No. 7500100

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

North American Plant Breeders

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, 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 (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

ALFALFA

'Apollo'

PLANT VARIETY PROTECTION OFFICE · U.S. DEPARTMENT OF AGRICULTURE

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* 13th *day of* September *in the year of our Lord one thousand nine hundred and* seventy-nine

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 Apollo Tested as NAPB 44	2. KIND NAME Alfalfa	FOR OFFICIAL USE ONLY PV NUMBER 7500100
3. GENUS AND SPECIES NAME Medicago Sativa	4. FAMILY NAME *(Botanical)* Leguminacea	FILING DATE 6·23·75 TIME 10:30 A.M.
	5. DATE OF DETERMINATION March, 1974	FEE RECEIVED $ 250.00 $ 250.00 $ 250.00 BALANCE DUE $ — $ — $ ----
6. NAME OF APPLICANT(S) North American Plant Breeders	7. ADDRESS *(Street and No. or R.F.D. No., City, State, and ZIP Code)* ~~P. O. Box 991~~ ~~Little Rock, Arkansas 72203~~ P.O. Box 2955, 5201 Johnson Dr. Mission, KS 66205 KE	8. TELEPHONE AREA CODE AND NUMBER 501-374-1652
9. IF THE NAMED APPLICANT IS NOT A PERSON, FORM OF ORGANIZATION: *(Corporation, partnership, association, etc.)* Corporation	10. STATE OF INCORPORATION Connecticut	11. DATE OF INCORPORATION March 9, 1973

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

~~Mr. Barry W. A. Greengrass, General Manager~~ Mr. Giles E. Dixon
North American Plant Breeders
~~P. O. Box 991~~
~~Little Rock, Arkansas 72203~~
P.O. Box 2955, 5201 Johnson Drive
Mission, KS 66205
KE

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
- [ ] 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.)* [ ] YES [X] 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.

North American Plant ~~Breeders~~

June 2, 1975
(DATE)

Jim B Moutray
(SIGNATURE OF APPLICANT)

Dr. Jim B. Moutray
Forage Breeder

(DATE)

(SIGNATURE OF APPLICANT)

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.

RECEIVED
JUN 19 1975
S. DEPARTMENT
DIV.
PVPO

EXHIBIT A

Origin and Breeding History of the Variety

APOLLO

Apollo was developed using three cycles of phenotypic recurrent selection beginning in the spring of 1971. Initially 12,000 plants were screened for Phytophthora root rot resistance using the greenhouse procedure later described by Frosheiser and Barnes in Standard Tests For Characterizing Disease And Insect Resistance of Alfalfa Varieties, a committee report to the 23rd Alfalfa Improvement conference. In the initial cycle of selection, resistant plants were saved from the named varieties Titan, Vernal, Weevlchek, Anchor, Saranac, Tempo, Kanza, Dawson and Cody, plus breeding lines already in the program which had been selected for winterhardiness yield and bacterial wilt resistance. Survivors were intercrossed with subsequent cycles of greenhouse and field selection. In each cycle of selection a minimum of 200 plants were selected, with sufficient numbers screened so that selection for vigor as well as Phytophthora resistance was possible. During the development of Apollo a total in excess of 120,000 plants were screened for Phytophthora resistance. Final selections were made from the North American Plant Breeder's field Phytophthora nursery (946 selections) and North American Plant Breeder entries in the University of Minnesota Phytophthora fee test (202) in the fall of 1973. Of the 1148 parent clones, approximately 75% trace to hardy parentage predominately Titan, Vernal and Weevlchek. The other 25% trace equally to Flemish types predominately Anchor, Tempo, Saranac and Central types predominately Dawson, Cody and Kanza.

Breeders seed of Apollo was produced in the greenhouse at Ames, Iowa, during the period October, 1973, to August, 1974, with a sufficient quantity held in cold storage for the life of the variety. Stability of the cultivar will be assured since all commercial seed will trace to the original breeders seed. Foundation seed will be produced only from breeders seed, while certified seed may be produced from breeders or foundation. Seed produced from certified will not be recognized as Apollo.

AMENDED EXHIBIT A

APOLLO: Origin and Breeding History

It is confirmed that during seed production no variants beyond the limits defined under Exhibit C have been found and that the multiplication procedure will ensure that the seed being sold as Apollo will not have shifted in characteristics beyond accepted limits for alfalfa varieties.

ADDENDUM TO EXHIBIT A

APOLLO - - UNIFORMITY

It is also confirmed that:

"APOLLO MEETS PRESENTLY ACCEPTABLE LEVELS OF UNIFORMITY FOR ALFALFA VARIETIES."

NORTH AMERICAN PLANT BREEDERS

August 1, 1978
Date

Giles E. Dixon
Research Director

7500100

EXHIBIT B

Botanical Description of the Variety

APOLLO

Apollo exhibits good seedling vigor, fast recovery after cutting and good fall growth typical of high yielding alfalfas with substantial Flemish or Central type background. For fall growth habit Apollo resembles Citation more closely than any variety it has been compared to at Ames, Iowa, being virtually equal in fall dormancy. Apollo is much less fall dormant than Vernal and Agate. Bacterial wilt resistance is equal to Vernal with leafhopper tolerance better than Vernal and Nugget and much better than Agate.

