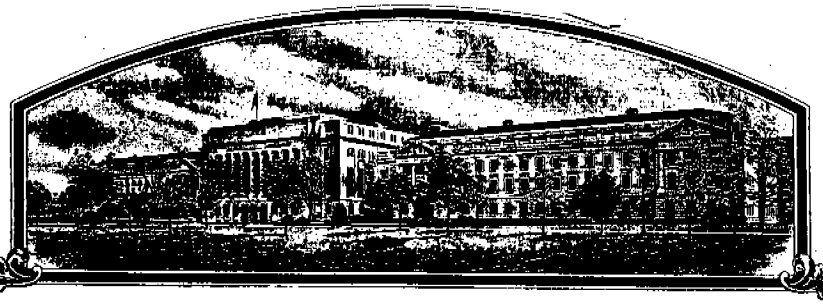

No. 7200019

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

The Pennsylvania Agricultural Experiment Station

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF seventeen YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS PART OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS [illegible] BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

PERENNIAL RYEGRASS

'Pennfine'

In Testimony Whereof, *I have hereunto set my hand and caused the seal of the* **Plant Variety Protection Office** *to be affixed at the City of* Washington *this* 28th *day of* January *in the year of our Lord one thousand nine hundred and* seventy-seven

Attest:

S. J. Rolli[illegible]

Commissioner
Plant Variety Protection Office
Grain Division
Agricultural Marketing Service

[illegible]
[illegible]tary of Agriculture

FORM GR-470
(12-15-72)

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
GRAIN DIVISION
HYATTSVILLE, MARYLAND 20782

FORM APPROVED
OMB NO. 40-R3712

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

INSTRUCTIONS: *See Reverse.*

1. VARIETY NAME OR TEMPORARY DESIGNATION Pennfine	2. KIND NAME Perennial ryegrass	FOR OFFICIAL USE ONLY PV NUMBER 72019
3. GENUS AND SPECIES NAME Lolium perenne	4. FAMILY NAME *(Botanical)* Gramineae	FILING DATE 8·23·71 TIME 9 A.M.
	5. DATE OF DETERMINATION 1966	FEE RECEIVED $ 250.00 $ 250.00 $ 250.00 BALANCE DUE $ — $ — $ —
6. NAME OF APPLICANT(S) The Pennsylvania Agricultural Experiment Station	7. ADDRESS *(Street and No. or R.F.D. No., City, State, and ZIP Code)* 229 Agricultural Administration Building University Park, Pa. 16802	8. TELEPHONE AREA CODE AND NUMBER 814/865-5419
9. IF THE NAMED APPLICANT IS NOT A PERSON, FORM OF ORGANIZATION: *(Corporation, partnership, association, etc.)* State Experiment Station	10. STATE OF INCORPORATION	11. DATE OF INCORPORATION

12. Name and mailing address of applicant representative(s), if any, to serve in this application and receive all papers:

Dr. W. I. Thomas, Associate Director
Agricultural Experiment Station
229 Agricultural Administration Building
University Park, Pa. 16802

13. CHECK BOX BELOW FOR EACH ATTACHMENT SUBMITTED:

- [X] 13A. Exhibit A, Origin and Breeding History of the Variety *(See Section 52 of the Plant Variety Protection Act.)*
- [X] 13B. Exhibit B, Botanical Description of the Variety
- [X] 13C. Exhibit C, Objective Description of the Variety
- [X] 13D. Exhibit D, Data Indicative of Novelty
- [X] 13E. Exhibit E, Statement of the Basis of Applicant's Ownership

14A. Does the applicant(s) specify that seed of this variety be sold by variety name only as a class of certified seed? *(See Section 83(a). (If "Yes," answer 14B and 14C below.)* [X] YES [ ] NO

14B. Does the applicant(s) specify that this variety be limited as to number of generations? [X] YES [ ] NO

14C. If "Yes," to 14B, how many generations of production beyond breeder seed? [X] FOUNDATION [ ] REGISTERED [X] CERTIFIED

The applicant declares that a viable sample of basic seed of this variety will be deposited upon request before issuance of a certificate and will be replenished periodically in accordance with such regulations as may be applicable.

