No. 200800023

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Frito-Lay North America, Inc.

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

An application requesting a certificate of protection for an alleged distinct variety of sexually reproduced, or tuber propagated 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 TWENTY 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 conditioning it for propagation, or stocking it for any of the above purposes, 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.)

POTATO

'FL 2126'

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, D.C.*** *this twenty-eighth day of October, in the year* ***two thousand and eleven.***

Attest:

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Secretary of Agriculture

REPRODUCE LOCALLY. *Include form number and date on all reproductions* — Form Approved - OMB No. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF OWNER
Frito-Lay North America, Inc.

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME
2000 95.12

3. VARIETY NAME
FL 2126

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*
7701 Legacy Drive
Plano, TX 75024

5. TELEPHONE *(include area code)*
(972) 334-3822

6. FAX *(include area code)*
(972) 334-5965

FOR OFFICIAL USE ONLY

PVPO NUMBER
#200800023

FILING DATE
11/5/2007

7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION *(corporation, partnership, association, etc.)*
Corporation

8. IF INCORPORATED, GIVE STATE OF INCORPORATION
DE

9. DATE OF INCORPORATION
August 8, 1989

10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. *(First person listed will receive all papers)*
Robert J. Jondle, Esquire
Jondle & Accociates, PC
858 Happy Canyon Road
Suie 230
Castle Rock, CO 80108

FEES RECEIVED

FILING AND EXAMINATION FEES:
$ 4,382.00
DATE 11/5/2007

CERTIFICATION FEE:
$
DATE

11. TELEPHONE *(Include area code)*
(303) 799-6444

12. FAX *(Include area code)*
(303) 799-6898

13. E-MAIL
rjondle@jondlelaw.com

14. CROP KIND *(Common Name)*
Potato

16. FAMILY NAME *(Botanical)*
Solanaceae

15. GENUS AND SPECIES NAME OF CROP
Solanum tuberosum L.

17. IS THE VARIETY A FIRST GENERATION HYBRID?
☐ YES ☑ NO

18. DOES THE VARIETY CONTAIN ANY TRANSGENES? (***OPTIONAL***)
☐ YES ☑ NO
IF SO, PLEASE GIVE THE ASSIGNED USDA-APHIS REFERENCE NUMBER FOR THE APPROVED PETITION TO DEREGULATE THE GENETICALLY MODIFIED PLANT FOR COMMERICALIZATION. _____

19. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED
(Follow instructions on reverse)

a. ☑ Exhibit A. Origin and Breeding History of the Variety
b. ☑ Exhibit B. Statement of Distinctness
c. ☑ Exhibit C. Objective Description of Variety
d. ☑ Exhibit D. Additional Description of the Variety *(Optional)*
e. ☑ Exhibit E. Statement of the Basis of the Owner's Ownership
f. ☑ Voucher Sample *(2,500 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository)*
g. ☑ Filing and Examination Fee ($3,652), made payable to "Treasurer of the United States" *(Mail to the Plant Variety Protection Office)*

20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? *(See Section 83(a) of the Plant Variety Protection Act)*
☐ YES *(If "yes", answer items 21 and 22 below)* ☑ NO *(If "no", go to item 23)*

21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES?
☐ YES ☑ NO
IF YES, WHICH CLASSES? ☐ FOUNDATION ☐ REGISTERED ☐ CERTIFIED

22. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?
☐ YES ☑ NO
IF YES, SPECIFY THE NUMBER 1,2,3, etc. FOR EACH CLASS.
☐ FOUNDATION ☐ REGISTERED ☐ CERTIFIED
(If additional explanation is necessary, please use the space indicated on the reverse.)

23. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES?
☐ YES ☑ NO
IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. *(Please use space indicated on reverse.)*

24. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT *(PLANT BREEDER'S RIGHT OR PATENT)*?
☐ YES ☑ NO
IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. *(Please use space indicated on reverse.)*

25. The owners declare that a viable sample of basic seed of the variety has been furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.

The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.

Owner(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE ~~OF OWNER~~
Thomas P. Schur

NAME *(Please print or type)*
Thomas P. Schur

CAPACITY OR TITLE
THOMAS P. SCHUR
ASSISTANT SECRETARY
FRITO-LAY NORTH AMERICA, INC.

DATE

SIGNATURE OF OWNER

NAME *(Please print or type)*

CAPACITY OR TITLE
Secretary

DATE
1 November 2007

(See reverse for instructions and information collection burden statement)

ST-470 (04-03) designed by the Plant Variety Protection Office using Word 2002.

#200800023

INSTRUCTIONS

GENERAL: To be effectively filed with the Plant Variety Protection Office (PVPO), **ALL** of the following items must be **received** in the PVPO: (1) Completed application form signed by the owner; (2) completed exhibits A, B, C, E; (3) for a seed reproduced variety at least 2,500 viable untreated seeds, for a hybrid variety at least 2,500 untreated seeds of each line necessary to **reproduce** the variety, or for tuber reproduced varieties verification that a viable *(in the sense that it will reproduce an entire plant)* tissue culture will be deposited and maintained in an approved public repository; (4) check drawn on a U.S. bank for $3,652 ($432 filing fee and $3,220 examination fee), payable to "Treasurer of the United States" *(See Section 97.6 of the Regulations and Rules of Practice.)* Partial applications will be held in the PVPO for not more than 90 days, then returned to the applicant as unfiled. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 401, NAL Building, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. Retain one copy for your files. All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. **DO NOT** use masking materials to make corrections. If a certificate is allowed, you will be requested to send a check payable to "Treasurer of the United States" in the amount of $432 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

Plant Variety Protection Office
Telephone: (301) 504-5518
FAX: (301) 504-5291
Homepage: http://www.ams.usda.gov/science/pvpo/pvpindex.htm

To avoid conflict with other variety names in use, the applicant must check the appropriate recognized authority and provide evidence that name has been cleared by the appropriate recognized authority before the Certificate of Protection is issued. For example, for agricultural and vegetable crops, contact: Seed Branch, AMS, USDA, 10301 Baltimore Avenue, Suite 401 NAL Building, Beltsville, MD 20705. Telephone: (301) 504-5682 http://www.ams.usda.gov/lsg/seed.htm.

ITEM

19a. Give:
(1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method;
(2) the details of subsequent stages of selection and multiplication;
(3) evidence of uniformity and stability; and
(4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified

19b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:

(1) identify these varieties and state all differences objectively;
(2) attach statistical data for characters expressed numerically and demonstrate that these are clear differences; and
(3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.

19c. Exhibit C forms are available from the PVPO Office for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.

19d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, *etc.*

19e. Section 52(5) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.

20. If "Yes" is specified *(seed of this variety be sold by variety name only, as a class of certified seed)*, the applicant **MAY NOT** reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. *(See Regulations and Rules of Practice, Section 97.103).*

23. *See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.*

24. *See Section 55 of the Act for instructions on claiming the benefit of an earlier filing date.*

22. CONTINUED FROM FRONT *(Please provide a statement as to the limitation and sequence of generations that may be certified.)*

23. CONTINUED FROM FRONT *(Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety (including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U.S. or other countries.)*

24. CONTINUED FROM FRONT *(Please give the country, date of filing or issuance, and assigned reference number, if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).)*

NOTES: It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. The fees for filing a change of address; owner's representative; ownership or assignment; or any modification of owner's name is specified in Section 97.175 of the regulations. *(See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of the Regulations and Rules of Practice.)*

#200800023 Exhibit A: Breeding History #200800023

Print Form

1. Describe the genealogy (including public and commercial varieties, lines or clones used) and the breeding methods.

FL 2126 originated in the Frito-Lay North America, Inc. private breeding program. The variety is a result of classical hybridization breeding. No gene insertion was involved in the breeding of FL 2126 or its parents. In 1998, Robert W. Hoopes made a cross between FL 1867 and Hermes (pedigree attached). FL 1867 was chosen as a breeding parent because of its high solids, uniform size and its potential for transmitting Globodera rostochiensis (R resistance to its progeny. Hermes was chosen for its exceptional flavor, high yield and yellow flesh. Seeds from the cross were sown in the greenhouses near Rhinelander, WI in 1999 and the resulting tubers were harvested and planted in the field in the spring of 2000. One of the selections from this progeny was given the designation 2000 95.12.

2. Give the details of subsequent stages of selection and multiplication.

Year	Detail of stage	Selection Criteria
2000	1st year in the field	Tuber appearance, Set
2001	2nd year in the field, 48 hills planted	Uniform tuber shape, Yield, High solids
2002	3rd year in the field, 50 pounds planted	Same as 2nd year, Bruise resistance, Good fry color at 42 degrees for 7 months
2003	4th year in the field, 300 pounds planted	Same as 3rd year
2004	Area Trial #1, 9 locations	Excellent fry color fresh through late storage, High solids, Yield, Tuber appearance
2005	Area Trial #2, 9 locations	Same as AT 1

3a. Is the variety uniform? ☒ Yes ☐ No

How did you test for uniformity?

Uniformity was tested for 4 years in Rhinelander and 2 years in Area Trials around the US (TX, ID, WNE, ENE, MO, MI, WI, ME, FL) as outlined above.

3b. Is the variety stable? ☒ Yes ☐ No

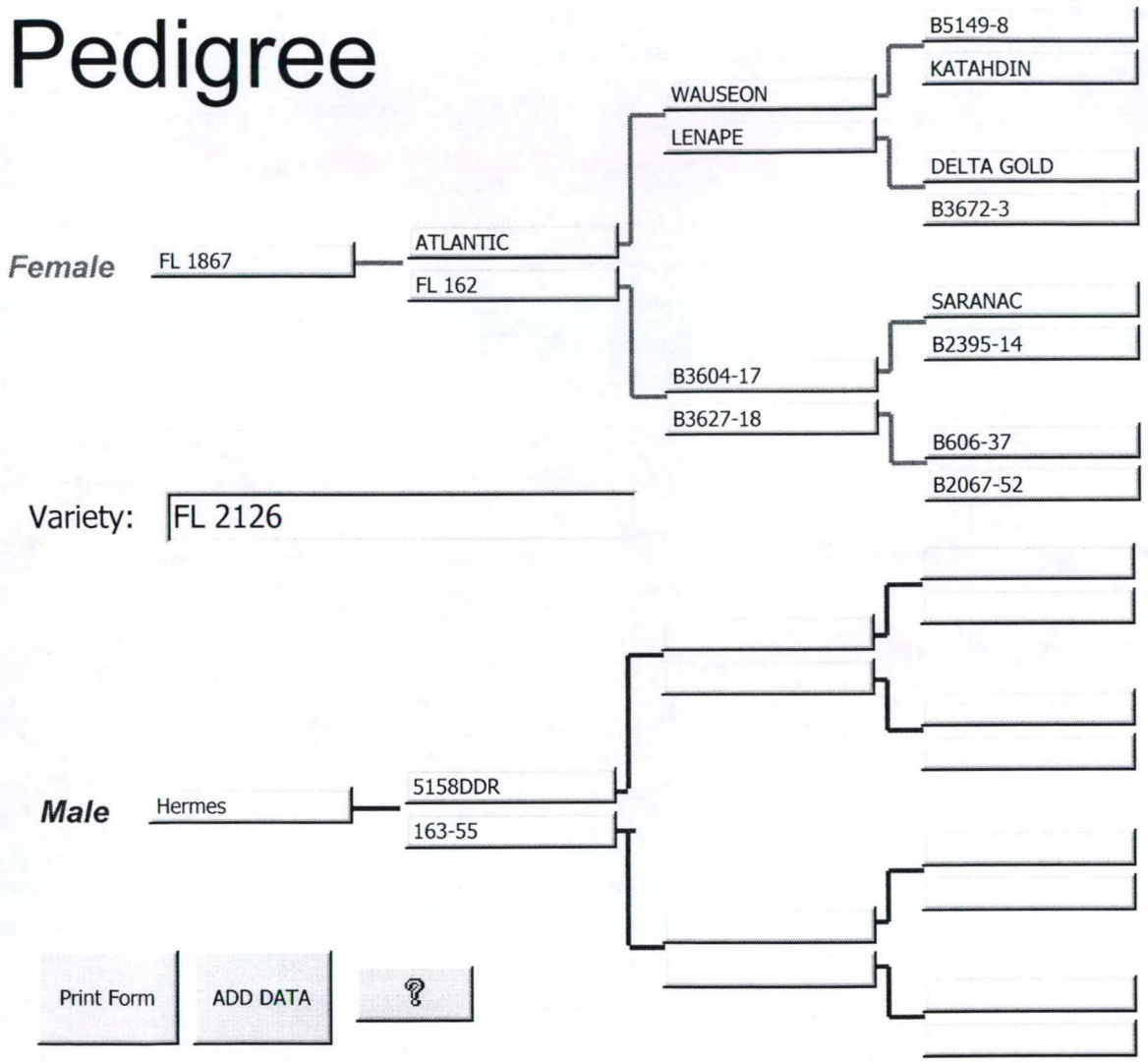
How did you test for stability? Over how many generations?

Stability was tested for 6 generations as outlined above.

4. Are genetic variations observable or expected during reproduction and multiplication? ☐ Yes ☒ No

If yes, state how these variants may be identified, their type and frequency.

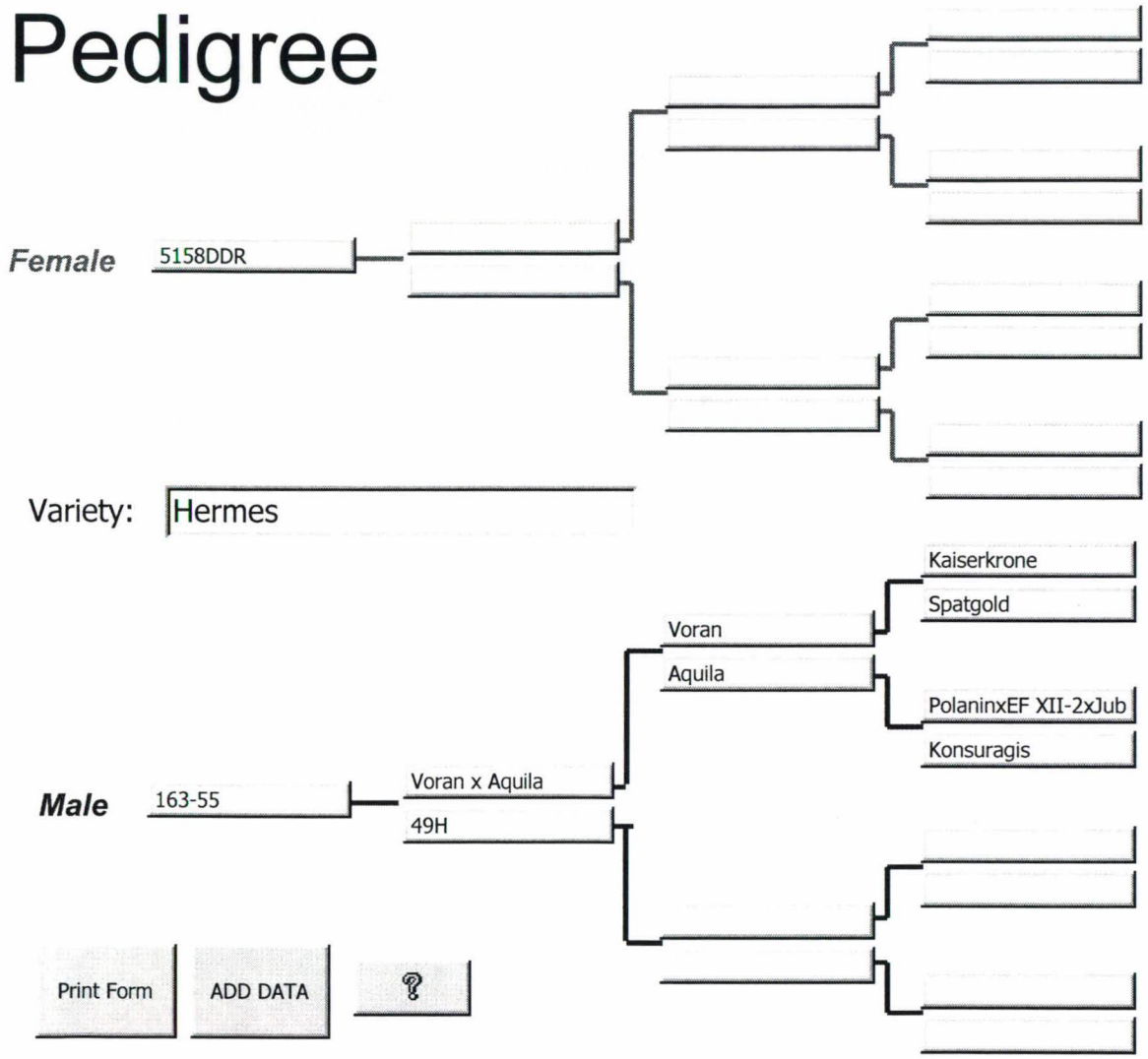
Pedigree



Variety Details (FL 2126)

Synonym:	2000 95.12
Shape:	Oblong
Flesh:	White
Skin:	White
Flower:	White
Maturity:	
Yield:	Medium
Usage:	Fresh and storage
Other:	Fair bruise resistance
Breeder:	Hoopes
Year:	1998
Institutes:	Frito-Lay
Citation:	
Comment:	Resistant to golden nematode

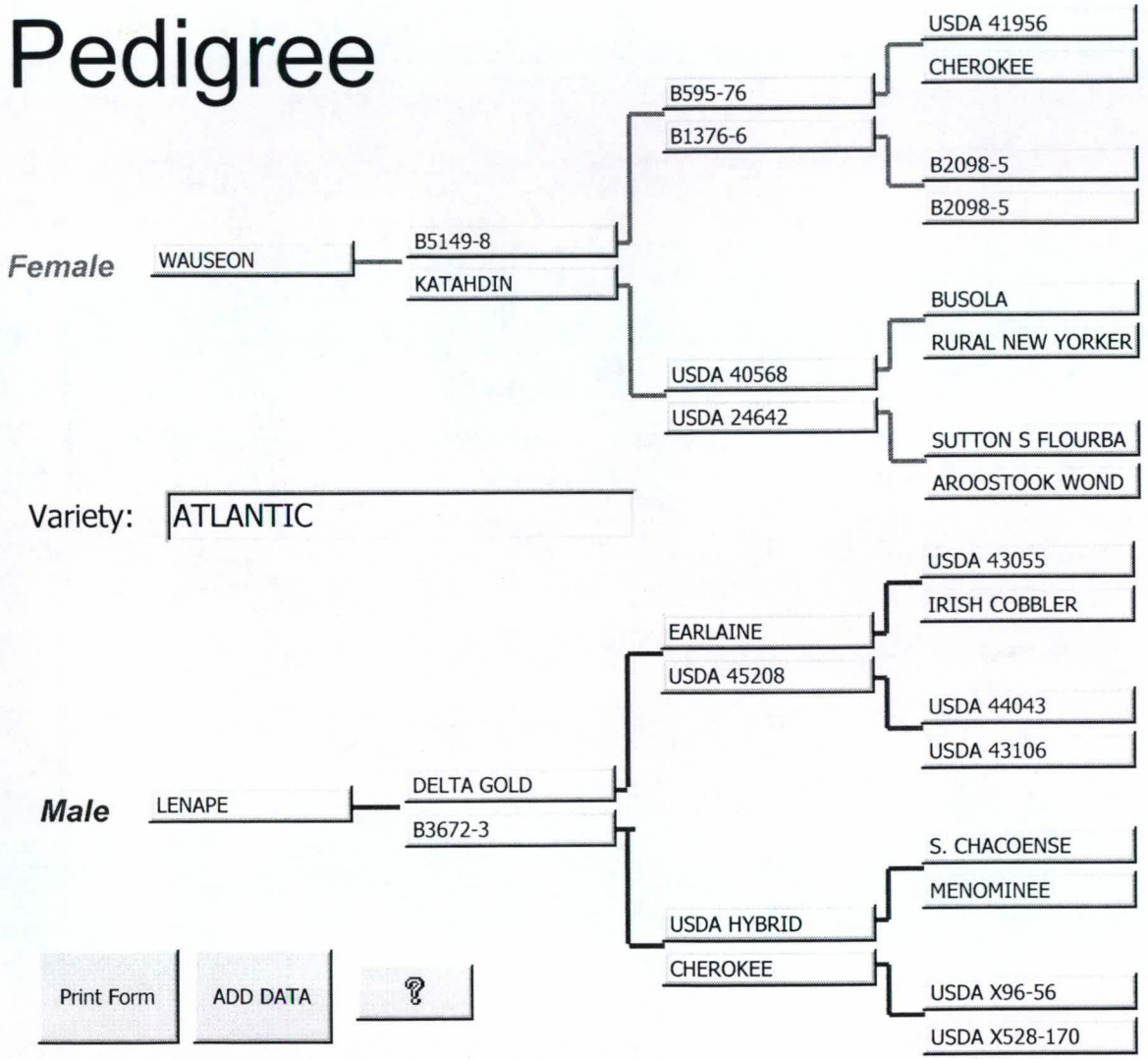
Pedigree



Variety Details (Hermes

Synonym:	FL 2087
Shape:	Round
Flesh:	Deep yellow
Skin:	Yellow
Flower:	Purple
Maturity:	Late
Yield:	Medium high
Usage:	
Other:	
Breeder:	
Year:	
Institutes:	
Citation:	
Comment:	Noted for making chips with good flavor. Released 1973, Austria

Pedigree



Variety Details (ATLANTIC)

Synonym:	B6987-56;
Shape:	OBLONG
Flesh:	
Skin:	BUFF
Flower:	LAVENDER
Maturity:	MEDIUM
Yield:	HIGH
Usage:	CHIPPING
Other:	HIGH SG, RES GOLD NEM,PVX
Breeder:	WEBB
Year:	1976
Institutes:	USDA, ME, FL
Citation:	APJ 55:141
Comment:	Res. PVX; susc. Hollow heart and internal necrosis

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Print Form

EXHIBIT B: Statement of distinctness

Based on overall morphology, FL 2126 (*Applicant's new variety*) is most similar to Atlantic (*Most similar comparison variey(ies)*)

FL 2126 (*Applicant's new variety*) most clearly differs from Atlantic (*Most similar comparison variety(ies)*) in the following traits:

Name the specific trait, then list the value of that trait for each variety in the comparison. Attach appropriate supporting evidence (see the Guidelines for Presenting Evidence in Support of Variety Distinctness, available from the PVP Office or website).

1. Qualitative traits:	New Variety: FL 2126	Comparison Variety: Atlantic	Evidence
Light Sprout shape	Spherical	Conical	
Leaf Silhouette	Closed	Open	See photos in Exhibit D
2. Color traits:			
Corolla Color	RHS 157A White	RHS 82C Purple Violet	
Calyx Coloration	Absent	Medium	See photos in Ex. D
Stigma Color	144A Yellow-Green	137A Green	
Anther Color	13A Yellow	14A Yellow-Orange	
3. Quantitative traits:			
Bruise Profile	Low Susceptibility	High Susceptibility	See Exhibit D-7
Number of secondary and tertiary leaflet pairs	15.4 +/- 4.3 N=20	8.95 +/- 1.5 N=20	Attached
Florets/Inflorescence	4.65 +/- 4.8 N=20	16.2 +/- 2.2 N=20	Attached
4. Other:			
Isozyme finger print			See Exhibit D-1

NUMBER OF 2° AND 3° LEAFLET PAIRS

PLANT #	FL 2126	ATLANTIC
1	19	9
2	16	12
3	14	7
4	20	10
5	19	8
6	11	10
7	21	8
8	8	10
9	23	10
10	18	9
11	12	9
12	14	12
13	11	8
14	23	10
15	11	7
16	14	8
17	12	9
18	15	9
19	15	6
20	12	8

FL 2126		*ATLANTIC*	
Mean	15.4	Mean	8.95
Standard Error	0.966273	Standard Error	0.343932
Median	14.5	Median	9
Mode	14	Mode	9
Standard Deviation	4.321306	Standard Deviation	1.538112
Sample Variance	18.67368	Sample Variance	2.365789
Kurtosis	-0.84175	Kurtosis	0.176354
Skewness	0.344204	Skewness	0.285178
Range	15	Range	6
Minimum	8	Minimum	6
Maximum	23	Maximum	12
Sum	308	Sum	179
Count	20	Count	20
Confidence Level(95.0%)	2.022434	Confidence Level(95.0%)	0.719859

NUMBER OF FLORETS PER INFLORESCENCE

PLANT #	FL 2126	ATLANTIC
1	20	16
2	4	18
3	10	11
4	10	18
5	2	13
6	8	16
7	1	18
8	10	18
9	3	18
10	4	16
11	1	15
12	1	17
13	1	17
14	1	19
15	1	12
16	4	17
17	3	16
18	1	18
19	2	13
20	6	18

FL 2126		*ATLANTIC*	
Mean	4.65	Mean	16.2
Standard Error	1.08646	Standard Error	0.510933
Median	3	Median	17
Mode	1	Mode	18
Standard Deviation	4.858796	Standard Deviation	2.284962
Sample Variance	23.60789	Sample Variance	5.221053
Kurtosis	4.167951	Kurtosis	0.145194
Skewness	1.90104	Skewness	-1.06705
Range	19	Range	8
Minimum	1	Minimum	11
Maximum	20	Maximum	19
Sum	93	Sum	324
Count	20	Count	20
Confidence Level(95.0%)	2.273987	Confidence Level(95.0%)	1.069396

#200800023

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MD 20705

Exhibit C

OBJECTIVE DESCRIPTION OF VARIETY
Potato (*Solanum tuberosum* L.)

