of soil covered by turf. At emergence, seedlings were sparsely but uniformly distributed. By the June following planting, turf had formed in discrete patches, with weeds starting to invade the open areas. By July, the soil surface was covered by turf and weeds. The letters following data of fall 1968 and May 1969 indicate statistical groups of equal performance (Duncan's multiple range).

The fastest germinators are in group "A". The slowest or poorest germination of groups "D" and "E" may have resulted from poor seed or the innate characteristics of the cultivar. Both Kenblue and Merion gave intermediate responses.

The ability of seedlings to form dense turf during the first growing season is also revealed in Table 2. The slowly developing varieties are in groups "F" and "G". Most had established dense turf by the end of the first growing season. Warren's A-20 was not included because it was planted as sod.

Persistence. Although turf density was recorded monthly throughout the growing seasons, we will use the data of August 1973 to illustrate turf permanence. August was selected because a heavy infestation of crabgrass followed excessive rains later in the summer and because turf samples were taken then for analyses.

The cultivars of highest turf density after 5 years, Kenblue, Warren's A-20, A-34, and Birka are shown in Column 3 of Table 2. Those that deteriorated or were reduced by competition were Adelphi, Delta, Georgetown, and Nugget. The remainder

Table 2. Turf establishment, persistence and performance for 5 years

Cultivar	Establishment		Persistence (Aug. 1973)		Performance[1]			
	3wk. Emergence (Fall 1968)	Density (May 1969)	Density	Thatch depth	Density	Color	Leaf fineness	Weeds
Adelphi	2.3 AC	4.3 BF	2.3 H	6.3 AD	5.3 K	6.7 AE	5.7 G	4.4 CD
Arista	1.7 CE	5.0 AF	5.0 BH	7.0 BD	6.6 BJ	7.1 AD	6.8 BG	3.4 BD
Belturf	2.0 AC	4.0 CG	7.3 AD	6.0 AC	7.6 AC	6.1 DE	7.4 AC	2.7 AD
Birka	2.0 BD	4.7 AF	7.7 AB	7.0 AD	7.3 AF	6.8 AE	7.3 AD	2.0 AB
Campus	2.3 AC	5.0 AF	6.7 AE	8.0 BD	6.7 BI	7.0 AE	6.8 BF	3.8 BD
Cougar	2.3 AC	3.7 DG	6.7 AE	6.7 AD	7.0 BH	6.4 AE	6.8 BF	3.3 BD
Delta	3.0 A	5.7 AD	3.7 FH	6.0 AC	6.1 EK	6.8 AE	6.8 BG	4.5 D
Fylking	2.3 AC	5.3 AE	6.3 AF	9.0 CD	7.0 BH	6.8 AE	7.3 AD	2.6 AD
Geary	3.0 A	6.3 AB	6.7 AE	5.7 AB	6.8 BI	6.5 AE	7.0 AE	3.5 BD
Georgetown	1.7 AB	5.3 AE	3.7 FH	5.3 AB	6.3 CK	6.8 AE	6.5 BG	3.8 BD
Jacklin S-21	3.0 A	6.7 A	6.0 AF	5.7 AB	6.6 BJ	6.5 AE	6.8 BF	3.7 BD
Kenblue	2.3 AC	6.3 AB	7.7 AB	6.0 AC	6.8 BI	6.6 AE	7.7 AB	3.5 BD
Merion	2.3 AC	4.7 AF	5.3 BF	6.3 AD	6.8 BI	6.7 AE	6.9 AE	3.4 BD
Minn-6	2.0 BD	5.3 AF	7.0 AD	6.3 AD	7.4 AC	6.5 AE	7.3 AD	3.3 BD
Newport	2.3 AC	4.7 AF	4.7 CH	5.0 AB	6.8 BI	6.8 AE	6.5 BG	4.1 BD
NJE P-115	2.3 AC	5.3 AE	4.0 EH	6.3 AD	5.8 HK	6.4 AE	6.1 EG	3.4 BD
Nugget	1.7 CE	3.0 FG	2.7 GH	5.7 AB	6.0 EK	6.8 AE	6.8 BG	4.1 BD
Palouse	2.7 AB	5.3 AE	6.0 AF	5.7 AB	6.9 BH	6.3 AE	7.1 AE	3.4 BD
Park	2.0 BD	5.7 AD	4.3 DH	4.7 A	6.5 BD	6.5 AE	6.8 BF	4.6 D
Pennstar	2.0 BD	4.7 AF	6.7 AE	7.7 AD	7.3 AF	6.9 AE	7.1 AE	2.3 AC
Prato	2.3 AC	5.3 AE	6.0 AF	7.3 AD	7.3 AE	6.4 AE	7.0 AE	2.8 AD
Primo	2.0 BD	5.0 AF	6.3 AF	8.0 BD	7.2 BG	7.0 AE	6.4 CG	2.8 AD
Sodco	2.0 BD	4.0 CG	5.7 BF	7.0 AD	7.0 BH	7.1 AD	6.7 BG	2.8 AD
S. Dakota Cert	2.7 AB	5.3 AE	6.3 AF	6.7 AD	7.1 BH	6.6 AE	6.9 AE	3.8 BD
Sydsport	1.7 CE	3.7 DG	4.3 DH	5.0 AB	6.5 FK	6.0 E	7.1 BG	3.9 BD
Vantage	1.0 E	2.3 G	5.0 BH	5.0 AB	6.3 CK	6.7 AE	6.7 BG	4.6 D
Warren's A-20			8.7 A	9.3 D	8.5 A	6.7 AE	8.0 A	1.2 A
Warren's A-34	1.7 CE	4.7 AF	7.7 AB	7.7 AD	7.8 AB	6.1 DE	7.2 AE	2.5 AD
Windsor	2.7 AB	4.7 AF	5.7 BF	5.3 AB	6.7 BI	6.3 AE	6.8 BF	3.8 BD
	P = 0.01	P = 0.01	P = 0.001	P = 0.02	P = 0.001	P = 0.001	P = 0.001	P = 0.001