The undersigned applicant(s) of this sexually-reproduced novel plant variety believes that the variety is distinct, uniform, and stable as required in Section 41 and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.

Applicant is informed that false representation herein can jeopardize protection and result in penalties.

9/30/76
(DATE)

Walter I. Thomas
(SIGNATURE OF APPLICANT)

(DATE)

(SIGNATURE OF APPLICANT)

00001

FORM GR-470 (REVERSE)

RECEIVED NOV 2 1978

INSTRUCTIONS

GENERAL: Send an original copy of the application, exhibits and $250.00 fee to U.S. Dept. of Agriculture, Agricultural Marketing Service, Grain Division, 6525 Belcrest Road, Hyattsville, Maryland 20782. (See Section 180.175 of the regulations and rules of practice.) Retain one copy for your files. All items on the face of the form are self-explanatory unless noted below.

ITEM

5 Insert the date the applicant determined that he had a new variety based on the definition in Section 41 (a) of the Act and decision is made to increase the seed.

13a First, give the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method. Second, give the details of subsequent stages of selection and multiplication. Third, indicate the type and frequency of variants during reproduction and multiplication and state how these variants may be identified. Fourth, provide evidence on stability.

13b First, give any special characteristics of the seed and of the plant as it passes through the seedling stage, flowering stage and the fruiting stage. Second, describe the mature plant and compare it with a similar commercial variety grown under the same conditions, and indicate the differences.

13c A supplemental form will be furnished by the PVPO to describe in detail a variety for each kind of seed.

13d Provide complete data indicative of novelty. Seed and plant specimens or photographs of seed and plant comparisons clearly indicating novelty may be submitted. Seeds submitted may be sterile.

13e Indicate whether applicant is the actual breeder, the employer of the breeder, the owner through purchase or inheritance, etc.

Origin and Breeding History

'Pennfine' ryegrass Lolium perenne L. is a nonfluorescent turf-type perennial ryegrass developed as a three-clone synthetic variety at The Pennsylvania Agricultural Experiment Station. All three clones were selected in southeast Pennsylvania, two are golf course fairway selections, and the third was found on a tennis court.

Original source is unknown and the areas were reseeded as turf for approximately 40 years. All clones in the ryegrass program required a spread of 12 inches minimum, and the clones in question ranged from 16 to 28 inches. This fact leads one to estimate an age of at least 15 years under close-cut turf selection pressure.

Breeder's selection involved texture, mowability, winter survival, snowmold tolerance, and heading and anthesis dates. Prior to turf quality testing, uniformity of heading and anthesis were also confirmed in 2 years' of testing in Oregon under commercial production conditions.

The Pennfine variety shows a high degree of uniformity for a three-clone synthetic. Uniformity testing involved two generations of space planted and turf trials. Two Foundation growers failed to detect distinctive variants in 40 acres of production in Oregon and Washington. Observations to date indicate a relatively stable variety on the basis of morphological characters and turf response.

Commercial production will involve three generations, Breeders', Foundation, and Certified. Breeders' seed will be produced at University Park, Pa., and others in the Pacific Northwest states. Commercial seed will be in the "certified only" category, with seed failing to meet certified standards not eligible for variety name.

Comparison of Mature Plants of 'Pennfine' and Five Cultivars of Perennial Ryegrass *Lolium perenne*

To compare plants of perennial ryegrass, measurements were made June 30, 1971, of 50 plants each of six cultivars of perennial ryegrass growing in western Idaho on the Rathdrum Ranch of the Jacklin Seed Company. The ranch is located approximately 20 miles east of Spokane, Washington. Each plot of ryegrass was approximately 5 m long by 2 m wide. Plots had been fertilized and irrigated as was customary for seed production in this area. All plants measured had headed and anthesis had occurred. Seed would probably have been ripe in 10 to 14 days. Plots had been established in mid-September 1970 to evaluate ryegrass cultivars under environmental conditions for commercial seed production.

Measurements were made of flagleaf size, head length, internode length, and head weight. Data were analyzed by analysis of variance and significant differences delineated by Duncan's modified (Bayesian) least significant difference test.

