No. 7300090

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Iowa Agriculture and Home Economics 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, MULTIPLYING 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. UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

BIRDSFOOT TREFOIL

'Carroll'

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* 11th *day of* September *in the year of our Lord one thousand nine hundred and* eighty.

Attest:

Commissioner
Plant Variety Protection Office
Grain Division
Agricultural Marketing Service

Secretary 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	2. KIND NAME	FOR OFFICIAL USE ONLY
Carroll	Birdsfoot trefoil	PV NUMBER 73090
3. GENUS AND SPECIES NAME	4. FAMILY NAME *(Botanical)*	FILING DATE 5-4-73 / TIME 8:00 A.M.
Lotus corniculatus	Leguminosae	FEE RECEIVED $250.00 / BALANCE DUE $0.00
	5. DATE OF DETERMINATION April 16, 1970	$250.00 / $
		$250.00 / $7/2/80

6. NAME OF APPLICANT(S)	7. ADDRESS *(Street and No. or R.F.D. No., City, State, and ZIP Code)*	8. TELEPHONE AREA CODE AND NUMBER
Committee for Agricultural Development Iowa Agriculture and Home Economics Experiment Station	R24 Curtiss Hall Iowa State University Ames, Iowa 50010	(515)294-1736

9. IF THE NAMED APPLICANT IS NOT A PERSON, FORM OF ORGANIZATION: *(Corporation, partnership, association, etc.)*	10. STATE OF INCORPORATION	11. DATE OF INCORPORATION
Corporation	Iowa	1943

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

Agent

Ralph Bean
Room 24, Curtiss Hall
Iowa State University
Ames, Iowa 50010

& Dr Irving Carlson

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 [X] 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.

April 30, 1973
(DATE)

Ralph Bean
(SIGNATURE OF APPLICANT)
Business Manager

(DATE)

(SIGNATURE OF APPLICANT)

FORM GR-470 (REVERSE)

U. S. DEPARTMENT
RECEIVED
MAY 4 1973
AMS, S. & D. DIV.
PVPO

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.

Exhibit A

Origin and Breeding History of the Variety

1. 'Carroll' is a synthetic variety derived from two introductions from the USSR, PI 228151 (Kuban 44) and PI 258467 (Morshansk 528). It was developed by recurrent phenotypic selection.

2. Twenty-eight plants selected for vigor from the two introductions were intercrossed in 1960 to produce 42 F_1 progenies. In 1962, 18 plants were selected for large seed size, vigor, and good seed production characteristics from 2400 F_1 plants. Thirty-four plants selected in 1964 for large seed size, vigor, low disease incidence, and good flowering characteristics from open-pollination progenies of the 18 selections were allowed to interpollinate in isolation to produce Syn. 1 seed of Carroll. Syn. 2 seed was produced in Minnesota during 1966-70 and classed as breeder seed. Foundation and registered seed were first produced respectively in 1970 and 1972 in Minnesota.

3. No unusual variants have been noticed in Carroll.

4. The Syn. 2 and Syn. 3 generations have performed similarly (see attached data indicative of novelty).

Exhibit B

Botanical Description of the Variety

'Carroll' is a semierect variety that blooms 2 to 5 days earlier and has larger seeds than 'Empire'. It is more vigorous than Empire in the seedling stage, in regrowth after cutting, and in spring growth after coming through a winter. Also, it is more upright in growth habit than Empire.

No botanical characteristics atypical for the species have been noticed in Carroll. *Lotus corniculatus* L. is a diffuse many-stemmed perennial, with pinnately 5-foliolate leaves, the basal pair of leaflets simulating stipules; flowers yellow, in capitate umbels on long erect peduncles.

April 8, 1976

OBJECTIVE DESCRIPTION OF VARIETY
Trefoil (Lotus spp.)

CARROLL
PV# 73090

Characteristics described, including numerical measurements, should represent those that are typical for the variety. Ranges may be given also. Measured data should be for SPACED PLANTS. Royal Horticultural Society or any recognized color fan may be used to determine plant colors; designate system used: _____. Describe location of test area Central Iowa. All questions need not be answered, however, completeness should be striven for in order to establish the most adequate variety identification.