Apollo has a high level of resistance to Phytophthora root rot and is equal to Agate, the only other variety with high resistance to this disease. Citation is not resistant to Phytophthora root rot.

FORM GR 470-32
(3/75)

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
GRAIN DIVISION
HYATTSVILLE, MARYLAND 20782

FOR[illegible]PPROVED, OMB NO. 40-R3712

EXHIBIT C

OBJECTIVE DESCRIPTION OF VARIETY

Alfalfa (Medicago sativa L. complex)

NAME OF APPLICANT(S)
North American Plant Breeders

ADDRESS (*Street and No., or R.F.D. No., City, State, and Zip Code*)
P. O. Box 991
Little Rock, Arkansas 72203

VARIETY NAME OR TEMPORARY DESIGNATION
Apollo

FOR OFFICIAL USE ONLY
PVPO NUMBER
7500100

Place the appropriate number that describes the varietal character of this variety in the boxes below.
Place a zero in first box (e.g. [0][8][9] or [0][9]) when number is either 99 or less or 9 or less.

NOTE: For single plant data a minimum of 100 plants is suggested

1. PRIMARY AREA OF ADAPTATION
All except # 5

[ ] 1 = NORTHWEST 2 = NORTHCENTRAL 3 = NORTHEAST
4 = SOUTHEAST 5 = SOUTHWEST 6 = SOUTHERN PLAINS
7 = INTERMOUNTAIN

INDICATE AREA WHERE TEST WAS CONDUCTED. FURTHER EXPLANATION CAN GO IN COMMENTS AT THE END OF THE FORM.
[ ] AREA TESTED
2, 4, 6

2. WINTER HARDINESS

[7] 1 = NON-HARDY (Mesa Sirsa) 3 = INTERMEDIATE NON-HARDY
5 = MODERATELY HARDY (Saranac) 7 = HARDY (Vernal)
9 = EXTREMELY HARDY (Norseman)

[1] SOURCE OF INFORMATION: 1 = ANTICIPATED 2 = MEASURED

[2] AREA TESTED

3. FALL GROWTH HABIT

[6] 1 = ERECT (Mesa Sirsa) 3 = SEMIERECT (DuPuits)
5 = INTERMEDIATE (Saranac) 7 = SEMIDECUMENT (Vernal)
9 = DECUMBENT (Norsement)

[2] AREA TESTED

4. RECOVERY AFTER FIRST SPRING CUTTING

[3] 1 = VERY FAST (Mesa Sirsa) 3 = FAST (Saranac) 5 = INTERMEDIATE
7 = SLOW (Vernal) 9 = VERY SLOW (Norseman)

[2] AREA TESTED

5. FLOWERING DATE (FIRST SPRING GROWTH)

[ ][ ] DAYS EARLIER THAN . . . . .
[ ][ ] DAYS LATER THAN . . . . .

[ ] 1 = MESA SIRSA 2 = LAHONTAN
3 = SARANAC 4 = VERNAL
5 = NORSEMAN

[ ] AREA TESTED

6. CROWN TYPE

[7] 1 = SPREADING ROOTS 3 = SPREADING RHIZOMES (Teton)
5 = BROAD (Vernal) 7 = INTERMEDIATE (Saranac)
9 = NARROW (Mesa Sirsa)

[2] AREA TESTED

7. PLANT COLOR

[5] 3 = DARK GREEN (Weevlchek) 5 = GREEN (Vernal)
7 = LIGHT GREEN (Ranger)

[2] AREA TESTED

8. HAIRINESS

[ ][ ][ ] % PLANTS WITH PUBESCENT STEMS

[0][8][2] % PLANTS WITH PUBESCENT PODS

9. POD SHAPE

[0][8][8] % PLANTS WITH TIGHT COILS

[0][1][2] % PLANTS WITH LOOSE COILS

[0][0][0] % PLANTS WITH SICKLE PODS (Less than 1 coil)

EXHIBIT D

NOVELTY STATEMENT

'APOLLO'

'Apollo' is most similar to 'Anchor', all characteristics considered.

'Apollo' differs from 'Anchor' by having a high level of resistance to Phytophthora root rot (*Phytophthora megasperma* Drechs.) while 'Anchor' is susceptible.

1979 Misc. Report 24 Univ. Minn.

Table 2. Winterhardiness index and disease resistance of alfalfa varieties eligible for certification