[1] Average for July, 1970-73.

showed reasonable degrees of persistence. Poor performance may have been caused by our low fertility regime, pests, or for dwarf cultivars, too high a cut.

All cultivars developed thatch to depths of 5 to 9 cm (Table 2). Thatch weight varied between 1.6 to 5.5 g/cm^2 but the differences among cultivars were not significant. The density of thatch (g/cm^3), which varied from 0.33 to 0.61, was not significantly different. Irrespective of cultivar, however, thatch density appears to increase with depth. The mean density of thatch was 0.41, 0.46, 0.48, 0.55 and 0.58 g/cm^3 for depths of 5, 6, 7, 8, and 9 cm, respectively.

Performance over 4 years of growth. To examine cultivar response during the second to fifth years of growth, 4-year-means of turf density for July are presented in Column 5 of Table 2. The best performers, designated by "A", are Belturf, Birka, Minn-6, Pennstar, Prato, Warren's A-20 and A-34. Compared with August 1973 (Column 3, Table 2), 10 cultivars showed no change, 7 improved and 11 had deteriorated in turf density by the fifth year.

Color. Cultivars of bluegrass vary in color, and the color can be influenced greatly by N fertility. For example, Merion is a deep blue-green color at proper N levels, but appears light yellow-green when N levels are low. Color responses are presented in Table 2 for July (6 to 8 weeks following fertilizer application).

Fineness of leaf. The leaf width determines in part the fineness or coarseness of turf. Together with leaf number, it appears to be critical for good performance at short cutting heights. Based on data on leaf width in July of 4 years (Table 2), 13 cultivars fall in the group "A" of finest leaves.

Weeds. Dandelion, plantain, chickweed, clover and crabgrass, the common weeds infesting lawns in

Connecticut, were found in the plots. In addition, quackgrass was present in the soil from the start of the experiment. The average area of the plots occupied by weeds in July of the 4 years is presented in Table 2. Generally, dense turf resisted weed invasion. However, the test plots were situated next to weedy fields on two sides and were bordered on one side by a roadway from which weed seed apparently washed from upland fields after heavy rains. Warren's A-20, which was planted as sod of turf density 9, resisted weed invasion for the 5 years. Seeded cultivars with the fewest weeds were Belturf, Birka, Fylking, Pennstar, Prato, Primo, Sodco, and Warren's A-34.

The area occupied by crabgrass, quackgrass, chickweed, and clover was estimated in October, 1973. No significant resistance to any of these weeds was found.