Head weight. To compare head weight, five replications of 15 heads each of six cultivars of perennial ryegrass were weighed to 0.01 g. The heads were air-dried and trimmed to include only the portion above the lowest floret. Heads of 'Pennfine' weighed the least and those of 'Norlea' the most (Table 1). The coefficient of variability for this measurement was 6.2%.

Head length. To compare head length, 50 heads of each of six cultivars of perennial ryegrass were measured to the nearest millimeter. The heads had been air-dried. Measurements were made from the tip of the

head to the internode below the lowest floret. Heads of Pennfine were the shortest and those of Norlea the longest (Table 2). The coefficient of variability for this measurement was 14.8%.

Flagleaf. To compare size of the flagleaf in six cultivars of perennial ryegrass, measurements of the flagleaf length and width were made on 50 plants each of six cultivars of perennial ryegrass. Flagleaf width to the nearest 0.1 mm was measured at a spot 4 mm from the basal end where the leaf joined the leaf sheath. Measurements were made with a 10X magnifying glass equipped with a reticle calibrated to 0.1 mm. Flagleaf length was measured to the nearest 0.5 mm using a steel metric tape. Length measurements were made from leaf tip to a point where the leaf and leaf sheath joined, i.e., on a line with the ligule. The flagleaf of Pennfine was by far the shortest and narrowest while that of Norlea was the longest and widest (Table 3). The derived measurement LW accentuated leaf measurement differences so that all six cultivars were significantly different one from the other. In contrast, differences in the ratio of flagleaf length to width (L/W) were not as diagnostic of cultivar differences as measurements of flagleaf length, width, and L/W. The coefficients of variability for measurements of flagleaf length and width were 17.6 and 14.2%, respectively. For the derived quantities LW and L/W, the coefficients of variability were 25.9 and 19.2%, respectively.

Internode length. To compare internode length, measurements to the nearest millimeter were made of the first (basal) six internodes of the ryegrass head. Internode length was measured to the nearest millimeter. For each internode, Pennfine was the shortest. Internodes of 'Linn' were either the longest (internodes 2, 3) or not significantly different from

the longest (internodes 4, 5). The coefficients of variability for internode length ranged from 21.3 to 25.7%.

The ratios of one internode to another were also compared (Table 5). Some varieties differed significantly (p = .05) from others in the ratios of each internode length to internodes 1 and 2. Ratios of the length of each internode to internodes 3, 4, 5, and 6 were generally nonsignificant. The coefficients of variability for the length of each internode to internode 1 varied from 17.3 to 28.6%, for the ratios to internode 2 from 46.6 to 68.0%, and for the ratios to internode 3 from 67.8 to 102.3%.

Ranking of six cultivars from least to greatest for plant characteristics, the relative ranking was Pennfine = 12, 'Manhattan' = 29, Linn = 43, 'Pelo' = 52, Norlea = 55, and 'NK-100' = 58 (Table 6). Thus, as the above data indicate, Pennfine has smaller flagleaves, shorter and lighter heads, and shorter internodes than the other five cultivars evaluated.

Relative maturity. Observations June 3 and 16, 1971, indicated that with regard to relative maturity and head emergence Pennfine and Linn would be classified as early, NK-100 as medium, Norlea as medium late, and Pelo and Manhattan as late (Table 7).

Seed characteristics. No discernible characteristics of Pennfine ryegrass seed have been detected to date, but work is continuing along these lines. Seed size, number, and weight appear to be appreciably smaller and lighter than Linn and similar to Manhattan. These data cannot be finally assessed until a representative number of samples are obtained from production areas to determine location and year variables. Data will be submitted in the future.

DATA INDICATIVE OF NOVELTY
Pennfine Perennial Ryegrass
Application No. 72019

Pennfine perennial ryegrass, Lolium perenne, is a nonfluorescent turf-type developed as a three-clone synthetic variety at the Pennsylvania Agricultural Experiment Station. Parental clones used to synthesize the variety were selected in Southeast Pennsylvania during a search of old turfgrass areas from 1958-62. Two of the parents were found on golf course fairways and the third on a turfed tennis court — all areas known to be in turf for at least 40 years. Parental clones ranged in diameter from 16-28 inches, and were estimated to be at least 15 years of age under close-cut turf selection pressure.

