NEBRASKA POTATO EYES

Technical News Reports for the Nebraska Potato Industry

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EDITOR'S NOTE

Late blight has hit the presses-- Denver Post, Omaha World Herald, Wall Street Journal, and USA Today. Its even been on the National Public Radio. Late blight, the cause of the Irish potato famine in the 1840's, spread this season in the U.S. partly due to the heavy rains in the Heartland. Strains from Europe and Mexico have been found in the U.S. from New York to Washington. Late blight has not caused much problems in Nebraska yet. Storage trouble can still occur. But, next year could be another story if we are not prepared for it. Therefore, in addition to our scheduled emphasis on weeds and herbicides at this year's Nebraska Potato Focus, a special talk will be given on this disease on Wednesday (Dec 15) morning. The agenda for the conference is:

Tuesday, 14 December 1993

12:30 Opening
12:45 Herbicide Review/Pavlista, Univ. of Nebraska
1:00 Herbicide Rotation/Westra, Colorado St. Univ.
2:00 Dissipation & Canopy/Binning, Univ. of Wisconsin
3:00 Break
4:00 Herbicide Sensitivity/Love, Univ. of Idaho
5:00 Panel Discussion
7:30 Banquet at Gordon Howard's Oregon Trail

Wednesday, 15 December 1993

8:00 Herbicide Resistance/Lyon, Univ. of Nebraska
9:00 Application Regulations/Schulze, Univ. of Nebraska
9:45 Break
10:30 Late Blight/Leever, Potato Certification Assoc.
11:00 Worker Protection/Jacobson, EPA
11:30 Panel Discussion
12:30 Lunch
1:30 Workshops on Potato Injury and Weed Identification/Wilson and Lyon, Univ. of Nebraska

The Nebraska Potato Council will meet before the Focus at 10 am in the Board Room at the Center.

Included in this issue are reports on the First Annual World Congress held in July on Prince Edward Island in Canada, the 12th Triennial conference of the European Association of Potato Researchers held in July at Paris, France and the Potato Researcher's Symposium held in April at Scottsdale, AZ. These reports touch on potato production statistics, Maillard Browning Reaction (why chips turn brown), vine desiccation, fertilization, pests, and much much more. Data from the 1993 Nebraska variety trials are reported. The various trials conducted this year were possible through the cooperation of Tim May, Curt Meier, Dale Moore, Jack Nielsen, Rollin Packer, and Butch Thompson and I thank them very much. With NAFTA coming closer, I put together some statistics on the U.S. - Mexico potato trade that I thought you would find illuminating.

U.S. — MEXICO

Potato Trade

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In This Issue...

World Potato Congress & Expo

Joe Schon
Executive Vice President
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The first World Potato Congress and Exposition was held at Charlottetown on Prince Edward Island in Canada in July, 1993. Delegates and speakers came from all over the world and represented nearly all the potato growing regions. The following are capsulated highlights of significant presentations:

Utilization:

Due to their international commitments, McCain Foods is the largest supplier of french fries to McDonald's outside of the USA. (T. van Leersum)

McDonald's worldwide uses over 100,000 acres of potatoes for french fries. This amounts to 150 million pounds of fries or 300 million lb of raw spuds serving 13,500 outlets. Every 300 new outlets need 80 million lbs of potatoes. The outlet in Moscow, Russia, serves 5,000 lbs of fries per day; this is much greater than the 3,500 lb per week sold by a US outlet. McDonald's projects demand increases of 6.4% per year for fries. (H. Gregory)

Frito Lay now owns Sabritas (Mexico), Helmires (S. America), Smith & Walker (UK), and Arnots (Australia). The worldwide average potato consumption is 77 lb per person. In the USA, consumption is about 7 lb of potato chips per person, per year or 30 lb raw potatoes. Getting quality potatoes is the biggest hurdle for international expansion. (F. Flieler)

In the Peoples Rep. China, 32 million tons of potatoes are processed, mostly for potato noodles. (H. Zandstra)

Idaho produces six (6) times the total potato production of Mexico. The Mexican market will increase consumption only at the rate of the population rise. (Q. Kubicek)

Production:

In 1992, the European Economic Community produced about 52 million tons of potatoes. The yields ranged from a low of 90 cwt/acre in Portugal to a high of 360 in the Netherlands. Of the total, 15% was used for starch, 16% for chips, fries and dehydration, and 9% for seed. (G. Graf)

The 1992 harvest in the UK was one million tons (22 million cwt) which is about double the normal harvest. This plus an excess potato production in the rest of Europe resulted in depressed prices. (J. Godfrey)

In Russia, there are/were 19,000 state and collective farms averaging 620 acres of potatoes each. Production was about 42 million tons in 1992 or one-ninth of the world's total. Only 50% of the harvest was usable due to damage-induced spoilage; of the remaining, only 25% was adequately stored. (P. Makarov)

Russia plans to build between 10 to 100 new dehydration plants over the next few years.

In the Czech Republic, of the 46.7 million cwt of potatoes produced, tablestock accounts for 79%, seed 11% and processing 10%. The greatest problem is bruising resulting in storage loss. (E. Hansvater)

The major pest problems in Europe today are late blight, Colorado potato beetle, potato cyst nematodes, and potato tuber moth. (D. van der Zaag)

The following gives a summary of production in different parts of the world as reported at the Congress.

Country/ Region	Potato Acreage millions	Yield cwt/acres	Population millions	Problems
EEC	4	254	-	late blight, CPB
Russia	10	90	-	mechanization, storage
Lithuania	0.25	134	4	-
Czech Rep.	0.26	180	11	storage/bruising
Rumania	0.5	65	21	drought/pests
Mexico	0.17	144	51	late blight
Cuba	0.03	200	9	-
Argentina	0.24	190	35	handling/storage
Uruguay	0.05	90	3	handling/storage
Africa	1.8	[107]*	750**	

Asia total production = 66 million tons

*mean for developing nations
**50% increase over past 10 years

Who is the largest private potato grower in the world? Mr. Gutierrez of Columbia with about 30,000 acres.

European Association For Potato Research

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The 12th Triennial Conference of the European Assoc. for Potato Research was held in July, 1993 in Paris, France. It was very well attended by researchers from all over the world. Speakers come from every continent except Antarctica.

Process Quality -- Darkening of chips and fries are due to the "Maillard Browning" which is due to polymerized cyclamen.

Glucose (sugar) + Asparagine (amino acid) cyclamine which polymerizes and turns brown during frying.

Free amino acids increase at 41 F more so than at 50 F. Note that 70% of the amino acid pool is in the tubers. Reconditioning effect is not only due to respiration; other possibilities are sucrose re-formation, starch biosynthesis

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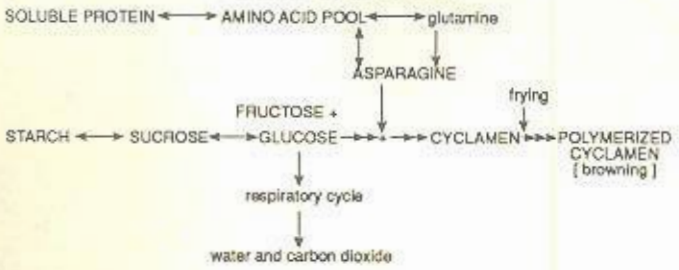
and synthesis of glucose-fructose-fructose... chains. Turnover of chemicals in amino acid/sugar pools are the keys to browning. (Cobb)

SCHEME for MAILLARD BROWNING:



In the United Kingdom, Record is the leading chip variety and Pentland Dell the leading frier. Russet Burbank is considered for specialty markets. Reconditioning is used to burn off sugar but some draw-backs to this method are sprouting, peel loss, disease development, unpredictability, and cost. Reconditioning differences were observed for the two varieties, Pentland Dell and Record. Pentland Dell when reconditioned at 70 F showed lighter fry color early in the season but not after long term storage. For Record, the chip variety, the effects of storage temperature duration were less. Reconditioning also resulted in tuber weight loss and decrease in specific gravity (R. Storey and A. Briddon, UK)

—Editor's note: One of the very interesting things that came from this talk and others is the difference in fry color requirements between the UK and the USA/Canada. In the UK, they are looking for a lighter fry than a chip ('crisp'). Agtron readings (they use an FF25) is 45 on Pentland Dell at harvest and 25 on Record, their top chipper (Table 1). On US standards, Record would be unacceptable.

Storage temperature	Time, weeks	Pentland Dell fry color (Agtron FF25)	Record
41 F	0	42	25
	12	15	5
	24	17	5
	36	15	6
50F	0	42	25
	12	38	18
	24	35	18
	36	15	22

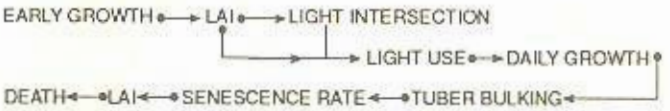
Herbicide -- 'DEFI" is a thiocarbamate registered in Northern Europe (France, Belgium, Germany) in 1993 on potatoes. It is applied pre-emergence and at emergence but causes injury when applied post. Defi, common name prosulfocarb, attacks broadleaves and grasses. One target is black nightshade. For 90% control, 4 lb/acre is needed and residual activity lasts for one month after potatoes emerge. No effect on yield and grades were noted. Defi can be tank mixed with either Dual or Sencor/Lexone and get good complimentation. (J-M Beraud et al) [Editor's note: Zeneca has not decided whether to develop this product for the USA market.]

Vine Desiccation--Common vine desiccating technique in Scotland are flailing, sulfuric acid and diquat (Reglone). Tests using the Dutch technique of vine (hulm) pulling did not show good success in the UK as reported in the Netherlands. For good vine pulling, vines needed to be erect and planted straight, and rocks interfere. When efficient pulling occurred, many tubers were exposed resulting in a high number of green tubers. The strength of many vines were greater than the pull force needed to remove vines from the row (ridge). (F. Milne et al)

Growth Modeling--The yield performance of several European and a couple of African potato varieties were compared in three counties, the Netherlands, Tunisia and Rwanda, representing a spectrum of climate from temperate to tropical. Within countries, several sites were used to represent different altitudes and photoperiods (seasons). Yield differences by location/site were correlated with the total amount of light intercepted by leaves. The components of this are: 1. the light intensity which is not readily controllable and 2. the percent ground cover which can be influenced. A model was developed from the data accumulated over two years.

Early plant growth, roots, stems, leaves, increase leaf area index (LAI a measure of leaf canopy size). A greater LAI results in a greater amount of light being intercepted and an increase in light use efficiency (photosynthesis, carbohydrate production). With the greater increase in photosynthesis or food production, the plants daily growth is promoted and dry matter partitioning or movement occurs to the tubers and other plant parts. Tuber growth rate affects the senescence or aging rate of the plant. In other words, as tubers grow, senescence is promoted and LAI is reduced. The yield of early cultivars is regulated by the leaf area index and senescence. The senescence rate is associated with the maturation time and tuber bulking of early and late season varieties. (P. Kooman et al, Netherlands)

GROWTH MODEL:



Fertilization -- In the UK, indeterminate varieties require less nitrogen (N) than determinate ones.

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[This is different than the USA/Canada. R. Burbank which is indeterminate requires among the most N of varieties.] Optimal N needs were reported to be between 60 and 125 #/acre across several varieties.

Nitrogen on Potato Canopy

Growth	Effect
Emergence	None
Stem Number	None
Main Axis Leaf Area	Little
Leaf Number	Little
Area/Leaf	Little
Branch/Leaf Area	Main
Branch Leaf Number	Main
Area/Leaf	Little
Senescence	Main

Potato Researcher's Symposium

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In April, 1993, Zeneca Ag Products (formerly ICI) sponsored the Potato Researcher's Symposium held in Scottsdale, Arizona. The name change from ICI to Zeneca represents an internal restructuring combining all of its bioscience businesses under one umbrella. In North America, Zeneca is a $2.7 billion bioscience company with 8,400 employees. Some of its potato products are Diquat, Gramoxone, Eptam, Ambush, Captan, and Vapam.

The following are some highlights:

Acreages and Varieties

Idaho - Total acreage is continually increasing. As a percent of total acreage, Russet Burbank is going down and Shepody is going up, possibly peaking around 7%. Norkotah Russet and Frontier Russet had short-lived increases but seem to have leveled at about 1% for now. See Table 1. Frontier has shown some water rot and blackspot, possibly too much watering. In 1993, yield is expected to be down 5 to 15% due to late planting. In 1991, 56% of the potatoes went to processing, 27% fresh market and 7% seed (Phil Nolte).

Table 1. Varietal acreage changes as % of total.

Variety	1987	1988	1989	1990	1991	1992
R. Burbank	97.7	97.3	93.9	91.6	90.1	87.8
Shepody	-	1.0	1.1	2.1	3.9	6.8
Norkotah R.	-	0.5	3.4	2.7	1.1	1.2
Frontier R.	-	-	-	-	2.7	1.1

Diseases/Insects

Oregon - The number 1 problems in 1992 were the green peach aphid and nematodes. Leaf roll was in Russet Burbank fields. With the loss of Temik, the current practice is the use of organo phosphates: Thimet at planting or early postemergence, DiSyston applied aerially or side-dressed, and Monitor applied as much as six times. (Steve James)

Leaf roll seems to be coming back to Washington also due to loss of Temik. (Gary Peltar)

Powdery scab is reported to be increasing in Oregon, in Washington and somewhat in Idaho.

Silver scurf is on the rise in Idaho, in Washington where it is a storage problem and has caused a lowering in specific gravity, in Colorado, where it is believed to have entered on Norkotah R. seed, and in the Red River Valley (ND & MN). Note, there are no varieties resistant to silver scurf and there are no chemical controls.

Silver scurf, pink eye (corky patch) and black dot can cause the "tight skin syndrome" in which the tuber's skin doesn't peel readily.

Ridomil applied to plants before harvest/desiccation speeds up wound healing.

One of the most important reasons to vine desiccate is to prevent late blight from going into storage on tubers and to inhibit the spread of wet rot in storage.

Due to the increased concerns of Mertect (TBZ, thiabendazole) resistance in Fusarium dry rot and silver scurf, Gary Secor of NDSU summarized our knowledge to date on these increasing pest problems. In a collection of Fusarium isolates across the US, nine out of 12 isolates were tolerant to Mertect. Up to spring, 1993, 75% of the 337 isolates collected were resistant to Mertect. All of these were one strain or species of Fusarium and were only in states where Mertect is used a lot on tubers going into storage. The incidence and severity of dry rot in storage increased regardless of resistance level. There was also observed a cross-resistance to TOPS (Topsin, thiophanate-methyl). Two factors relate to the amount of disease on tubers: resistance to Mertect and aggressiveness of infection. Resistant Fusarium strains have been recovered from soils as well as on tubers. Resistance seems to be a single gene involved in the speed of cell division of the fungus. (Gary Secor)

Nematodes

In Idaho, 25% of the fields are infested with nematodes. Metam sodium (Vapam, Busan) is used to fumigate fields. It works better in alkaline pH than in acid pH soils. Cover crops are also used. These include sudangrass and fallow. (Saad Hofez)

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The effects of metam sodium is seen in higher yields but there is really not much change in the measurable soil population of nematodes and fungi. (Joe Noling) [Editor's note — also observed in Alliance in 1990 test]

Vine Desiccation

Stem-end and vascular discoloration are related to a too fast desiccation in soil that is too low in moisture and the presence of wilt organisms. Diquat, paraquat and sulfuric acid were compared on Russet Burbank in Idaho (Table 2). The former two treatments had a slower desiccation rate than the acid but also had less stem-end discoloration. (Gale Harding)

Table 2. % vine desiccation of R. Burbank in Idaho.

	9 Sept	12 Sept	19 Sept
Check	51	66	87
Diquat	75	89	96*
Paraquat	81	88	97*
Sulfuric Acid	92	97	100

*less stem-end discoloration than sulfuric acid.

Skin set starts about a week after vine desiccation. Leaf and stem desiccation takes 7 to 10 days and 10 to 15 days, respectively, for early varieties such as R. Norkotah, Norgold R., Shepody and Frontier R. in Oregon. It takes 10 to 15 days and 15 to 21 days for leaf and stem desiccation, respectively, in longer maturing varieties such as Century R., Ranger R. and R. Burbank. Ranger R. seems harder to desiccate than R. Burbank. Chipping varieties, Atlantic and Norchip, take as long as the later season russet varieties. Norchip desiccates quicker than Atlantic (Table 3). The days after desiccation required to achieve less than 5% skinning are 21 for R. Burbank and Ranger R., 14 for Shepody (still green on top), R. Norkotah and Norchip, and marginally 21 days for Atlantic. (Steve James)

Table 3. Days to desiccation after Diquat treatment in Oregon.

	leaf desiccation	stem desiccation
early russets	7-10	10-15
later russets	10-15	15-21
chippers	10-15	15-21

Vine pulling may decrease the incidence of black scurf ('Rhizoc') on tubers. (Gary Peltar)

Ignite is being tested as a desiccant by American Hoechst. (Leigh Morrow)

The results on Flair, the new formulation of endothall, in Maine is very similar to that in Nebraska. The rate needed to equal Diquat and Des-I-Cate is 20 oz ai/acre. (Leigh Morrow/Greg Porter) See following.

Data were presented covering three years of cooperative trials on Diquat, Des-I-Cate and Flair on Atlantic grown in Western Nebraska. There was no difference between a single application of Diquat at 4 oz ai/acre and Des-I-Cate at 16 oz ai/acre. Des-I-Cate, however, had a regrowth problem after 21 days. Flair at 16 oz ai/acre did not have a regrowth problem but was a less effective desiccant (Table 4a).

UCC-C4243, a Uniroyal experimental compound, was tested as a single application of 1.0 and 1.5 oz ai/acre in 1991 and 1992. This compound was visibly the best of all treatments looked at between 1989 and 1992 (Table 4b). The company had decided not to go into full testing until 1995 or 1996. (Alexander Pavlista)

Table 4. Leaf and stem desiccation, and skinning of Atlantic in Nebraska (1990-1992).

	Desiccation % leaf	Desiccation % stem	Skinning % tuber
a. 21 days after treatment			
check	22	1	20
Diquat	79	37	12
Des-I-Cate	81	34	10
Flair	55	31	10
b. 14 days after treatment:			
check	2	0	40
Diquat	64	25	43
C4243 at 1.5	71	54	26
C4243 at 1.5	94	72	28

Seed Quality and Storage

High relative humidity is needed in storage to minimize shrinkage (Table 5). (Neal Hallee)

Table 5. Water loss as % after one month storage.

relative humidity (%)	75	85	95
water loss (%)	6.4	3.4	1.1

However, RH above 95% is too high for wound healing. At 50 F, lignificaton occurs in 4 to 8 hours, suberization in 4 to 14 days and periderm (skin) formation in 6 to 19 days. (Leigh Morrow)

Young seed, less mature, are very different from old seed. Young seed have slower emergence, fewer main stems, larger vines, lower tuber set, longer bulking period, larger tubers, more tubers, slower senescence, and higher yields. Older more mature seeds are the reverse on all of these attributes. (Robert Thornton)

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Methanol

There was a recent research paper published in the National Academy of Science on methanol promotion of growth and yield that has stirred up a lot of controversy. Oregon researchers have started testing the effects of methanol applied to the foliage of potatoes. Early reports suggest that methanol with X77 as a surfactant decreased photorespiration, increases sugar production, increased growth, shortened maturity (for example earlier flowering), and reduces water needs in areas with bright sunlight. More on this will be reported as the story unfolds.

Mexico's Potato Trade

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With the current NAFTA discussion and upcoming vote, a look at Mexico's potato trade statistics seems appropriate. Mexico's total agricultural imports amounts to 2.13 billion $. This comprises 12% of Mexico's total imports. The U.S.A. market share of total agricultural imports into Mexico is 75% or about 1.6 billion $. The population of Mexico is over 92 million and growing at 2.3% per year. The urban population is over 35 million. Mexico is the second largest (after Canada) importer of U.S. exports. The following table (1) shows the importation of U.S. potato products to Mexico since 1987.

Some conclusions are evident from these data. First, Mexico is increasing its importation of U.S. potatoes every year. The importation of all categories of potatoes (except seed-3,000 tons) is on the rise. Fresh market potatoes accounts for the largest portion of U.S. potato exports to Mexico, 54% of the 1992 exports by tons of product. Since 1987, total potato exports to Mexico has increased 18 times. This is no small potatoes. The three-thousand ton drop in fresh/seed potatoes between 1991 and 1992 is primarily due to a halt in the importation of seed potatoes from the U.S. through so-called phytosanitary restrictions. If the Mexican potato market would be closed, it would affect U.S. production.

Table 1. U.S. Exports of Potato Products in U.S. tons to Mexico, 1987 to 1992.

Year	Fresh & Seed	Fries	Chips	Dehyd.	Other
1987	1664	69	10	108	41
1988	3463	86	1	132	247
1989	7587	537	463	139	536
1990	7742	2158	5405	244	514
1991	21492	3653	984	399	1108
1992	18486	7317	3400	865	4029

Source: U.S. Dept. of Commerce/Trade Census Bureau

Table 2 lists the USDA estimated changes in trade with Mexico and the farm price for certain key agricultural commodities in Nebraska which would result from NAFTA as compared to the situation if NAFTA was not implemented.

Table 2. Estimates of increased trade and prices after the transition period of the NAFTA in comparison to the same without NAFTA for several agricultural commodities.

(Source: Roy Frederick, UNL, "Impact of the NAFTA on Nebraska and the Great Plains" and taken from USDA estimates).