Diseases. The turf suffered to some degree from melting-out disease each spring. Dollar spot disease was active from July to September 1970, 1971, and 1973.

Melting-out disease. Data on melting-out disease for May 1970-73 are given in Table 3. The letters following the disease index represent distinctive groups of Duncan's multiple range. Those containing "A" had the least disease and those with "J" had the most disease. About half of the cultivars had some resistance to the disease. Cultivars showing most resistance were Nugget, Sydsport, Warren's A-20 and A-34. Those with the most disease were Delta, Geary, Jacklin S-21, Kenblue, Minn-6, Newport, Palouse, Park, South Dakota Cert., and Windsor. The causal organism was identified as *Helminthosporium vagans* Dreschl.

Table 3. Incidence of diseases and nematodes

	Diseases[1]		Nematodes[2]	
	Melting-out	Dollar spot	Ring	Stunt
Adelphi	2.2 AH	3.0 AE	12A	13A
Arista	2.0 AG	4.1 E	167AB	29A
Belturf	1.9 AF	2.3 AE	68AB	109C
Birka	2.0 AG	2.7 AE	52A	7A
Campus	1.6 AE	3.0 AE	73AB	25A
Cougar	2.8 BJ	2.3 AE	20A	49AC
Delta	4.2 IJ	2.8 AE	17A	106BC
Fylking	2.2 AH	2.1 AD	19A	4A
Geary	3.2 FI	1.9 AC	48A	26A
Georgetown	1.8 AF	2.8 AE	388BC	12A
Jacklin S-21	4.2 IJ	2.3 AE	8A	33A
Kenblue	4.9 JK	2.1 AD	25A	4A
Merion	1.9 AF	3.6 CE	159AB	13A
Minn-6	4.0 IJ	1.9 AC	7A	12A
Newport	3.1 EI	3.1 BE	273AC	45AC
NJE P-115	1.7 AF	3.6 CE	196AB	13A
Nugget	1.3 AC	3.9 DE	64AB	11A
Palouse	3.9 IJ	1.9 AC	37A	45AC
Park	3.1 EI	2.3 AE	23A	5A
Pennstar	2.1 AG	2.4 AE	47A	56AC
Prato	3.8 HJ	2.2 AE	12A	8A
Primo	2.9 CI	3.1 BE	44A	13A
Sodco	1.4 AD	2.4 AE	31A	17A
S. Dakota Cert	3.6 GJ	2.0 AD	45A	16A
Sydsport	1.2 AB	4.1 E	15A	8A
Vantage	2.8 BH	3.7 CE	75AB	19A
Warren's A-20	1.3 AC	1.1 A	535C	27A
Warren's A-34	1.3 AC	2.9 AE	56AB	35A
Windsor	3.0 DI	2.7 AE	101AB	32A
	P = 0.01	P = 0.01	P = 0.05	P = 0.05

[1]Ranking 0-9 = area of turf diseases, Melting-out data of May and Dollar spot data of August 1970, 71, 73.

[2]Nematode counts per 100 gm soil.

Dollar spot disease. Data on dollar spot disease for August 1970-73 are presented in Table 3. Cultivars that had the least disease are indicated by "A" and those that had the most disease by "E". Warren's A-20 had the greatest resistance; Arista, Nugget and Sydsport were the most susceptible. The others were intermediate in response.

Nematodes. Six plant parasitic nematodes were recovered from soil in the plots. A few pin nematodes were taken from a few plots. Few lance nematodes were recovered from four cultivars, low numbers of the dagger nematode were recovered from 24 cultivars, and appreciable numbers of the lesion nematode were recovered from all cultivars except Sodco. The differences were not statistically significant, however.

Differences in ring and stunt nematodes were statistically significant (Table 3). Many ring nematodes were found on Georgetown and Warren's A-20, and many stunt nematodes were found on Belturf and Delta, but their numbers were not sufficient to cause injury because these cultivars had produced turf of high density.

DISCUSSION

We will examine the interrelations among turf characteristics, and then the performance of cultivars.