Initial objectives in the selection program at University Park, Pa. were to screen for a finer texture (leaf width), and clean cut or mowability utilizing hand sheep shears in the greenhouse. Field screening on space plants concentrated on winter survival, foliar diseases, seedset and anthesis date. Eventual Pennfine parental clones and others were planted in Oregon, the projected area of commercial seed production, in cooperation with a grass seed grower and a seed company field man.

Oregon evaluation of clonal material revealed necessary dates of anthesis under production area climatic conditions. Novelty was revealed in earliness of anthesis and subsequent maturity, seed yield, seed maturity prior to rust infections which are common to ryegrass and other grass seed crops, and earliness of maturity which alleviated the need for several irrigations, a normal practice on other ryegrasses and grass varieties with later maturity dates. These observations were made by individuals very familiar with the entire research, development and production of perennial grasses in the Pacific Northwest, and were confirmed by the breeder during annual visits to the area.

These observations were made in comparison with the perennial ryegrass varieties in existence, and particularly those with turf use or potential:

Linn - predominant variety in production
NK-100 - European origin, early production stage
Pelo (NK-106) - " " " " "
Manhattan - then as Syn O, Syn H experimentals
Norlea - Canadian variety in production

Subsequent research was planned in randomized experimentation to ascertain novelty of Pennfine in comparison with the above ryegrasses in cooperation with personnel and property of the Jacklin Seed Company, Dishman, Washington. Individual variety plant measurements were made to document the novelty of Pennfine perennial ryegrass.

Novelty of Pennfine was statistically significant for the following plant characters:

(1) Head weight (Table 1)
(2) Head length (Table 2)
(3) Flagleaf size (Table 3)
(4) Internode lengths (Table 4)
(5) Internode length ratios (Table 5)

The most similar varieties to Pennfine on the basis of the above measurements were Linn and Manhattan (Table 6). In average maturity, Pennfine and Linn are equal, followed by NK-100 (5 days), Norlea (7 days), Pelo (13 days) and Manhattan (16 days).

Based on turf performance ratings and measures Pennfine was found to be most similar to Manhattan (Table 7, 8, 9).

In current (1976) research to develop a varietal purity testing system at Penn State, preliminary results based on 3-9 seedlots resulted in a separation of five varieties through a series of three tests (Table 10):

(1) Phenol test, light versus dark seed, 33 1/3% groupings: Pennfine and Linn, 8 and 17% separated from NK-100 (38), Pelo (40) and Manhattan (44).

(2) Basal sheath color, red versus green: Pennfine separated from other four by the absence of red until approximately two weeks after germination.

(3) Peroxidase electrophoresis: all perennial ryegrasses in the test showed up to 8 banding patterns. Pennfine was differentiated with a unique "humped" #2 band which is referred to as #2a. Only Linn and Pelo could not be separated quantitatively. Qualitatively techniques are incomplete at this time.

The novelty of Pennfine ryegrass is significantly ascertained in a series of mature plant, turf, seed and seedling experiments included in this exhibit as prepared and submitted by the breeder, J. M. Duich and G. W. McKee of The Pennsylvania Agricultural Experiment Station.

Table 1. Comparative weight of 15 heads of six cultivars of perennial ryegrass.

Variety	Weight, g
Pennfine	1.50 a*
Manhattan	2.05 b
NK-100	2.19 bc
Linn	2.23 bc
Pelo	2.56 c
Norlea	3.27 d

*Means followed by the same letter do not differ significantly a p - .01 by Duncan's modified (Bayesian) least significant difference test.

Table 2. Comparative head length of six cultivars of perennial ryegrass.

Variety	Head length, cm
Pennfine	16.73 a*
Linn	19.72 b
Manhattan	23.44 c
Pelo	25.05 d
NK-100	25.93 d
Norlea	30.22 e

*Means followed by the same letter do not differ significantly at P = .01 by Duncan's (Bayesian) least significant difference test.