INSTRUCTIONS

The Objective Description Form:
The objective description form lists characteristics to be used as the basis for developing the description of potato varieties. It is designed to guide the applicant in describing a variety in detail so a meaningful comparison with other potato varieties can be accomplished. It is recommended that this form be completed in as much detail as possible to ensure an accurate description. Please fill in the requested data and place the appropriate number that describes the varietal characters typical of this potato variety and the reference varieties in the respective boxes.

Test Guidelines:
Any statistical and trial (field test) data that may be necessary to support the variety description should be attached to this form. Please include for trial data the plot size, number of replications, number of plants, plant spacing, trial locations and growing periods. Trials should normally be conducted at one place, in the region that the variety has been adapted for, with a minimum of one growing period in the United States. All comparative data should be determined from varieties entered in the same trials. The size of the plots should be such that plants or parts of plants may be removed for measuring and counting without prejudice to the observations which must be made at the end of the growing period. As a minimum, each test should include a total of 60 plants which should be divided between two or more replicates. Separate plots for observation and measuring can only be used if they have been subject to similar environmental conditions. To determine color for a plant or plant parts a recognized standard color chart must be used such as the Royal Horticultural Society (RHS) Color Chart or Munsell Color Chart (MCC).

Reference Varieties:
The application variety should be compared to at least one reference variety preferably a set of reference varieties. The reference varieties should be market class standard varieties currently grown in the United States and or the variety (ies) most similar. The following varieties are recommended as market class standards to be used as reference varieties:

Yellow-flesh table-stock	Yukon Gold
Round-white table-stock	Superior
Chip-processing	Atlantic, Snowden, Norchip
Frozen-processing	Russet Burbank
Russet table-stock	Russet Burbank, Russet Norkotah, Goldrush
Red table-stock	Red Pontiac, Red Norland, Red Lasoda

If the applicant does not use one of the recommended reference varieties by the PVP office, a complete description of the reference variety should be submitted by the applicant (Exhibit C).

Characteristics:
Light sprout characteristics are supplied in **Figure 1**. The plant type and growth habit characteristics are collected at early first bloom. **Figure 2** is supplied to help visualize the growth habit. For this descriptor, look at the stems rather than the stems and foliage. Plant maturity is measured at natural vine senescence.

Stem characteristics are also collected at early bloom. Stem anthocyanin coloration is divided into two descriptors: Location and intensity. **Figure 3** is supplied to give an example of stem wings.

Leaf characteristics are observed at early first bloom. Fully-developed leaves located on the middle third of the plant should be used. Leaf pubescence refers to general trichomes. **Figure 4** is supplied for examples of leaf silhouette. Leaf stipules are shown in **Figure 5** for visual definition. **Figure 6** is supplied to define leaf characteristics. **Figure 7** should be used to describe terminal and primary leaflet shape. **Figures 8 and 9** are used to describe the terminal and primary leaflet shape of tip and base, respectively. To measure the total number of primary leaflets pairs, collect 10 fully developed petioles (with leaves attached from each replication) and take the average number of secondary and tertiary leaflets. Glandular trichomes should be described in the Additional Comments and Characteristics (Descriptor 15).

Inflorescence characteristics should be measured at early first bloom. **Figures 10, 11 and 12** are supplied to describe anther and stigma shape, respectively. Corolla, calyx, anther, stigma, and pollen should be observed on newly opened flowers. Berry production should be based on field-grown plants rather than greenhouse plants.

Tuber characteristics should be observed following harvest. **Figures 13 and 14** are available to describe distribution of secondary color and tuber shape, respectively.

Disease and pest reactions should be based upon specific tests or statistical analysis rather than just field observations, rating 1 as Highly Resistance and 9 as Highly Susceptible, please follow the scale on each descriptor. Other diseases or pests reactions not requested can be described if it is felt that it would be helpful to determine novelty of the variety.

Quality characteristics should be described according to the market use.

If the plant is transgenic, this gene insertion(s) should be described.

Chemical identification and any other characteristics can be described if they are helpful in distinguishing the variety.

Legend:

V = Application Variety

R1-R4 = Reference Varieties

* = Both the reference variety (ies) and application variety must be described for characteristics designated with an asterisk.

NAME OF APPLICANT (S)	TEMPORARY OR EXPERIMENTAL DESIGNATION	VARIETY NAME
Frito Lay North America, Inc.	2000 95.12	FL 2126

ADDRESS *(Street and No. or RD No., City, State, Zip Code, and Country)*

7701 Legacy Drive
Plano, TX 75024

FOR OFFICIAL USE ONLY

PVPO NUMBER

#200800023

REFERENCE VARIETIES: Enter the reference variety name in the appropriate box.

Application Variety (V)	Reference Variety 1 (R1)	Reference Variety 2 (R2)	Reference Variety 3 (R3)	Reference Variety 4 (R4)
FL 2126	Atlantic			

PLEASE READ ALL INSTRUCTIONS CAREFULLY:

1. MARKET CHARACTERISTICS:

***MARKET CLASS**:
1 = Yellow-flesh Tablestock 2 = Round-white Tablestock 3 = Chip-processing 4 = Frozen-processing
5 = Russet Tablestock 6 = Other _____

V	R1	R2	R3	R4
3	3			

2. LIGHT SPROUT CHARACTERISTICS: (See Figure 1)

***LIGHT SPROUT: GENERAL SHAPE**
1 = Spherical 2 = Ovoid 3 = Conica 4 = Broad cylindrica 5 = Narrow cylindrical 6 = Other _____

V	R1	R2	R3	R4
1	3/4			

***LIGHT SPROUT BASE: PUBESCENCE OF TIP**
1 = Absent 2 = Weak 3 = Medium 4 = Strong 5 = Very Strong

V	R1	R2	R3	R4
2	3			

***LIGHT SPROUT BASE: ANTHOCYANIN COLORATION**
1 = Green 2 = Red-violet 3 = Blue-violet 4 = Other(describe) _____

V	R1	R2	R3	R4
2	2			

***LIGHT SPROUT BASE: INTENSITY OF ANTHOCYANIN COLORATION (IF PRESENT)**
1 = Absent 2 = Weak 3 = Medium 4 = Strong 5 = Very Strong

V	R1	R2	R3	R4
2-3	4			

*** LIGHT SPROUT TIP: HABIT**
1 = Closed 2 = Intermediate 3 = Open

V	R1	R2	R3	R4
1	2			

2. LIGHT SPROUT CHARACTERISTICS: (continued)

LIGHT SPROUT TIP: PUBESCENCE
1 = Absent 2 = Weak 3 = Medium 4 = Strong 5 = Very Strong

V	2	R1	2	R2		R3		R4	

LIGHT SPROUT TIP ANTHOCYANIN COLORATION
1 = Green 2 = Red-violet 3 = Blue-violet 4 = Other(describe) _____

V	1	R1	1	R2		R3		R4	

Faint Red violet at tip

LIGHT SPROUT TIP: INTENSITY OF ANTHOCANIN COLORATION (IF PRESENT)
1 = Absent 2 = Weak 3 = Medium 4 = Strong 5 = Very Strong

V		R1		R2		R3		R4	

LIGHT SPROUT ROOT INITIALS: FREQUENCY
1 = Short 2 = Medium 3 = Long

V	1	R1	2	R2		R3		R4	

3. PLANT CHARACTERISTICS:

GROWTH HABIT: (See Figure 2)
3 = Erect (>45° with ground) 5 = Semi-erect (30-45° with ground) 7 = Spreading

V	5	R1	5	R2		R3		R4	

TYPE:
1 = Stem (foliage open, stems clearly visible) 2 = Intermediate 3 = Leaf (Foliage closed, stems hardly visible)

V	2	R1	2	R2		R3		R4	

MATURITY: Days after planting (DAP) at vine senescence

V	125-130	R1	120	R2		R3		R4	

PLANTING DATE:

V	4/27/05	R1	4/27/05	R2		R3		R4	

***REGIONAL AREA**:
1 = Pacific North West (WA, OR, ID, CO, CA) 2 = North Central (ND, WI, MI, MN, OH) 3 = North East (ME, NY, PA, NJ, MD, MA, RI,)
4 = Mid-Atlantic Erect (VI, NC, SC, South NJ, FL) 5 = South (LA, TX, AZ, NE) 6 = Canada
7 = Europe 8 = England 9 = Latin America 10 = Brazil 11 = Other _____

V	2	R1	2	R2		R3		R4	

MATURITY CLASS:
1 = Very Early (<100 DAP) 2 = Early (100-110 DAP) 3 = Mid-season (111-120 DAP) 4 = Late (121-130 DAP) 5 = Very Late (>130 DAP).

V	4	R1	3	R2		R3		R4	

4. STEM CHARACTERISTICS: Measure at early first bloom

*** STEM ANTHOCYANIN COLORATION**:
1 = Absent 3= Weak 5 = Medium 7 = Strong 9 = Very Strong

V	1	R1	2	R2		R3		R4	

STEM WINGS: (See Figure 3)
1 = Absent 3 = Weak 5 = Medium 7 = Strong 9 = Very Strong

V	5	R1	4	R2		R3		R4	

5. LEAF CHARACTERISTICS:

LEAF COLOR: (*Observe fully developed leaves located on middle 1/3 of plant)*
1 = Yellowing-green 2 = Olive-green 3 = Medium Green 4 = Dark Green 5 = Grey-green 6 = Other _____

V	3	R1	3	R2		R3		R4	

LEAF COLOR CHART VALUE: Royal Horticulture Society Color Chart or Munsell Color Chart
(*Observe fully developed leaves located on middle 1/3 of plant and circle the appropriate color chart)*

V	146A	R1	146A	R2		R3		R4	

LEAF PUBESCENCE DENSITY:
1 = Absent 2 = Sparse 3 = Medium 4 = Thick 5 = Heavy

V		R1		R2		R3		R4	

LEAF PUBESCENCE LENGTH:
1 = None 2 = Short 3 = Medium 4 = Long 5 = Very Long

V		R1		R2		R3		R4	

(*Note Descriptor #15 can be used to describe the type and length of the glandular trichomes observed.)*

*** LEAF SILHOUETTE**: (See Figure 4)
1 = Closed 3 = Medium 5 = Open

V	2	R1	5	R2		R3		R4	

PETIOLES ANTHOCYANIN COLORATION:
1 = Absent 3 = Weak 5 = Medium 7 = Strong 9 = Very Strong

V	1	R1	3	R2		R3		R4	

LEAF STIPULES SIZE: (Se Figure 5)
1 = Absent 3 = Small 5 = Medium 7 = Large

V	5	R1	5	R2		R3		R4	

TERMINAL LEAFLET SHAPE (See Figures 6 and 7)
1 = Narrowly ovate 2 = Medium Ovate 3 = Broadly Ovate 4 = Lanceolate 5 = Elliptical 6 = Obovate 7 = Oblong 8 = Other _____

V	3	R1	2	R2		R3		R4	

5. LEAF CHARACTERISTICS: (continued)

TERMINAL LEAFLET TIP SHAPE: (See Figures 6 and 8)
1 = Acute 2 = Cuspidate 3 = Acuminate 4 = Obtuse 5 = Other _____

V	3	R1	2/3	R2		R3		R4	

* **TERMINAL LEAFLET BASE SHAPE**: (See Figure 9)
1 = Cuneate 2 = Acute 3 = Obtuse 4 = Cordate 5 = Truncate 6 = Lobed 7 = Other _____

V	4	R1	4	R2		R3		R4	

TERMINAL LEAFLET MARGIN WAVINESS:
1 = Absent 2 = Slight 3 = Weak 4 = Medium 5 = Strong

V	3	R1	2	R2		R3		R4	

NUMBER OF PRIMARY LEAFLET PAIRS: (See Figure 6)

AVERAGE:

V	5.15	R1	4.5	R2		R3		R4	

RANGE:

V	4 to 6	R1	4 to 5	R2	to	R3	to	R4	to

PRIMARY LEAFLET TIP SHAPE: (See Figures 6 and 8)
1 = Acute 2 = Cuspidate 3 = Acuminate 4 = Obtuse 5 = Other _____

V	3	R1	2/3	R2		R3		R4	

PRIMARY LEAFLET SIZE:
1 = Very Small 2 = Small 3 = Medium 4 = Large 5 = Very Large

V	4	R1	5/4	R2		R3		R4	

PRIMARY LEAFLET SHAPE: (See Figures 6 and 7)
1 = Narrowly ovate 2 = Medium ovate 3 = Broadly ovate 4 = Lanceolate 5 = Elliptical 6 = Ovate 7 = Oblong 8 = Other _____

V	2/3	R1	2	R2		R3		R4	

PRIMARY LEAFLET BASE SHAPE: (See Figures 6 and 9)
1 = Cuneate 2 = Acute 3 = Obtuse 4 = Cordate 5 = Truncate 6 = Lobed 7 = Other _____

V	4	R1	4	R2		R3		R4	

NUMBER OF SECONDARY AND TERTIARY LEAFLET PAIRS: (See Figure 6)

AVERAGE:

V	15.4	R1	8.95	R2		R3		R4	

RANGE:

V	8 to 23	R1	7 to 12	R2	to	R3	to	R4	to

5. LEAF CHARACTERISTICS: (continued)

NUMBER OF INFLORESCENCE/PLANT:

AVERAGE:

V	R1	R2	R3	R4
.65	5.45			

RANGE:

V	R1	R2	R3	R4
0 to 2	2 to 9	to	to	to

NUMBER OF FLORETS/INFLORESCENCE:

AVERAGE:

V	R1	R2	R3	R4
4.65	16.2			

RANGE:

V	R1	R2	R3	R4
1 to 20	12 to 18	to	to	to

*** COROLLA INNER SURFACE COLOR CHART VALUE**: Royal Horticulture Society Color Chart or Munsell Color Chart (Measure predominant color of newly open flower and circle the appropriate color chart)

V	R1	R2	R3	R4
157A	82C			

*** COROLLA OUTER SURFACE COLOR CHART VALUE**: Royal Horticulture Society Color Chart or Munsell Color Chart (Measure predominant color of newly open flower and circle the appropriate color chart)

V	R1	R2	R3	R4
157A	82C			

*** COROLLA INNER SURFACE COLOR**: (Measure predominant color of newly open flower)
1 = White 2 = Red-violet 3 = Blue-violet 4 = Cream 5 = Red-purple 6 = Blue 7 = Pink 8 = Pink-white
9 = Purple 10 = Violet 11 = Other _____

V	R1	R2	R3	R4
1	9-10			

COROLLA SHAPE: (See Figure 10)
1 = Very rotate 2 = Rotate 3 = Pentagonal 4 = Semi-stellate 5 = Stellate

V	R1	R2	R3	R4
2	3			

6. INFLORESCENCE CHARACTERISTICS:

CALYX ANTHOCYANIN COLORATION:
1 = Absent 3 = Weak 5 = Medium 7 = Strong 9 = Very strong

V	R1	R2	R3	R4
1	5			

ANTHER COLOR CHART VALUE: Royal Horticulture Society Color Chart or Munsel Color Chart (Measure when newly opened flower is fully expanded and circle the appropriate color chart)

V	R1	R2	R3	R4
13A	14A			

ANTHER SHAPE: (See Figure 11)
1 = Broad cone 2 = Narrow cone 3 = Pear-shaped cone 4 = Loose 5 = Other

V	R1	R2	R3	R4
2/3	2			

6. INFLORESCENCE CHARACTERISTICS: (continued)

POLLEN PRODUCTION:
1 = None 3 = Some 5 = Abundant

V		R1		R2		R3		R4	

STIGMA SHAPE: (See Figure 12)
1 = Capitate 2 = Clavate 3 Bi-lobed

V	1	R1	1	R2		R3		R4	

STIGMA COLOR CHART VALUE: Royal Horticulture Society Color Chart or Munsel Color Chart (Circle the appropriate color chart)

V	144A	R1	137A	R2		R3		R4	

BERRY PRODUCTION: (Under field conditions)
1 = Absent 3 = Low 5 = Moderate 7 = Heavy 9 = Very Heavy

V		R1		R2		R3		R4	

7. TUBER CHARACTERISTICS:

*** PREDOMINANT SKIN COLOR**:
1 = White 2 = Light Yellow 3 = Yellow 4 = Buff 5 = Tan 6 = Brown 7 = Pink 8 = Red 9 = Purplish-red
10 = Purple 11 = Dark purple-black 12 = Other _____

V	5	R1	5	R2		R3		R4	

PREDOMINANT SKIN COLOR CHART VALUE: Royal Horticulture Society Color Chart or Munsell Color Chart (Circle the appropriate color chart)

V	RHS199C	R1	RHS 199C	R2		R3		R4	

SECONDARY SKIN COLOR:
1 = Absent 2 = Present (please describe)

V	1	R1	1	R2		R3		R4	

SECONDARY SKIN COLOR CHART VALUE: Royal Horticulture Society Color Chart or Munsell Color Chart (Circle the appropriate color)

V		R1		R2		R3		R4	

SECONDARY SKIN COLOR DISTRIBUTION: (See Figure 13)
1 = Eyes 2 = Eyebrows 3 = Splashed 4 = Scattered 5 = Spectacled 6 = Stippled 7 = Other _____

V		R1		R2		R3		R4	

SKIN TEXTURE:
1 = Smooth 2 = Rough (flaky) 3 = Netted 4 = Russetted 5 = Heavily russetted 6 = Other _____

V	2	R1	2	R2		R3		R4	

7. **TUBER CHARACTERISTICS**: (continued)

*** TUBER SHAPE**: (See Figure 14)
1 = Compressed 2 = Round 3 = Oval 4 = Oblong 5 = Long 6 = Other _____

V	3-4	R1	2-3	R2		R3		R4	

TUBER THICKNESS:
1 = Round 2 = Medium thick 3 = Slightly flattened 4 = Flattened 5 = Other _____

V	3	R1	2	R2		R3		R4	

TUBER LENGTH (mm):

AVERAGE:

V	70.4	R1	70.7	R2		R3		R4	

RANGE:

V	33 to 130	R1	40 to 130	R2	to	R3	to	R4	to

STANDARD DEVIATION:

V	17.8	R1	16.8	R2		R3		R4	

AVERAGE WEIGHT OF SAMPLE TAKEN:

V	27 #	R1	37.5 #	R2		R3		R4	

TUBER WIDTH (mm)

AVERAGE:

V	57.8	R1	68.3	R2		R3		R4	

RANGE:

V	34 to 101	R1	40 to 110	R2	to	R3	to	R4	to

STANDARD DEVIATION:

V	12.1	R1	12.9	R2		R3		R4	

AVERAGE WEIGHT OF SAMPLE TAKEN (g):

V	27 #	R1	37.5	R2		R3		R4	

7. **TUBER CHARACTERISTICS**: (continued)

TUBER THICKNESS (mm):

AVERAGE:

V	R1	R2	R3	R4
48.2	58.3			

RANGE:

V	R1	R2	R3	R4
30 to 75	35 to 95	to	to	to

STANDARD DEVIATION:

V	R1	R2	R3	R4
9.2	10.5			

AVERAGE WEIGHT OF SAMPLE TAKEN (g):

V	R1	R2	R3	R4
27	37.5			

TUBER EYE DEPTH:

1 = Protruding 3 = Shallow 5 = Intermediate 7 = Deep 9 = Very deep

V	R1	R2	R3	R4
5	7			

TUBER LATERAL EYES:

1 = Protruding 3 = Shallow 5 = Intermediate 7 = Deep 9 = Very deep

V	R1	R2	R3	R4
3	5			

NUMBER EYE/TUBER:

AVERAGE:

V	R1	R2	R3	R4

RANGE:

V	R1	R2	R3	R4
to	to	to	to	to

DISTRIBUTION OF TUBER EYES:

1 = Predominantly apical 2 = Evenly distributed

V	R1	R2	R3	R4
1	1			

PROMINENCE OF TUBER EYEBROWS:

1= Absent 2 = Slight prominence 3 = Medium prominence 4 = Very prominent 5 = Other _____

V	R1	R2	R3	R4
2	2			

7. **TUBER CHARACTERISTICS**: (continued)

PREDOMINANT TUBER FLESH COLOR
1 = White 2 = Light Yellow 3 = Yellow 4 = Buff 5 = Tan 6 = Brown 7 = Pink 8 = Red 9 = Purplish-red
10 = Purple 11 = Dark purple-black 12 = Other _____

V	1/ 2	R1	1	R2		R3		R4	

PRIMARY TUBER FLESH COLOR CHART VALUE: Royal Horticulture Society Color Chart or Munsell Color Chart (Circle the appropriate color chart)

V	RHS 160D	R1	RHS 158A	R2		R3		R4	

SECONDARY TUBER FLESH COLOR:

1 = Absent 2 = Present, please describe: _____

V	1	R1	1	R2		R3		R4	

SECONDARY TUBER FLESH COLOR CHART VALUE: Royal Horticulture Society Color Chart or Munsell Color Chart (Circle the appropriate color chart)

V		R1		R2		R3		R4	

NUMBER OF TUBERS/PLANT:
1 = Low (<8) 2 = Medium (8-15) 3 = High (>15)

V		R1		R2		R3		R4	

See Exhibit D

8. DISEASES CHARACTERISTICS:

DISEASES REACTION: 0 = Not Tested 1 = Highly Resistant 2 = Resistant Few Symptoms 3 = Resistance Few Lessions in Number and Size 4 = Moderately Resistance 5 = Intermedia Susceptible 6 = Moderate Susceptible 7 = Susceptible 9 = Highly Susceptible

LATE BLIGHT: (Phytophthora)

V	R1	R2	R3	R4
4				

EARLY BLIGHT: (Alternaria)

V	R1	R2	R3	R4
6				

SOFT ROT (Erwinia)

V	R1	R2	R3	R4
4				

COMMON SCAB (Streptomyces)

V	R1	R2	R3	R4
6	~~Pike~~ 3			

POWDERY SCAB (Spongospora)

V	R1	R2	R3	R4
4	5/6			

DRY ROT (Fusarium)

V	R1	R2	R3	R4

POTATO LEAF ROLL VIRUS (PLRV)

V	R1	R2	R3	R4

8. DISEASES CHARACTERISTICS: (continued)

POTATO VIRUS X (PVX)

V		R1		R2		R3		R4	

POTATO VIRUS Y (PVY)

V		R1		R2		R3		R4	

POTATO VIRUS M (PVM)

V		R1		R2		R3		R4	

POTATO VIRUS A (PVA)

V		R1		R2		R3		R4	

GOLDEN NEMATODE (Globodera)

V		R1		R2		R3		R4	

ROOT – KNOT NEMATODE (Meloidogyne)

V		R1		R2		R3		R4	

OTHER DISEASE Pink rot & Pythium Leak

V	4	R1	7	R2		R3		R4	

PHYSIOLOGICAL DISORDER

1 = Malformed shape 2 = Tuber cracking 3 = Feathering 4 = Hollow heart 5 = Internal necrosis
6 = Blackheart 7 = Internal sprouting 8 = Other _____

V		R1		R2		R3		R4	

9. PESTS CHARACTERISTICS:

PEST REACTION: 0 = Not Tested 1 = Highly Resistant 2 = Resistant Few Symptoms 3 = Resistance Few Lessions in Number and Size
4 = Moderately Resistance 5 = Intermedia Susceptible 6 = Moderate Susceptible
7 = Susceptible 9 = Highly Susceptible

COLORADO POTATO BEETLE (CPB) (*Leptinotarsa*)

V		R1		R2		R3		R4	

GREEN PEACH APHID (*Myzus*)

V		R1		R2		R3		R4	

OTHER:

V		R1		R2		R3		R4	

OTHER:

V		R1		R2		R3		R4	

10. GENE TRAITS:

INSERTION OF GENES: 1 = YES 2 = NO [X]

IF YES, describe the gene(s) introduced or attach information:

11. QUALITY CHARACTERISTICS:

CHIEF MARKET:

SPECIFIC GRAVITY (wt. air/wt. air – wt. water)
1 = <1.060 2 = 1.060-1.069 3 = 1.070-1.079 4 = 1.080-1.089 5 = >1.090

V	4	R1	4	R2		R3		R4	

TOTAL GLYCOALKALOID CONTENT (mg./100 g. fresh tuber)

V	3.95	R1	7.4	R2		R3		R4	

See Exhibit D

OTHER QUALITY CHARACTERISTICS: Describe any other quality characteristics that may aid in identification, (e.g., chip-processing, french fry processing, baking, boiling, after-cooking darkening). Please attach data and corresponding protocol.

12. CHEMICAL IDENTIFICATION:

Describe chemical traits of the candidate variety that aid in its identification (e.g., protien or DSN electrophoresis). Please attach data and the corresponding protocol.