Variety	Developer or owner[1]	Winter hardiness (index)[2]	RESISTANT PLANTS[3] Bacterial wilt (percent)	Phytophthora root rot (percent)
VERY WINTERHARDY		highest value best		
Norseman	Barzen of Minneapolis	7.9	30	4
Ladak	USDA (foreign introduction)[e]	7.5	8	2
Travois	S. Dakota Agr. Exp. Sta.[p]	7.4	37	1
Ramsey	Minnesota Agr. Exp. Sta. & USDA	6.7	37	9
WINTERHARDY				
Baker	Nebraska Agr. Exp. Sta. & USDA[p]	6.5	50	3
Vernal	Wisconsin Agr. Exp. Sta. & USDA[eghlkpq]	6.5	42	2
Titan	Rudy Patrick Co.[e]	6.4	60	2
Conquest	Pioneer Hi-Bred International Inc.[l]	6.3	21	4
123	DeKalb Ag Research Inc.[b]	6.3	41	3
WL 215	Waterman-Loomis Co.[h]	6.3	36	4
Agate	Minnesota Agr. Exp. Sta. & USDA[ehkpq]	6.0	65	43
Iroquois	Cornell University[q]	6.0	61	1
Ladak 65	Montana Agr. Exp. Sta.	6.0	36	2
Nugget	P-A-G[j]	5.9	46	<1
520	Pioneer Hi-Bred International Inc.[m]	5.9	40	1
521	Pioneer Hi-Bred International Inc.[m]	5.9	19	1
524	Pioneer Hi-Bred International Inc.[m]	5.9	24	7
545	Pioneer Hi-Bred International Inc.[m]	5.8	35	25
SX-10	Sexauer Co.[p]	5.7	5	3
Phytor	Northrup, King & Co.[i]	5.5	34	24
Valor	Land O'Lakes[g]	5.5	36	2
Weevlchek	Farmers Forage Res. Coop.	5.5	57	2
Anchor	Rudy Patrick Co.[e]	5.4	36	3
Polar 1	Pride Seed Co.[n]	5.4	49	8
Ranger	Nebraska Agr. Exp. Sta. & USDA[eghk]	5.4	18	2
WL 220	Waterman-Loomis Co.	5.4	49	12
MODERATELY WINTERHARDY				
Pacer	Land O'Lakes[g]	5.3	33	8
Citation	North American Plant Breeders[h]	5.2	45	2
Marathon	Cargill[a]	5.2	36	2
WL 307	Waterman-Loomis Co.	5.2	26	<1
Apollo	North American Plant Breeders[e]	5.1	36	40
Tempo	Farmers Forage Res. Coop.	5.1	26	2
A59	E.F. Mangelsdorf & Bros. Inc.[o]	5.0	16	4
WL 310	Waterman-Loomis Co.	5.0	42	3
530	Pioneer Hi-Bred International Inc.[m]	5.0	38	2
WL 309	Waterman-Loomis Co.[hk]	4.7	25	3
WL 311	Waterman-Loomis Co.	4.7	36	2
Honeoye	Cornell University	4.6	16	<1
Saranac AR	Cornell University	4.6	29	8
WL 318	Waterman-Loomis Co.[hk]	4.6	32	20
G777	Funk Seed Int.[d]	4.5	25	4
Saranac	Cornell University[qq]	4.5	49	2
Thor	Northrup, King & Co.[i]	4.5	69	1
Vista	Cal/West Seeds	4.5	34	<1
A-57	Embro Seed Co. Inc.[o]	4.4	12	6
Atlas	North American Plant Breeders	4.3	39	3
Warrior	Northrup, King & Co.[i]	4.3	20	<1
131	Cal/West Seeds[b]	4.3	10	1
531	Pioneer Hi-Bred International Inc.[m]	4.3	23	3
Olympic	North American Plant Breeders[c]	4.2	39	3
WL 219	Waterman-Loomis Co.	4.2	27	9
Vangard	North American Plant Breeders[e]	4.1	28	3

[1]1979 seed suppliers: a. Cargill Seeds, b. DeKalb, c. Farmland Industries, d. Funk Seeds International, e. Interstate Seed and Grain Co., g. Land O'Lakes, Inc., h. Midland Cooperatives, Inc., i. Northrup, King & Co., j. P-A-G Seeds, k. Peterson Biddick, l. Peterson Forage Seed Div., m. Pioneer Hi-Bred International, Inc., n. Pride Company, Inc., o. Ramy Seed Co., p. The Sexauer Company, q. Twin City Seed Co.
[2]Based on fall growth after cutting 1st week of September: 1 = tallest (least winterhardy), 9 = shortest.
[3]Plants with little or no injury are classified as resistant.

11

TABLE 1

Phytophthora Resistance of Apollo Alfalfa

	University of Minnesota 1974	
Variety	% Resistance	Severity Index
Apollo	43.7	2.73 [1]
Agate	46.7	2.61
Vernal	6.0	3.83
Saranac	2.4	4.07

[1] Higher numbers represent more damage to the plants.

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TABLE 2

Ames, Iowa 1974 Data - Alfalfa - Trial ID 74-81-01-03

Phytophthora Nursery [1]

Entry	% Phytophthora Resistance
Apollo	58.8
Agate	54.5
Saranac	8.7

[1] Seeded 5-24-74

Read 9-1-74 Procedures used were those described by Frosheiser and Barnes in Standard Tests For Characterizing Disease And Insect Resistance of Alfalfa Varieties, a committee report to the 23rd Alfalfa Improvement conference.