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Table 3. Comparative size of flagleaf of six cultivars of perennial ryegrass (plants headed).

Variety	Length (L), mm	Width (W), mm	LW, mm^2	L/W
Pennfine	138.6 a*	4.29 a	603.58 a	32.66 a
Linn	175.9 b	5.38 b	949.87 b	33.47 a
Manhattan	206.7 c	5.29 b	1102.12 c	39.60 b
Pelo	255.8 d	6.26 c	1610.99 e	41.11 bc
NK-100	262.5 d	5.52 b	1460.18 d	47.96 d
Norlea	282.2 e	6.55 c	1858.21 e	43.72 c

*Reading vertically for each comparison, means followed by the same letter do not differ significantly at P = .01 by Duncan's modified (Bayesian) least significant difference test.

Table 4. Comparative internode length of heads of six cultivars or perennial ryegrass.

	Internode number					
	1	2	3	4	5	6
Variety	mm					
Pennfine	24.0 a*	20.2 a	15.6 a	13.6 a	12.1 a	11.1 a
Manhattan	25.0 a	21.6 a	17.1 a	15.4 b	14.1 b	12.4 ab
Norlea	28.2 b	25.2 b	17.5 a	16.9 bc	14.0 b	13.6 b
Pelo	31.8 c	27.5 b	20.3 b	18.6 cd	14.8 bc	13.2 b
NK-100	32.4 c	26.8 b	21.3 b	20.0 d	17.5 d	15.6 c
Linn	34.5 c	27.7 b	21.6 b	17.9 c	16.1 cd	13.2 b

*Means followed by the same letter do not differ significantly at p = .01 by Duncan's modified (Bayesian) least significant difference test.

Table 5. Comparative internode ratios, heads of six cultivars of perennial ryegrass.

Variety	Internode ratio 2/1	3/1	4/1	5/1	6/1
Linn	.82 a*	.64 a	.54 a	.49 a	.39 a
NK-100	.84 ab	.67 a	.63 b	.56 bc	.50 c
Pennfine	.85 ab	.60 a	.58 ab	.52 abc	.47 bc
Manhattan	.87 ab	.69 a	.62 b	.57 c	.50 c
Pelo	.88 ab	.60 a	.60 b	.49 a	.43 ab
Norlea	.90 b	.63 a	.62 b	.50 ab	.50 c

	Internode ratio 1/2	3/2	4/2	5/2	6/2
Linn	1.25 a	.79 a	.66 a	.59 ab	.48 a
NK-100	1.45 a	.96 a	.85 b	.79 b	.68 b
Pennfine	1.20 a	.78 a	.68 a	.61 ab	.56 ab
Manhattan	1.17 a	.80 a	.72 ab	.66 ab	.59 ab
Pelo	1.18 a	.76 a	.70 ab	.56 a	.50 a
Norlea	1.18 a	.73 a	.69 a	.60 ab	.55 ab

*For each ratio comparison, cultivar means followed by the same letter do not differ at p = .05 by Duncan's modified (Bayesian) least significant difference test.

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Table 6. Comparative rank order for 12 characteristics of six cultivars of perennial ryegrass.

Variety	Head		Flagleaf				Internode length						
	Width	Length	Length	Width	LW	L/W	1	2	3	4	5	6	Ave
Pennfine	1*	1	1	1	1	1	1	1	1	1	1	1	1.0
Manhattan	2	3	3	2	3	3	2	2	2	2	3	2	2.4
Linn	4	2	2	3	2	2	6	6	6	4	5	4	3.8
Pelo	5	4	4	5	5	4	4	5	4	5	4	3	4.3
Norlea	6	6	6	6	6	6	3	3	3	3	2	5	4.6
NK-100	3	5	5	4	4	5	5	4	5	6	6	6	4.8

*Ranked in ascending order from least (1) to greatest (6).

Table 7. Turf quality ratings 1966-69. University Park, Pa.