13. FINGER PRINTING MARKERS:

ISOZYMES 1 = YES 2 = NO [ ]

IF YES, attach information See Exhibit D-1

14. DNA PROFILE: 1 = YES 2 = NO [X]

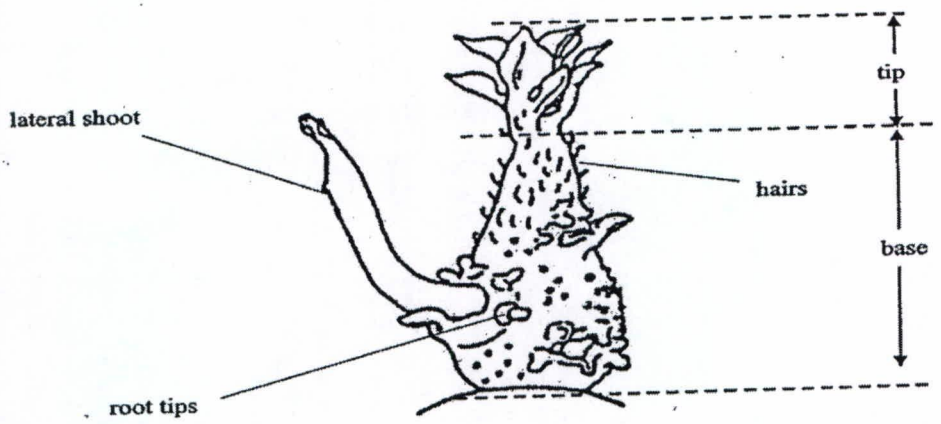
IF YES, attach information

15. ADDDITIONAL COMMENTS AND CHARACTERISTICS:

Include any additional descriptors that would be useful in distringuishing the candidate variety.

Figure 1: Light sprout

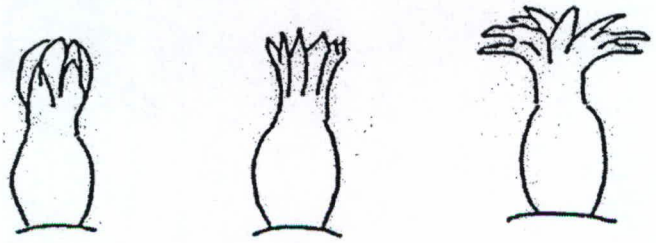
Light sprout dissection



Light sprout shape

1	2	3	4	5
spherical	ovoid	conical	broad cylindrical	narrow cylindrical

Light sprout tip habit

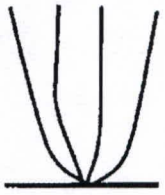


1	2	3
closed	intermediate	open

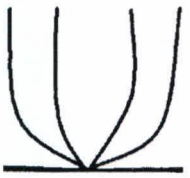
The characteristic should be observed after about 10 weeks to obtain a good differentiation in the collection.

Figure 2: Growth Habit

Erect



Semi Erect

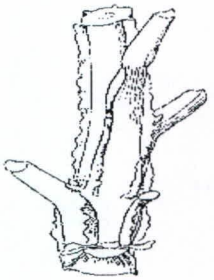


Spreading

Figure 3: Stem Wings

Weak

Medium



Strong

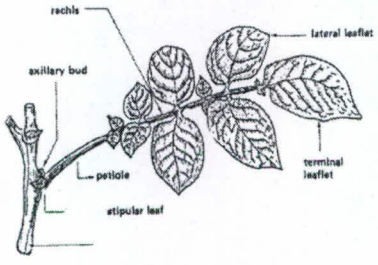
Figure 4: Leaf Sillhouette

Closed

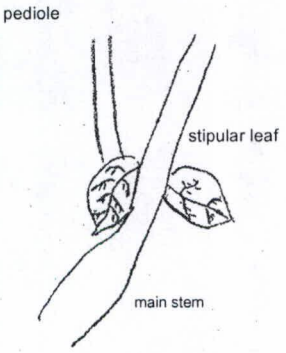
Medium

Open

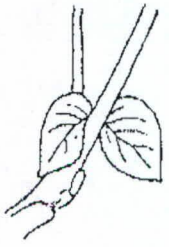
Figure 5: Leaf Stipules



General structures



Small stipular leaf



Medium stipular leaf

Large stipular leaf

Figure 6: Leaf Dissection

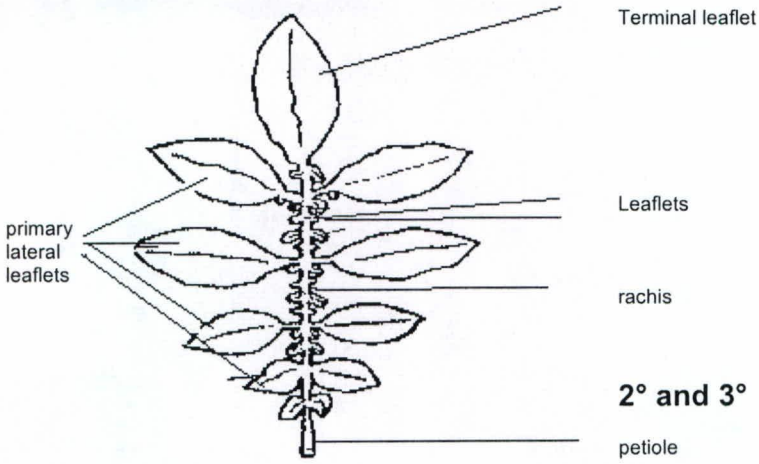
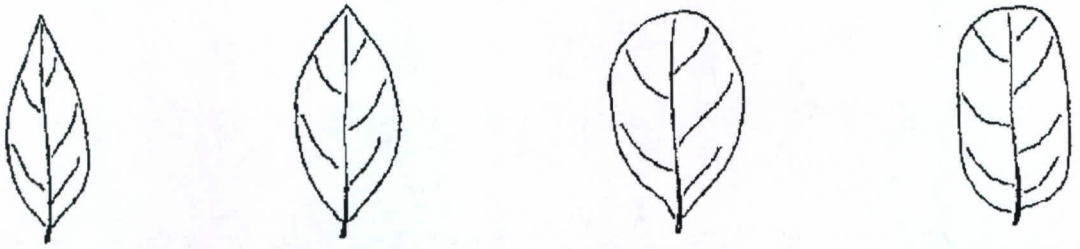


Figure 7: Terminal Leaflet Shape/Primary Leaflet Shape

Narrowly Ovate | Medium Ovate | Broadly Ovate



Lanceolate | Elliptical | Obovate | Oblong

Figure 8: Terminal Leaflet Shape of Tip/Primary Leaflet Shape of Tip

Acute | Cuspidate | Acuminate | Obtuse

Figure 9: Terminal Leaflet Shape of Base/Primary Leafelet Shape of Base

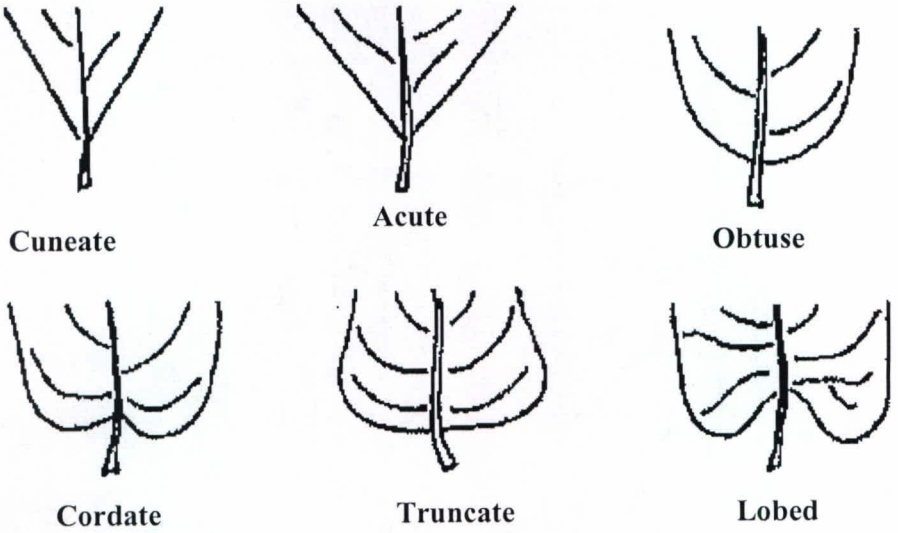


Figure 10: Corolla Shape

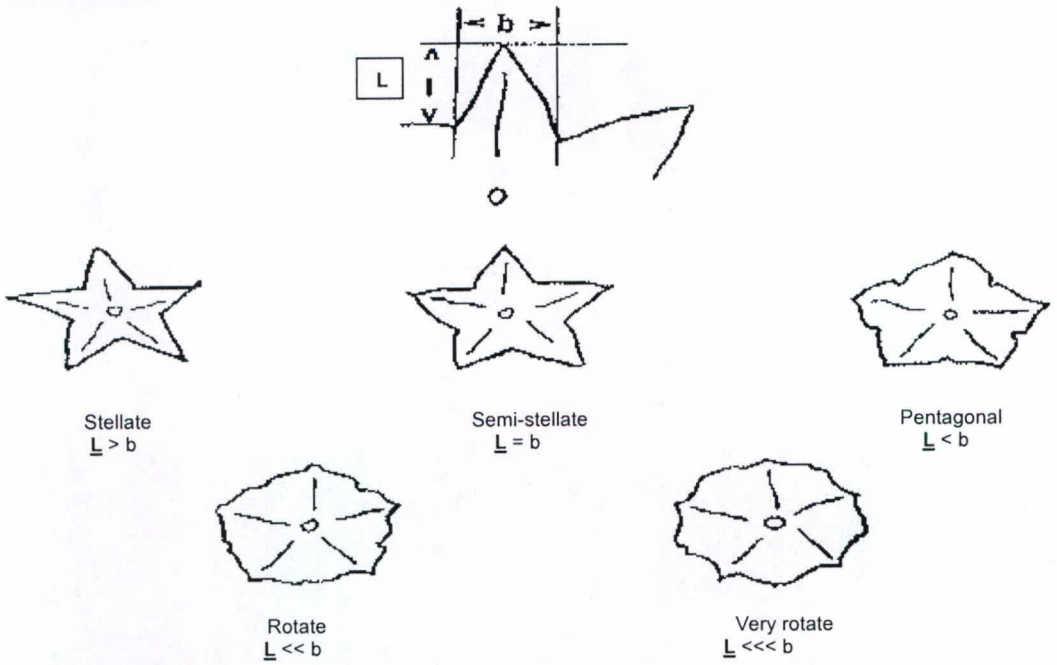
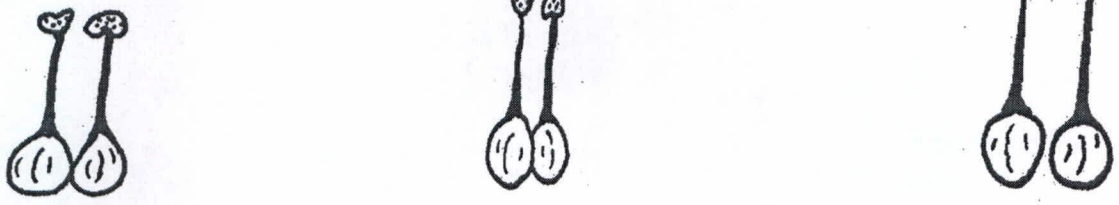


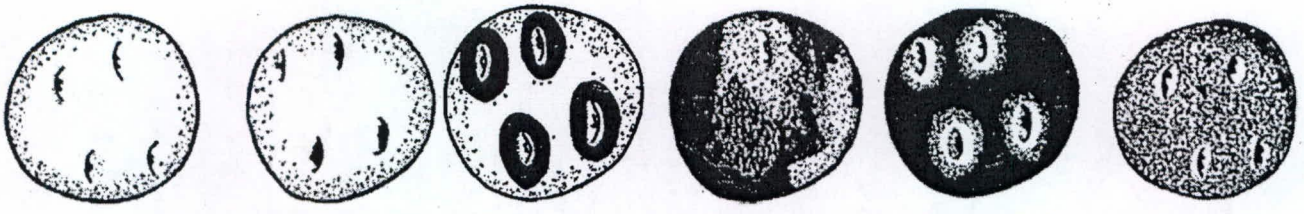
Figure 11: Anther Shape

Figure 12: Stigma Shape



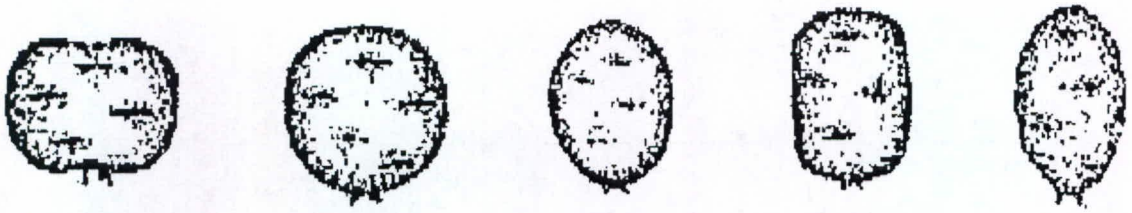
Capitate Clavate Bi-lobed

Figure 13: Distribution of Secondary Skin Tuber Color



Eyes Eyebrows Splashed Scattered Spectacled Stippled

Figure 14: Tuber Shape



Compressed Round Oval Oblong Long

References:
Huaman, Z. 1986. Systematic botany and morphology of the potato. Technical information Bulletin 6. International Potato Center, Lima, Peru.

Huaman, Z., Williams, J.T., Salhuana, W. and Vincent, L. Descriptors for the cultivated potato and the maintenance and distribution of germplasm collections. 1977. International Board for Plant Genetic Resources. Rome, Italy.

Potato (*Solanum tuberosum* L.) Guidelines for the conduct of tests for distinctness, uniformity and stability. International union for the protection of new varieties of plants (UPOV). 2004-03-31.

#2008000023

Gleichner, Becky B {FLNA}

From: Vaughan James [rvj@plantpath.wisc.edu]
Sent: Friday, October 13, 2006 10:34 AM
To: Gleichner, Becky B {FLNA}
Subject: RE: 2006 foliar trial - early blight analysis

Hi Becky

Does this give you enough information?

Vaughan

Evaluation of potato cultivars and breeding selections to identify resistance to early blight - Hancock, 2006

A trial including 84 potato cultivars and breeding selections was established 25 Apr at the Hancock Agricultural Research Station, in central WI, to evaluate foliar reaction to early and late blight. Small whole tubers or hand-cut seedpieces (approximately 2 oz) were mechanically planted in a randomized complete block design with three replications. There were five plants per replicate of each test line, and four Dark Red Norland plants (highly susceptible to both early and late blight) were planted between each pair of test lines (the red potatoes also help separate test lines at harvest). Rows with test lines were alternated with rows of Russet Burbank (also susceptible to both early and late blight) to help minimize interplot interference. Spacing was 12 in. within the row and 36 in. between rows. The soil type was Plainfield loamy sand, pH 6.6. Plots received standard fertilizer, irrigation, herbicide and insecticide applications but no fungicides were applied to the plots at any time. Plots were not inoculated, but relied on natural dispersal of Alternaria solani for disease establishment. Varieties were included in the trial for late blight evaluation also but no late blight (caused by Phytophthora infestans) was observed in Wisconsin during the 2006 growing season. Disease severity was rated on each plant weekly (3 Jul * 5 Sep) using the Horsfall-Barratt rating scale. Vine killer was applied on 6 and 13 Sep. Tubers were mechanically harvested on 27-28 Sep and were manually separated into undersize (<1.9 in. diam), US#1 size (>1.9 in.), and culls (misshapen or with green or decayed areas). Tubers were also rated for severity of pitted scab symptoms.

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Frito-Lay early blight tuber testing

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Tubers were inoculated with: *A. solani*, WI isolate 100 (As). For each test line, three replicates, each consisting of five tubers, were inoculated. Tubers were inoculated 14 Feb, 2006 with As, 6.7 x 10^4 spores/ml, prepared from cultures grown 10 days on clarified V8 agar at 20° C. Four shallow wounds (2 mm diam, 2 mm deep, spaced 2 cm apart along a line) were made on each tuber and a 10 µl drop of inoculum was placed on each wound. Tubers to be tested for early blight were placed in a growth chamber at 16° C, 90% RH immediately after inoculation until evaluated 12-13 Jun. Storage temperature and relative humidity were typical of conditions used for storing processing potatoes. Severity of symptoms and incidence of infection (the number of inoculation sites with symptoms) were recorded for each tuber. For early blight, the length and width of each lesion were recorded. Each tuber was cut in half, along the line connecting the inoculation points, and the depth of early blight symptoms was measured for each lesion.

Cultivar or line	Incidence of infection (%)	Mean lesion area (cm^2)	Estimated lesion volume [1] (cm^3)
FL1833	100	0.47	0.15
FL1867	97	0.70	0.28
FL1879	100	0.19	0.03
FL2000	100	0.21	0.02
FL2048	95	0.83	0.22
FL2049	100	0.14	0.01
FL2053	100	0.17	0.03
FL2061	98	0.17	0.02
FL2072	78	0.11	0.02
FL2095	100	0.48	0.19
FL2101	100	0.33	0.10
FL2119	100	0.15	0.03
FL2126	98	0.12	0.02
FL2128	100	1.94	1.02
FL2134	100	0.13	0.01
FL2137	100	0.32	0.08
FL2155	100	1.20	0.46
FL2158	93	0.84	0.32
FL2168	95	0.21	0.03
FL2171	100	0.58	0.25
FL2194	100	2.01	0.66
FL2197	100	0.67	0.40
FL2198	92	0.39	0.09
FL2201	100	0.25	0.06
FL2202	100	0.94	0.55
FL2215	98	0.33	0.08
FL2216	100	0.36	0.07
Russet Burbank check	100	0.85	0.43
$P > F$ [2]	0.49	< 0.01	< 0.01
LSD	NS	0.55	0.27

1. Estimated as one half the volume of an ellipsoid. The volume of an ellipsoid = 4/3 x area x depth. Area and maximum lesion depth were used for the calculation (volume was calculated for each lesion).
2. Analysis of variance was performed on data, and Fisher's protected least significant difference (LSD) was calculated (alpha = 0.05).

#200800023

POTATO (*Solanum tuberosum*)
Early Blight; *Alternaria solani*

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Evaluation of potato cultivars and breeding selections to identify resistance to early blight - Hancock, 2006 – Preliminary Report.

A trial including 84 potato cultivars and breeding selections was established 25 Apr at the Hancock Agricultural Research Station, in central WI, to evaluate foliar reaction to early and late blight. Small whole tubers or hand-cut seedpieces (approximately 2 oz) were mechanically planted in a randomized complete block design with three replications. There were five plants per replicate of each test line, and four Dark Red Norland plants (highly susceptible to both early and late blight) were planted between each pair of test lines (the red potatoes also help separate test lines at harvest). Rows with test lines were alternated with rows of Russet Burbank (also susceptible to both early and late blight) to help minimize interplot interference. Spacing was 12 in. within the row and 36 in. between rows. The soil type was Plainfield loamy sand, pH 6.6. Plots received standard fertilizer, irrigation, herbicide and insecticide applications but no fungicides were applied to the plots at any time. Plots were not inoculated, but relied on natural dispersal of *Alternaria solani* for disease establishment. Varieties were included in the trial for late blight evaluation also but no late blight (caused by *Phytophthora infestans*) was observed in Wisconsin during the 2006 growing season. Disease severity was rated on each plant weekly (3 Jul – 5 Sep) using the Horsfall-Barratt rating scale. Vine killer was applied on 6 and 13 Sep. Tubers were mechanically harvested on 27-28 Sep and were manually separated into undersize (<1.9 in. diam), US#1 size (>1.9 in.), and culls (misshapen or with green or decayed areas). Tubers were also rated for severity of pitted scab symptoms.

Table 1. Foliar disease severity for potato cultivars and breeding selections.

Trt No	Cultivar or Line	Source [2]	Maturity [3]	Foliar Disease Severity - Early Blight (%) [1]										Relative AUDPC [4]
				3 Jul	10 Jul	17 Jul	24 Jul	31 Jul	7 Aug	14 Aug	22 Aug	28 Aug	5 Sep	
1	Dark Red Norland	Com	E	1.0	3.1	11.6	45.1	87.7	94.0	95.0	94.7	96.1	97.3	0.645
2	Russet Burbank	Com	L	0.2	2.0	3.7	5.8	47.7	78.2	88.3	93.0	96.4	97.0	0.522
3	Defender	ID	L	2.0	3.2	4.2	5.9	27.7	53.3	74.8	81.1	94.2	95.9	0.444
4	AOTX95265-2ARU	TAMU	ML	1.4	2.3	10.6	28.6	76.9	90.3	90.8	93.9	97.2	97.5	0.605
5	AOTX95265-3RU	TAMU	ML	0.6	2.5	3.8	9.4	67.8	81.5	83.4	92.2	94.5	92.0	0.540
6	AOTX95265-4RU	TAMU	ML	0.5	2.0	3.9	6.3	66.3	80.7	87.5	91.6	95.1	95.6	0.541
7	AOTX95295-3RU	TAMU	ME	1.3	2.7	7.8	19.6	67.9	82.2	84.7	91.3	93.4	95.8	0.559
8	AOTX98137-1RU	TAMU	E	0.2	3.6	8.8	18.7	80.3	92.7	90.6	94.2	94.5	97.3	0.597
9	ATTX95490-2W	TAMU	L	1.4	2.2	11.4	14.7	61.7	81.2	80.9	86.6	82.8	94.4	0.527
10	ATTX961014-1R/Y	TAMU	L	1.1	1.8	9.7	18.1	92.0	98.0	96.7	96.2	97.8	97.6	0.627
11	ATTX98453-6R	TAMU	ME	0.8	2.2	6.0	11.5	82.7	93.4	94.0	95.6	95.6	95.8	0.594
12	ATX9117-1RU	TAMU	ML	1.3	2.5	4.0	3.9	20.2	52.9	76.1	84.6	92.7	97.2	0.436
13	ATX9202-3RU	TAMU	ML	0.9	2.0	4.3	8.1	56.8	78.5	85.1	93.2	92.1	94.5	0.526
14	ATX97147-4RU	TAMU	ML	1.1	0.9	4.1	4.0	6.3	42.6	60.1	79.7	87.6	94.4	0.376
15	COTX00104-7R	TAMU	M	1.1	2.1	4.1	5.5	28.0	64.2	75.2	89.2	86.2	94.6	0.453
16	COTX94218-1R	TAMU	L	1.6	2.6	3.1	4.2	8.0	23.2	28.6	65.7	71.7	83.5	0.282
17	MWTX2609-2RU	TAMU	L	1.1	1.2	2.3	4.1	15.0	49.2	72.9	88.9	89.7	94.6	0.419
18	MWTX2609-4RU	TAMU	L	0.8	1.7	2.7	2.8	7.2	38.4	61.3	79.2	84.5	92.5	0.367
19	TX1475-3W	TAMU	ML	1.1	2.3	4.4	7.2	49.6	88.1	92.0	94.5	94.9	95.9	0.541
20	TXA549-1RU	TAMU	L	0.5	2.3	3.3	5.0	12.8	60.4	71.3	86.6	90.2	95.6	0.429
21	AF 2172-56 RWh	ME		1.7	1.4	2.6	2.8	6.6	35.2	59.2	71.3	74.4	83.8	0.335
22	AF 2211-9 RWh	ME		0.5	1.4	3.1	4.2	16.7	67.1	88.0	94.5	96.4	97.8	0.474
23	AF 2215-1 RWh	ME		0.6	1.2	3.4	5.1	36.3	71.3	81.6	80.5	81.8	86.9	0.456
24	AF 2291-10 RWh	ME		1.4	3.3	6.2	8.1	26.5	44.2	62.1	75.3	82.5	91.4	0.400
25	AF 2322-2 RWh	ME		1.5	1.2	4.4	25.7	77.4	91.2	90.6	92.6	93.5	95.8	0.589
26	AF 2376-5 RWh	ME		0.7	1.4	2.5	2.9	5.3	16.3	60.9	72.2	83.7	90.6	0.330
27	AF 2412-2 Lrus	ME		0.6	1.4	4.8	6.9	48.0	61.7	78.5	85.0	87.2	91.4	0.472
28	AF 2916-1 RWh	ME		0.6	1.7	3.9	5.2	39.6	87.7	91.3	93.8	93.5	89.9	0.519