Interrelations between turf characteristics. Turf performance apparently can be measured best by the development and persistance of density. A dense stand grows leaves of fine texture, contains few weeds, and is necessary for appearance and wear (Table 4). Unfortunately, little definitive information is available on the density required for a good lawn. If turf is too dense in May, it is apt to suffer from melting-out (as indicated by the positive correlation coefficient between turf density and the disease) (Table 4), but dense turf in August has little relation to melting-out.

Dense turf is accompanied by heavy thatch (Table 5). A minimum depth of 2 to 3 cm (1 in.),

Table 4. Correlation coeffecients among turf characteristics

A. May 1970, 71, 73

	Density	Color	Leaf fineness	Weeds
Color	-0.09			
Leaf fineness	0.72***	-0.04		
Weeds	-0.75***	0.05	-0.57***	
Melting-out	0.22***	-0.27***	0.24***	-0.25***

B. August 1970, 71,73

	Density	Color	Leaf fineness	Weeds
Color	-0.19***			
Leaf fineness	0.61***	-0.17**		
Weeds	-0.72***	0.29***	-0.52***	
Dollar spot	-0.20***	0.09	-0.26***	0.07

C. 1970, 71, 73

	August Color	Leaf fineness	Weeds
Density (May)	-0.14*	0.26***	-0.34***
Melting-out (May)	0.04	-0.03	0.10

Table 5. Correlation coefficients - 1973[1]

	Density	Thatch depth	Thatch wt	Weeds	Melting-out	Dollar spot
Thatch depth	0.40***					
Thatch wt.	0.41***	0.85***				
Weeds	-0.75***	-0.47***	-0.60***			
Melting-out	-0.04	-0.33***	-0.42***	0.16		
Dollar spot	-0.03	0.28***	0.33***	-0.28**	-0.13	
Nematodes	0.07	0.21*	0.22*	-0.13	-0.24*	0.18

[1] Data for August except melting-out disease for May.

is needed to resist wear, to insulate from heat, and to hold moisture (Beard, 1973). Cultivars developing thatch deeper than 6 cm may develop problems. Excessive thatch impedes water penetration, becomes impervious to water on drying, and causes loss of turf following drought.

Excessive thatch is promoted by high soil fertility Thus, thatch problems can be expected with cultivars that require high fertility to develop dense turf. For example, Merion developed medium thatch levels and poor stands during 5 years of growth on our low fertility program. But when feritility levels are increased to grow dense turf (3-6 lb N per 1,000 ft^2 per season), thatch becomes excessive and mechanical removal is required (Beard, 1973).

A cultivar performing satisfactorily on low fertility may not build up thatch. For example, Kenblue, barring severe attacks of melting-out disease, can provide dense turf at 1 - 2 lb N per 1,000 ft^2 per year with no thatch problems.

The primary advantage of thatch is resistance to wear. The heavy use of athletic fields, play areas of the home lawn, and along paths can wear away turf. New growth for recovery comes from live stolons in the thatch.

Thatchy turf can suffer severely from disease. Table 5 indicates that dollar spot is more apt to be serious on turf with deep and heavy thatch. Loss of turf from epidemics of Fusarium blight is associated with heavy thatch that develops in Merion bluegrass after 5 to 10 years of growth (Bean, 1966). Heavy thatch also appears to encourage nematodes (Table 5 and 6).

Little relationship between the incidence of melting-out and dollar spot diseases can be seen in Table 5. If the new cultivars responded as Kenblue and Merion, those resistant to melting-out should have been susceptible to dollar spot and vice versa. However, the lack of any relationship between the incidence of melting-out and of dollar spot suggests that response to the diseases is inherited independently.

If we assume that cultivars in Group "A" of Table 3 are resistant to the respective diseases, cultivars fall into four categories (Table 7). The first, typical of Merion, resists melting-out; the second, typical of Kenblue, resists dollar spot; the third resists both; and the fourth resists neither disease. Cultivars resisting both diseases are a source of genes for further selection for resistance.