	Leaf width mm	Seedling Vertical growth	Mowing quality rating	Turf Ratings			
				Density	Rust	Lfspt	Red thread
Pennfine	2.5	40*	8.3	8.8	8.0	7.9	6.5
Manhattan	2.7	50	7.3	8.7	8.8	2.7	3.5
NK-100	2.9	80	4.4	6.5	8.0	3.5	7.2
Pelo	3.1	80	5.2	7.2	8.0	3.8	6.5
Norlea	3.1	60	6.6	6.3	3.0	5.5	7.8
Linn	3.8	80	2.6	5.3	9.0	8.5	7.6
LSD .05	0.5	15	1.4	1.9	2.1	2.2	2.2

*annual ryegrass standard = 100
ratings - 1 to 10, 10 = best

Table 8. Ryegrass overseeding evaluation, State College, Mississippi, 1969-70.

Variety	Winter turf quality evaluations*							
	11/12	12/18	1/13	2/11	3/26	4/9	5/5	6/5
Pennfine	6.5	6.7	6.7	5.2	8.7	6.7	4.0	7.0
Manhattan	7.2	7.0	7.2	6.2	7.7	6.7	1.7	6.5
Medalist II	6.6	6.0	6.7	4.0	5.5	4.5	1.7	4.5
Annual	7.7	7.5	7.0	2.7	5.2	6.0	1.5	3.5
Magnolia	8.2	6.5	6.5	3.0	5.5	4.7	1.0	3.0

*Rating scale: 1 to 10; 10 = best, 5 = acceptable turf.

Table 9. Ryegrass overseeding evaluation, College Station, Texas, 1969-70.

	Days to emergence	Color	Avg. putting surface*	Average transition*	*Poa annua* competition
Pennfine	5-6	med to dark	1.2	2.0	good
Manhattan	7	med	1.1	2.0	fair
NK-100	5	light to med	1.6	3.1	good
Linn	5	light	1.9	3.1	good
Pelo	5	light to med	1.9	2.4	good
Medalist II	5	light to med	1.3	3.0	good
Annual	3	light	2.4	3.3	good

*Scale: 1 to 5; 1 = excellent, 5 = unacceptable.

Table 10. Varietal separation by seed phenol test, seedling sheath color, and peroxidase electrophoresis test. 1976.

	Seed Phenol Test		Seedling Leaf Sheath Color		Peroxidase Electrophoresis Test Band Number								
	% light	% dark	% red	% green	1	2	2a	3	4	5	6	7	8
Linn	17	83	77	23	-	+	-	-	-	+	-	-	+
Manhattan	44	56	86	14	-	+	-	-	+	+	+	-	+
NK-100	38	62	97	3	+	+	-	-	-	-	+	+	+
Pelo	40	60	96	4	-	+	-	-	-	+	-	-	+
Pennfine	8	92	0	100	-	+	+	-	+	+	+	-	+
Separations:	Linn PF		PF		NK-100		PF		Man PF	NK-100	Linn Pelo	NK-100	

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Table 1. Comparative weight of 15 heads of six cultivars of perennial ryegrass.

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Norlea	3.27 d

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Table 3. Comparative size of flagleaf of six cultivars of perennial ryegrass (plants headed).

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Linn	175.9 b	5.38 b	949.87 b	33.47 a
Manhattan	206.7 c	5.29 b	1102.12 c	39.60 b
Pelo	255.8 d	6.26 c	1610.99 e	41.11 bc
NK-100	262.5 d	5.52 b	1460.18 d	47.96 d
Norlea	282.2 e	6.55 c	1858.21 e	43.72 c

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Table 4. Comparative internode length of heads of six cultivars of perennial ryegrass.

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Variety	mm					
Pennfine	24.0 a*	20.2 a	15.6 a	13.6 a	12.1 a	11.1 a
Manhattan	25.0 a	21.6 a	17.1 a	15.4 b	14.1 b	12.4 ab
Norlea	28.2 b	25.2 b	17.5 a	16.9 bc	14.0 b	13.6 b
Pelo	31.8 c	27.5 b	20.3 b	18.6 cd	14.8 bc	13.2 b
NK-100	32.4 c	26.8 b	21.3 b	20.0 d	17.5 d	15.6 c
Linn	34.5 c	27.7 b	21.6 b	17.9 c	16.1 cd	13.2 b

*Means followed by the same letter do not differ significantly at p = .01 by Duncan's modified (Bayesian) least significant difference test.