Trt No	Cultivar or Line	Source [2]	Maturity [3]	Foliar Disease Severity - Early Blight (%) [1]										Relative AUDPC [4]
				3 Jul	10 Jul	17 Jul	24 Jul	31 Jul	7 Aug	14 Aug	22 Aug	28 Aug	5 Sep	
29	Colorado Rose	CSU		1.5	1.0	2.6	4.2	18.0	72.1	91.1	91.1	92.3	96.4	0.475
30	Rio Grande Russet	CSU		0.6	1.1	2.3	4.7	22.2	55.9	59.6	66.7	68.3	81.9	0.363
31	CO94035-15RU	CSU	M	1.1	1.6	2.8	2.6	4.0	16.9	35.9	58.8	80.0	90.5	0.281
32	CO95051-7W	CSU		1.3	1.3	2.8	5.2	10.6	57.1	65.0	82.0	88.9	91.4	0.405
33	CO95086-8RU	CSU		1.9	1.6	4.2	8.1	64.2	83.5	85.0	83.8	87.8	90.0	0.521
34	CO95172-3RU	CSU		0.9	1.4	2.3	2.5	5.3	18.1	49.6	54.2	72.5	81.9	0.281
35	VC0967-2R/Y	CSU	EM	0.9	2.3	7.8	5.9	34.9	74.7	83.4	87.1	88.0	93.4	0.486
36	VC1002-3W/Y	CSU	M	1.0	2.2	2.5	4.4	8.1	52.7	73.8	88.0	90.0	94.2	0.417
37	VC1009-1W/Y	CSU		1.2	1.4	2.3	2.8	6.4	28.4	62.1	70.0	86.1	96.0	0.349
38	A96814-65LB	ID	L	2.9	3.6	5.0	3.5	19.7	50.9	62.7	78.4	85.2	88.3	0.400
39	A97066-42LB	ID	ML	1.4	1.5	2.5	2.5	4.1	11.4	51.6	78.0	90.4	96.7	0.330
40	A00324-1	ID	EM	0.4	0.3	2.6	3.6	8.4	46.7	70.0	83.4	91.7	95.9	0.401
41	A00382-3LB	ID	M	0.6	1.9	3.3	5.3	9.1	62.5	79.4	90.0	92.2	94.8	0.442
42	A00412-3LB	ID	ML	0.9	1.5	2.3	2.6	5.6	22.1	64.2	82.2	92.2	98.1	0.365
43	A00466-1LBC	ID	ML	1.3	2.2	3.4	2.9	11.7	31.3	71.4	88.2	91.0	95.8	0.397
44	A00472-20LB	ID	ML	1.4	1.5	5.0	4.8	25.6	27.8	46.7	74.3	77.5	88.6	0.348
45	A01259-51 LBY	ID	ML	1.2	0.9	5.0	6.7	11.2	48.3	68.4	73.8	83.9	90.0	0.388
46	A01283-36LB	ID	ML	3.1	3.3	4.7	6.6	21.9	68.1	79.6	94.4	96.1	98.3	0.479
47	A01375-57LB	ID	M	1.9	3.0	4.5	3.6	4.4	10.3	48.3	81.2	92.4	97.1	0.336
48	A01590-76LB	ID	M	1.2	1.9	2.8	3.1	5.6	22.5	42.7	70.2	78.5	93.8	0.311
49	IND 1072	ID	L	1.5	1.7	2.8	3.1	3.7	9.7	29.8	48.8	80.3	86.4	0.254
50	MX6766014	ID	L	1.9	3.0	4.8	3.7	5.0	12.5	28.8	79.0	87.7	93.0	0.307
51	NDA5507-3Y	ID	EM	0.6	1.0	5.5	6.0	33.8	81.3	81.5	89.5	92.5	95.2	0.494
52	FL24	F-L	L	0.8	2.3	2.9	2.8	3.6	8.4	26.5	55.0	78.1	89.4	0.255
53	FL25	F-L	L	0.8	1.2	2.2	3.1	6.9	33.1	55.4	78.8	88.8	92.2	0.357
54	FL1	F-L	M	0.5	0.8	3.0	4.8	35.7	75.6	89.3	92.8	89.1	93.6	0.494
55	FL2	F-L	?	2.6	2.6	3.1	3.7	5.6	13.1	35.5	56.3	66.5	80.6	0.259
56	FL3	F-L	ML	0.9	0.8	3.9	3.7	19.9	56.1	74.3	89.7	92.0	95.3	0.438
57	FL4	F-L	ML	1.1	1.8	4.1	4.9	15.6	73.0	93.4	99.8	100.0	100.0	0.500
58	FL5	F-L	?	1.4	1.9	4.4	6.7	18.8	64.6	85.0	91.4	95.0	97.2	0.470
59	FL6	F-L	L	0.5	1.7	3.8	7.2	54.6	79.5	84.2	89.7	93.0	95.2	0.519
60	FL7	F-L	L	2.0	2.3	4.0	6.0	20.6	44.4	55.8	67.5	72.5	84.7	0.357
61	FL8	F-L	L	1.0	1.7	2.8	3.1	12.2	55.8	79.1	92.2	97.4	98.8	0.445
62	FL9	F-L	L	0.2	2.2	2.8	3.3	8.4	31.3	72.9	80.5	87.4	86.3	0.375
63	FL10	F-L	EM	1.4	1.9	6.1	8.9	33.3	59.2	72.8	84.7	87.3	92.2	0.452
64	FL11	F-L	EM	0.8	1.0	3.7	6.7	31.8	67.2	86.1	93.8	95.6	95.8	0.489
65	FL12	F-L	M	0.6	0.5	2.8	3.2	6.4	33.2	68.6	88.6	94.1	98.1	0.392
66	FL13	F-L	L	1.1	1.4	3.1	2.3	4.7	9.7	47.5	70.0	85.0	93.9	0.308
67	FL14	F-L	L	1.4	2.2	3.7	3.7	8.4	27.9	72.5	91.1	95.8	98.6	0.402
68	FL15	F-L	L	1.2	2.0	3.4	3.3	23.5	60.8	80.6	92.4	95.2	98.3	0.464
69	FL16	F-L	M	2.6	3.4	9.4	5.6	17.5	50.8	67.5	80.3	89.2	94.2	0.420
70	FL17	F-L	M	1.2	2.6	4.5	6.7	30.0	59.4	77.5	80.6	85.3	91.1	0.443
71	FL18	F-L	L	0.0	1.9	2.8	5.3	41.5	75.6	89.4	91.7	92.3	95.0	0.504
72	FL19	F-L	L	0.2	1.7	2.3	2.5	5.0	13.1	42.1	62.9	72.7	81.7	0.276
73	FL20	F-L	L	0.9	1.6	3.1	2.6	7.8	21.1	39.6	64.0	78.5	87.4	0.297
74	FL21	F-L	?	0.5	1.1	4.2	3.8	12.5	46.3	65.2	84.7	90.5	92.7	0.400
75	FL22	F-L	M	0.5	1.3	2.0	2.8	4.9	11.2	33.7	60.7	74.9	83.8	0.265
76	FL23	F-L	ML	0.5	2.2	2.9	3.7	22.3	46.5	53.2	64.0	71.3	78.0	0.344
77	W3162-3LB Rus	NCV		1.4	2.0	3.3	2.9	11.0	47.1	69.4	76.3	87.8	94.7	0.393
78	MSL 794B Rus	NCV		0.9	1.8	6.1	5.6	19.7	57.9	61.7	79.7	84.9	93.9	0.411
79	W4184-3 Rus	NCV		1.4	1.7	4.2	7.8	71.4	95.5	99.2	99.4	99.5	100.0	0.595
80	MSA 8254 2B Rus	NCV		0.8	1.4	5.1	3.3	7.2	39.2	64.6	73.7	80.5	93.4	0.364
81	A93157-6LS	NCV		1.2	1.7	3.6	6.1	6.2	15.0	54.2	75.7	77.1	94.2	0.326

Trt No	Cultivar or Line	Source [2]	Maturity [3]	Foliar Disease Severity - Early Blight (%) [1] 3 Jul	10 Jul	17 Jul	24 Jul	31 Jul	7 Aug	14 Aug	22 Aug	28 Aug	5 Sep	Relative AUDPC [4]
82	W1360-5LB Rus	NCV		0.9	1.2	2.8	5.1	24.5	67.1	69.2	80.0	86.6	92.0	0.431
83	J103	USDA-WI		1.7	2.2	2.5	2.8	3.6	7.6	10.0	18.6	19.8	49.2	0.106
84	T450	USDA-WI		0.6	2.3	3.7	2.9	3.9	8.4	24.9	61.3	70.0	78.5	0.245
$P > F$ [5]				< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
LSD				1.2	1.2	2.9	7.3	22.8	22.5	21.0	16.0	12.7	10.5	0.082

1 Severity rated on a Horsfall-Barratt scale of 0 (no infection) to 11 (all foliage and stems dead). Ratings were converted to percentages.

2 Maturity group: E = Early; EM = Early-Medium; L = Late; L-VL = Late to Very Late; M = Medium; ML = Medium to Late; NK = Not known; VL = Very Late

3 Sources of material used in this trial

Com	Commercial grower
CSU	Colorado State University - David Holm
F-L	Frito-Lay, Bob Moerkerke
ID	USDA/ARS Aberdeen, ID - Rich Novy
ME	University of Maine, Z. Ganga
NCV	North Central Variety Trial, C Kostichka,: A= USDA/ARS Aberdeen, ID - Rich Novy; MS = Michigan State Univ., Plant and Soil Science Dept - David Douches; W= UW-Madison, Dept. of Horticulture Potato Breeding Program - J. Palta, B. Bowen
TAMU	Texas A & M University - Creighton Miller
USDA-WI	USDA/UW Plant Pathology, D. Halterman

4 Relative area under the disease progress curve. Data for each date were plotted on a graph and the area under the line was calculated for each treatment providing a measure of the relative severity of disease throughout the season. A disease rating of 100% for the entire season would produce a value of 1.0. All relative AUDPC values are expressed as a proportion of this value. Either decreased disease severity or later disease development contribute to lower relative areas under the disease progress curve.

5 Analysis of variance was performed on data, and Fisher's protected least significant difference (LSD) was calculated (alpha=0.05). NS = not significant at $P = 0.05$.

Table 3. Yield for potato cultivars and breeding selections.

Trt no	Cultivar or Line	Yield [1] Total lb/hill	cwt/A Total	cwt/A US#1 size	% US#1 size	% Undersize	% Culls	Pit scab severity [2]
1	Dark Red Norland	3.8	546.2	376.1	68.4	12.5	19.1	0.7
2	Russet Burbank	4.1	589.0	325.7	55.1	40.1	4.8	1.0
3	Defender	3.8	554.7	372.7	63.0	14.3	22.7	1.0
4	AOTX95265-2ARU	3.1	453.0	364.9	77.6	16.0	6.4	0.7
5	AOTX95265-3RU	3.2	460.8	310.7	67.3	29.0	3.7	1.0
6	AOTX95265-4RU	4.3	626.3	494.6	78.7	8.2	13.2	1.7
7	AOTX95295-3RU	3.3	476.3	354.3	72.2	25.5	2.3	1.3
8	AOTX98137-1RU	4.0	576.0	396.9	69.0	23.2	7.9	1.3
9	ATTX95490-2W	7.2	1043.5	666.0	63.5	10.1	26.4	1.7
10	ATTX961014-1R/Y	2.6	381.4	269.1	69.8	21.4	8.8	3.0
11	ATTX98453-6R	2.4	350.4	242.0	67.5	21.1	11.4	0.7
12	ATX9117-1RU	2.8	404.6	345.8	85.0	11.9	3.1	1.3
13	ATX9202-3RU	3.7	539.2	435.8	80.5	12.6	6.9	0.7
14	ATX97147-4RU	3.3	481.1	319.4	66.7	26.3	7.0	0.0
15	COTX00104-7R	4.4	632.1	465.1	73.9	11.1	15.0	0.3
16	COTX94218-1R	5.2	754.1	588.5	76.7	20.1	3.3	2.3
17	MWTX2609-2RU	4.5	657.3	444.3	67.2	14.6	18.2	2.7
18	MWTX2609-4RU	4.9	710.5	435.6	59.2	13.9	26.8	2.3
19	TX1475-3W	3.4	491.7	273.0	55.0	4.7	40.3	2.3
20	TXA549-1RU	5.3	764.7	595.3	77.4	8.4	14.3	1.3
21	AF 2172-56 RWh	4.5	656.3	578.9	88.1	2.3	9.6	0.7
22	AF 2211-9 RWh	3.6	521.8	392.0	75.1	6.9	18.0	1.7
23	AF 2215-1 RWh	3.5	506.3	437.5	85.7	6.0	8.2	2.0
24	AF 2291-10 RWh	3.2	471.4	411.4	87.4	7.3	5.4	0.3
25	AF 2322-2 RWh	3.2	471.4	369.8	78.6	8.5	12.9	2.3
26	AF 2376-5 RWh	4.0	584.0	495.4	85.1	7.3	7.6	1.3
27	AF 2412-2 Lrus	2.7	390.1	244.9	62.1	29.5	8.4	2.3
28	AF 2916-1 RWh	3.7	538.2	419.1	77.5	7.0	15.5	1.0

Trt no	Cultivar or Line	Yield [1]						Pit scab severity [2]
			cwt/A		%			
		Total lb/hill	Total	US#1 size	US#1 size	Undersize	Culls	
29	Colorado Rose	4.9	704.7	507.2	71.6	9.4	19.0	2.3
30	Rio Grande Russet	4.5	656.3	511.1	77.0	16.8	6.1	0.7
31	CO94035-15RU	4.1	599.2	533.4	88.9	6.9	4.3	0.7
32	CO95051-7W	3.1	456.9	394.0	85.9	8.0	6.1	0.3
33	CO95086-8RU	3.5	514.0	453.0	88.2	6.8	5.0	0.0
34	CO95172-3RU	4.3	620.5	466.6	75.0	17.8	7.1	0.3
35	VC0967-2R/Y	5.7	822.6	681.0	81.8	16.1	2.1	1.3
36	VC1002-3W/Y	4.2	606.0	543.0	88.2	7.8	4.0	0.7
37	VC1009-1W/Y	5.8	848.0	691.2	81.5	13.6	4.9	1.7
38	A96814-65LB	3.4	491.7	341.7	68.3	23.8	7.9	1.0
39	A97066-42LB	2.7	385.0	263.3	67.5	19.5	13.0	1.7
40	A00324-1	4.4	644.7	535.3	82.6	14.1	3.3	0.0
41	A00382-3LB	2.8	410.4	327.2	78.4	19.9	1.8	0.0
42	A00412-3LB	3.3	481.1	377.5	78.6	11.8	9.6	1.0
43	A00466-1LBC	3.9	569.7	465.4	81.6	16.4	2.0	0.3
44	A00472-20LB	3.3	473.4	341.7	70.5	29.5	0.0	1.7
45	A01259-51 LBY	3.2	464.6	294.3	63.5	34.2	2.3	1.7
46	A01283-36LB	2.8	399.8	277.8	68.0	20.9	11.1	0.3
47	A01375-57LB	2.6	374.1	292.3	76.7	19.6	3.7	0.0
48	A01590-76LB	5.4	777.3	592.4	76.5	20.5	3.0	0.0
49	IND 1072	4.3	621.5	463.7	73.5	10.9	15.6	2.3
50	MX6766014	2.2	314.6	131.6	38.5	51.8	9.7	2.0
51	NDA5507-3Y	5.2	748.3	633.3	84.4	5.0	10.6	0.3
52	FL24	5.6	819.9	764.7	93.2	6.3	0.5	1.0
53	FL25	3.2	464.6	362.0	78.1	18.6	3.4	1.3
54	FL1	3.9	560.5	509.2	90.9	6.2	2.9	1.0
55	FL2	3.1	454.0	243.9	53.7	45.4	0.9	1.0
56	FL3	4.0	578.9	469.5	81.1	6.2	12.6	0.7
57	FL4	3.8	557.6	481.1	86.2	5.5	8.4	0.3
58	FL5	3.7	541.1	433.7	80.1	4.6	15.3	1.3
59	FL6	3.1	447.2	327.2	73.5	21.6	4.9	1.7
60	FL7	4.0	579.8	479.2	82.6	14.9	2.5	0.3
61	FL8	3.4	493.7	396.9	79.3	8.3	12.3	2.3
62	FL9	4.8	695.0	581.3	82.3	4.3	13.3	2.7
63	FL10	4.6	671.1	483.5	72.5	7.6	19.9	1.3
64	FL11	4.0	576.0	515.0	89.1	6.0	4.9	2.0
65	FL12	4.7	678.1	615.4	90.2	5.9	3.8	0.7
66	FL13	4.7	683.4	558.5	81.6	10.1	8.2	1.3
67	FL14	3.9	562.4	378.5	67.5	28.5	4.0	1.7
68	FL15	4.6	669.9	535.3	80.5	5.6	13.9	1.7
69	FL16	5.1	747.3	679.5	90.8	3.5	5.6	0.3
70	FL17	4.4	642.8	556.6	86.6	11.6	1.8	0.0
71	FL18	3.7	540.1	373.6	67.0	6.7	26.4	0.7
72	FL19	4.3	631.1	572.1	90.7	3.7	5.6	0.7
73	FL20	4.8	701.6	623.6	88.7	9.8	1.5	0.7
74	FL21	4.1	602.1	496.6	82.2	13.2	4.5	1.0
75	FL22	4.2	604.5	473.6	77.6	3.0	19.4	1.0
76	FL23	4.5	646.6	553.7	85.7	6.7	7.6	1.3
77	W3162-3LB Rus	3.3	480.6	369.8	75.2	18.5	6.3	1.3
78	MSL 794B Rus	3.5	509.2	363.0	71.3	26.1	2.6	1.3
79	W4184-3 Rus	3.0	428.8	385.3	90.0	10.0	0.0	0.3
80	MSA 8254 2B Rus	3.5	515.0	411.4	79.9	17.0	3.0	0.7
81	A93157-6LS	3.7	541.1	428.8	78.9	11.1	10.0	0.3
82	W1360-5LB Rus	2.4	350.4	182.0	50.9	46.6	2.5	0.0
83	J103	3.8	553.7	360.1	63.5	30.4	6.1	2.0

Trt no	Cultivar or Line	Yield [1]						Pit scab severity [2]
			cwt/A		%			
		Total lb/hill	Total	US#1 size	US#1 size	Undersize	Culls	
84	T450	3.0	441.4	341.7	76.3	13.6	10.0	1.7
P>F[3]		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
LSD		1.0	163.0	14.1	10.0	9.5	1.0	0.2

1. Yield from 5 ft of row, converted to cwt/A. Yield was graded by hand by passing tubers over a 1 7/8-in. grading chain to separate undersize (<1 7/8 in. diam), from those that were 1 7/8 in. These larger tubers were classed as US#1 size or culls (if rotted, green or severely misshapen).
2. Overall pit scab severity was rated for the group of tubers harvested from each plot. 0 = no pit scab observed; 1 = slight pit scab; 2 = moderate; 3 = severe pit scab.
3. Analysis of variance was performed on data, and Fisher's protected least significant difference (LSD) was calculated (alpha=0.05). NS = not significant at $P = 0.05$

FritoLay Tuber Late Blight Susceptibility Variety Trial: Michigan State University 2004 – 2005.

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Materials and methods

Tubers of for the experiments were obtained from FritoLay (Rhinelander, WI) and stored at 3°C in the dark at 90% relative humidity until used. Tubers for all the experiments were within the size grade range 50 - 150 mm diameter (any plane). Visual examination of a random sample of tubers from each from each entry (n = 2) for disease symptoms indicated that the tubers were free from late blight. The sample was further tested with the ELISA immuno-diagnostic Alert Multi-well kit (Alert Multiwell Kit - *Phytophthora sp.* Neogen Corporation, Lansing, MI, USA). *P. infestans* was not detected in any of the tubers.

One inoculation technique was used in this study; tuber tissue inoculation. An isolate of *P. infestans* [*P.i.*-US8 (US8 biotype, PAI 03-007, phenylamide-insensitive, A_2 mating type, MI)] was used. Cultures of *P. infestans* were propagated on rye agar for 14 days in the dark at 15°C. Prior to inoculation, all tubers were washed in distilled H_2O to remove soil. The tubers were then surface sterilized by soaking in 2% sodium hypochlorite (Clorox 5.25%) solution for four hours. Tubers were dried in a controlled environment with continuous airflow at 15°C in dry air (30% relative humidity) for four hours prior to inoculation.

Tuber tissue inoculation; sporangia were harvested from the petri dishes by rinsing the mycelium/sporangia mat in cold (4°C) sterile, distilled H_2O and scraping the agar surface with a rubber policeman. The mycelium/sporangia suspension was stirred with a magnetic stirrer for 1 hour. The suspension was strained through four layers of cheesecloth and sporangia concentration was adjusted to about 1 x 10^6 total sporangia ml^{-1} (discharged and non-discharged) and measured with a hemacytometer. The sporangial suspensions were stored for 6 h at 4°C to encourage zoospore release from the sporangia. The washed, surface-sterilized tubers were inoculated by a sub-peridermal injection of a sporangia suspension of 2 x 10^{-5} ml (delivering zoospores released from about 20 sporangia $inoculation^{-1}$) with a hypodermic syringe and needle at the apical end of the tuber about 0.5 cm from the dominant sprout to a maximum depth of 1 cm. The non-inoculated control tubers were inoculated with cold (4°C) sterile, distilled H_2O.

Tubers were stored in a temperature-controlled environment chamber, 1.8 m^3 volume (Environmental Growth Chambers, Chagrin Falls Ohio, USA) at 10°C. Relative humidity was maintained at 90% within the chamber. Tubers were stored within ventilated plastic boxes (15 tubers/box). Disease development rates within tubers in relation to storage temperature were known from previous experiments and a single sampling date was selected about 30 days after inoculation (DAI). Sample size was n = 15 tubers for each inoculation method which after tubers were cut into three slices yielded 45 estimates of tuber tissue infection.

The experiment was conducted in Feb - Mar 2006. Tubers were dormant during the period between Oct and Mar. A digital image analysis technique was used to assess tuber tissue infection. Briefly, the scanned surface was the cut face of a sample tuber. A sharp knife was used to ensure a smooth cut face. Fresh-cut tuber sections were placed cut surface down on a glass plate, 40 x 30 cm and 2 mm thick. The glass plate was used to prevent surface contamination of the scanner glass and permitted multiple samples to be prepared and moved to the scanner for image production. The plate was transferred to a flatbed scanner (HP ScanJet 4c, Hewlett-Packard Co., Houston, TX) controlled by an IBM-compatible PC. A 486DX2-80 CPU and a RAM capacity of 32 MB, adequate for the image processing. Scanner control software (DeskScan II ver. 2.4, Hewlett-Packard, Co., Houston, TX), generated an image of the cut tuber surfaces against a black background. The image was formed from light reflected from the cut tuber surfaces.

The brightness value of the image controlled the light intensity of every pixel in the image. The contrast value controlled the differences between light and dark regions of the image. While the scanner control software was able to automatically adjust the brightness and contrast of the image by comparing

the relative size of the pale tuber surfaces against the black background, the settings were manually set to 180 units (brightness) and 200 units (contrast) to ensure consistent readings. A photograph-quality image was taken and stored for analysis (e.g. Fig. 1 2000/01 report). A typical image in Tagged Image Format (*.tif) occupies 1 megabyte. Typical ARI values for a range of infected and uninfected cut tuber surfaces were shown on Figure 1 2000/01 report.

The image files created with the scanner software were loaded into the image analysis software (SigmaScan ver. 3.0, Jandel Scientific, San Rafael, CA). The black background has 0 light intensity units (LIU), while pure white has 255 LIU. Disease-free and blemish-free tuber tissue is pale. Diseased or blemished tuber tissue is darkened. The image of the cut tuber surface was selected for analysis, and isolated from the adjacent regions of the image. The image was carefully cropped for irregularly shaped tubers to remove the image of the adjacent tuber skin, and the image of the cut surface was unedited. The area was selected with the fill tool, which encompassed all pixels within a given area brighter than the cut-off threshold. The area selection cut-off threshold was set to 10 LIU, effectively allowing the software to exclude all parts of the image darker than 10 LIU, e.g. the black background. The average reflective intensity (ARI) of all the pixels within the image gave a measurement of infection severity of the tuber tissue of each sample.

The ARI was measured in sections from the apical, middle and basal regions of the tuber, approximately 25% (apical), 50% (middle) and 75% (basal) of the length of the tuber (respectively) as measured from the apical end. The amount of late blight infected tissue per tuber was expressed as a single value (Mean ARI) calculated as the average ARI of the apical, middle and basal sections (total images, n = 45 per Mean ARI). The presence of *P. infestans* in sample tubers was confirmed by isolating pure cultures of *P. infestans* from the infected tuber tissue and successful re-inoculation of potato tubers and leaves. The Relative Average Reflective Intensity (RARI) of tuber tissue slices was calculated by dividing the ARI of tuber slices by the mean ARI of non-inoculated tubers [1-(ARI tissue/mean ARI non-inoculated tissue)]; with a maximum value of 1.0. The RARI was multiplied by 100 to express the metric as a percentage. Values close to zero indicate minimal impact of the pathogen on tuber tissue using the sub-periderm inoculation method and are resistant to *P. infestans*. For the skin inoculation method, values close to zero indicate minimal impact of the pathogen and effect of the periderm as a mechanical barrier to infection by *P. infestans*. Cultivar susceptibility was determined with ANOVA by comparing the RARI values for both inoculation methods.