TABLE 3

Fall Dormancy

	NAPB Ames, Iowa 10-22-74 Measurements	
	Planted April 18, 1974	Planted April 30, 1974
Variety	Height % Vernal	Height % Vernal
Vernal	100.0	100.0
Apollo	137.8	128.2
Agate	116.2	102.5

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TABLE 4

Leafhopper Yellowing

	NAPB Ames Iowa July 17, 1974 Ratings	
	Planted April 18, 1974	Planted April 30, 1974
Variety	Plant damage rating	Plant damage rating
Apollo	4.8 [1]	3.6
Vernal	5.0	4.0
Saranac	5.4	4.6
Agate	5.6	4.2

1 Lower numbers indicate less damage to leaves

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TABLE 5

Fall dormancy of alfalfa varieties in forage trials

Entry	NAPB Ames, Iowa[1] 10-22-74	NAPB Ames, Iowa[1] 10-14-75	NAPB Ames, Iowa[1] 10-22-74	NAPB Ames, Iowa[1] 10-14-75	NAPB Ames, Iowa[1] 10-15-75	NAPB Brookston[2] Indiana 10-28-75	Univ.Neb.[2] Mead 10-6-75	Texas A & M[1] Bushland 10-15-75	Univ. Wisc.[1] Janesville 10-22-75
Apollo	6.12	11.6	6.0	14.1	5.9	5.4	---	11.4	7.62
Atlas	---	---	6.5	14.1	6.4	4.0	---	13.0	---
Olympic	7.32	13.7	6.5	14.1	7.3	2.2	4.25	13.4	9.35
Victor	7.20	13.6	6.5	14.1	6.6	3.0	5.00	14.6	8.26
Nugget	5.6	12.4	5.4	12.7	5.0	8.0	---	---	---
Citation	6.1	12.2	5.6	14.1	4.9	6.0	5.00	---	---
Anchor	5.4	13.2	5.6	13.2	5.4	6.4	---	9.1	---
Titan	4.5	11.9	4.8	12.0	5.0	7.8	---	9.5	---
Vernal[3]	4.4	9.8	4.7	11.3	---	5.4	5.75	9.1	6.12
Saranac	7.0	14.0	6.7	14.3	5.7	5.2	4.75	10.6	8.06
Agate	5.2	11.6	4.8	12.2	4.9	8.4	---	8.3	---
LSD 5%		1.9		.8		1.25			
C. V.		11.9		4.9		19.5			
Seeded	4-74		5-74		4-75	4-75	4-74	8-74	5-75

1 Height in inches

2 Higher ratings indicate less fall growth

3 Left out of data from 1975 seedings. Seed received as certified Vernal does not have Vernal fall dormancy characteristics.

TABLE 6

Crown Width of Alfalfa Varieties at Ames, Iowa

Variety	Av. Width[1] Inches	No. Plants
Anchor	4.78	139
Nugget	4.48	130
Citation	4.22	156
Apollo	4.05	195
Atlas	4.73	199
Olympic	4.34	185
Victor	4.79	158
Titan	4.94	160
Saranac	3.89	207

Seeded in 30" rows May 1974 and thinned to one plant per foot. Measured October 31, 1975.

TABLE 7

Pod Shape and Pubescence of NAPB Alfalfa Varieties, October 1975, Warden, Washington

Variety	% Plants With[1] Pubescent Pods	% Plants With Tight Pods	% Plants With Loose Pods	% Plants With Sickle Pods
Anchor	89	86	14	0
Nugget	66	87	13	0
Citation	86	90	10	0
Apollo	82	88	12	0
Atlas	77	82	18	0
Olympic	79	81	19	0
Victor	93	84	16	0

1 1-4 rating, 1 = most hair 1 + 2 = % pubescent pods

TABLE 10

1975 Bacterial Wilt Trial
University of Minnesota

Entry	Minnesota Seed Lot No.	Average severity index*	Actual percent resistant plants**
Narragansett	AS-4	4.01	0.9
Ranger	AR-132	2.79	17.9
Vernal	FC 33696	2.30	34.2
LSD 5% level		.32	
LSD 1% level		.42	
CV		8.5%	

*Calculated on basis of average severity infection of individual plants in each of 3 replications (about 75 plants observed per entry per rep.).

Your entry(ies): Jim Moutray - North American Plant Breeders

Apollo (NAPB-44)	3137	2.32	29.1
Olympic (NAPB-43)	3138	2.23	31.5
Victor (NAPB-42)	3139	2.62	22.2
Atlas (NAPB-41)	3140	2.24	31.2

** Plants scored 0 and 1 (on a 1-5 scale) considered resistant.

TABLE 11

Anthracnose resistance of Apollo, Atlas, Olympic and Victor alfalfa

	Laboratory Tests						Field Rating	
	Virginia Poly. Institute[1] Glenn Buss May - June 1975		Kansas State Univ.[2] Don Stuteville Aug. - Sept. 1975		North Carolina[3] State-Thad Busbice May-June 1975	NAPB[4] Ames, Iowa Nov-Dec.1974		1975 NAPB[5] Forage Trial Brookston,Ind. 10-28-75
	% resistant[6] plants	Total plants rated	% survivors	Plants tested	% resistant plants	% resistant[6] plants	Total plants rated	
Apollo	69	32	3.3	240	34	11.7	165	5.6[7]
Atlas	96	24	40.8	244	59	44.6	172	3.0
Olympic	87	31	42.4	239	41	54.5	182	2.2
Victor	85	41	50.8	235	59	40.1	155	1.4
Anchor	--	--	--	--	--	10.1	143	6.2
Saranac	36	28	2.5	208	21	--		--
Belts 2-An4	91	56	--	--	--	--	--	--
Arc	--	--	76.4	179	66	49.9	176	1.8
Saranac AR	--	--	--	--	--	--	--	2.2
LSD 5% level			21.2		17			1.2

1 "Inoculation did not take too well. Damping off also caused problems and severely reduced numbers before and during the inoculation. The data are not much more than rough indicators of resistance."