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Table 5. Comparative internode ratios, heads of six cultivars of perennial ryegrass.

Variety	Internode ratio				
	2/1	3/1	4/1	5/1	6/1
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Pennfine	.85 ab	.60 a	.58 ab	.52 abc	.47 bc
Manhattan	.87 ab	.69 a	.62 b	.57 c	.50 c
Pelo	.88 ab	.60 a	.60 b	.49 a	.43 ab
Norlea	.90 b	.63 a	.62 b	.50 ab	.50 c

	Internode ratio				
	1/2	3/2	4/2	5/2	6/2
Linn	1.25 a	.79 a	.66 a	.59 ab	.48 a
NK-100	1.45 a	.96 a	.85 b	.79 b	.68 b
Pennfine	1.20 a	.78 a	.68 a	.61 ab	.56 ab
Manhattan	1.17 a	.80 a	.72 ab	.66 ab	.59 ab
Pelo	1.18 a	.76 a	.70 ab	.56 a	.50 a
Norlea	1.18 a	.73 a	.69 a	.60 ab	.55 ab

*For each ratio comparison, cultivar means followed by the same letter do not differ at p = .05 by Duncan's modified (Bayesian) least significant difference test.

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Table 6. Comparative rank order for 12 characteristics of six cultivars of perennial ryegrass.

	Head		Flagleaf				Internode length					
Variety	Width	Length	Length	Width	LW	L/W	1	2	3	4	5	6
Pennfine	1*	1	1	1	1	1	1	1	1	1	1	1
Manhattan	2	3	3	2	3	3	2	2	2	2	3	2
Linn	4	2	2	3	2	2	6	6	6	4	5	4
Pelo	5	4	4	5	5	4	4	5	4	5	4	3
Norlea	6	6	6	6	6	6	3	3	3	3	2	5
NK-100	3	5	5	4	4	5	5	4	5	6	6	6

*Ranked in ascending order from least (1) to greatest (6).

Table 7. Comparative time to head, six cultivars of perennial ryegrass.*

	Reproductive status		
Variety	June 3	June 16	Relative maturity
Linn	headed		early
Pennfine	headed		early
NK-100	starting to head		medium
Norlea		headed	medium late
Pelo		starting to head	late
Manhattan		starting to head	late

*Based on observations by Jacklin Seed Company personnel.

Exhibit 12E

Statement of the Basis of Applicant's Ownership

The applicant of 'Pennfine' perennial ryegrass Lolium perenne is The Pennsylvania Agricultural Experiment Station, 106 Armsby Building, University Park, Pennsylvania 16802. Said applicant is employer of breeder with all assigned rights.

Applicant's representative is Dr. W. I. Thomas, Associate Director, The Pennsylvania Agricultural Experiment Station, 106 Armsby Building, University Park, Pennsylvania 16802.

Application No. 72019
'Pennfine'

7200019

9/3/75

U.S. DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service
Grain Division
Objective Description of Cultivars
RYEGRASS
(*Lolium spp.*)

1. SPECIES:

[2] 1=L. multiflorum (annual or Italian: includes Westerwoldicum)
2=L. perenne (perennial) 3=L. rigidum (includes Wimmera)
4=Hybrid (of species) _____ 5=Other (specify) _____

2. PLOIDY:

[1] 1=Diploid 2=Tetraploid 3= Other (specify) _____

3. DURATION:

[3] 1=Annual or biennial 2=Short lived perennial (3-4 years)
3=Perennial (more than 4 years)

STANDARD CULTIVARS

1=Gulf 2=Wimmera 62 3=Linn 4=Pelo
5=Norlea 6=Aberystwyth S-23 7=Manhattan 8=Pennfine

4. MATURITY (50% Headed): (Use standard cultivars from above.)

[1] 1=Very early 3=Early 5=Medium 7=Late 9=Very late
[17] Days earlier than [7] standard cultivar
[ ] Days later than [ ] standard cultivar

5. MATURE PLANT HEIGHT: (Use standard cultivars from above.)

[42] cm. High [18] cm. Shorter than [3] standard cultivar
[ ] cm. Taller than [ ] standard cultivar

