PHREC 99-05e

NEBRASKA

POTATO EYES

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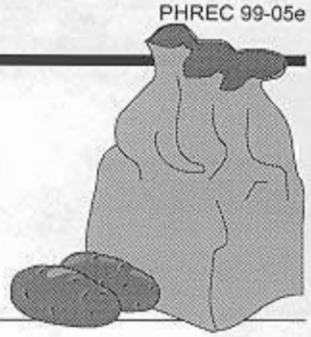

Updates: SuperTin and Purogene

TTPH

-- After a near cancellation of the potato label on triphenyltin-OH (TPTH, *e.g.*, SuperTin) in late Sept. by the EPA, EPA announced in Oct. that TPTH will be eligible for re-registration on potatoes. The change of heart by the EPA came as a result of a concerted effort to point out the benefit of TPTH use for potato disease control. (I was a part of this effort.) There will be a number of restrictions imposed. The two most concerning to growers are: a setback requirement of 100 ft for ground application and 300 ft for aerial from natural bodies of water (Irrigation ditches are exempted.) and a maximum application of 9 oz ai (TPTH) /season (3 application in stead of 4). The label for sugar beets was also saved.

Chlorine Dioxide

-- Purogene, Purogene Plus and Anthium have received Section 18 registration in Nebraska in Sept. The principle question that I'm asked by growers concerns the acidification procedure. Bio-Cide International, producers of Purogene, suggest: Add 1 to 6 oz of citric acid (food grade powder, 99.99% pure) to 1.3 fl.oz. (potatoes in storage) or 2.6 fl.oz. (potatoes going to storage) to lower to pH 2 to 3 on the same day of use. Then add acidified product to one gallon water (200 or 400 ppm, respectively). UAP (Pueblo Chem. Co.) informed me that they have access to citri acid from Nortrace Co. (Ask for Dick Barrett @ UAP in Greeley, CO.)

A national grower using ClO2 made this suggestion to me: Add product to water to make 4000 ppm (26 fl.oz. in a gallon); apply HCl (hydrochloric acid, muriatic acid) to pH 2 to 3; cover for an hour. Then, add sodium bicarbonate to raise pH back and dilute to 200 ppm (in storage) or 400 ppm (to storage). [Note! Add acid to water! Not water to acid!]

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Inside this issue...

Lab to Label (part 5)

TIME LINES

Usually it takes seven to as much as ten years to go from Discovery, primary screening, to the submission of a registration package to the EPA for review and comment. In other words, to go through all three phases. The following are the rough time line for major events along the road to a product.

Phase I. Discovery

Year 0-2: primary screening in the laboratory and greenhouse -- synthesis of compounds or by-products, determination of activity type and potential targets.

Year 1-3: testing for mutagenicity, eye irritation, acute dermal toxicity, and acute oral toxicity.

Year 2-5: secondary screening in the greenhouse and field -- rates, timings and methods of application, initial formulation development.

Year 2-5: mode of action discovery, relation of activity to chemical structure, efficacy on various crops and pests, use determination, and patent development.

Phase II. Development

Year 2-4: short-term toxicity studies, 7 and 21-day tests, excretion and elimination, and early metabolic trials.

Year 3-4: decision to move from Discovery to Development.

Year 3-4: chemical stability and fire hazard studies.

Year 2-5: pilot plant manufacturing research.

Year 3-7: large-scale, field trials with Universities and consultants -- environmental assessment, interaction with soil microbes, rain fastness, and solar radiation effects on activity.

Year 3-7: residue studies -- plants, animals, soil, water.

Year 3->: market analysis throughout the products lifetime.

Phase III. Registration

Year 3-7: metabolic studies in crops, target pests and non-target organisms.

Year 3-8: long-term residue studies on crops, pests and soils.

Year 4-7: long-term toxicity studies -- 90-days to 2-years tests, cancer research (carcinogenicity)

Year 4-7: long-term environmental fate -- soil, water, air, bio-accumulation through the food web.

Year 5-8: processing-manufacturing research

Year 7-8: submission to EPA, label development

Check out the Nebraska Potato Eyes online:
http://www.ianr.unl.edu/ianr/phrec/Peyes.htm

Cultivars: Umatilla Russet

The release of Umatilla Russet (AO82-611-7, "611") was announced in 1998 by Oregon State Univ., Univ. of Idaho, Washington State Univ., and the USDA. Umatilla Russet is a long russet meant for fry processing and tablestock. It resulted from a cross made in 1982 between Butte and an Idaho clone by Dr. Joseph Pavek, and selected in 1984 in Oregon. This variety was tested in the Western Regional Trials for three years plus in various State trials such as in Nebraska where it was tested at Imperial, O'Neill and Scottsbluff.

Summary of Properties

Purpose -- primarily frozen fries and somewhat for tablestock

Maturity -- moderately late season, slightly earlier than R. Burbank, about 120 day growing season

Vine -- medium height, semi-erect, compact, slightly smaller than R. Burbank

Flowers -- very few, lavender to mostly reddish purple

Leaves -- dark green with open silhouette

Stem -- fewer per plant than R. Burbank

Eyes -- shallow, less than 20/ tuber, well distributed

Tuber Color -- tan, russeted skin; cream-colored flesh

Tuber Shape -- slightly longer than R. Burbank, occasional tapering at apex; less attractive than R. Norkotah for tablestock; blockier than R. Burbank

Yield -- greater marketable yield than R. Burbank

Specific Gravity -- slightly above R. Burbank

Dormancy -- 2-3 weeks shorter than R. Burbank

Storage -- hold fry color, need early sprout control, sprouts before March at 45 F

Glycoalkaloids -- low (1.1 mg/100g fresh weight)

Cooking Quality -- fries lighter than R. Burbank

Bruising -- more susceptible to blackspot and shatter than R. Burbank and R. Norkotah

External Defects -- fewer growth cracks than R. Burbank; second growths have occasionally been reported but less than with R. Burbank

Internal Defects -- resistant to sugar ends, hollow heart and black center

Disease -- moderately resistant to early dying and tuber net necrosis; moderately resistant to common scab but less so than R. Burbank; moderately susceptible to early blight, dry rot and soft rot; very susceptible to foliar PLRV; possible resistance to tuber late blight reported

Herbicide Sensitivity -- resistant to metribuzin injury

Fertilization -- Nitrogen:
short season ~150#/a, heavy soil ~200#/a, light soil ~240#/a

Irrigation -- similar to R. Burbank scheduling; more resistant to water-stress related misshapen than R. Burbank

Conclusions and Comments

Umatilla Russet's primary target market is frozen processing, French fries, but it also looks very good for tablestock usage. It significantly out-yielded Russet Burbank in Oregon (Table 1) as well as R. Norkotah in the Western Trials (Table 2). In Nebraska, it out-yielded Russet Burbank and Russet Norkotah as well as the overall russet average (Table 3). Specific gravity was consistently higher than R. Burbank and R. Norkotah. In the Western Trials, Umatilla R. had significantly less hollow heart-brown center than R. Burbank. Umatilla R.'s market ratings were better than R. Burbank and R. Norkotah for both fry processing and fresh market. In the Nebraska trials, fry color was not significantly lighter than the two russet standards but was lighter than R. Norkotah in the Western Trials. There were less off-shape tubers from Umatilla R. than from R. Burbank and about the same number as the trials' averages. Although not significant, there may have been fewer Umatilla R. tubers with common scab and black scurf than from R. Burbank.

Umatilla Russet has the potential for a key place in Nebraska's potato industry and it is highly recommended for grower evaluations.

Table1. Performance of Umatilla Russet in irrigated trials at four locations in Oregon from 1990-1994.

	Total Yield cwt/ac	US#1 Yield cwt/a	Specific Gravity
Umatilla R.	674	513	1.080
R. Burbank	730	444	1.076

Table 2. Performance of Umatilla Russet in the Western Regional Trials, 1989-1991 (1989 = Norgold Russet; 1990 & 1991 = Russet Norkkotah).

a. Yield & Quality	US#1 >4oz, cwt/a	Specific Gravity	Hollow Heart, %
Umatilla R.	362 A	1.086 A	1.7 c
R. Burbank	289 B	1.079 B	5.3 ab
R. Norkotah	270 B	1.071 C	3.3 bc
trials ave.	300 B	1.077 B	7.0 a

b. Cooking Merit	Fry Color	Fresh Market	Frozen Processing
Umatilla R.	1.5 C	3.4 A	3.9 A
R. Burbank	1.7 C	1.8 C	2.7 B
R. Norkotah	2.3 A	1.8 C	3.0 B
trials ave.	2.0 B	2.6 B	3.2 B

A-B-C = significantly different from each other at 95% confidence level.
a-b-c = significantly different from each other at 85% confidence level.
USDA Fry Color Chart scale: 0 (lightest) to 4 (darkest), out of 45 F storage. Merit scale: 1 = poor cooking quality to 5 = ideal.

Table 3. Performance of Umatilla Russet in Nebraska.
1995 = Alliance, Central City, North Platte, 1996 = Imperial, Kearney
1997 & 1998 = Imperial, O'Neill, Scottsbluff

	US#1 Yield cwt/ac	Specific Gravity	SFA Chip Color
Umatilla R.	348 A	1.079 A	3.3
R. Burbank	289 B	1.073 B	3.4
R. Norkotah	266 B	1.073 B	3.3
trials ave.	278 B	1.074 B	3.3

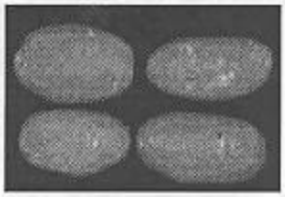
	Common Scab,%	Black Scurf,%	Off-Shape,%
Umatilla R.	1	11	7 B
R. Burbank	4	16	12 A
R. Norkotah	0	12	4 B
trials ave.	4	11	6 B

A-B = significantly different from each other at 95% confidence level.

a-b = significantly different from each other at 90% confidence level.

SFA Chip Color Chart scale: 1 (lightest) to 5 (darkest).

Cultivars: Bannock Russet



The release of Bannock Russet (A81-473-2) was announced in 1998 by the USDA, Univ. of Idaho, Oregon State Univ. and Washington State Univ. Bannock Russet is an oblong russet meant for tablestock and somewhat for French-fry processing. Its target market is that of Russet Burbank. It resulted from a cross made in 1981 between two Idaho clones by Dr. Joseph Pavek, and selected by Drs. Pavek and Dennis Corsini in 1984. This variety was tested in the Western Regional Trials for three years plus in State trials such as in Nebraska.

Summary of Properties

Purpose -- tablestock and frozen fries
Maturity -- late season, later than R. Burbank
Vine -- large, spreading, vigorous
Flowers -- medium amount, large, white
Leaves -- semi-open silhouette
Stem -- very few per plant
Eyes -- intermediate depth, few predominantly apical (poor distribution); larger (3 oz) pieces needed to insure eye, and to increase stems and set
Tuber Color -- medium brown, heavily russeted skin; white flesh
Tuber Shape -- oblong, often short, L:W ratio = 1.5; good baker; oversizes
Set -- lower than R. Burbank, 3-8 tubers (less than R. Burbank)
Yield -- greater marketable yield than R. Burbank
Specific Gravity -- slightly above R. Burbank
Dormancy -- medium shorter than R. Burbank
Storage --fries lighter than R. Burbank out of 40 F storge
Glycoalkaloids -- low (1.2 mg/100g fresh weight)
Sugars -- slightly lower reducing sugars than R. Burbank but more sucrose
Cooking Quality -- excellent fries out of 45 F storage, excellent baker