The incidence of nematodes was related to both thatch depth and weight. The data of Table 5 suggests that these numbers of nematodes are not sufficient to retard growth, and that they probably multiply in lush turf. Individually, populations of the lance

Table 6. Correlation coefficients of turf characteristics to Nematode populations

	Dagger	Lance	Lesion	Ring	Stunt
Color	-0.17	0.02	0.03	0.17	-0.12
Turf density	-0.02	-0.04	-0.08	0.22*	-0.01
Thatch depth	-0.07	0.27**	0.06	0.20*	-0.01
Thatch weight	-0.03	0.34***	0.13	0.20*	0.02
Stunt	0.22*	-0.06	0.27**	0.10	
Ring	-0.15	-0.06	-0.02		
Lesion	0.01	0.04			
Lance	0.09				

Table 7. Reaction of cultivars to dollar spot and melting-out

Resistant to melting-out	Resistant to Dollar spot	Resistant to both diseases	Resistant to neither disease
Arista	Cougar	Adelphi	Newport
Merion	Delta	Belturf	Primo
NJE P-115	Geary	Birka	Vantage
Nugget	Jacklin S-21	Campus	
Sydsport	Kenblue	Fylking	
	Minn-6	Georgetown	
	Palouse	Pennstar	
	Park	Sodco	
	Prato	Warren's A-20	
	S. Dak. Cert.	Warren's A-34	
	Windsor		

nematode were correlated with turf density, thatch depth and weight (Table 6).

Interestingly, the number of stunt nematodes increases with the number of lesion and dagger nematodes, although the lesion and dagger nematodes exhibit no mutual relationship. Thatch increases the possibility of nematode problems because much thatch consists of live rhizomes and roots upon which nematodes feed.

Turf of high density evidently resists weeds (Table 5) because most weeds are propagated by seed. High mowing height retards weed germination and survival by increasing shade (Ahrens *et al.*, 1960).

Turf characteristics for new cultivars. Dense turf on low fertility appears to be the most desirable characteristic for lawns. Resistance to diseases and other pests is also important. Leaf fineness, dark color, and persistence under close mowing may be important for specialty turf.

Dense turf, however, necessitates abundant tillering and hence can cause thatchiness. Definitive data are needed to resolve the relation between turf stand, thatch, and resistance to wear. Moreover, cutting height profoundly affects thatch. The common practice in the care of home lawns in the past 15 years has been to raise the cutting height to 2 in. to retard turf browning from drought. The higher cut increases turf density immediately, and excessive thatch soon becomes a problem. Mechanical measures to remove thatch are now common practice in maintenance.

Quality of cultivars for lawns. Cultivars maintaining dense stands after five seasons were Birka, Kenblue, Warren's A-20, and A-34. However, 16 cultivars were in Group "A" for dense turf in Table 2. For convenience, these are listed in Table 8 along with the cultivars in other categories. Of the 16 cultivars, 12 had thatch less than 8 cm deep. Barring excessive wear, these can be maintained with a low fertility program at 1.5 in. mowing height with little concern for thatch. The other cultivars may require thatch reduction. All cultivars except Campus and Cougar developed fine leaves; all except Belturf and Warren's A-34 maintained a dark color; seven resisted melting-out and dollar spot. Evidently there is no cultivar for all purposes. The importance of mowing height, fertility, and resistance to wear vary with the purpose.

SUMMARY

Twenty-nine cultivars of Kentucky bluegrass *(Poa pratensis)* were grown as turf under low fertility for 5 years. Most cultivars had established dense turf by the end of the first season. Sixteen cultivars remained dense after 5 years, but four of these had the potential for becoming thatchy. The density of thatch increased with thatch depth. Thatch weight and depth were associated with turf density. Ten of the 29 cultivars demonstrated resistance to melting-out and dollar spot diseases. Melting-out disease was associated with high turf density, while dollar spot was associated with thatch. Evidently certain cultivars of bluegrass can produce quality turf of long persistence under a low fertility program.

Table 8. Quality of cultivars after 5 years of growth under low fertility and a mowing height of 1.5 inch.

High turf density	Thatch depth less than 8 cm	Fine leaf	Dark color	Resistance to both diseases
Belturf	●	●		●
Birka	●	●	●	●
Campus			●	●
Cougar	●		●	
Fylking		●	●	●
Geary	●	●	●	
Jacklin S-21	●		●	
Kenblue	●	●	●	
Minn-6	●	●	●	
Palouse	●	●	●	
Pennstar	●	●	●	●
Prato	●	●	●	
Primo			●	
S. Dak. Cert.	●	●	●	
Warren's A-20		●	●	●
Warren's A-34	●	●		●

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