Results

Tuber tissue inoculation: The mean RARI values of tubers inoculated by sub-periderm injection indicated that the cultivars FL2000 and FL2003 318.08 (nsd from each other with RARI from 0.00 – 4.30), and FL2134, FL2198, FL2061, FL2142, FL2158, FL2215 and FL2702 were not significantly different from each other and had RARI values fairly close to zero (range 4.3 – 10.9), indicating that the values were close to or less than the mean ARI of non-inoculated tubers of the same cultivar (Table 1). These cultivars could therefore be considered to have tolerance to tuber late blight (US8 genotype).

Of special note was that FL2128 which scored resistant in the tests 2005 was susceptible in 2006; FL2119 resistant in 2005 was moderately susceptible in 2006 and FL2142 remained in the resistant grouping (Table 2). The isolate used for inoculations in 2006 differed from that in 2005. We are currently investigating differences between the two isolates.

Table 1. Late blight development in tuber tissue of Frito-Lay cultivars 28 days after inoculation by sub-peridermal injection of tuber periderm with a zoospore suspension of *Phytophthora infestans* (US8) 0.5 cm from the apical meristem.

Cultivar[z]	RARI tissue[y]
FL2003 381.14	27.83a[x]
FL1833	27.08ab
FL2216	26.88ab
FL2128	25.46ab
FL1879	25.24ab
FL2171	23.72abc
FL2048	22.84abcd
FL2053	22.50abcd
FL2095	21.18abcde
FL1233	20.42 bcdef
FL2003 230.11	18.32 cdefg
FL2202	18.09 cdefg
FL2049	16.53 defgh
FL2101	16.36 defgh
FL2003 225.98	15.25 efghi
FL2119	15.19 efghi
FL1625	14.89 efghi
FL2197	14.60 efghi
FL2137	14.08 fghij
FL2206	13.95 fghijk
FL2201	13.71 ghijk
FL2126	13.65 ghijkl
FL2160	13.33 ghijkl
FL2168	12.62 ghijkl
FL2702	10.87 hijklm
FL2215	10.53 hijklm
FL2158	9.37 ijklm
FL2142	8.82 ijklm
FL2061	7.63 jklm
FL2198	7.33 klm
FL2134	7.03 lm
FL2003 318.08	4.30 mn
FL2000	0.00 n
	6.666

[z] Cultivars ranked by in decreasing order of susceptibility to *Phytophthora infestans* genotype US8.

[y] Relative Average Reflective Intensity (RARI) of tuber tissue slices of tubers inoculated with *P. infestans* genotype US8 by sub-periderm inoculation. The RARI is calculated by dividing the ARI of tuber slices by the mean ARI of non-inoculated [1-(ARI tissue/mean ARI non-inoculated tissue)]*100; with a maximum value of 100. Values close to zero indicate minimal impact of the pathogen and are most resistant to *P. infestans*.

[x] Cultivars sharing the same letter are not significantly different at $p = 0.05$ (Tukey Multiple Comparison).

Table 2. Comparison of RARI values from 2005 to 2006.

Cultivar	2005	2006	Difference
FL1625	14.4	14.89	similar
FL1833	21.9	27.08	similar
FL1879	19.9	25.24	similar
FL2000	16	0	More resistant
FL2048	17.6	22.84	similar
FL2049	17.6	16.53	similar
FL2053	22.6	22.5	similar
FL2061	15.4	7.63	More resistant
FL2095	14	21.18	similar
FL2101	15.1	16.36	similar
FL2119	-1.1	15.19	Less resistant
FL2126	20.2	13.65	similar
FL2128	5.1	25.46	Less resistant
FL2134	15.1	7.03	More resistant
FL2137	6.7	14.08	Less resistant
FL2142	-0.2	8.82	Less resistant

POTATO (*Solanum tuberosum* L.'FritoLay clones')

Late blight; *Phytophthora infestans*

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Evaluation of late blight response of FritoLay advanced varieties and new clones: 2006.

Potatoes (whole seed) were planted at the Michigan State University Muck Soils Experimental Station, Bath, MI on 25 May into beds (34-in row spacing) 10-ft long and replicated four times in the advanced clone trial in a randomized complete block design and as two non-replicated plant plots for the new clones. Plots were irrigated as needed with sprinklers and were hilled immediately before sprays began. All rows were inoculated (3.4 fl oz/25-ft row) with a zoospore suspension of *Phytophthora infestans* US8 biotype (insensitive to metalaxyl, A2 mating type) at 10^4 spores/fl oz on 25 Jul and again on 14 Aug after severe weather events (described below). Fungicides were not applied. Weeds were controlled by hilling and by covering rows with black plastic mulch. Dual 8E (2 pt/A on 20 Jun), Basagran (2 pt/A on 20 Jun and 15 Jul) and Poast (1.5 pt/A on 28 Jul) was applied for supplemental weed control. Insects were controlled with Admire 2F (20 fl oz/A at planting on 25 May), Sevin 80S (1.25 lb/A on 1 and 28 Jul), Thiodan 3EC (2.33 pt/A on 1 and 21 Aug) and Pounce 3.2EC (8 oz/A on 28 Jul). Plots were rated visually for percentage foliar area affected by late blight on 22, 29 Aug and 12 Sep [41 days after the second inoculation (DAI)] when there was foliar infection in some plots. The relative area under the disease progress curve was calculated for each treatment from date of inoculation, 14 Aug to 25 Sep, a period of 41 days. Green leaf area remaining was assessed 50 DAI. Data were analyzed by one-way ANOVA where there was replication. Maximum and minimum air temperature (°F) were 92.0 and 36.3 and 1-d with maximum temperature >90°F (Jun), 92.0 and 42.7 and 3-d with maximum temperature >90°F (Jul), 95.2 and 41.6 and 3-d with maximum temperature >90°F (Aug) and 82.3 and 45.5 (Sep). Maximum and minimum soil temperature (°F) were 87.8 and 56.0 (Jun), 89.9 and 53.1 (Jul), 92.2 and 59.4 (Aug) and 67.3 and 57.5 (Sep). Maximum and minimum soil moisture (% of field capacity) was 78.3 and 64.9 (Jun); 116.6 and 66.7 (Jul), 119.1 and 80.4 (Aug) and 85.8 and 79.1 (Sep). Precipitation was 2.93 in. (Jun), 6.77 in. (Jul), 3.47 in. (Aug) and 0.68 in. (Sep). The total number of late blight disease severity values (DSV) over the inoculation period was 98 using 90% ambient %RH as bases for DSV accumulation). Full details of the daily meteorological conditions are shown in Figures 1 and 2. Plots were irrigated to supplement precipitation to about 0.1 in./A/4 day period with overhead sprinkle irrigation.

Supplementary meteorological information: leaf wetness duration was consistently greater than 12 h for much of the period after emergence, precipitation was frequent and during late July about 40 days after emergence > 4" of rain fell over a 12 h period (Fig 1) resulting in soil saturation (Fig 2) which has a profound effect on both plat and disease epidemic. This despite late blight conducive conditions prevailing up to this point. Maximum seasonal temperature (in excess of 90F) occurred shortly after this soil saturation and resulted in serious root and therefore crop loss (see circled periods in Figs 1 and 2). Steps were taken to enhance crop health but the plants never really recovered their full potential and some of the clones did not survive. Plots were re-inoculated on 14 Aug but conditions were not conducive for late blight development with few DSV accumulating. Despite the challenges of the season some late blight developed during late August. Caution in final interpretation should be taken as the only data presented are on early clones that survived the adverse growing conditions and that had less than 5% foliar late blight by 41 DAI. Of the first and second year clones, lines of families with less than 5% foliar late blight by 13 Sep were reported in Tables 1 and 2, respectively. The line numbers of the different families are in the same column as the family. Of the advanced clones, taking 41 days after inoculation (dai) as a key reference point, cvs with foliar late blight 2.3 to 10.0, 3.0 to 10.8 and 4.8 to 11.3% foliar late blight were not significantly different (Table 3). In terms of the relative area under the disease progress curve (RAUDPC) from inoculation to 41 dai, cvs with RAUDPC values 0.45 to 1.35, 0.53 to 1.47, and 0.63 to 1.57 were not significantly different (Table 3). Cultivars with percentage defoliation from 46.3 to 60.0, 56.3 to 75.0, 75.0 to 95.0 and 81.3 to 100.0% were not significantly different (Table 3). In conclusion, the epidemic in 2006, due to extreme weather events was not ideal for varietal evaluations.

Table 2. First year FritoLay lines Late Blight response @ MSU. Lines with less than 5% foliar late blight on 15 Aug and 12 Sep.

Family number												
76	80	93	164	165	166	183	187	208	209	227	295	341
32		32	73	24	71	72	32	41	77	55	24	22
36		41	74	25	72	73	33	43	81	56	28	24
40		45	79	26	74	74	34	44	83	60	30	29
43		46	86	27	75	75	36	46	84	61	31	30
44		47	88	28	76	78	37	47	88	62	40	31
45		49	89	29	77	79	41	49	93	63		33
		50	90	30	78	82	42	59	96	64		36
		51	92	31	79	84	43		111	67		37
		53	94	35	8	88	44		112	68		40
		54	95		83	9	45					41
		56	96		86	91	48					
		58	97		87	93	50					
		59	98		88	94						
		60	99		91	95						
			100		93	96						
			102		94	98						
			103		95	99						
			105		96	102						
			106		98	103						
			110		99	105						
			115			106						
			116			107						
						108						
						113						
						115						
						117						
						119						
						12						
						129						
						13						
						131						
						132						
						133						
						134						

Table 2 Second year FritoLay lines Late Blight response @ MSU. Lines with less than 5% foliar late blight on 15 Aug and 12 Sep.

Family Number													
233	234	274	277	296	297	350	351	352	356	374	377	387	423
20	11	01	19	06	04	01	05	03	03	02	08	15	18
	65	24	21	25	08	04	34	13	12	15	10		
	92	26	22	37	16	14	43	17	15	48	12		
	94	31	28		21	17	50	18	23		37		
		39	43		26	18					47		
			65		41	38					48		
			78		45	45					51		
			95								58		
			113										
			118										
			121										
			137										
			139										
			142										
			147										
			151										

Table 3 Advanced FritoLay lines Late Blight response @ MSU. Foliar late blight, RAUDPC and green leaf area remaining at the end of the growing season.

Line	Foliar Late Blight 9/25/06 (41 DAI)		RAUDPC (Max = 100) From 0 – 41 DAI		Green leaf area remaining on 4 Oct 50 DAI	
FL2095	6.5	abc	1.01	abc	81.3	ab
FL2101	11.3	a	1.57	a	100.0	a
FL2119	10.0	abc	1.31	abc	100.0	a
FL2126	2.3	c	0.63	abc	56.3	cd
FL2128	3.3	bc	0.45	c	46.3	d
FL2134	6.5	abc	1.13	abc	60.0	cd
FL2137	8.3	abc	1.29	abc	84.0	ab
FL2142	6.8	abc	0.98	abc	87.5	ab
FL2155	7.0	abc	1.35	abc	100.0	a
FL2158	5.0	abc	0.89	abc	95.0	ab
FL2168	4.8	abc	0.75	abc	97.5	a
FL2171	6.5	abc	1.07	abc	86.3	ab
FL2194	6.5	abc	1.00	abc	93.8	ab
FL2195	4.8	abc	0.74	abc	87.5	ab
FL2197	5.8	abc	0.84	abc	97.5	a
FL2198	4.8	abc	0.69	abc	75.0	bc
FL2201	3.3	bc	0.60	bc	100.0	a
FL2202	5.0	abc	0.72	abc	97.5	a
FL2206	8.3	abc	1.18	abc	100.0	a
FL2215	7.3	abc	0.89	abc	97.5	a
FL2216	3.3	bc	0.66	abc	97.5	a
FL2218	2.5	c	0.72	abc	97.5	a
FL2085	3.0	bc	0.53	bc	97.5	a
FL2086	6.5	abc	1.11	abc	92.5	ab
FL1533	7.5	abc	1.15	abc	100.0	a
FL1625	10.8	ab	1.47	ab	100.0	a
$LSD_{0.05}$	7.87		0.957		20.34	

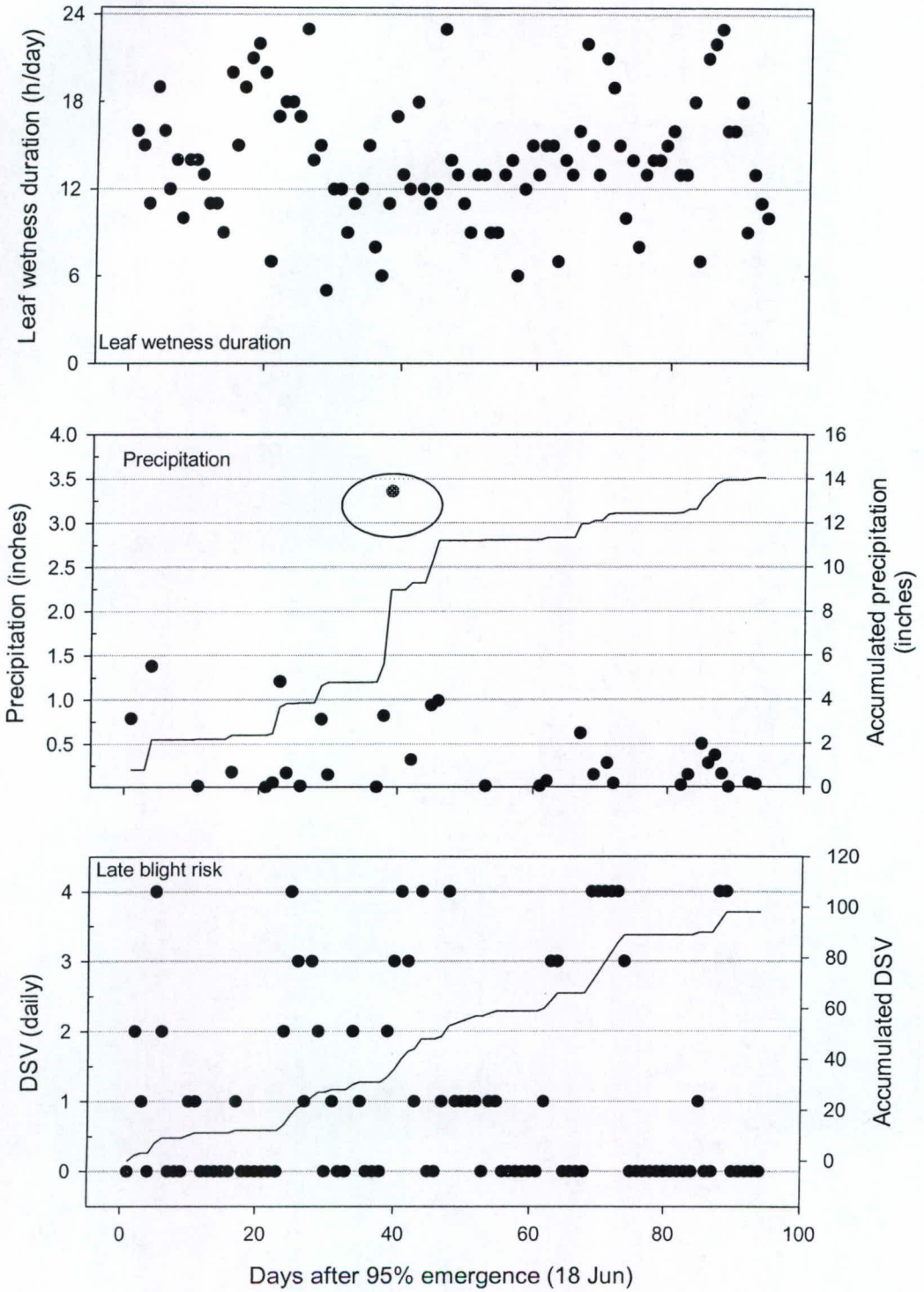

Figure 1. Leaf wetness duration, precipitation and potato late blight disease severity values (DSV) from 95% emergence to late senescence at the Muck Soils research Farm, Laingsburg, MI, 2006.

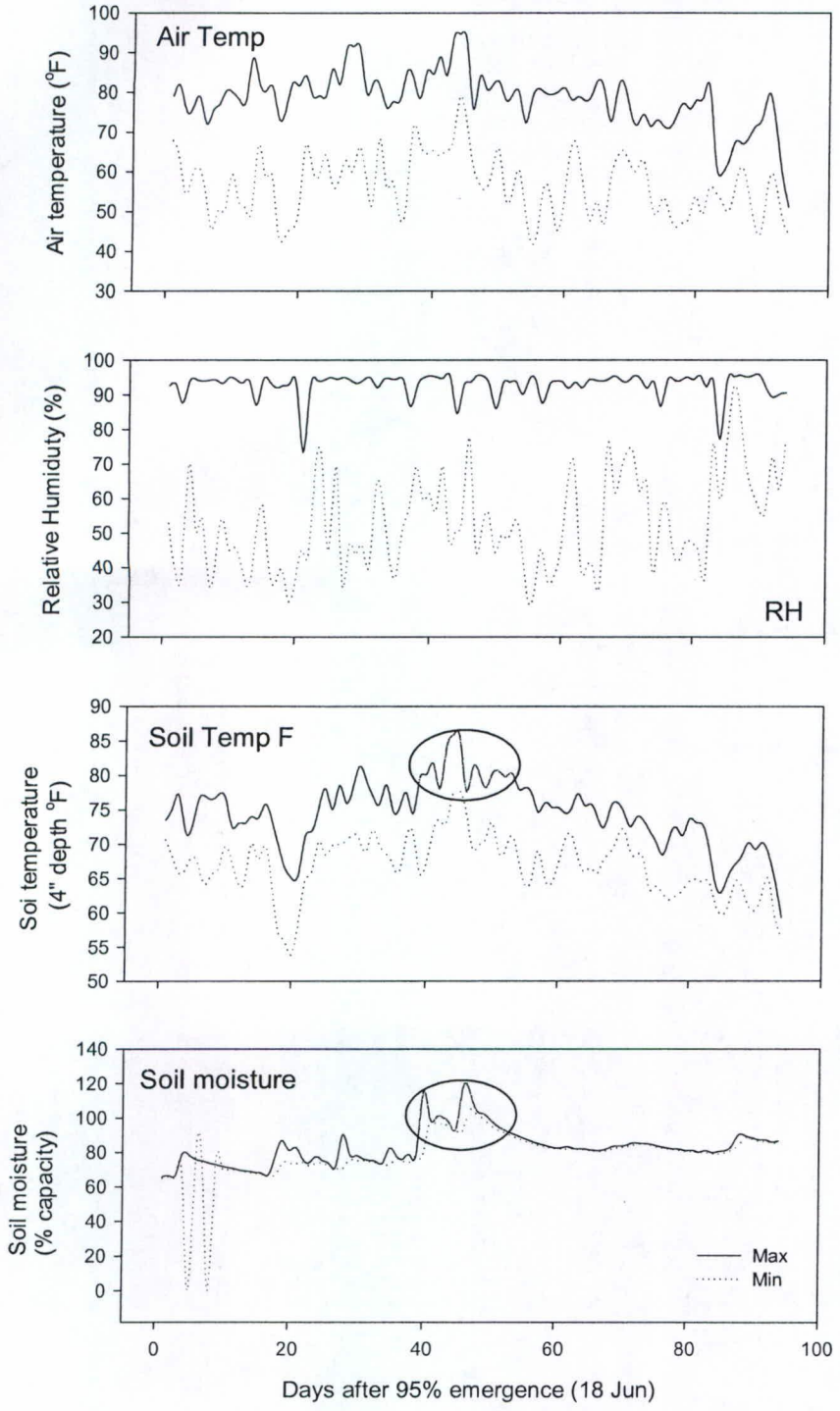

Figure 2. Maximum and minimum air temperature, relative humidity, soil temperature and soil moisture from 95% emergence to late senescence at the Muck Soils research Farm, Laingsburg, MI, 2006.

FritoLay Soft Rot Results – March 2006

Dr. Amy Charkowski
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Department of Plant Pathology
1630 Linden Drive
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phone: 608-262-1598+D11

Introduction

Commercial varieties of potatoes have little resistance to bacterial soft rot, which, in Wisconsin, is caused by *Erwinia carotovora*. It is possible, however for plants to be resistant to this pathogen. Some wild potato species and some commercial varieties of other crops, such as sugarbeet, have high levels of resistance to bacterial soft rot.

The purpose of this project was to determine the relative resistance of several breeding lines of potatoes to *E. carotovora*. Some important caveats need to be remembered when examining this data:

1. This data was obtained over three years using potatoes that were in different physiological conditions. In 2002, the tubers had been in storage for several months, in 2003, the tubers were tested directly after harvest. The tubers tested in 2005 and 2006 were stored for several months.
2. I don't know if there are plot effects that could affect the data. Presumably all the tubers tested from each line were grown in a single plot.
3. In previous years, the tubers varied significantly in size. In 2005 and 2006, all of the tubers were approximately the same size.
4. Resistance to blackleg or stem rot, diseases caused by *Erwinia* when it infects the stem rather than the tuber, may not be correlated to resistance to tuber soft rot. Therefore, these results should only be used to compare tuber soft rot resistance.
5. We incubated the tubers under harsh conditions; at 28C (82F) for two days with high humidity. (In 2005, the tubers were incubated for three days.) This is not how growers would store tubers, although these conditions could be found in a field. If tubers are resistant under these harsh conditions, they should store very well under more favorable conditions.
6. In 2005, the Pike tubers had many internal necrotic flecks. The cause of this flecking may also affect the tuber resistance to soft rot. In 2006, no unusual tuber symptoms were noted other than some common scab on some tubers.

Methods

Several methods have been developed to compare resistance of potato lines. We choose to use the widely used "stab" method because fewer tubers are required for this assay and because it is a reasonable model for how tubers might become infected with *E. carotovora* if they were wounded mechanically or by insects during the summer or at harvest.

To test the potato lines:

1. *E. carotovora* subsp. *carotovora* bacteria were grown on LB agar medium and suspended in water to 10^7 CFU/ml (approximately 10,000,000 cells/ml).
2. A 15 mm deep wound was made in the tubers with a pipet tip.
3. 10 µl of bacterial suspension was placed in the wound. Thus each wound was inoculated with approximately 100,000 bacterial cells.
4. The tubers were placed under humid conditions at 28°C for two days.

5. The tubers were cut open and the amount of decayed tissue was weighed.

In 2002, we used a mist chamber, which did not provide very reproducible results. We also used the FritoLay strain of *Erwinia* and a 10-fold higher inoculum level.

In 2003, 2005, and 2006, we placed the tubers in plastic bags in a large 28°C incubator. We used strain WPP14, a highly virulent *E. carotovora* strain isolated from central Wisconsin. The results were much more reproducible between replicate samples.

In 2002 we had few tubers to examine (10 per line) so we were unable to do many replicates. We divided the tubers into two groups of five to assay them. In 2003 and 2005, we had many more tubers from each line, so were able to examine them in replicate.

Results for 2006

The amount of tissue macerated shows how susceptible a tuber is once an infection has begun – basically, how well the potato can limit an infection. The incidence of infection shows how well a tuber can stop the infection from occurring in the first place.

Most resistant: 2048, 2000, 2128, 2101, 2095, 2072, 2053, 2198, 2171, 2201

Intermediate: 2168, 2194, 2126

Least resistant: 2215, 2197, 1867, 2049, 1879, 2134, 2137, 2216, 2119, 2202, 2155, 2158, 2061, 1833,

If one goal of this breeding program is to obtain soft rot resistant lines, then lines 2048, 2000, 2128, 2101, 2095, 2072, 2053, 2198, 2171, 2201appear to be good candidates, based upon the 2006 data.

Materials Methods for MSU Scab Evaluations.txt

From: Joseph John Coombs [coombs@msu.edu]
Sent: Friday, October 13, 2006 2:39 PM
To: Gleichner@msu.edu; Gleichner, Becky B {FLNA}
Cc: David S. Douches; coombs@msu.edu
Subject: Materials & Methods for MSU Scab Evaluations

Dear Becky Gleichner,

Dave asked that I send you a brief description of our M&M for our scab evaluations.

The Common Scab Disease Nursery at Michigan State University is conducted on a field at the MSU Soils Farm dedicated to evaluating common scab of potato. The field was inoculated with Common Scab (Streptomyces scabies) from aggressive Michigan isolates, and has been cultivated for high disease pressure for the past five years. Potatoes follow potatoes every year (no crop rotation) and organic matter is added to promote disease development. High levels of disease pressure have been seen every year of the trial.

The trial was planted as a randomized complete block design consisting of four replications of five-hill plots. Scab-susceptible potato clones are used as markers between plots. Standard cultivation practices are used for field preparation, planting, etc. under non-irrigated conditions. The plots are harvested with a one-row digger and laid on top of the soil for evaluation of disease severity. Plots are assessed for type of scab lesion present (surface, raised, or pitted scab), percent coverage of worst tuber, and an overall plot disease rating of 0 to 5. We use a modified scale of a 0-5 ranking based upon a combined score for scab coverage and lesion severity. A rating of 0 indicates zero infection. A score of 1.0 indicates a trace amount of infection. A moderate resistance (1.0 - 2.0) correlates with <10% infection. A score of 3.0 is average susceptibility that we typically associate the the variety Atlantic with surface coverage of 10-50% and pitted lesions. Scores of 4.0 or greater are found on lines with >50% infection and severe pitted lesions.