2 No ratings taken, survivors considered resistant.

3 "Test was not as good as hoped, higher than usual environmental factor. Value for Saranac is unrealistically high."

4 Test only fair as rhizoctonia invaded benches and made determinations difficult.

5 Ratings complicated by presence of mildew plus Leptosphaerulina and common leafspot

6 Test conducted using Barnes basic scheme. Ratings of 1 + 2 = resistance.

7 Lower numbers are most desirable.

TABLE 12

Downy mildew resistance of Apollo, Atlas, Olympic and Victor alfalfa in Kansas State test by Dr. Don Stuteville -September, 1975

	% Plants Mildew Free		
	Isolate		
Entry	I 5	I 7	I 5 and I 7[1] in combination
Apollo	18.5	11.7	4.7
Atlas	30.0	30.4	12.0
Olympic	32.8	19.7	12.6
Victor	28.4	14.5	5.7
Saranac (Res. Ck.)	52.8	27.3	21.5
Anchor	36.8	39.0	21.6
Arc	---	---	4.8
Vernal	---	---	4.2
Agate	---	---	7.1
Kanza (Sus. Ck.)	1.0	1.9	1.1
LSD..05	10.4	9.8	21.2

1 Very severe test

TABLE 13

1974 Phytophthora Trial

University of Minnesota

Entry	Minn. Seed lot No.	Average severity index*	Actual Percent resistant plants**
Saranac (SCC 72)	2694	4.07	2.4
Vernal (VCC 72)	2695	3.83	6.0
15 x 17 (Syn. 2)	2895	4.74	1.0
Agate	2590	2.61	46.7
LSD 5% level		0.46	
LSD 1% level		0.60	
CV		9.5 %	

*Calculated on basis of average severity infection of individual plants in each of 4 replications.

**Plants scored 1 and 2 (on a 1-6 scale) considered resistant.

Your entry(ies): North American Plant Breeders

NAPB-44 -Apollo	3050	2.73	43.7
NAPB-45 - Exp.	3051	2.87	37.1
NAPB-46 - Exp.	3052	2.72	41.0
NAPB-47 - Exp.	3053	2.53	53.1

Mailed 10-18-74
Dr. Jim Moutray

Laddie J. Elling

cc: Duane M. Smith

TABLE 14

1975 Phytophthora Trial

University of Minnesota

Entry	Minn. Seed Lot No.	Average severity index*	Actual Percent resistant plants**
Saranac (SCC 72)	3043	5.26	0.0
15 x 17 (Syn. 2)	2895	5.55	0.0
Agate (Foundation)	2892	3.34	20.0
LSD 5% level		0.49	
LSD 1% level		0.65	
CV		8.5%	

*Calculated on basis of average severity infection of individual plants in each of 4 replications.

**Plants scored 1 and 2 (on a 1-6 scale) considered resistant.

Your entry(ies): Jim Moutray - North American Plant Breeders

Atlas	3140	5.51	0.0
Olympic	3138	4.75	1.5
Victor	3139	4.87	0.0
Apollo	3137	3.90	12.5

TABLE 15

Phytophthora Resistance of Apollo Alfalfa in NAPB Trials

Entry	Ames 1974[1] Phytophthora Nursery % Resistant Plants	Brookston, Indiana % Stand 7-21-74	74-85-01-01[2] % Stand 5-14-75
Apollo	58.8	72	96
Anchor	9.1	30	62
Nugget	--	24	28
Citation	--	30	64
Agate	54.5	64	92
Saranac	8.7	18	24
Titan	--	22	56
Ramsey	--	42	62
Vernal	--	28	62
LSD .05	14.3	17.14	36.8
C. V.	21.8	14.38	35.8
Replications	12	5	5

[1] Procedures used are those desctibed in ARS - NC-19

[2] Forage trial seeded April 18, 1974, with 100% stands. May rains kept ground saturated for three weeks. Phytophthora root rot severely depleted stands.

TABLE 17

1974 Spaced Plant Nursery, NAPB Ames, Iowa

Leafhopper Yellowing Tolerance[1]

Entry	% resistance[2]	Average Severity[2] Index	Number of plants rated
Apollo	59	3.40	178
Atlas	38	3.95	133
Olympic	65	3.31	175
Victor	56	3.38	146
Nugget	45	3.83	120
Citation	55	3.48	154
Titan	53	3.52	144
Anchor	16	4.63	128
Vernal	55	3.56	163
Saranac	37	3.97	201
Ranger	24	4.16	186
Weevlchek	87	2.70	198

1 Seeded 5-14-74 and thinned to 12" spacing June '74, ratings made 8-27-75.

2 Procedures used are those described in ARS-NC-19, 1-9 rating, 1-3 counted as resistant. Lower ASI ratings are most desirable.