1. SPECIES:
[1] 1= Birdsfoot trefoil (Lotus corniculatus), 2= Narrow leaf trefoil (L. tenuis) 3= Big trefoil (L. pedunculatus)

2. MATURITY (Spring, 50% bloom): Give Test Area _____

[ ][4] Days earlier than [4]
Maturity same as [ ]
[ ][ ] Days later than [ ]

Comparison Varieties (Also for use below)
1= Viking 2= Cascade 3= Leo
4= Empire 5= Los Banos 6= Columbia
7= Other _____

3. PLANT (Spring, 50% bloom):

[ ][ ] cm Height
[ ][ ] cm Shorter than [ ]
Height same as [ ]
[ ][ ] cm Taller than [ ]
} Comparison Variety

[ ][ ] cm Width
[ ][ ] cm Narrower than [ ]
Width same as [ ]
[ ][ ] cm Wider than [ ]
} Comparison Variety

[2] Type: 1= Determinate 2= Indeterminate

4. STEM:

[2] Habit: 1= Decumbent (Empire) 2= Semierect 3= Erect (Viking)
[1] Surface: 1= Glabrous 2= Slightly Pubescent 3= Pubescent
[3] Color: 1= White 2= Reddish 3 = Green
[2] Recovery ability from crown-buds as compared to stubble-buds: 1= Low 2= Same 3= High

[ ][ ] cm Internode Length (Between 7th and 8th node from stem base at mature stage)

[ ][ ] Stems per plant 1st year [ ][ ][ ] Stems per plant 2nd year

5. LEAVES:

[5] Shape (Typical terminal leaflet): 1= Linear-Lanceolate 2= Linear 3= Oblong 4= Lanceolate 5= Obovate 6= Other (specify) _____

[1] Surface: 1= Glabrous 2= Slightly pubescent 3= Pubescent

[2] Color: 1= Glaucous green (Mansfield) 2= Green 3= Other (specify) ____

Typical Terminal Leaflet:

[18] mm Length

[ ] mm Shorter than [ ]
Length same as [ ]
[ ] mm Longer than [ ]
} Comparison Variety

[9] mm Width

[ ] mm Narrower than [ ]
Width same as [ ]
[ ] mm Wider than [ ]
} Comparison Variety

6. FLOWERS:

[1] Petal Color: 1= Yellow 2= Orange 3= Red 4= Other (specify) _____

[2] Petal Tint: 1= Orange stripes 2= Red stripes 3= Other _____

1 & [3] Keel Tip Color: 1= Yellow 2= Red 3= Brown

[2] Calyx Teeth:Tube Ratio: 1= 2:1 2= 1:1 3= 1:2 4= 1:3

[6.7] Flowers/Umbel 3rd yr. [ ] Flowers/Umbel 2nd yr. [ ] mm Length of Umbel

[ ] Pods/Umbel 1st yr. [ ] Pods/ Umbel 2nd yr.

[ ] Seeds/ Umbel 1st yr. [ ] Seeds/Umbel 2nd yr.

[ ] Umbels/Plant 1st yr. [ ] Umbels/Plant 2nd yr.

7. PODS:

[ ] Shattering % (Tan ripe, 35% relative humidity or sulfuric acid):
1= Low (1-10) 2= Medium (11-30) 3= High (Above 30)

[ ] mm Length

[ ] mm Shorter than [ ]
Length same as [ ]
[ ] mm Longer than [ ]
} Comparison Variety

8. SEED:

[2] Shape: 1= Oval 2= Round

[3] Color: 1= Buff 2= Light brown 3= Brown
4= Dark brown 5= Yellowish green 6= Olive green
7= Olive 8= Dark purple 9= Purplish black
10= Nearly black 11= Other (specify) _____