I hope that this gives you a good idea of the methods for the scab trial, but feel free to ask if you have any further questions.

Sincerely,
Joe Coombs

#200800023

Michigan State University
Potato Breeding and Genetics

2006 Frito-Lay Scab Trial
Michigan State University Scab Disease Nursery
Planted: 5/10/06
Evaluated: 9/1/06

	Rating (0-5)	Range	
Line	AVG	high	low
FL2085	1.5	2	1
FL2086	3.0	3	3
FL2095	2.0	2	2
FL2101	2.7	3	2
FL2119	2.5	3	2
FL2126	2.0	2	2
FL2128	2.0	2	2
FL2134	2.7	3	2
FL2137	0.8	1	0
FL2142	2.3	3	1
FL2155	1.3	2	1
FL2158	1.5	2	1
FL2168	3.0	3	3
FL2171	1.3	2	1
FL2194	2.0	2	2
FL2195	1.8	2	1
FL2197	2.3	3	2
FL2198	2.8	3	2
FL2201	2.0	2	2
FL2202	0.8	2	0
FL2206	2.0	2	2
FL2215	1.3	2	1
FL2216	2.3	3	2
PIKE	1.5	2	1
Mean	2.0	2.3	1.6

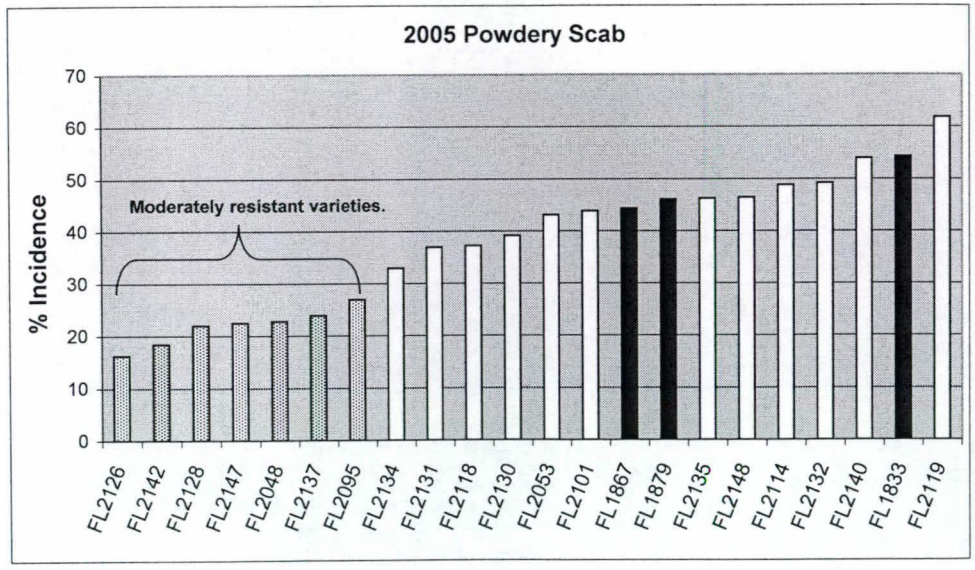
**Scab Disease Rating: 0: No Infection; 1: Low Infection <5%; 3: Intermediate; 5: Highly Susceptible.*

#20080000023

2005 Powdery Scab Data

Variety	% Incidence
FL2126	16.2
FL2142	18.4
FL2093	21
FL2128	22
FL2147	22.5
FL2048	22.8
FL2137	23.9
FL2095	26.9
FL2000	31.8
FL2113	32.4
FL2134	32.9
FL2049	34.2
FL2072	34.7
FL2107	36.5
FL2131	36.9
FL2118	37.2
FL1922	37.3
Pike	37.7
FL2130	39.1
FL2061	41.5
Atlantic	42.1
FL2053	43.1
FL2101	43.8
FL1867	44.3
FL1879	46.1
FL2135	46.2
FL2148	46.4
FL2114	48.8
FL2132	49.2
FL2140	53.9
FL1833	54.3
FL2119	61.8

denotes varieties that would be considered moderately resistant according to Barb Christ at Penn State University.



Materials and Methods for Cultivar/Genotype Susceptibility to Pink Rot and Leak

Source of isolates. Isolates used in this study were obtained from tubers with symptoms of pink rot or leak collected as part of a survey of commercial potato fields. *Phytophthora erythroseptica* isolate 266-2 and *Pythium ultimum* isolate 153-7, previously determined to be sensitive to mefenoxam and used in other challenge-inoculation studies were inoculated onto potato tubers (cv. Russet Burbank) to confirm pathogenicity prior to post-harvest challenge inoculations. Isolate aggressiveness was maintained each year by similarly inoculating tubers followed by re-isolation.

Production of test tubers. Potato cultivars Atlantic, Dark Red Norland, Goldrush, Kennebec, Pike, Russet Burbank, Russet Norkotah and Snowden are used as internal controls. These cultivars were selected for their susceptibility or resistance to infection by *P. erythroseptica* and *P. ultimum* based on previous studies. Check cultivars and all other clones to be evaluated were grown in irrigated production plots near Tappen, ND. Each cultivar/clone was planted in single row plots with whole or cut certified seed tubers. All strips were separated by buffers 4 rows wide planted to potatoes (cv. Russet Burbank). Seed was planted at 30 cm spacing. The crop was managed each year using agronomic practices typical of those recommended for irrigated potato production in the region.

Post-harvest inoculation. To insure an adequate quantity of tubers of the desired size and periderm development, plants were killed by mechanical flailing approximately 2-3 weeks prior to maturity. Following harvest, disease-free tubers (140 – 190 g) were held at 90% relative humidity (15°C) for approximately 2 weeks to optimize wound healing and were acclimated at room temperature (20 – 25°C) for 1 to 2 days prior to inoculation with *P. erythroseptica* or *P. ultimum* isolates. Post-harvest challenge inoculations were conducted on a total of 240 tubers per treatment (4 replications X 20 tubers X 3 trials). Inoculation trials were conducted at approximately 2 week intervals each year using tubers randomly selected from the material harvested from each treatment production strip.

Inoculum was prepared according to protocols previously described in the literature by our research group. Freshly prepared zoospore suspensions, adjusted to a concentration of 2×10^4 zoospores ml^{-1}, served as the inoculum for *P. erythroseptica.* Tubers of each cultivar were selected fat random and placed in plastic moist chamber boxes (33 cm X 24 cm X 12 cm) lined at the bottom with No. 3 plastic mesh. The tubers were inoculated with 10 µl of the zoospore suspension (approximately 200 zoospores) on each of three apical eyes then were covered with four layers of paper towels moistened to saturation with deionized water. To promote infection, the chamber boxes were sealed to establish a high humidity environment and incubated in the dark at ambient temperature at 20 – 22°C for 10 days.

Inoculations with *P. ultimum* were carried out using mycelial cultures of the pathogen, as previously described (39, 45). The isolate was grown on modified V8 juice agar (100 ml V8 juice, 1.25 g $CaCO_3$, 15 g of agar, 900 ml deionized H_2O) for 36 h at 20 – 22°C. The periderm of tubers to be inoculated was manually wounded by abrasion using a commercially available general purpose #96 abrasive pad. *Pythium*-colonized 5 mm diameter agar plugs were cut from the margin of actively growing cultures and placed in the center of the 1 cm^2 abraded area (1 plug per tuber, mycelium side down). Tubers

inoculated in this manner were placed in plastic moist chamber boxes, covered with moist paper towels and incubated as described above for *P. erythroseptica*.

Disease assessment. Disease incidence and severity were assessed using techniques similar to those described previously by our research group. Inoculated tubers were cut and internal tissue was examined for the development of the pink color characteristic of pink rot infection or watery, black discoloration diagnostic of leak. For pink rot, inoculated tubers were removed from the moist chambers after 10 days and infection was determined by cutting each tuber in half through the axis from the sites of inoculation on the apical bud end to the basal stem end. Leak evaluations were conducted after a 6 day incubation period. Tubers inoculated with *P. ultimum* were bisected through the point of inoculation, perpendicular to the longitudinal axis. In both cases, split tubers were covered with paper towels saturated with tap water and incubated at ambient temperatures of 20 – 22°C for approximately 30 minutes to enhance development of the color characteristic of the specific disease. Infected tubers were counted and disease incidence (I) was expressed as I = (Number of infected tubers / Number of inoculated tubers) X 100. Disease severity was quantified and defined as a function of depth of penetration (P) by determining the maximum width (W) and the depth (D) of rot from the inoculation point where $P = [W/2 + (D-5)] / 2$.

Statistical analysis of post-harvest challenge inoculation trials.

Data were transformed to infection percentage and variance homogeneity of the transformed data was tested using Levene's method. Analysis of variance (ANOVA) was performed using the General Linear Model of SAS (PROC GLM, SAS Institute, Inc, Cary, NC) and mean percentage disease control was differentiated using Fisher's protected least significant difference (LSD) test ($P = 0.05$).

Pink Rot Variety Evaluation - Tappen Series 6000

Treatment	Selection	*P. erythroseptica* challenge inoculation	
		Incidence (%)	Penetration (mm)
6001	FL 1833	68.6	42.5
6002	FL 1867	77.2	39.8
6003	FL 1879	60.0	42.5
6004	FL 2085	62.5	43.1
6005	FL 2086	80.0	45.5
6006	FL 2095	62.5	43.0
6007	FL 2101	46.4	37.7
6008	FL 2119	55.0	40.6
6009	FL 2126	7.5	38.1
6010	FL 2128	23.1	43.8
6011	FL 2134	67.5	41.3
6012	FL 2137	45.0	44.0
6013	FL 2142	17.5	38.9
6014	FL 2155	47.8	43.0
6015	FL 2158	70.5	40.3
6016	FL 2168	32.5	41.9
6017	FL 2171	40.0	43.7
6018	FL 2194	77.5	40.9
6019	FL 2195	90.0	43.2
6020	FL 2197	59.2	39.7
6021	FL 2198	80.0	43.5
6022	FL 2201	50.0	44.4
6023	FL 2202	85.0	40.1
6024	FL 2206	32.5	37.3
6025	FL 2215	64.7	41.8
6026	FL 2216	62.5	43.2
6027	Atlantic	72.5	38.3
6028	Red Norland	87.5	39.1
6029	Russet Norkotah	42.5	38.4
6030	Snowden	97.5	36.5
$LSD_{P=0.05}$		13.2	2.5

NOTE: Treatments 6027-6030 were used as controls for challenge inoculations, but were not grown with the remainder of the trial and were NDSU seed source.

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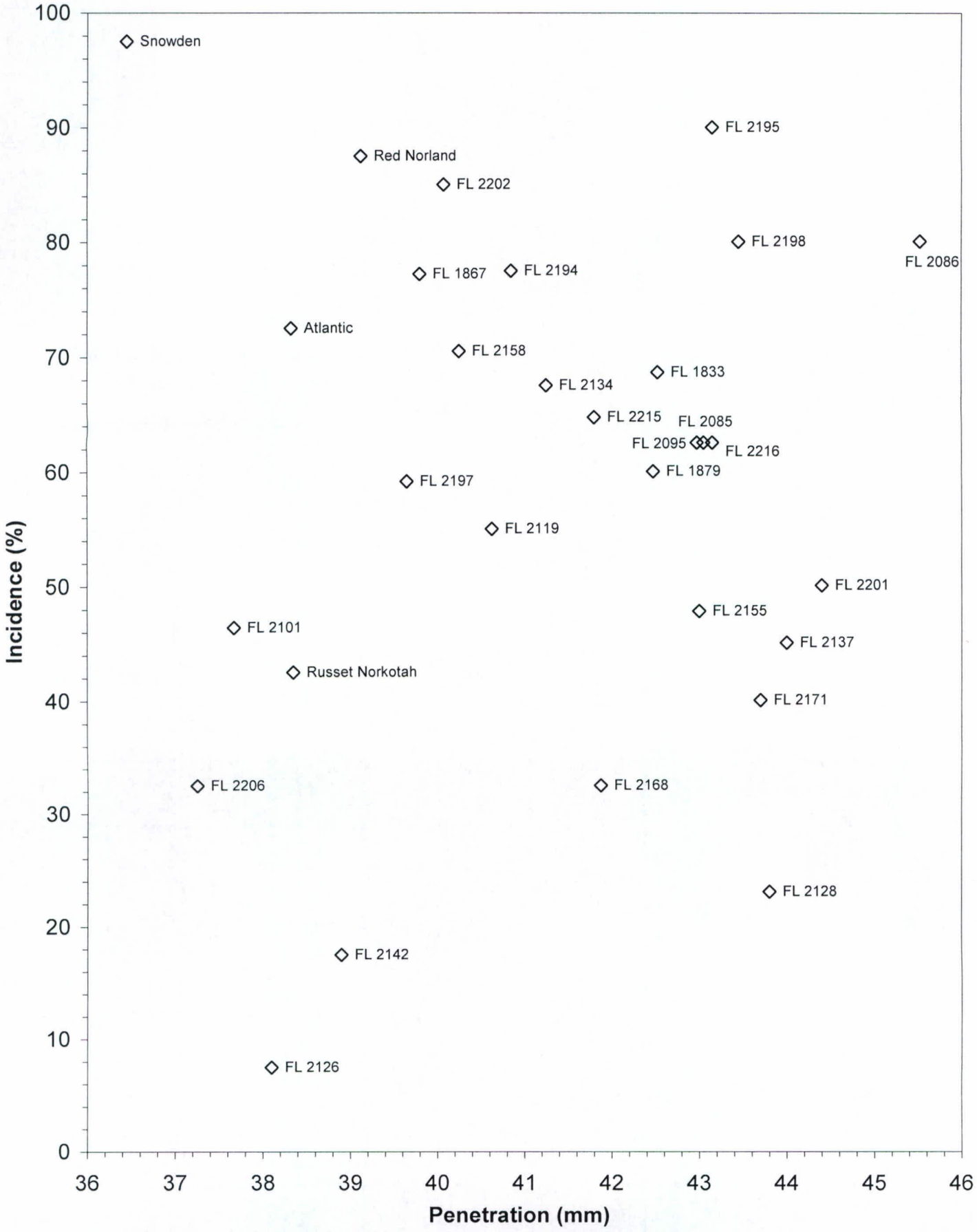
Pink Rot Variety Evaluations (Tappen Series 6000)



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Leak Variety Evaluation (5900 Series)

Location: Tappen, ND
Plot design: Increase only; 30 hills/selection: 5 feet spacers between clones

Planting date: May 16, 2006
Row width: 36 inches
Plant spacing: 12 inches

Fertilizer:

Pre-plant Incorporated:	21#N, 95#P, 206#K, 40#S;
Banded Starter:	44#N, 151#P;
Sidedress:	85#N; May 31
Fertigation:	40#N; July 13
	14#N; July 21
	20#N; August 3

Herbicide: Prowl H_2O (2.0 pt/a) + Matrix (1.5 oz / a); June 1

Insecticide: Admire Pro In-Furrow (8.0 oz/a)
Asana (6.0 oz/a) July 12, 21, August 9

Fungicide application dates:

June 22	Dithane (2.0 lb/a)
June28	Bravo Zn (2.125 pt/a) + Tanos (6.0 oz/a)
July 5	Bravo Zn
July 12	Dithane (2.0 lb/a) + Endura (3.0 oz/a)
July 19	Bravo Zn
July 27	Manzate (1.5 lb/a) + Tanos
August 1	Echo ZN (2.125 pt/a)
August 9	Manzate (2.0 lb/a)
August 16	Echo 720 (1.5 pt/a)
August 23	Dithane

Vine Kill: Reglone (2.0 pt / a) + LI700; August 31

Harvest: October 4

Post Harvest Challenge Inoculations: October 10 and October 16

Leak Variety Evaluations - Tappen Series 5900

Treatment	Variety	*P. ultimum* challenge inoculation	
		Incidence (%)	Penetration (mm)
5901	FL 1833	52.5	26.0
5902	FL 1867	29.7	16.4
5903	FL 1879	72.5	23.0
5904	FL 2085	50.0	23.8
5905	FL 2086	40.0	15.9
5906	FL 2095	27.5	9.2
5907	FL 2101	30.1	14.0
5908	FL 2119	48.8	14.6
5909	FL 2126	33.8	6.5
5910	FL 2128	16.3	7.0
5911	FL 2134	60.0	12.6
5912	FL 2137	55.0	12.3
5913	FL 2142	23.8	7.7
5914	FL 2155	19.3	13.2
5915	FL 2158	72.5	24.6
5916	FL 2168	27.5	9.2
5917	FL 2171	37.5	17.3
5918	FL 2194	30.3	15.5
5919	FL 2195	50.0	17.7
5920	FL 2197	32.5	17.9
5921	FL 2198	78.8	21.9
5922	FL 2201	21.3	14.3
5923	FL 2202	49.5	14.6
5924	FL 2206	32.5	11.8
5925	FL 2215	27.5	8.6
5926	FL 2216	53.8	22.8
5927	Red Norland	83.8	23.4
5928	Russet Norkotah	77.5	16.3
5929	Snowden	42.5	20.7
5930	Altantic	78.8	20.1
$LSD_{P=0.05}$		20.6	7.2

NOTE: Treatments 5927-5930 were not grown with the remainder of the trial and were NDSU seed source, and were used as controls for challenge inoculations.

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Leak Variety Evaluations (Tappen Series 5900)

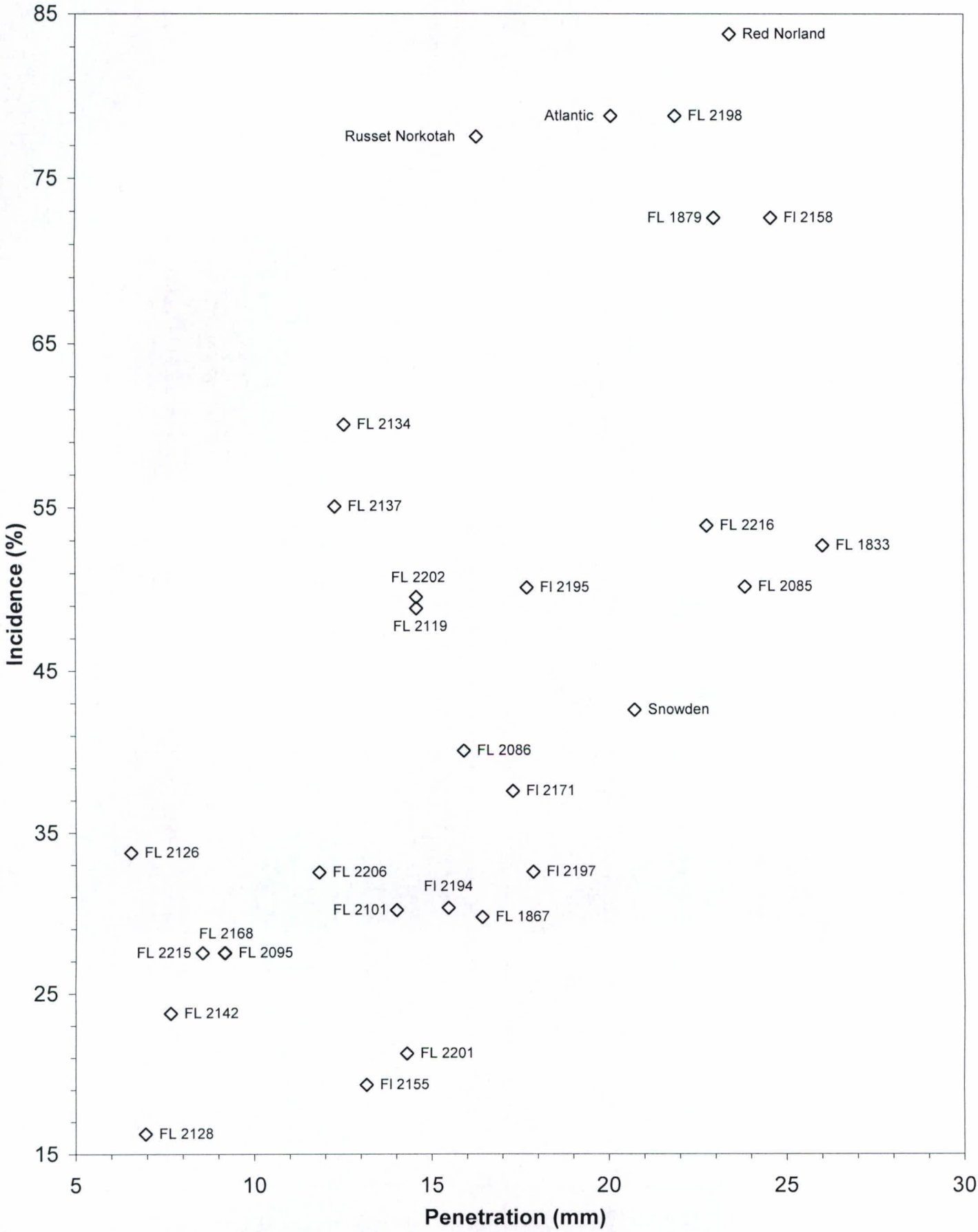


EXHIBIT D: Additional description of the variety

As additional information about FL 2126, the following are included:

1) Isozyme fingerprint of FL 2126, with reference to the methodology utilized by Dr. David Douches of Michigan State University. Comparison of fingerprint of FL 2126 with that of Atlantic shows distinct patterns for each variety.

2) Glycoalkaloid data, comparing FL 2126 with Atlantic, furnished by Dr. Stephen Love and Lura Schroeder of the University of Idaho.

3) Photographs of typical plants, leaves, flowers, sprouts and tubers.

4) Solids and yields from 10 Area Trials.