TABLE 18

Leafhopper yellowing tolerance of alfalfa varieties in NAPB forage trials[1]

Entry	Ames, Iowa 7-17-74	Ames, Iowa 7-6-75	Ames, Iowa 7-17-74	Ames, Iowa 7-6-75	Ames, Iowa 8-28-75	Brookston, Ind. 7-1-75	Brookston, Ind. 8-13-75	Brookston, Ind. 8-13-75	Brookston, Ind. 6-26-75	Brookston, Ind. 8-25-75	Average
Apollo	4.8	3.2	3.6	3.8	3.2	3.0	6.0	5.8	4.2	2.8	4.0
Anchor	5.2	4.8	5.0	5.0	4.0	7.4	7.4	6.8	4.2	4.4	5.4
Atlas	--	--	4.0	4.6	3.4	--	--	3.8	3.0	3.4	--
Olympic	4.8	4.2	4.0	5.0	2.8	6.2	5.8	4.4	2.6	2.8	4.3
Victor	4.4	3.0	3.2	4.2	2.8	5.8	7.2	5.6	3.6	2.4	4.2
Nugget	5.2	4.0	3.8	4.4	2.6	6.2	7.2	6.4	3.6	4.8	4.8
Citation	5.0	3.8	4.0	4.2	2.6	6.4	6.6	3.6	2.8	2.6	4.2
Vernal[2]	5.0	3.8	4.0	4.6	--	5.6	4.6	3.6	--	--	--
Saranac	5.4	5.2	4.6	5.0	4.0	7.5	8.2	5.6	3.6	2.4	5.2
Titan	4.2	3.0	3.6	4.0	2.0	4.4	4.6	3.6	2.0	2.2	3.4
Agate	5.6	5.3	4.2	5.0	4.2	3.8	6.6	7.0	4.4	4.0	5.0
Seeded	4-74		5-74		4-75	4-74		5-74	4-75		

1 Lower numbers indicate less yellowing

2 Left out of data from 1975 seedings. Seed received as certified Vernal does not have Vernal fall dormancy characteristics.

TABLE 19

Bloom Note on Alfalfa Varieties at Hutchinson, Kansas

Variety	% Flowering[1]
Titan	27
Anchor	39
Vernal	23
Saranac	42
Apollo	33
Atlas	48
Victor	52
Olympic	38
Citation	61
Nugget	47
Agate	27
Kanza	25

1 First cutting made 5-20-75, bloom note taken 7-1-75 in forage plots

TABLE 20

1975 Seed Yield of alfalfa varieties at Warden, Washington[1]

Entry	% of checks[1]
Apollo	128
Atlas	132
Olympic	135
Victor	81
Nugget	135
Citation	134
Anchor	79
Vernal	85
Saranac	98
Titan	137
Agate	100
LSD 5%	45.9
C. V.	69.4

Checks average lbs/acre = 629

[1] Checks are Titan, Anchor, Vernal and Saranac

Seeded May 1974 in 44" rows at 2 lbs/acre

EXHIBIT E

Statement of the Basis of Applicant's Ownership

APOLLO

The variety was bred by employees of Rudy Patrick (now called Mel Thor Inc.) Company beginning in 1971, but ownership of the variety was successively trasferred from the Rudy Patrick Co. to International Plant Breeders Corporation (now called the Rudy Patrick Company, and from International Plant Breeders Corporation, now called the Rudy Patrick Company) to North American Plant Breeders, the present owners.

BILL OF SALE AND ASSIGNMENT

KNOW ALL MEN BY THESE PRESENTS that AGRIPRO BIOSCIENCES INC., a Delaware corporation (hereinafter referred to as "Seller"), pursuant to that certain Asset Purchase Agreement of even date herewith by and between Seller and AGR ACQUISITION CORPORATION, a Delaware corporation (hereinafter referred to as "Buyer") and for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, does hereby grant, bargain, sell, assign, convey and deliver unto Buyer, all of Seller's right, title and interest in and to the plant varieties owned/registered by Seller and more particularly set forth on Exhibit A attached hereto for which PVP Certificates have been issued by or may be pending before the U. S. Department of Agriculture.

TO HAVE AND TO HOLD UNTO PURCHASER, its successors and assigns forever.

IN WITNESS WHEREOF, Seller has executed this Bill of Sale and Assignment as of the 30th day of June, 1994.

AGRIPRO BIOSCIENCES INC.

BY: W. A. Zama

Title: President

STATE OF KANSAS, COUNTY OF JOHNSON

Before me, the undersigned, a Notary Public of the State and County aforesaid, personally appeared W. A. ZAMA with whom I am personally acquainted (or proved to me on the basis of satisfactory evidence) and who, upon oath, acknowledged himself to be the PRESIDENT of Agripro Biosciences Inc., the within named bargainor, a corporation, and that he as such PRESIDENT, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing the name of the corporation by himself as PRESIDENT.

WITNESS my hand and Notarial Seal at office the day and year above written.

Alma M. Weaver
Notary Public

My Commission Expires:
June 22, 1998

ALMA M. WEAVER
NOTARY PUBLIC
STATE OF KANSAS
My Appt. Exp. June 22, 1998

State of Delaware

Office of the Secretary of State

I, EDWARD J. FREEL, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF AMENDMENT OF "AGR ACQUISITION CORPORATION", CHANGING ITS NAME FROM "AGR ACQUISITION CORPORATION" TO "AGRIPRO SEEDS, INC.", FILED IN THIS OFFICE ON THE THIRTIETH DAY OF JUNE, A.D. 1994, AT 4:30 O'CLOCK P.M.

A CERTIFIED COPY OF THIS CERTIFICATE HAS BEEN FORWARDED TO THE NEW CASTLE COUNTY RECORDER OF DEEDS FOR RECORDING.