[3] Speckling (Dark spots): 1= None 2= Few 3= Many

[1.0] mm Length

[ ] mm Shorter than
Length same as
[ ] mm Longer than
} Comparison Variety

[1.0] mm Width

[ ] mm Narrower than
Width same as
[ ] mm Wider than
} Comparison Variety

[1.0] mm Thick

[ ] mm Thinner than
Thickness same as
[ ] mm Thicker than
} Comparison Variety

[1.4] grams per 1000 seed

[ ] grams Less than
Weight same as
[ ] grams More than
} Comparison Variety

9. GROWTH RATE (A. Seedling, B. Cutting Recovery, C. Spring):

	A	B	C
Slower than			
Same as			
Faster than	4	4	4

} Comparison Variety

10. DISEASE, INSECT, AND NEMATODE (0= Not tested, 1= Susceptible, 2= Resistant):

[0] Rhizoctonia solani	[0] R. leguminicola	[0] Cercospora loti
[0] Fusarium roseum	[0] Macrophomina phaseoli	[0] Verticillium spp. _____
[1] Micoleptodiscus terrestris	[0] M. sphaericus	[0] Sclerotinia trifoliorum
[0] Sclerotium rolfsii	[0] Stemphylium loti	[0] Phomopsis loti
[0] Nematode	[0] Spittlebug	[0] Potato Leafhopper
[0] Alfalfa plantbug	[0] Trefoil Seed Chalcid	[0] Rapid Plantbug
[0] Walshia moth	[0] Lygus bug	[ ] Other _____
[ ] Other _____	[ ] Other _____	[ ] Other _____

NOTE: Under 13, ADDITIONAL DESCRIPTION, give comparative reaction with a standard variety appropriate for each disease tested and indicate if disease reaction of the variety exceeds, equals or is less than the standard.

11. GIVE VARIETY OR VARIETIES THAT MOST CLOSELY RESEMBLE THE APPLICATION VARIETY.

For the following characteristics indicate degree of resemblance (D.R.) by placing in the column marked, D. R., one of the following numbers:
1= Application variety is less than comparison variety, 2= Same as,
3= More than, better, greater, darker, more disease resistant, etc.

Character	Variety	D.R.	Character	Variety	D.R.
Leaflet shape			Stem habit	Leo	2
Stems per plant			Internode length		
Seed color	Leo	2	Flowers/umbel		
Seeds/umbel			Pods/umbel		
Umbels/plant			Cold injury tol.		
Heat tolerance			Drought tol.		
Wet soil tol.			Air pollution		
Palatability			Digestibility		
Late season for. qual.					

12. SEEDLING HEIGHT AND PLANT CONSTITUENTS (Give data for application and similar standard variety): Name of Standard _____.

VARIETY	HEIGHT* mm	CAROTENE ** %	PROTEIN ** %	TANNIN ** %	HYDROCYANIC ACID ** %
Application					
Standard					

* 6 weeks after germination; 8 hr. photoperiod, 20°C, cool white florescent light 2,000 f.c. ; dark 5°C.
** 10% bloom stage.

13. ADDITIONAL DESCRIPTION: (Use additional sheets as required)

Describe all characteristics that cannot be adequately described in the form above. Comparative varieties should be used as may be appropriate, such as for disease. Append all comparative trial and evaluation data, including measured characters, environmental, and disease tests.

Application No. 73090, Birdsfoot Trefoil, "Carroll"

Revised Exhibit D
Data Indicative of Novelty

The attached data are presented to indicate that "Carroll" is a novel variety. It has the unique combination of the following characteristics:

1. Large seed size
2. Good seedling vigor
3. Semi-erect growth habit
4. Early flowering
5. Good winterhardiness
6. High forage yield
7. Good seed production potential.

Carroll most closely resembles the variety "Leo". Instances of a significant difference between Carroll and Leo are listed in Table 5. Carroll was significantly superior to Leo in seedling vigor, stand percentage, and stand rating in a test at Ames, Iowa; in yield of dry matter at Crookston, Minnesota; New Liskeard, Ontario, Canada; and Saskatoon, Saskatchewan, Canada; and in spring vigor at Saskatoon. Carroll was significantly inferior to Leo in height of regrowth and regrowth rating at Ames; in yield of dry matter at Grand Rapids, Minnesota; and in seed yield at Saskatoon, Canada.

Application No. 73090, Birdsfoot Trefoil, "Carroll"

Exhibit D, Data Indicative of Novelty (Continued)

Table 5. Instances of a significant difference in performance between Carroll and Leo birdsfoot trefoil cultivars in forage and seed yield tests.