5) Storage sugar profile

6) Tubers per plant

7) Bruise profile

EXHIBIT D-1

Isozyme fingerprints of FL2126 compared to Atlantic

Variety	Year of Test	MDH1	MDH2	PGD3	IDH1	PGI1	APS1	GOT1	GOT2	PGM1	PGM2	DIA1	DIA2	PRX3	ADH1
FL 2126	2005	1222	2222			2222		3344	3355	1123	2222				
Atlantic	1996	2223	2223	1122	1112	2222	1111	4444	3555	1112	2223	1112	1144	2222	

Source of Data: Dr. David Douches, Michigan State University, 2005

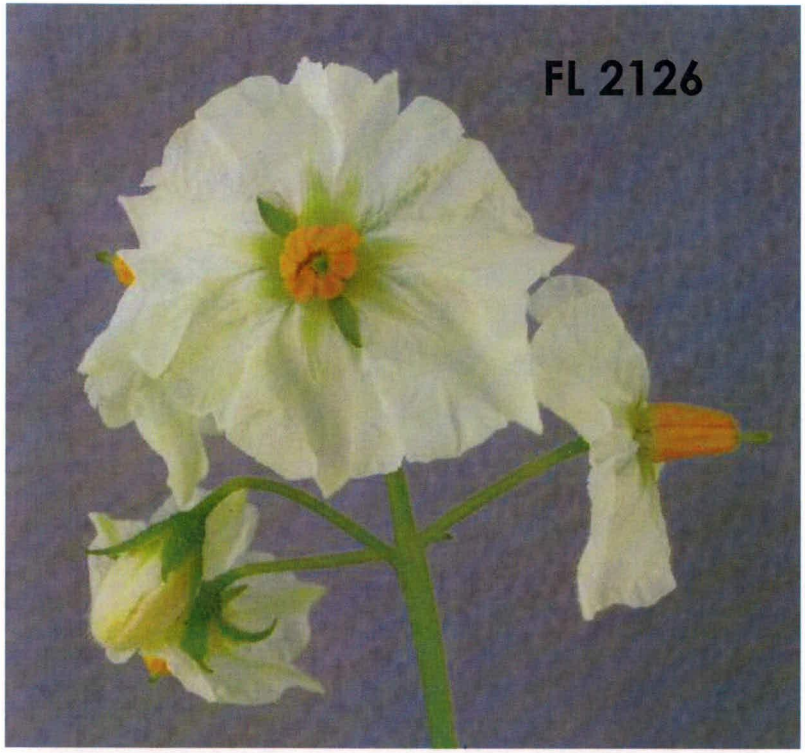
Procedures and allelic designations used are according to Douches, D.S and K. Lundlum. 1991. Electrophoretic Characterization of North American Potato Cultivars. Am Potato J. 68:767-780

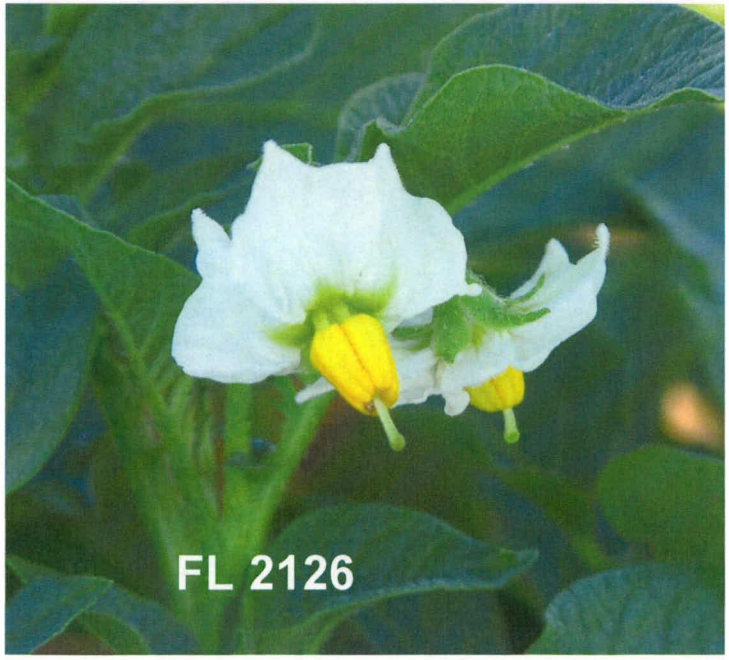
EXHIBIT D-2

Glycoalkaloids of FL2126 compared to Atlantic

Variety	Year of Test	OD@ 600	STD (mg/OD)	(mg/ aliquot)	Total Volume (4 mg/ aliquot)	8g sample (total mg/ 8 g)	Idaho solids	FL solids (Idaho x .85)	(total mg /8g*% solids)	Total Glycoalkaloids (mg/100g fresh)
FL 2126	3/2005	0.181	0.72	0.130	10.000	1.294	**23.24**	**19.75**	3.759	**3.76**
FL 2126	3/2005	0.190	0.72	0.140	10.000	1.359			3.946	**3.95**
FL 2126	9/27/06	0.208	0.72	0.149	10.000	1.487	**24.51**	**20.83**	4.557	**4.56**
FL 2126	2/1/06	0.227	0.75	0.169	10.000	1.051	**23.51**	**19.98**	1.691	**1.69**
Atlantic	3/2005	0.339	0.72	0.240	10.000	2.424	**24.43**	**20.77**	7.401	**7.4**
Atlantic	9/27/06	0.333	0.72	0.238	10.000	2.381	**21.81**	**18.54**	6.492	**6.49**

Source of data: Lura Schroeder, University of Idaho





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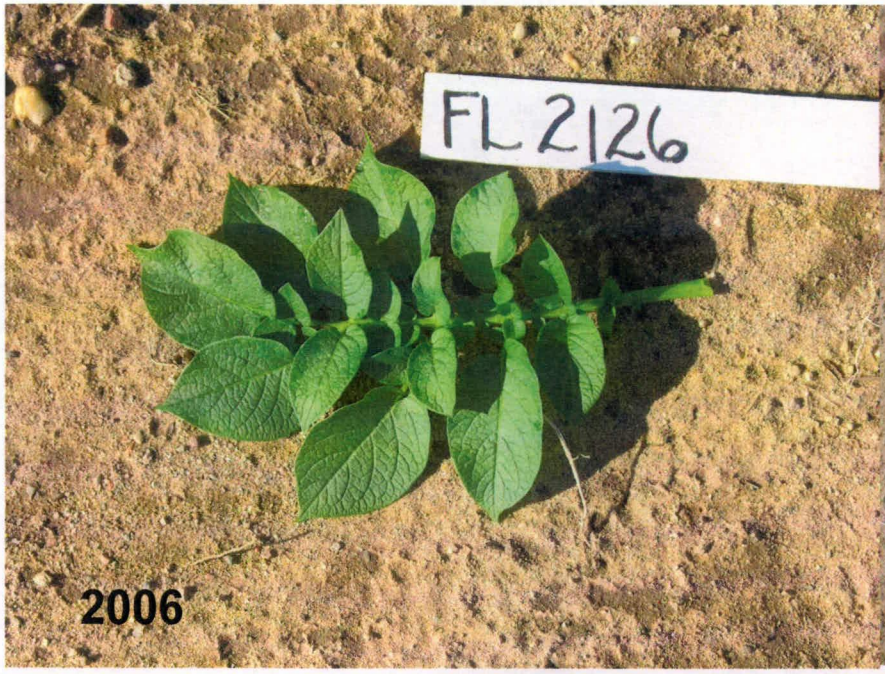
FL 2126
2006


2005


ATLANTIC

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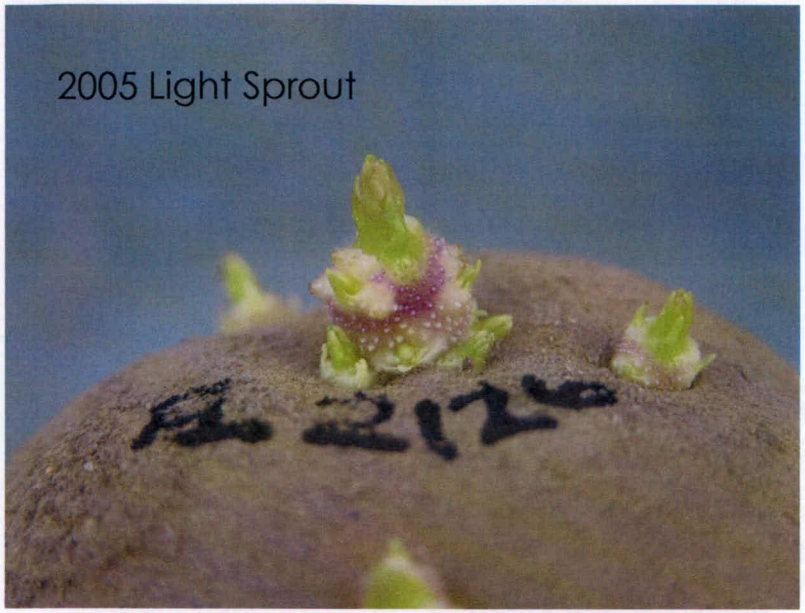

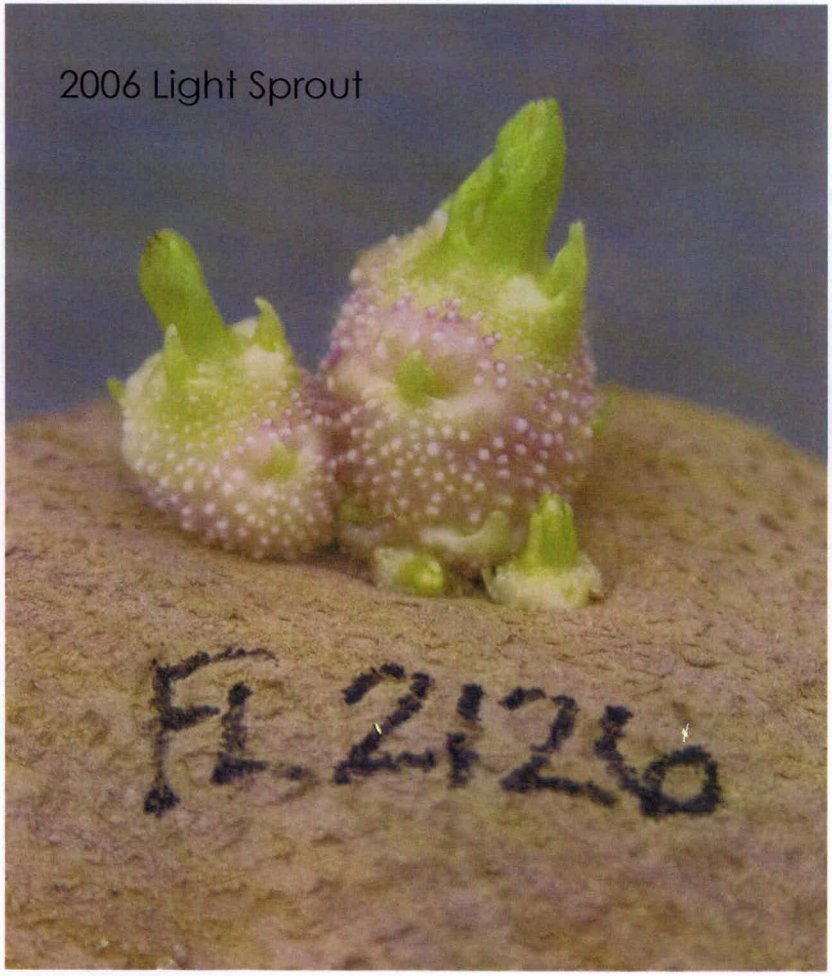

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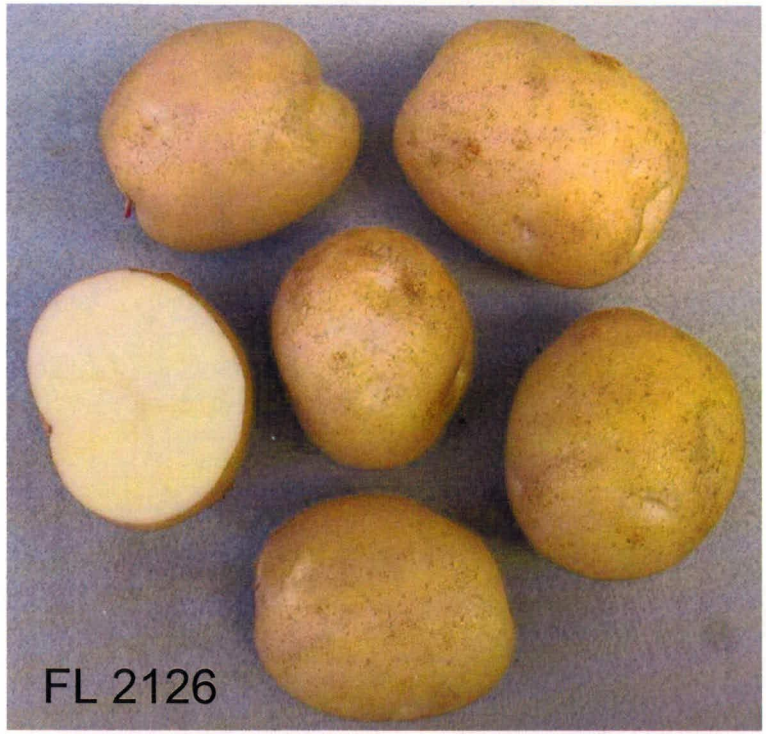
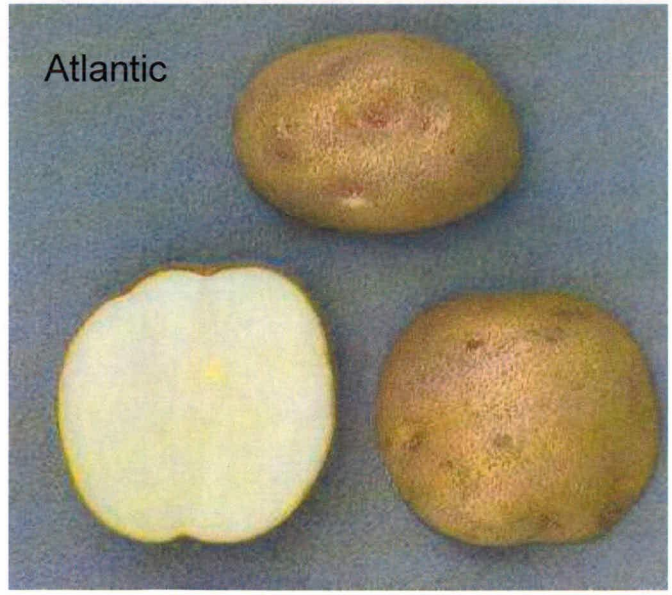
FL 2126 past full bloom


4th Year
4th Year
95.12
RH
FL 2126


FL 2126


2nd Year
2nd Year
1255
1255
Three Lakes
Three Lakes
Atlantic


Atlantic

#20080023

#200800023

FL 2126

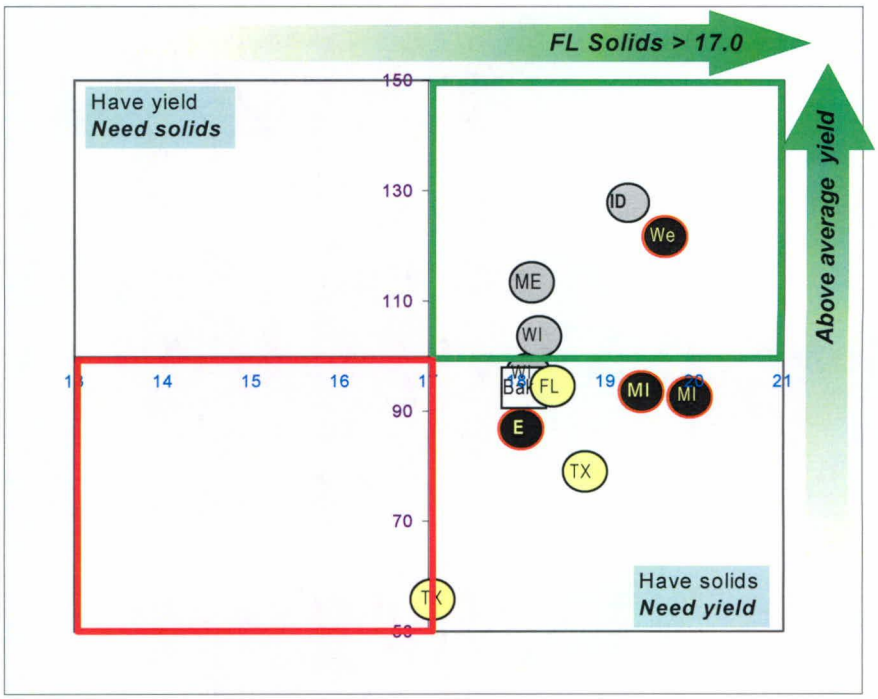
Actual Solids vs Total Yield Index

Maine
Idaho
Wisconsin

Michigan
East Nebraska
West Nebraska

California:
Bakersfield
Cuyama

Florida
Texas



	DAP	FL Solids %	FL Solids Index	Total Yield cwt/ac	Total Yield Index	2 - 4" Yield cwt/ac	2 - 4" Yield Index	Total solids/acre pounds	Total solids/acre Index	2"- 4" solids/ac pounds	2"- 4" solids/ac Index
Maine late	131	**18.2**	*107*	**357**	*113*	**162**	*72*	**6472**	*121*	**2949**	*77*
Idaho late	151	**21.5**	*112*	**501**	*125*	**422**	*113*	**10755**	*140*	**9049**	*128*
Idaho mid	112	**19.3**	*108*	**502**	*128*	**415**	*116*	**9643**	*139*	**7993**	*126*
Wisconsin late	159	**18.1**	*108*	**524**	*97*	**380**	*81*	**9490**	*106*	**6892**	*88*
Wisconsin mid	118	**18.3**	*109*	**435**	*104*	**286**	*83*	**7933**	*113*	**5228**	*91*
Michigan late	149	**19.4**	*109*	**486**	*94*	**372**	*87*	**9423**	*102*	**7208**	*95*
Michigan mid	115	**20.0**	*109*	**456**	*93*	**259**	*68*	**9100**	*100*	**5144**	*73*
West NE mid	128	**19.7**	*108*	**481**	*122*	**350**	*105*	**9478**	*132*	**6899**	*114*
East NE late	130	**18.1**	*116*	**341**	*87*	**200**	*61*	**6150**	*100*	**3608**	*70*
Cuyama, CA	129	**21.2**	*111*	**342**	*105*	**232**	*80*	**7260**	*116*	**4929**	*89*
Bakersfield, CA	138	**18.1**	*104*	**475**	*94*	**390**	*83*	**8573**	*99*	**7037**	*87*
Pearsall, TX mid	118	**18.8**	*107*	**335**	*79*	**216**	*62*	**6251**	*84*	**4009**	*66*
Pearsall, TX early	99	**17.1**	*100*	**181**	*56*	**27**	*12*	**3092**	*56*	**454**	*12*
Hastings, FL late	129	**18.4**	*100*	**355**	*95*	**221**	*70*	**6532**	*95*	**4053**	*71*

Wisconsin Area Trial 2005 — Sorted by Cultivar

Mid Harvest — 118 DAP

planted: 4/27/2005
harvested: 8/23/2005

	Cultivar		FL Solids % solids	FL Solids Index	Total Yield Cwt/acre	Total Yield Index	2 - 4" Yield Cwt/Ac	2 - 4" Yield Index	% of Yield 2 - 4"	% of Yield Undersize	Tubers/ plant	Solids/acre Total Yld	Solids/acre Index	Solids/acre 2 - 4" Yld	Solids/acre Index	Vine Mat	% Cover	Scab score*	Fresh chip app	Fresh chip 'L'	Fresh chip 'b'	
1	Atlantic	white	17.2	102	465	111	425	124	92%	8%		7,995	114	7,319	127	4	88%	3	2	66	21.7	
2	1833	pale yellow	16.1	96	463	110	434	126	94%	6%		7,446	106	6,978	121	4	80%	3	1	63	24.1	
3	1867	white	17.8	106	471	112	438	127	93%	7%		8,350	119	7,636	133	3	28%	3	1	66	21.2	
4	1879	pale yellow	15.9	94	436	104	416	121	95%	5%		6,913	99	6,589	115	4	85%		1	65	21.6	
5	1930	yellow	17.2	103	403	96	340	99	84%	16%		6,922	99	5,844	102	3	50%	3	1	63	24.8	
6	2053	white	19.1	114	452	108	376	109	83%	17%		8,604	123	7,170	124	3	80%	3	1	69	24.1	
7	2085	magenta	13.8	82	384	92	348	101	91%	10%		5,263	75	4,778	83	3	68%	4	3	42	9.6	magenta flesh
8	2086	blue	14.2	84	378	90	189	55	50%	51%		5,340	76	2,666	46	4	68%	3	3	34	3.4	blue flesh
9	2114	pale yellow	18.0	108	389	93	229	67	60%	41%		7,012	100	4,132	72	3	58%		1	67	25.5	**very high solids, long shape, exc chips fresh & storage, PVY resistant, v attractivec,** needs size
10	2118	yellow	16.1	96	405	97	286	83	70%	30%		6,577	94	4,654	81	4	100%		1	64	23.4	**good solids & yield**, sus to scab, mod bruise, exc fresh chip, at least 1 mo storage. Best in **ENE, ID, MI, FL**
11	2119	white	17.4	103	461	110	405	118	88%	13%		8,066	115	7,093	123	4	93%		2	65	22.5	good solids, good yield, res to bruise & late blight, vig, late vine, needs long season . Best in **WI & MI**
12	2126	cream	18.3	109	435	104	286	83	66%	34%		7,933	113	5,228	91	4	75%		1	62	20.1	**high solids** everywhere, **bruise res**, high tuber set, low mkt yield, needs size, late vine, 2004 storage good. Best yield in **ID, WI, ME**
13	2128	white	17.8	106	379	90	277	80	73%	27%		6,746	96	4,917	85	4	95%		1	65	21.6	**high solids, bruise res, scab res** (?) maybe res to LB. Better at late harv. Variable storage results. Best for **TX, FL, WNE**
14	2130	white	16.8	100	440	105	382	111	87%	13%		7,400	105	6,429	112	3	50%		1	65	21.5	**good solids**, good chips, low to avg yld, avg bruise, **scab tolerant?,** tubers stick to stolons until mature, late vine, very attractive. Growers willing to work with vine to improve yield
15	2131	pale yellow	16.0	95	462	110	392	114	85%	15%		7,404	106	6,279	109	4	68%	3	2	65	23.7	**high yield, bruise res**, solids >1879, good chips fresh & storage. Best in **ENE, ME, WNE.**
16	2132	yellow	17.0	101	384	92	335	97	87%	13%		6,527	93	5,706	99	4	98%	3	1	65	25.7	**High yield,** avg solids, short storage or FRESH only, some bruise sus, Best in **TX, MI, WI, ID**
17	2134	cream	18.1	108	365	87	219	64	60%	40%		6,610	94	3,960	69	3	50%	4	1	64	21.4	**high solids = 1867**, high set, low yield, storage 5 months, scab sus, short dormancy, vig late vine, some bruise sus. Best in **TX** (high solids, low yield).
18	2135	yellow	16.6	99	448	107	381	111	85%	15%		7,459	106	6,331	110	4	83%	2	1	63	22.9	competitive, > avg solids, bruise sus, scab sus, exc fresh & good storage, Kan & Newton. Good in nearly **all locations**
19	2137	white	17.2	102	367	87	346	100	94%	6%		6,253	89	5,891	102	4	90%		1	65	19.4	**Good solids & yield**, tolerant to pitted scab?, good fresh, exc storage, avg bruise. MAY FRY OUT OF 42F
20	2140	yellow	18.2	108	379	90	283	82	75%	25%		6,880	98	5,149	90	3	43%		1	63	26.6	**high solids, PVY res**, modest tot yield, high set, good storage, small tubers need size, late maturity
21	2147	white	18.2	108	287	69	196	57	68%	32%		5,196	74	3,547	62	5	100%	3	2	64	23.7	Foliar LB res, good yield, low solids. FRESH ONLY? Only in WI in 2004. Slight br sus. ME & TX interested
22	2148	yellow	15.3	91	495	118	468	136	94%	6%		7,533	107	7,120	124	3	43%	3	1	65	20.8	high solids, low bruise, yield unknown(damaged plot), storage probably to 7mo
23	2152	yellow	18.6	111	334	80	165	48	49%	51%		6,172	88	3,058	53	4	93%	2	1	65	27.5	**PVY res, very high solids,** low tot yield, attractive, UNLIKELY STORAGE, small **oblong** tubers, mod bruising
24	2154	yellow	17.3	103	428	102	373	108	87%	13%		7,435	106	6,468	113	4	75%	4	2	65	25.4	**high solids,** mod yield, good tuber size, bruise sus, UNCERTAIN STORAGE, deep stem end. **Very good in Florida 4thyr**
25	2155	white	18.0	107	452	108	432	125	96%	5%		8,127	116	7,774	135	3	80%		1	64	21.2	**very high solids, exc chips fresh & storage,** avg to low yield, flat, poor app, off shapes **scab res?** Bruise low to high. **High solids/good yld in Florida 4thyr.**
26	2156	yellow	18.1	108	434	104	357	104	83%	18%		7,900	113	6,482	113	4	85%		1	65	25.0	**High yield > Atl, low bruise,** >17 solids, good chips, attractive, fairly flat, **scab tol?**
27	2158	pale yellow	16.4	98	478	114	446	130	93%	7%		7,871	112	7,347	128	4	88%		1	66	23.8	**good yield, avg to good solids,** good size, bruise sus, exc fresh, good storage, **scab res? High solids/good yld in Florida 4thyr**
28	2159	pale yellow	15.5	92	412	98	323	94	66%	35%		6,348	91	4,965	86	3	75%		1	63	24.3	**very high yield, >Atlantic, high set,** med size, low solids, good storage, **scab tol?**
29	2160	yellow	17.1	102	497	118	415	120	83%	17%		8,483	121	7,082	123	4	65%		1	69	26.5	**good yield, avg solids, bruise res,** med size, good storage, attached stolons
30	2162	yellow	16.6	99	474	113	422	122	89%	11%		7,839	112	6,979	121	3	40%	4	1	66	26.9	**high early yield, >17 solids,** avg bruise, good storage, early vine mat, good size, GC's, severe pitted scab.
31	2165	white	16.7	99	333	79	283	82	85%	16%		5,552	79	4,714	82	4	88%	3	1	63	21.9	**good yield, avg solids, FRESH only, good size , PVY resistant, bruise res.**
32	2167	pale yellow	16.7	99	460	110	404	117	88%	12%		7,651	109	6,731	117	2	30%		1	66	25.4	**high solids, bruise res, exc chips, good storage,** low yield, small & needs size, early mat, **scab res** ? yellow>1833
33	2168	pale yellow	17.7	105	420	100	358	104	85%	15%		7,441	106	6,349	110	4	85%	3	1	63	22.1	**high solids, high yield, FRESH only,** exc unif app, sus to scab, bruise low to high, very attractive. High yield/solids in **Florida 4th yr**
34	2169	yellow	16.2	96	396	95	307	89	78%	22%		6,419	91	4,968	86	2	33%	3	1	66	26.6	**good yield, avg solids, good fresh/exc storage,** small to med, early vine, some bruise sus Vgood in **Florida 4th yr**
35	2170	yellow	16.0	96	355	85	315	91	89%	11%		5,691	81	5,050	88	4	100%	4	2	62	25.3	**very big oblong tubers,** avg solids, good storage, good late yield, sev scab. Huge yield in **Florida** w >avg solids. ROBERT's
36	2171	pale yellow	16.9	101	400	95	330	96	83%	17%		6,739	96	5,563	97	3	63%		1	67	22.6	**good yield, >17 solids, good storage, v attractive, scab res?**
37	2172	very yellow														3	88%					**too yellow? Scab tol?, mediocre yield, low solids, GC's, very attractive, exc fresh & storage**
38	2173	yellow	14.5	86	462	110	434	126	94%	6%		6,689	95	6,279	109	3	45%		1	62	25.7	**high yield, high set, very** low solids, **bruise res, exc fresh chips, good size, scab tol?**
39	LB 248.02		16.8	100	429	102	224	65	52%	48%		7,183	102	3,737	65	3	75%	3	1	64	22.0	
40	PVY 9.22	yellow	14.6	87	472	112	422	123	90%	11%		6,893	98	6,164	107	4	63%		1	67	26.1	very low solids 2004, **huge yield, PVY res, low bruise** , large tubers, big late vine, variable fresh scores
41	PVY 15.15	white	16.4	98	407	97	334	97	82%	18%		6,676	95	5,476	95	2	23%	3	2	61	21.2	**good solids, modest yield, PVY res,** high bruise, early vine, attractive, small tubers
	AVERAGE		16.8		420		345					7,038		5,765								
	LSD.05		0.9		73.4		74.0															
	C.V.%		4%		13%		16%															