SECRETARY OF STATE

2394087 8100

AUTHENTICATION: 7169071

944121584

DATE: 07-01-94

CERTIFICATE OF AMENDMENT
OF
CERTIFICATE OF INCORPORATION
OF
AGR ACQUISITION CORPORATION

AGR Acquisition Corporation, a corporation organized and existing under and by virtue of the General Corporation Law of the State of Delaware,

DOES HEREBY CERTIFY:

FIRST: that the Board of Directors of said corporation, by the unanimous written consent of its members filed with the minutes of the Board, adopted a resolution proposing and declaring advisable the following amendment to the Certificate of Incorporation of said corporation:

RESOLVED, that the Certificate of Incorporation of this corporation be amended by changing the Article thereof numbered "ARTICLE I" so that, as amended, said Article shall be and read as follows:

"ARTICLE I

Name

The name of the corporation (hereinafter called the 'Corporation') is Agripro Seeds, Inc."

SECOND: That in lieu of a meeting and vote of stockholders, the sole shareholder of the corporation has given unanimous written consent to said amendment in accordance with the provisions of Section 228 of the General Corporation Law of the State of Delaware.

THIRD: That the aforesaid amendment was duly adopted in accordance with the applicable provisions of Sections 242 and 228 of the General Corporation Law of the State of Delaware.

FOURTH: That the capital of said corporation shall not be reduced under or by reason of said amendment.

IN WITNESS WHEREOF, said AGR Acquisition Corporation has caused this certificate to be signed by Gary T. Hancock, its President, and attested by Ann Steelman, its Secretary, this 30th day of June, 1994.

AGR ACQUISITION CORPORATION

BY: Gary T. Hancock
Gary T. Hancock, President

ATTEST:

BY: Ann Steelman
Ann Steelman, Secretary

FORM GR 470-32
(3/75)

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
GRAIN DIVISION
HYATTSVILLE, MARYLAND 20782

FOR[illegible]PROVED, OMB NO. 40-R3712

EXHIBIT C

OBJECTIVE DESCRIPTION OF VARIETY

Alfalfa (Medicago sativa L. complex)

NAME OF APPLICANT(S)
North American Plant Breeders

ADDRESS (*Street and No., or R.F.D. No., City, State, and Zip Code*)
P. O. Box 991
Little Rock, Arkansas 72203

VARIETY NAME OR TEMPORARY DESIGNATION
Apollo

FOR OFFICIAL USE ONLY
PVPO NUMBER
7500100

Place the appropriate number that describes the varietal character of this variety in the boxes below.
Place a zero in first box (e.g. [0][8][9] or [0][9]) when number is either 99 or less or 9 or less.

NOTE: For single plant data a minimum of 100 plants is suggested

1. PRIMARY AREA OF ADAPTATION

All except # 5

[ ] 1 = NORTHWEST 2 = NORTHCENTRAL 3 = NORTHEAST
4 = SOUTHEAST 5 = SOUTHWEST 6 = SOUTHERN PLAINS
7 = INTERMOUNTAIN

INDICATE AREA WHERE TEST WAS CONDUCTED. FURTHER EXPLANATION CAN GO IN COMMENTS AT THE END OF THE FORM.

[ ] AREA TESTED
2, 4, 6

2. WINTER HARDINESS

[7] 1 = NON-HARDY (Mesa Sirsa) 3 = INTERMEDIATE NON-HARDY
5 = MODERATELY HARDY (Saranac) 7 = HARDY (Vernal)
9 = EXTREMELY HARDY (Norseman)

[1] SOURCE OF INFORMATION: 1 = ANTICIPATED 2 = MEASURED

[2] AREA TESTED

3. FALL GROWTH HABIT

[6] 1 = ERECT (Mesa Sirsa) 3 = SEMIERECT (DuPuits)
5 = INTERMEDIATE (Saranac) 7 = SEMIDECUMENT (Vernal)
9 = DECUMBENT (Norsement)

[2] AREA TESTED

4. RECOVERY AFTER FIRST SPRING CUTTING

[3] 1 = VERY FAST (Mesa Sirsa) 3 = FAST (Saranac) 5 = INTERMEDIATE
7 = SLOW (Vernal) 9 = VERY SLOW (Norseman)

[2] AREA TESTED

5. FLOWERING DATE (FIRST SPRING GROWTH)

[ ][ ] DAYS EARLIER THAN . . . . . [ ] 1 = MESA SIRSA 2 = LAHONTAN
[ ][ ] DAYS LATER THAN . . . . . [ ] 3 = SARANAC 4 = VERNAL
5 = NORSEMAN

[ ] AREA TESTED

6. CROWN TYPE

[7] 1 = SPREADING ROOTS 3 = SPREADING RHIZOMES (Teton)
5 = BROAD (Vernal) 7 = INTERMEDIATE (Saranac)
9 = NARROW (Mesa Sirsa)

[2] AREA TESTED

7. PLANT COLOR

[5] 3 = DARK GREEN (Weevlchek) 5 = GREEN (Vernal)
7 = LIGHT GREEN (Ranger)

[2] AREA TESTED

8. HAIRINESS

[ ][ ][ ] % PLANTS WITH PUBESCENT STEMS

[0][8][2] % PLANTS WITH PUBESCENT PODS

9. POD SHAPE

[0][8][8] % PLANTS WITH TIGHT COILS

[0][1][2] % PLANTS WITH LOOSE COILS

[0][0][0] % PLANTS WITH SICKLE PODS (Less than 1 coil)