Trait	Location	Carroll	Leo	LSD(.05)
Seedling vigor rating (1=best, 5=poorest) May 17, 1971	Ames, Iowa	1.5	2.8	0.7
Height of regrowth in inches, August 18, 1971	Ames, Iowa	6.5	8.0	1.3
Regrowth rating (1=best, 9=poorest) August 18, 1971	Ames, Iowa	5.8	4.2	1.5
Stand percentage, May 8, 1972	Ames, Iowa	96.0	90.0	4.6
Stand rating (1=best, 5=poorest) October 2, 1973	Ames, Iowa	1.2	1.8	0.5
Average annual yield of dry matter (T/A), 1968-69	Crookston, Minn.	3.60	3.02	0.38
Average annual yield of dry matter (T/A), 1968-69	Grand Rapids, Minn.	2.10	2.58	0.38
Yield of dry matter (lbs/acre), 1974	New Liskeard, Ontario Canada	5740	5050	460
Yield of dry matter (T/A), 1975	Saskatoon, Sask., Canada	1.64	1.23	0.25
Spring vigor rating (1=best, 9=poorest), 1975	Saskatoon, Sask., Canada	2.0	3.2	1.2
Seed yield (lbs/A?), 1975	Saskatoon, Sask., Canada	668	945	171

Higgins

Iowa State University of Science and Technology Ames, Iowa 50011

Department of Agronomy
Telephone 515-294-1360

December 22, 1978

Mr. S. F. Rollin
Plant Variety Protection Office
Grain and Seed Division
Agricultural Marketing Service, USDA
National Agricultural Library Building
Beltsville, Maryland 20705

Dear Mr. Rollin:

SUBJECT: Birdsfoot Trefoil Application No. 73090, 'Carroll'

During the past two years, we have collected additional data to support our claim that 'Carroll' is a unique variety.

The problem was to distinguish Carroll from Leo, the variety Carroll most closely resembles.

Dr. L. W. Nittler, Department of Seed and Vegetable Sciences, New York Agricultural Experiment Station, Geneva, New York, found that Carroll differed from Leo in frequency of plants with red stems in the seedling stage. The percentage of plants with red stems was 10% for Carroll and 25% for Leo. The seedlings were grown in four Hoagland No. 3 nutrient solutions in a growth chamber at a temperature of 76°F and 2200 foot candles of light. The nutrient solutions varied in proportion of ammonium to nitrate nitrogen, from all nitrate nitrogen to 75% ammonium nitrogen and 25% nitrate nitrogen. The difference between Carroll and Leo in frequency of plants with red stems was consistent across nutrient solutions.

In a space-planted field experiment near Ames, we found that Carroll differed from Leo in dry matter yield per plant 60 days after transplanting to the field. The results were as follows:

	Dry weight per plant in grams on July 12, 1977
Carroll	9.65
Leo	7.62
Empire	6.11
Viking	4.41
L.S.D., 0.05	1.09

Iowa State University of Science and Technology Ames, Iowa 50011

Department of Agronomy
Telephone 515-294-1360

March 24, 1980

Mr. Joseph J. Higgins
Plant Variety Protection Office
National Agricultural Library Building
Beltsville, Maryland 20705

Dear Mr. Higgins:

Subject: Birdsfoot Trefoil Application No. 73090, 'Carroll'

I wish to submit the following data to support our claim that 'Carroll' is a unique variety.

Variety	100-seed weight, mg
Carroll	126.5
Leo	116.3
Empire	115.0
L.S.D., 0.05	9.5

Seed weight determinations were made on samples of seed harvested in 1979 from a seed yield trial conducted by Dr. L. J. Elling, Department of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minnesota. The strains were grown in a randomized complete block design with three replications. These data indicate that Carroll can be distinguished from 'Leo', the variety it most closely resembles, on the basis of seed weight.

This difference between Carroll and Leo is likely the genetic basis for the significant difference in dry matter yield per plant 60 days after transplanting to the field that was reported in my letter to S. F. Rollin on December 22, 1978.

Sincerely,

Irving Carlson

Irving Carlson
Professor of Plant Breeding

ITC/mjv

Exhibit E

Statement of the Basis of Applicants Ownership

The Committee for Agricultural Development, Iowa State University, Ames, Iowa, increases and distributes foundation seed of varieties developed by the Iowa Agriculture and Home Economics Experiment Station. Employees of the Iowa Agriculture and Home Economics Experiment Station were the first and only breeders of the 'Carroll' variety of birdsfoot trefoil for which a certificate of protection is solicited.

Iowa Agriculture and Home Economics Experiment Station is owner and developer of 'Carroll'.
The Committee for Agriculture Development is the agent of the station.
Letter 29 Dec 1977
DJH 1/4/78