6. PERCENT WINTER DAMAGE (estimated as percent of the area appearing dead):
(Use standard cultivars from above.)

[10] Percent damage of application cultivar
[65] Percent damage of [3] standard cultivar

7. TURF DENSITY: (Use standard cultivars from above.)

[206] Tillers per 100 sq. cm.
[14] Less tillers per 100 sq. cm. than [7] standard cultivar
[62] More tillers per 100 sq. cm. than [3] standard cultivar

8. FLAG LEAF (at full growth): (Use standard cultivars from above.)

[14] cm. Length (from ligule to tip)
[2] cm. Shorter than [7] standard cultivar
[ ] cm. Longer than [ ] standard cultivar
[4] mm. Width (at widest point)
[2] mm. Narrower than [5] standard cultivar
[ ] mm. Wider than [ ] standard cultivar
[7] Flag leaf at boot stage: 1=Deflexed 3=Recurved 5=Horizontal
7=Semi-erect 9=Erect

9. LEAVES:

[3] Vernation: 1=Leaves rolled in young shoots
2=Leaves semi-rolled (folded with rolled edges)
3=Leaves folded in young shoots
[100] % Plants with anthocyanin in lower leaf sheath
[2] Foliage color: 1=yellow green 2=medium green 3=blue green

10. SPIKE:

00010

[167] mm. Spike length (tip to internode below lowest floret)
[67] mm. Shorter than [7]
[ ] mm. Longer than [ ] (Use standard cultivars from above.)

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10. SPIKE (continued):

9999 mg. per ten spikes (trimmed to internode below lowest floret)
3530 mg. lighter per ten spikes than 7
mg. heavier per ten spikes than
Use standard cultivars from above.
6 Florets per spikelet

Percentage of plants with:

Rachis: 100 % smooth
Spike color: 100 % green
Lemma: 0 % awned
% rough
% purple
mm. awn length

7.6 mm. glume length
1=Spikelet length nearly equal to outer glumes
2=Spikelet length much longer than outer glumes

11. COLEOPTILE:

100 %Plants with anthocyanin in coleoptile

12. ANTHER COLOR:

% Plants with white anthers
% Plants with purple anthers
100 % Plants with yellow anthers

13. ROOT AND PLANT CHARACTERS:

% Plants with prostrate growth habit
100 % Plants with upright growth habit
0 % Plants with fluorescent roots

14. SEED:

1418 mg. per 1,000 seed 444 mm. total length of 10 seeds
10 mm. total width of 10 seeds

15. DISEASE (0=Not tested, 2=Highly susceptible, 4=Moderately susceptible, 6=Moderately resistant, 8=Highly resistant):

6 Crown rust (Puccinia coronata)
6 Leaf spot (Helminthosporium)
6 Snow mold (Typhula)
8 Dollar spot (Sclerotinia)
8 Mildew
6 Red thread (Corticium)
6 Brown patch (Rhizoctonia)
6 Other (specify) Fusarium [illegible]

16. INSECT (0=Not tested, 2=Highly susceptible, 4=Moderately susceptible, 6=Moderately resistant, 8=Highly resistant):
☐ Specify none seen to date

17. GIVE RESEMBLANCE VALUE IN LEFT COLUMN AND VARIETY IN RIGHT COLUMN FOR VARIETY WITH WHICH COMPARISON IS MADE: (1=Less than, 2=Same as, 3=More erect, more resistant, denser, more persistent, darker or greater height.)

Resemblance	Character	Similar variety
2	Plant habit (erectness)	Manhattan
3	Tillering	NK100
3	Winter hardiness	Linn
3	High temp.stress resistance	Manhattan
3	Turf persistence	Linn
1	Plant color	Manhattan
1	Vertical seedling growth rate	Norlea
3	Crown density	Norlea
1	Mower shredding resistance	Manhattan

18. GIVE AREA OF ADAPTATION AND INTENDED USE: Northeast, Southeast, Southwest

19. GIVE AREA TEST RESULTS PRESENTED FROM: Northeast, Southeast, Southwest

COMMENTS: