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NEBRASKA

POTATO EYES

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Updates

Fulfill (pymetrozine), an aphicide from Novartis, received full registration on potato, Section 3. It is effective against the green peach aphid, transmitter of leafroll virus. Fulfill is applied to potato foliage at about 2.75 ounces per acre. Research indicates that this rate is comparable to 1.5 pt Monitor/a and 3.75 oz Provado/a. Although aphids may live a few days, they stop feeding and transmitting viruses within two hours. Residual activity lasts about two weeks. Fulfill is safe to beneficial insects and fits IPM.

Thimet (phorate) by Amer. Cyanamid received a clean bill of health. EPA declared it non-carcinogenic; FDA declared that dietary risks are not a concern. FDA and USDA reported that diet checks are well below tolerance.

Mocap (ethoprop) by Rhone-Poulenc is clearing FQPA for pre-plant and pre-emergence use in potato. Due to its toxicity, handling is the isseue.

Dyfonate, another wireworm control product, is withdrawn.

Related News

A new Executive Order has been drafted concerning pesticide reduction. The Order would require federal agencies to reduce use of at least 15 chemicals in five years. The EPA will need to submit a list of 15 or more chemicals for use reduction. The draft Order targets organo-phosphates (Thimet and Mocap are organo-phosphates.) and carbamates (Sevin, used in flea collars, is a carbamate.) for elimination by the end of 2000. This Order pertains only to federal agencies but sets a tone that can have a wide-ranging effect. The Order is titled "Greening the Government Through Leadership in Environmental Management" and is posted at www.nasda-hq.org/joint/toxic_chemicals.html

[editorial: Does one hand know what the other is doing? Refer above.]

Alexander D. Pavlista

Inside this issue...

Dr. Pavlista Honored by USDA

The USDA recognized Dr. Alexander Pavlista of the University of Nebraska with a "Certificate of Appreciation" award for research. Dr. Darrell Nelson, Dean of UNL's Agricultural Research Division, presented the plaque to Dr. Pavlista on December 15, 1999 at the Panhandle Research and Extension Center at Scottsbluff, NE, following Dr. Pavlista's press conference.

Dr. Darrell Nelson presents Dr. Pavlista with a certificate of appreciation.

Dr. Pavlista was a member of a five-person team that included Drs. Maury Wiese and Joseph Guenthner, both Univ. of Idaho, Mr. Joseph Sieczka, Cornell Univ., and Dr. Jeffrey Wyman, Univ. Wisconsin. Each received this award from the USDA for their assessment of U.S. potato production and quality relative to pest management practices, pesticide use, and target pests. The project resulted in a NAPIAP report (2-CA-98) titled "Use, Target Pests, and Economic Impact of Pesticides Applied to Potatoes in the United States" and an article in the American Jour. Potato Research (January-February, 1999).

"We believe that our colleagues in the States as well as the potato industry will find that this publication makes a strong contribution to pest management strategies in potato production and a useful reference publication," said Charles Laughlin, Administrator of USDA-CREES in Washington, D.C. In a letter accompanying the plaques, Edward Wilson, Deputy Administrator, wrote "The information contained in this publication will be used extensively by the USDA and the EPA in the development of crop profiles and the development of transition strategies for Food Quality Protection Act implementation." Dean Nelson said "This really means something. We have scientists at this location that receive national and international acclaim for their work."

The team conducted an assessment of pest management practices in potato production. This research helps "put a scientific basis to what has been (pesticides) an emotional issue," Dr. Pavlista said at his press conference. He added "the bottom line (of the project) is what would happen to the potato industry nationally if any one pesticide is lost."

Cultivars: Gem Russet

The release of Gem Russet (A8495-1) will be released in 2000 jointly by USDA-ARS, and the extension centers of U. Idaho, Oregon St. U. and Washington St. U. Gem Russet is a long russet meant for fry processing and tablestock, dual-purpose. It resulted from a cross made in 1984 by Dr. Joseph Pavek in Idaho. Russet Norkotah is a parent, and Atlantic and Lemhi Russet are grand-parents. This variety was tested in the Western Regional Trials for three years, 1993-1995, plus in State trials such as in Nebraska where it was tested at Alliance, Central City, Imperial, Minden, O'Neill, North Platte, and Scottsbluff over the course of three years, 1995-1997. The following summarizes its properties and some of the field data.

Summary of Properties

Purpose -- frozen fries and tablestock, markets of Rs. Burbank and Norkotah

Maturity -- medium to late season, slightly earlier than R. Burbank

Vine -- medium, smaller than R. Burbank, larger than R. Norkotah; upright

Flowers -- white, large, medium amount

Leaves -- closed type

Eyes -- medium amount, well-distributed - predominantly at bud end

Tuber Color -- medium-russeted, brown skin, white flesh

Tuber Shape -- oblong to long as R. Burbank; excellent shape and appearance

Set -- moderate, 5 to 10 (7 average)

Yield -- medium to high; at some locations mediocre

Specific Gravity -- high, greater R. Burbank

Dormancy -- long

Emergence -- late, about 95% stand as with R. Burbank

Storage -- long-term storage

Glycoalkaloids -- low, 2.7 mg/100g fresh weight, quarter of R. Burbank

Vitamin C -- high, 25.3 mg/100g fresh weight, 40% more than R. Burbank

Cooking Quality -- fries excellent out of 45 F and acceptably out of 40 F; fries lighter than R. Burbank

Sugar -- low, half that of R. Burbank out of the field; .04% dry weight

Bruising -- blackspot (IBS) about as R. Burbank and R. Norkotah; shatters as R. Burbank and less than R. Norkotah

External Defects -- growth cracks about as R. Norkotah; less off-shape about a quarter than R. Burbank

Internal Defects -- less hollow heart than R. Burbank, as R. Norkotah

Disease -- medium to common scab possibly less than R. Burbank; medium to early dying, less susceptible than R. Burbank; susceptible to early blight as R. Burbank but less than R. Norkotah; moderately susceptible to bacterial soft rot as R. Norkotah and more so than R. Burbank; highly susceptible to PVY

Herbicide Sensitivity -- no sensitivity reported

Fertilization -- similar to R. Burbank except responds well to early, pre-bulking nitrogen

Irrigation -- similar to R. Burbank scheduling

Adaptability -- good quality under stress

Continued on page 4

Table 1. Performance of Gem Russet in the Western Regional Trials, 1993-1995. 7 States: CA, CO, ID, NM, OR, TX, WA
full season = 27 site-years, short season = 16 site-years

a. Full Season

	Total Yield cwt/ac	US#1 Yield cwt/ac	12oz Yield cwt/ac	Specific Gravity
Gem Russet	486 b	420 a	90 b	1.088 a
R. Burbank	576 a	426 a	95 b	1.084 b
R. Norkotah	388 c	320 b	87 b	1.076 d
trials ave.	533 ab	451 a	159 a	1.082 c

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

b. Short Season

	Total Yield cwt/ac	US#1 Yield cwt/ac	12oz Yield cwt/ac	Specific Gravity
Gem Russet	346	259 a	21 c	1.083 a
R. Burbank	370	205 b	9 d	1.077 b
R. Norkotah	321	266 a	36 b	1.073 b
trials ave.	361	270 a	55 a	1.076 b

c. Defects

	Hollow Heart,%	Growth Cracks	Black Spot	Shatter Bruise
Gem Russet	5	4.9 a	3.0	4.3 b
R. Burbank	13	4.2 b	3.2	4.3 b
R. Norkotah	4	5.0 a	3.5	4.8 a
trials ave.	4	4.5 b	3.2	4.2 b

Growth Cracks: 1 = severe, 5 = none (higher # better)
Black Spot: 1 = darkest, 5 = lightest (lower # better)
Shatter Bruise: 1 = severe, 5 = none (higher # better)

d. Cooking Merit

	Fry Color	Frozen Processing	Fresh Market
Gem Russet	0.9 c	3.5 a	3.2 a
R. Burbank	1.5 b	3.1 ab	2.7 b
R. Norkotah	2.2 a	1.9 c	3.1 ab
trials ave.	1.7 b	2.7 b	3.1 ab

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 2. Performance of Gem Russet in Nebraska.
1995 = Alliance, Central City, North Platte
1996 = Imperial, Minden
1997 = Imperial, O'Neill, Scottsbluff
a. Yield and Quality

	Total Yield cwt/ac	US#1 Yield cwt/ac	Specific Gravity	Fry Color
Gem Russet	299 b	277	1.078 a	49 a
R. Burbank	345 a	272	1.074 b	42 b
R. Norkotah	298 b	259	1.071 b	44 b
trials ave.	307 ab	277	1.073 b	45 b

b. Disease Reactions

	Common Scab,%	Black Scurf,%	Off-Shape,%	Hollow Heart, %
Gem Russet	1	14	2 b	2
R. Burbank	5	16	12 a	0
R. Norkotah	0	14	3 b	0
trials ave.	5	15	6 b	1

a-b = significantly different from each other at 90% confidence level.
Fry Color: lower = darker, higher = lighter, 50 = fries very well.

Micro-nutrients Review

Following up on last year's article on nitrogen, phosphorus, potassium, and sulfur, it's time to review major micro-nutrients. The effects of a deficit and/or excess of Boron, Calcium, Magnesium, Manganese, and Zinc will be outlined.

Boron

The function of boron in plants is not well understood. It is involved in carbohydrate transport, and cell membrane and cell wall development.

Deficiency is very rare in crops. The main deficiency symptom on vines is bushiness. This results from death of the growing points and growth of lateral buds. Branching occurs due to loss of apical dominance. Leaves may exhibit leaf roll like symptoms. Roots are short or stunted, and thick.

Tubers are small with surface cracking. Localized brown areas appear under skin near stolon end. There's brown vascular discoloration.

Even small amounts of added boron can be toxic to many varieties. It is normally associated with arid and semiarid environments, or where municipal compost is applied. Symptoms are a yellowing (chlorosis) of mature leaves and on margins of young ones. The yellowing can turn brown (necrosis).

Calcium

This nutrient is key in cell wall strength and cellular adherence.

Deficiency in potatoes is most severe in acid (pH<5) sandy soil. Vine symptoms include spindly stems and small, upward rolling, crinkled leaflets. Leaflets have yellow margins that may turn brown. In severe cases, leaves are wrinkled and have a rosette appearance, and roots don't grow.

Tubers have vascular discoloration near the stolon end and flecks in the core. Calcium deficiency has been associated with some physiological disorders such as internal heat necrosis. Severe deficiency causes extremely small tubers to form. In seed tubers, multiple lateral sprouts and internal sprouting may develop.

No excess symptoms are reported.

Magnesium

An essential part of chlorophyll (much like iron to hemoglobin in blood, magnesium is also part of energy transfer.

Magnesium is highly water soluble and leaches readily. Therefore, deficiency is more common than other micro-nutrients. Readily-drained, acid, sandy soils are most prone to deficiency. Symptoms occur on older leaves which appear pale, light green beginning at the tip, moving to margins and then between veins. Yellowing becomes most severe at center of leaflet. Leaves become thick and brittle, and roll upward. Roots become stunted. High potassium lowers magnesium uptake and increases deficiency.

Manganese

Manganese activates many enzymes including metabolism, energy transport and fatty acid synthesis.

Deficiency is rare and occurs on alkaline (pH>8) calcareous soil. Young leaves (upper canopy) lack luster and are light green between the veins that turns to yellow and then to white. Older, lower leaves are least affected. In severe deficiency, brown spots may appear along veins of younger leaves.

Excess manganese occurs on light acid (pH<5) soils due to the nutrient's solubility. Potato is very sensitive. Stem streaking is the main symptom. Early toxicity symptom is a dark flecking on stems and petioles starting at the base of the vine and moving up. Symptoms progress fast after flowering and stems turn dark brown and become brittle. Plants are stunted and leaves are pale yellow-green with yellowing between veins and brown margins. Stems become dry, hang and break off. Plants die early.

Zinc

Zinc as manganese activates many enzymes. It is also essential for synthesis of auxin, a key hormone controlling cell growth.

Deficiency results usually on alkaline soils or in the presence of excessive phosphorus. Symptoms include stunting, brown spots on stems and petioles, and leaf malformation. Young leaves roll up as with leaf roll virus and have a tip burn. The leaf roll is called "fern leaf" and is upward and cupping; leaves are also thick, brittle and puckered. Older leaves have gray-brown areas and bronzing along margins.

Application of zinc containing fungicides readily prevents deficiency.

No excess symptoms are reported.

Summary of Main Symptoms

Boron	bushy vine, leaf roll, short roots; tubers: small, vascular discoloration. Excess = toxic, leaf browning.
Calcium	spindly vine, small rolled yellow leaves, short roots; tubers: vascular discoloration, heat necrosis.
Magnesium	inter-veinal yellowing of older leaves, leaf thickening and brittleness, short roots.
Manganese	inter-veinal leaf yellowing to whitening. Excess = stem streaking then brittleness, vine stunting, leaf yellowing
Zinc	vine stunting, spottiness on stem, leaf misshaping with tip burn and brittleness.

Soil pH Affect on Availability

The availability of boron, calcium, magnesium, manganese, and zince for potato growth and development is directly affected by the soil pH. For instance, in strongly alkaline soils, availability of iron, manganese and zinc is very limited. While in strongly acid soils, magnesium availability is limited.

Soil pH range for optimal B, Ca, Mg, Mn, and Zn availability.

Nutrient	Optimal pH Range	
Boron	5.0 - 7.0	gradual decrease below 5, and above 7 up to 8.5, then > 8.75 rapid increase from 8.5 to 8.75, then no change
Calcium	7.0 - 8.5	gradual decrease below 7, and above 8.5
Magnesium	7.0 - 8.5	gradual decrease below 7, and above 8.5
Manganese	5.0 - 6.5	gradual decrease below 5, and very gradual decrease above 6.5
Zinc	5.0 - 7.0	gradual decrease below 5, and gradual decrease from 7 to 8.5, then levels off >8.5 at a low level

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Cultivars: Gem Russet

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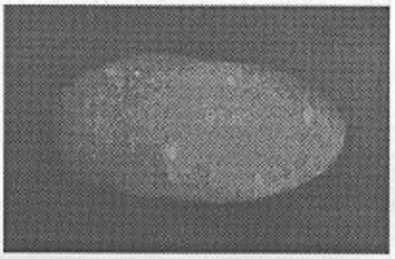
Conclusions and Comments

Gem Russet's target markets are for both frozen processing, French fries, and tablestock usage. In the Western Trials, Gem Russet was rated as a better fry and fresh market potato than Russet Burbank, and about the same as Russet Norkotah for the fresh market. Although Gem Russet's total yield is less than Russet Burbank's, its marketable yield is about the same due to Russet Burbank's greater pick-outs. About 25% of Russet Burbanks yield was discarded versus half that for Gem Russet. Gem Russet's solids were consistently greater than that for Russet Burbank and Russet Norkotah. Its fry color was consistently lighter than that for Russet Burbank and Russet Norkotah. It also had a consistently better shape than Russet Burbank. Hollow heart was not significantly different between Gem Russet and Russet Burbank or Russet Norkotah. Although does not show a marketable yield improvement, Gem Russet should be able to compete with Russet Burbank for the processing and fresh markets, and against Russet Norkotah for the full season fresh market.



Photographs courtesy of Dr. Steven Love

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