#200800023

Wisconsin Area Trial 2005 — Sorted by Cultivar

Late Harvest — 159 DAP

planted: 4/27/2005
harvested: 10/3/2005

Yield data lost to power outage

	Cultivar		FL Solids		Total Yield		2 - 4" Yield		% of Yield		Tubers/	Solids/acre				Vine	%	Scab	Fresh chip		
			% solids	Index	Cwt/acre	Index	Cwt/Ac	Index	2.- 4"	Undersize	plant	Total Yld	Index	2 - 4" Yld	Index	Mat	Cover	score*	app	'L'	'b'
1	Atantic	white	16.9	101	561	104	521	110	93%	7%		9,500	106	8,817	113	1	0%	3	1	67	22.3
2	1833	pale yellow	16.1	96	577	107	555	118	96%	4%		9,272	103	8,904	113	1	0%		1	65	21.5
3	1867	white	16.9	101	596	110	561	119	94%	6%		10,193	113	9,605	122	1	0%		1	68	21.5
4	1879	pale yellow	16.2	97	607	112	587	124	97%	3%		9,866	110	9,543	122	1	0%		1	65	21.0
5	1930	yellow	17.2		522	97	452	96	86%	14%						1	0%		2	62	25.2
6	2053	white	18.4	110	533	99	480	102	90%	10%		9,803	109	8,820	113	1	0%		1	68	19.5
7	2085	magenta	13.9	83	472	87	447	95	95%	5%		6,558	73	6,214	79	1	0%	3	2	41	6.3
8	2086	blue	14.0	83	522	97	325	69	62%	38%		7,295	81	4,531	58	1	0%	3	3	31	0.1
9	2114	pale yellow	18.1	108	506	94	354	75	69%	31%		9,158	102	6,410	82	1	0%		1	67	22.8
10	2118	yellow	17.6	105	583	108	462	98	79%	21%		10,233	114	8,101	103	1	0%	3	1	67	23.8
11	2119	white	18.0	107	593	110	550	117	93%	8%	8	10,667	119	9,888	126	1	0%		1	66	20.9
12	2126	cream	18.1	108	524	97	380	81	72%	28%	11	9,490	106	6,892	88	1	0%		1	65	22.6
13	2128	white	18.5	110	534	99	459	97	86%	14%	11	9,871	110	8,487	109	1	0%		1	68	20.8
14	2130	white	17.3	103	516	95	468	99	91%	10%		8,917	99	8,081	103	1	0%		1	65	21.1
15	2131	pale yellow	16.1	96	587	109	531	113	90%	10%	8	9,417	105	8,515	109	1	0%		2	66	23.2
16	2132	yellow	17.9	107	595	110	561	119	94%	6%		10,643	118	10,052	128	1	0%	4	2	64	25.4
17	2134	cream	17.3	103	439	81	330	70	75%	26%		7,586	84	5,721	73	1	0%	3	1	64	22.6
18	2135	yellow	16.4	98	538	99	470	99	87%	13%		8,845	99	7,726	99	1	0%		2	62	21.5
19	2137	white	17.1	102	529	98	514	109	97%	3%	9	9,013	100	8,757	112	1	0%		1	66	21.2
20	2140	yellow	17.6	105												1	0%		2	67	26.1
21	2147	white	18.9	113												1	0%		1	65	23.9
22	2148	yellow	16.0	95												1	0%		1	67	21.3
23	2152	yellow	18.1	108												1	0%		1	66	26.0
24	2154	yellow	17.7	106												1	0%		2	65	24.9
25	2155	white	18.0	107							8					1	0%		1	67	20.4
26	2156	yellow	17.3	103							10					1	0%		1	67	25.6
27	2158	pale yellow	17.0	101							8					1	0%		1	65	24.8
28	2159	pale yellow	15.9	95							10					1	0%		1	66	24.3
29	2160	yellow	17.3	103	602	111	530	112	88%	12%	8	10,405	116	9,167	117	1	0%		1	66	25.1
30	2162	yellow	15.9	95	564	104	518	110	91%	9%	11	9,003	100	8,262	105	1	0%		1	65	25.4
31	2165	white	17.2	102	516	96	474	100	92%	8%	9	8,855	99	8,123	104	1	0%		1	65	21.6
32	2167	pale yellow	15.9	95	468	87	430	91	92%	8%	12	7,459	83	6,842	87	1	0%		1	69	26.7
33	2168	pale yellow	17.3	103	527	98	473	100	90%	10%	10	9,097	101	8,172	104	1	0%		1	66	24.9
34	2169	yellow	15.4	92	527	97	461	98	87%	13%	16	8,112	90	7,106	91	1	0%		1	66	20.9
35	2170	yellow	16.1	96	617	114	572	121	93%	7%		9,916	110	9,202	117	1	0%		1	64	25.2
36	2171	pale yellow	16.8	100	547	101	467	99	86%	15%		9,195	102	7,853	100	1	0%		1	68	24.6
37	2172	very yellow	16.6	99	481	89	405	86	84%	16%		8,013	89	6,754	86	1	0%		1	65	23.2
38	2173	yellow	14.0	84	601	111	561	119	94%	7%	12	8,422	94	7,872	100	1	0%		2	63	26.3
39	LB 248.02		16.9	101	511	94	340	72	66%	34%	14	8,651	96	5,765	74	1	0%		1	67	24.4
40	PVY 9.22	yellow	14.6	87	470	87	392	83	83%	17%	8	6,843	76	5,712	73	1	0%		2	67	26.7
41	PVY 15.15	white	16.0	95	624	115	576	122	92%	8%	11	9,965	111	9,197	117	1	0%		1	65	22.9
	AVERAGE		16.8		543		475					9,041		7,906							
	LSD.05		0.6		80.7		84.1														
	C.V.%		3%		11%		13%														

Rhinelander Area Trial 2006

Mid Harvest 132 DAP

Sorted by Cultivar

planted: 5/24/2006
harvested: 10/3/2006

Controls
VQ
AT2
AT1

	Cultivar		FL Solids % solids	FL Solids Index	Total Yield Cwt/acre	Total Yield Index	2 - 4" Yield Cwt/Ac	2 - 4" Yield Index	% of Yield 2 - 4"	% of Yield Undersize	Solids/acre Total Yld	Solids/acre Index	Solids/acre 2 - 4" Yld	Solids/acre Index	Vine Mat	% Cover	Scab score*	Fresh chip app	Fresh chip L'	Fresh chip b'
1	Atlantic	white flesh	18.8	98	257	107	206	111	76%	25%	4,788	104	3,830	107			5	2	64	23.8
2	1833	pale yellow	18.9	99	325	135	316	170	97%	3%	6,105	132	5,931	166			3	1	64	26.3
3	1867	white flesh	17.9	93	187	78	151	81	78%	22%	3,372	73	2,731	76			4	1	67	23.5
4	1879	pale yellow	16.0	83	196	81	168	91	85%	16%	3,154	68	2,710	76			4	1	66	25.1
5	2053	white flesh	20.0	104	248	103	201	108	81%	20%	4,951	107	4,003	112			3	1	66	23.2
6	2072	yellow flesh	21.0	109	105	44	89	48	78%	23%	2,148	46	1,808	51			2	1	66	27.1
7	2085	red flesh	16.8	87	228	95	165	89	72%	28%	3,825	83	2,772	77			3			
8	2086	blue flesh	15.5	81	184	76	13	7	6%	94%	2,850	62	196	6			4			
9	2119	white flesh	19.0	99	290	120	208	112	72%	29%	5,543	120	3,976	111			1	1	64	24.9
10	2126	cream flesh	21.2	111	235	98	87	47	38%	63%	4,974	107	1,869	52			2	1	65	25.9
11	2128	white flesh	20.6	108	270	113	194	105	71%	29%	5,563	120	3,984	112			3	2	65	24.5
12	2134	cream flesh	18.9	98	116	48	38	20	30%	70%	2,169	47	692	19			4	1	65	22.2
13	2137	white flesh	19.9	103	188	78	159	86	84%	16%	3,717	80	3,152	88			3	1	67	22.5
14	2151	white flesh	18.2	94	188	78	156	84	82%	19%	3,481	75	2,882	81			4	1	68	21.1
15	2153	white flesh	19.5	102	179	75	132	71	72%	28%	3,522	76	2,614	74			4	1	64	22.8
16	2155	white flesh	20.3	106	222	93	197	106	85%	15%	4,506	98	3,994	112			3	1	68	20.2
17	2158	pale yellow	18.5	96	304	126	250	135	81%	20%	5,651	122	4,672	131			1	2	60	26.3
18	2160	yellow flesh	19.5	101	368	153	290	156	79%	21%	7,154	155	5,635	157			3	1	68	28.7
19	2168	pale yellow	19.2	100	261	108	178	96	67%	34%	4,993	108	3,399	95			4	2	65	25.6
20	2171	pale yellow	18.1	94	299	125	260	140	87%	13%	5,373	116	4,672	131			1	1	66	25.8
21	2191	yellow flesh	18.8	99	289	120	240	130	84%	16%	5,436	118	4,510	126			1	2	65	27.8
22	2192	pale yellow	18.2	95	311	129	280	151	90%	11%	5,692	123	5,132	144			2	1	67	25.4
23	2193	yellow flesh	19.8	103	285	118	243	131	85%	15%	5,609	121	4,784	134			1	1	65	26.0
24	2194	pale yellow	21.1	110	280	116	245	132	87%	13%	5,876	127	5,138	144			1	2	64	26.1
25	2195	white flesh	19.7	103	225	94	174	94	74%	27%	4,265	92	3,274	92			5	1	65	27.9
26	2196	white flesh	19.9	104	326	136	272	147	84%	17%	6,484	140	5,400	151			3	2	64	25.2
27	2197	white flesh	19.8	103	246	102	169	91	68%	32%	4,888	106	3,360	94			3	1	66	23.0
28	2198	yellow flesh	19.0	100	199	83	135	73	68%	33%	3,773	82	2,556	72			3	1	65	27.8
29	2199	white flesh	18.5	97	204	85	135	73	64%	37%	3,749	81	2,475	69			1	1	64	23.0
30	2200	white flesh	18.7	98	136	57	108	58	78%	23%	2,549	55	2,014	56			5	2	61	24.3
31	2201	pale yellow	19.3	101	287	119	257	139	89%	12%	5,547	120	4,972	139			3	1	60	24.5
32	2202	pale yellow	19.0	99	236	98	193	104	79%	22%	4,477	97	3,664	103			3	2	66	25.6
33	2204	white flesh	18.6	97	230	96	209	112	91%	9%	4,251	92	3,858	108			3	1	64	22.1
34	2206	white flesh	20.0	105	307	128	263	142	85%	15%	6,190	134	5,311	149			3	1	65	23.7
35	2207	very yellow	19.5	101	295	123	230	124	77%	23%	5,730	124	4,452	124			5	1	65	30.5
36	2208	white flesh	18.9	98	159	66	96	52	59%	41%	2,978	64	1,787	50			3	1	65	22.3
37	2209	very yellow	20.4	106	313	130	180	97	58%	43%	6,357	138	3,649	102			1	1	64	28.3
38	2212	white flesh	20.3	106	265	110	206	111	78%	23%	5,365	116	4,167	117			3	1	64	23.1
39	2213	white flesh	18.6	97	238	99	205	110	86%	15%	4,418	95	3,810	107				1	67	23.6
40	2214	yellow flesh	22.1	115	253	105	205	111	81%	19%	5,589	121	4,533	127			3	1	65	26.3
41	2215	white flesh	20.9	109	198	82	138	74	70%	30%	4,139	89	2,864	80			1	1	64	23.9
42	2216	pale yellow	18.7	98	250	104	219	118	88%	13%	4,664	101	4,073	114			5	2	67	24.7
43	2217	yellow flesh	17.2	89	180	75	129	70	70%	30%	3,089	67	2,215	62				2	66	26.9
	AVERAGE		19.2		241		186				4,627		3,570							
	LSD.05		1.2		103.0		110.3													
	C.V.%		9%		22%		30%													

#20080023

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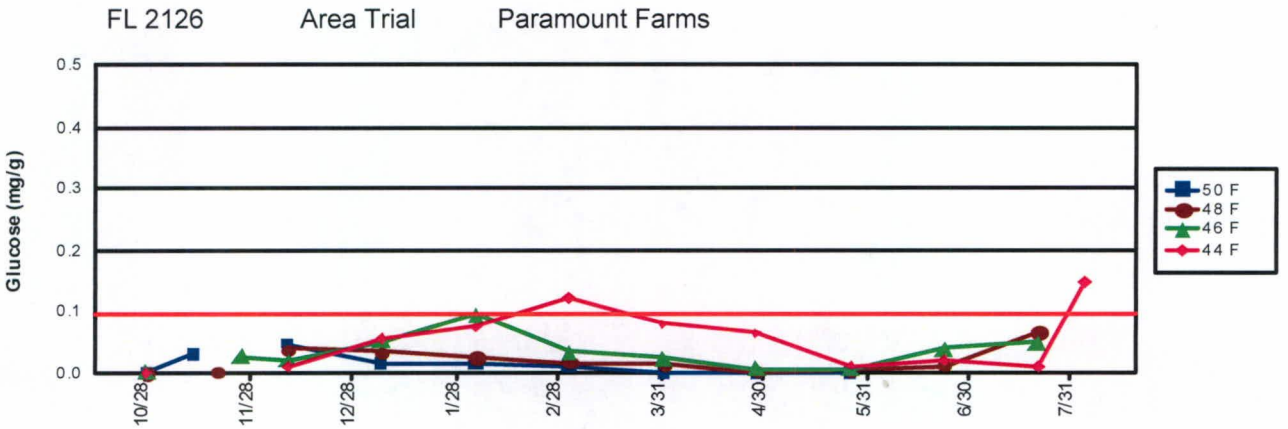
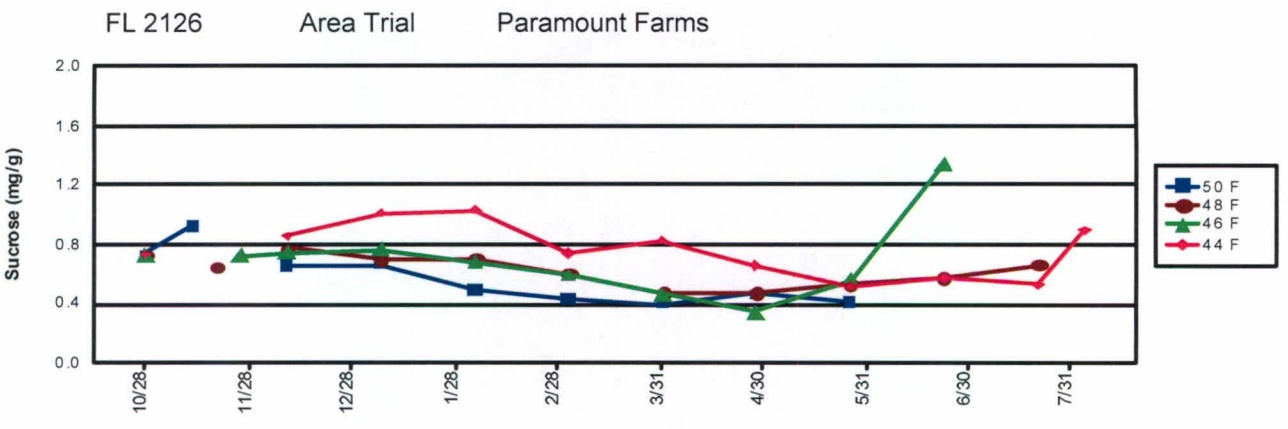
2126	42°					50°				
	1 month	3 months	5 months	7 months	9 months	1 month	3 months	5 months	7 months	9 months
	Glucose					*Glucose*				
Idaho, late		0.947	0.624	1.214		0.127	0.034	0.000	0.031	0.024
Michigan, late		3.342	1.075			0.151	0.120	0.029	0.056	0.117
East NE, late		0.945	1.581	1.721			0.037	0.004	0.007	0.028
Wisconsin, mid		2.729	3.167	2.771			0.250	0.130	0.010	0.011
Wisconsin, late		2.923	2.511	3.260			0.124	0.072	0.000	0.002
	Sucrose					*Sucrose*				
Idaho, late		7.231	1.903	4.975		1.451	0.973	0.304	0.634	1.559
Michigan, late		1.799	0.968			0.802	0.773	0.551	0.578	0.886
East NE, late		5.035	6.552	4.520			1.055	0.904	0.699	0.931
Wisconsin, mid		1.792	2.024	2.087			0.861	0.692	0.575	0.476
Wisconsin, late		2.201	1.805	1.918			0.684	0.717	0.453	0.481

Legend

Sucrose	*Glucose*
onset of senescence	< 0.07
Not recoverable	0.07 - 0.10
	> 0.10





Tubers/plant

	DAP	2126	Atlantic	1833	1867	1879	2048	2053	Chipeta
Maine late	131								
Idaho late	151	**11**			5	5		7	4
Idaho mid	112	**12**			6	5		8	4
Wisconsin late	159	**11**							
Wisconsin mid	118								
Michigan late	149	**14**		9	8	7		10	
Michigan mid	115	**7**		8	11	7		7	
West NE mid	128								
East NE late	130	**12**		8	8	9		9	
Cuyama, CA	129								
Bakersfield, CA	138								
Pearsall, TX mid	118	**7**	7		6		6	9	
Pearsall, TX early	99	**6**	6		6		6	9	
Hastings, FL late	129								

Bruise Program Protocol

Purpose

The purpose of this program is to experimentally determine the susceptibility of early and advanced breeding lines to bruising and to then use this information when needed in the screening process.

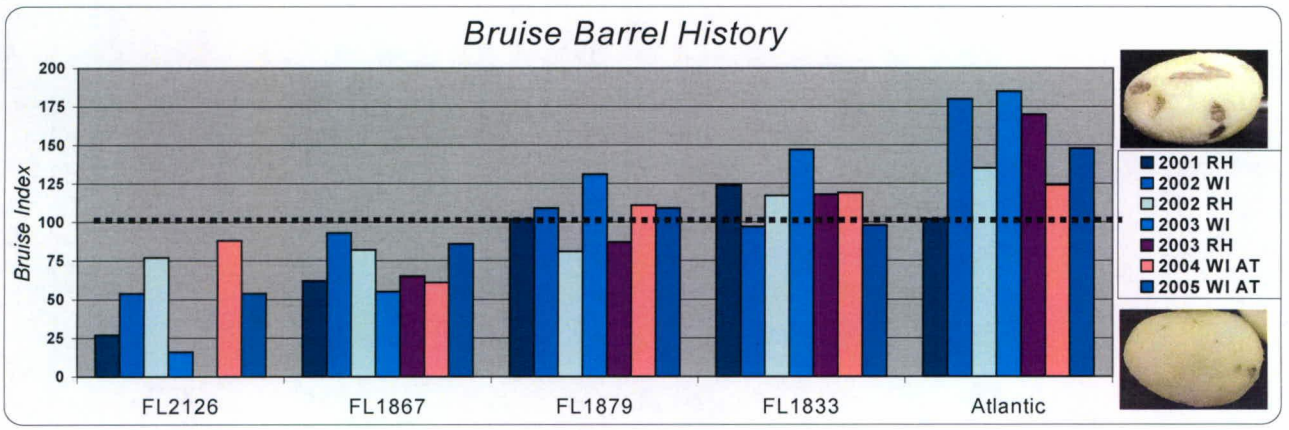
Procedure

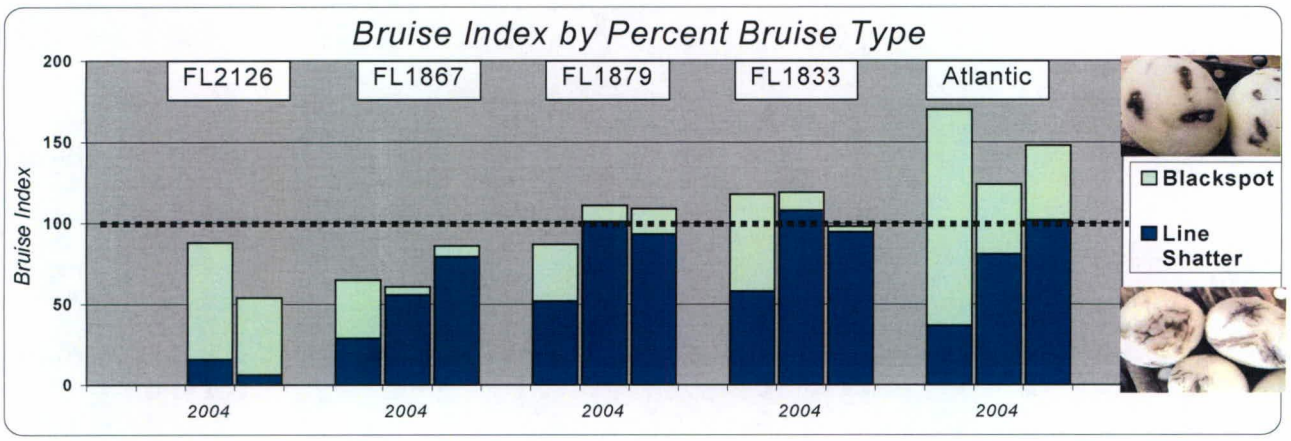
1. Samples are collected from the field at time of harvest.
2. The samples are then bruised within 36 hours at room temperature 9 tubers at a time in the bruise barrel for 10 revolutions.
3. After a minimum period of 2 days, the tubers are then peeled in a Hobart peeler and assessed for number of bruises per tuber and predominant bruise type.

Summary of plots bruised and sample size:

Plot	*Sample size (# tubers)*
2nd year	9
3rd year	18
4th year (mid and late harvest)	27
Area Trial (mid and late harvest)	36

FL2126:Bruise





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U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

Application is required in order to determine if a plant variety protection certificate is to be issued *(7 U.S.C. 2421)*. The information is held confidential until the certificate is issued *(7 U.S.C. 2426)*.

1. NAME OF APPLICANT(S)	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER	3. VARIETY NAME
Frito-Lay North America, Inc.	2000 95.12	FL 2126
4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP, and Country)*	**5. TELEPHONE** *(Include area code)*	**6. FAX** *(Include area code)*
7701 Legacy Drive Plano, TX 75024	(972) 334-3822	(972) 334-5965
	7. PVPO NUMBER	

8. Does the applicant own all rights to the variety? Mark an "X" in the appropriate block. **If no, please explain.** ☑ **YES** ☐ **NO**

9. Is the applicant (individual or company) a U.S. national or a U.S. based company? **If no, give name of country.** ☑ **YES** ☐ **NO**

10. Is the applicant the original owner? ☑ **YES** ☐ **NO** **If no, please answer <u>one</u> of the following:**

a. If the original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. National(s)?
☐ **YES** ☐ **NO** **If no, give name of country**

b. If the original rights to variety were owned by a company(ies), is (are) the original owner(s) a U.S. based company?
☐ **YES** ☐ **NO** **If no, give name of country**

11. Additional explanation on ownership *(Trace ownership from original breeder to current owner. Use the reverse for extra space if needed)*:

Breeders employed by Frito-Lay North America, Inc. developed the variety FL 2126. By agreement between Frito-Lay and its employees, all rights to inventions and discoveries made by the employees while employed by Frito-Lay are assigned to Frito-Lay North America, Inc. with no owenership rights of any kind retained by the employees.

PLEASE NOTE:

Plant variety protection can only be afforded to the owners (not licensees) who meet the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed the final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definitions.

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U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MD 20705

EXHIBIT F
DECLARATION REGARDING DEPOSIT

NAME OF OWNER (S)	ADDRESS *(Street and No. or RD No., City, State, and Zip Code and Country)*	TEMPORARY OR EXPERIMENTAL DESIGNATION
Frito Lay North America, Inc.	4295 Tenderfoot Road Rhinelander, WI 54501	2000 95.12
		VARIETY NAME FL 2126
NAME OF OWNER REPRESENTATIVE (S)	**ADDRESS** *(Street and No. or RD No., City, State, and Zip Code and Country)*	**FOR OFFICIAL USE ONLY**
Robert W. Hoopes	4295 Tenderfoot Road Rhinelander, WI 54501	**PVPO NUMBER**

I do hereby declare that during the life of the certificate a viable sample of propagating material of the subject variety will be deposited, and replenished as needed periodically, in a public repository in the United States in accordance with the regulations established by the Plant Variety Protection Office.

Thomas P. Schur — Signature

2 November 2007 — Date

THOMAS P. SCHUR
ASSISTANT SECRETARY
FRITO-LAY NORTH AMERICA, INC.

2007 NOV 5 PM 1:20

THOMAS P SCHUR
ASSISTANT SECRETARY
FRITO-LAY NORTH AMERICA, INC.