Bruising -- resistant to blackspot, susceptible to shatter
External Defects -- resistant to growth cracks and secondary growths
Internal Defects -- some hollow heart
Disease -- very resistant to common scab and PVY; resistant to early dying, net necrosis (PLRV), early blight (foliar), and soft rot; moderately susceptible to tuber blight; susceptible to dry rot, foliar PLRV, PVX and late blight; less susceptible to diseases than R. Burbank.
Herbicide Sensitivity -- resistant to metribuzin injury
Fertilization -- most critical management factor = Nitrogen: much less N needed (50-70%) than for R. Burbank, 120-150#/a, end application by early Aug.
Irrigation -- same for R. Burbank

Conclusions and Comments

Bannock Russet's target markets are tablestock and frozen processing, French fries. It out-yielded Russet Burbank in the Pacific Northwest trials (Table1) but yielded about the same as R. Burbank in the Western trials (Tables 2). It out-yielded Russet Norkotah in the Western Trials. Its specific gravity was about the same as R. Burbank but higher than R. Norkotah. Fry color was about like R. Burbank and lighter than R. Norkotah. Bannock Russet was rated better for the fresh market than R. Burbank and similar to R. Norkotah, and rated better than either for processing. In Nebraska, Bannock Russet yielded less than R. Burbank and similar to R. Norkotah (Table 3). Specific gravity was higher than R. Norkotah. In the Nebraska trials, fry color was not significantly lighter from the two russet standards. Percent off-shape tubers was not significantly lower than with R. Burbank. Although not significant, there may have been fewer Bannock R. tubers with black scurf than from R. Burbank and R. Norkotah.

Bannock Russet may not present an advantage in Nebraska's potato industry.

Table 1. Performance of Bannock Russet in Idaho (38 trials), Oregon (8 trials), Washington (15 trials), 1986-1996.

	Total Yield cwt/ac	US#1 Yield cwt/a	Specific Gravity 1.0xx
Bannock R.	548	466	1.081
R. Burbank	555	352	1.078

Table 2. Performance of Bannock Russet in the Western Regional Trials, 1991-1993 (seven western States)

a. Yield & Quality	US#1 >4oz cwt/a	Specific Gravity	Internal Blackspot %
Bannock R.	450 A	1.083 A	2.4
R. Burbank	433 A	1.082 AB	2.6
R. Norkotah	321 B	1.074 C	2.8
trials ave.	427 A	1.080 B	2.4

b. Cooking Merit	Fry Color	Fresh Market	Frozen Processing
Bannock R.	1.3 C	3.2 A	3.5 A
R. Burbank	1.3 C	2.4 B	2.7 B
R. Norkotah	2.4 A	3.0 A	1.5 C
trials ave.	1.9 B	3.3 A	2.5 B

A-B-C = significantly different from each other at 95% confidence level. Internal blackspot scale: 1 (lightest) to 5 (dardest)
USDA Fry Color Chart scale: 0 (lightest) to 4 (darkest), out of 45 F storage. Merit scale: 1 (poor cooking quality) to 5 (ideal)

Table 3. Performance of Bannock Russet in Nebraska.
1995 = Alliance, Central City, North Platte
1996 = Imperial, Kearney
1997 = Imperial, O'Neill, Scottsbluff

	US#1 Yield cwt/ac	Specific Gravity	SFA Chip Color
Bannock R.	230 B	1.075 a	3.1
R. Burbank	323 A	1.074 ab	3.5
R. Norkotah	269 AB	1.071 b	3.4
trials ave.	284 AB	1.072 ab	3.4

	Common Scab,%	Black Scurf,%	Off-Shape,%
Bannock R.	3	8	6 AB
R. Burbank	5	16	12 A
R. Norkotah	0	14	3 B
trials ave.	5	14	6 AB

A-B = significantly different from each other at 95% confidence level.

a-b = significantly different from each other at 85% confidence level.

SFA Chip Color Chart scale: 1 (lightest) to 5 (darkest).

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Acknowledgments: Photos are the courtesy of Oregon State University. Much of the information on Umatilla Russet and Bannock Russet was obtained from Drs. Alvin Mosley and Steven Love, respectively.

Check out the Nebraska Potato Eyes online:
http://www.ianr.unl.edu/ianr/phrec/Peyes.htm