10. GIVE ITEM LENGTH FREQUENCY DISTRIBUTION FOR SUBMITTED AND 1 TO 5 STANDARD VARIETIES 1/

VARIETY NAME	STEM LENGTH FREQUENCY DISTRIBUTION 2/											AVERAGE STEM LENGTH
	0 – 5 mm. %	6 – 10 mm. %	11 – 15 mm. %	16 – 20 mm. %	21 – 30 mm. %	31 – 40 mm. %	41 – 50 mm. %	51 – 60 mm. %	61 – 70 mm. %	71 – 80 mm. %	81 + mm. %	

11. FLOWER COLOR 3/ (DETERMINE COLOR ON FRESHLY OPENED FLOWERS)

0 8 4 % PURPLE 0 1 6 % VARIEGATED 0 0 0 % YELLOW 0 0 0 % CREAM 0 0 0 % WHITE

12. DISEASE, INSECT, AND NEMATODE RESISTANCE: (Enter resistance of submitted and check cultivars. Circle check cultivars used.)

DISEASE	CULTIVAR	% RESISTANT PLANTS	AVG. SEVERITY INDEX (ASI)	ASI LSD .05	TEST, YEAR & LOCATION 4/
BACTERIAL WILT	(SUBMITTED)	29	2.32	.32	Univ. Minn. 1975 (Table 10)
	(RES. CK.) VERNAL	34	2.30		
	(SUS. CK.) NARRAGANSETT	0.9	4.01		
ANTHRACNOSE	(SUBMITTED)	16.3			Av. 3 tests (Table 11) 2 tests for Saranac
	(RES. CK.) ARC	64.1			
	(SUS. CK.) SARANAC	11.8			
COMMON LEAF SPOT	(SUBMITTED)				
	(RES. CK.) RAMSEY				
	(SUS. CK.) RANGER				
DOWNY MILDEW	(SUBMITTED)	4.7			Kansas State 1975 (Table 12)
	(RES. CK.) SARANAC	21.5			
	(SUS. CK.) KANZA	1.1			
PHYTOPHTHORA ROOT ROT	(SUBMITTED)	38			Av. 3 tests Tables 13, 14, 15
	(RES. CK.) AGATE	40			
	(SUS. CK.) SARANAC	4			
OTHER	(SUBMITTED)				
	(RES. CK.)				
	(SUS. CK.)				

1/ Preferred standards: Saranac, Vernal, Norseman, Lahontan, Mesa Sirsa. Twelve hours light at 25° C with 20,000 lux of cool white florescent; 2,000 lux of incandescent filament light and twelve hours darkness at 5°C.

2/ From cotyledonary node to tip of stem 20 days after planting.

3/ For further clarification consult USDA Agricultural Handbook No. 424.

4/ Give: The institution in charge of test, (2) year, and (3) location of test. Describe test procedure if it differs from procedure suggested in ARS-NC-19, September 1974.

12. DISEASE, INSECT, AND NEMATODE RESISTANCE: (Enter resistance of submitted and check cultivars. Circle check cultivars used.)

DISEASE	CULTIVAR	% RESISTANT PLANTS	AVG. SEVERITY INDEX (ASI)	ASI LSD .05	TEST, YEAR & LOCATION 4/
OTHER	(SUBMITTED)				
	(RES. CK.)				
	(SUS. CK.)				
OTHER	(SUBMITTED)				
	(RES. CK.)				
	(SUS. CK.)				

INSECT	CULTIVAR	% SEEDLING SURVIVAL	AVG' SEVERITY INDEX (ASI)	ASI LSD .05	TEST, YEAR & LOCATION 4/
PEA APHID	(SUBMITTED)				
	(RES. CK.) KANZA				
	(SUS. CK.) RANGER				
SPOTTED ALFALFA APHID	(SUBMITTED)				
	(RES. CK.) KANZA				
	(SUS. CK.) RANGER				

INSECT	CULTIVAR	% DEFOLIATION	AVG. SEVERITY INDEX (ASI)	ASI LSD .05	TEST, YEAR & LOCATION 4/
ALFALFA WEEVIL	(SUBMITTED)				
	(RES. CK.) ~~AXX~~Arc				
	(SUS. CK.) VERNAL				

INSECT	CULTIVAR	% RESISTANT PLANTS	EMERGED ADULTS PER PLANT	EMERGED LSD .05	TEST, YEAR & LOCATION 4/
ALFALFA SEED CHALCID	(SUBMITTED)				
	(RES. CK.) LAHONTAN				
	(SUS. CK.) SONORA				

INSECT	CULTIVAR	% RESISTANT PLANTS	AVG. SEVERITY INDEX (ASI)	ASI LSD .05	TEST, YEAR & LOCATION 4/
POTATO LEAF-HOPPER	(SUBMITTED)	59	3.40		NAPB Ames, Iowa 1975 (Table 17)
	Weevlchek (RES. CK.)	87	2.70		
	(SUS. CK.) Ranger	24	4.16		
OTHER	(SUBMITTED)				
	(RES. CK.)				
	(SUS. CK.)				

4/ Give: The institution in charge of test, (2) year, and (3) location of test. Describe test procedure if it differs from procedure suggested in ARS-NC-19, September 1974.