Ag Product	Exports to Mexico compared to no NAFTA	Price of commodity compared to no NAFTA
Corn	+ 50%	+ 5¢/bushel (+ 400 million $)
Sorghum	+ 15%	+ 3 to 5¢/bushel
Wheat	+ 40%	+ 1 to 2¢/bushel (+ 30 million $)
Soybeans	+ 12%	+ 2% (+ 400-500 million $)
Dry Beans	+ 100% (double)	+ 1% (+ 15 million $)
Sugar (beets + cane)	?? Will depend on Mexico developing a taste for corn sweeteners -- Note recent agreement	??
Cattle/Beef (increased trade in both directions)	marginal	+ 1% (0.50-1.00$/cwt) + 200-400 million $)
Swine/Pork	+ 100 (double)	$1.00/cwt

"... successful implementation of NAFTA becomes not so much an option, but an imperative." Roy Frederick

1993 Potato Trials in Nebraska

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The 1993 potato trials were conducted across Nebraska. The tablestock trials, red and russet varieties, were at Wood River and Imperial; the one at Alliance could not be harvested. The chip trials, white varieties, were at Central City and Alliance (2 sites). The North Central Regional (NCR) Potato Trial was at Alliance. There were four red, four russet and 18 white-skinned varieties in the Nebraska trials, and 14 entries in the NCR trial. Days from planting to harvest ranged from 122 to 136. All seed pieces were cut and treated with TOPS 2,5D; cultural practices were according to the cooperating growers who chose the field and planted the trials except the NCR. All trials were under center-pivot irrigation. Rainfall was 'way' above average. In Eastern Nebraska, 20 inches of rain fell in July; in the Panhandle, 20 inches fell by September. Planting was delayed in the east due to rain as well.

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1993 Potato Trials In Nebraska
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Temperature was 'way' below normal with no county reporting temperature above 95 F. Hail occurred sporadically in the Panhandle throughout the summer and, on September 13, a freeze hit with temperatures as low as 23 F. Late blight was also evident in many places at the end of August.

As in 1992, Red LaSoda had the highest yield and percentage of US #1 tubers, and ND1871-3R had the next highest yield. Fontenot (LA12-59) had the highest specific gravity as in past years/trials; its yield was like Dark Red Norland also as in the past. Refer to "Cultivars; FONTENOT" in Nebraska Potato Eyes, Summer 1993 (vol. 5, iss. 2).

Yields of the russet varieties were mediocre in 1993. Goldrush dropped from a mean of 404 cwt/ac in 1992 to 189 cwt/ac this year. There was no real difference in the yields of R. Norkotah, Ranger R. and W1005. Ranger R. and W1005 had very good specific gravities, 1.087 mean. Shape defects -- pear shape, knobs and cracks -- were a major problem with Goldrush in both locations. Also reported in "Cultivars: Goldrush" in Nebraska Potato Eyes, Fall 1992 (vol. 4, iss. 3). W1005 tubers tended to be long and thin, and have knobs and cracks. R. Norkotah had lots of black scurf at Imperial; at Wood River, there wasn't much of this disease. Scab was not a factor in the tablestock trial at either location. Ranger Russet remains among the best russet varieties and as a good standard. Refer to "Cultivars: Ranger Russet" in the Nebraska Potato Eyes, spring 1992 (vol. 4, iss. 1).

The top yielding chip, white, varieties were Chipeta and AC83306-1 as they were in 1992. The other varieties in the top 5 were Snowden, Monona and Atlantic. ND2417-6 and ND2471-8 were also well above average. The highest specific gravities were from Atlantic, Mainchip, Snowden, A80559-2, NYE55-35, and W870. All but Mainchip, which was not in the test in 1992, had among the highest last year as well. MN12823 had a low specific gravity compared to last year when it was among the highest. Chip color was acceptable for most varieties after harvest; these data after storage will not be available until 1994. The lightest chips came from Mainchip, NYE55-44, Snowden, Atlantic, and AC83306-1. Chipeta tended to oversize as in the past; refer to "Cultivars: Chipeta" later in this Nebraska Potato Eyes, Fall 1993 (vol. 5 iss. 3). The chipping varieties with the best combination of yield, dry matter content (specific gravity) and chip color were Atlantic and Snowden. If the yield of Mainchip can be increased, then this variety would also be among the top.

Table 1. Yield averages of the 1993 tablestock entries, means of 2 locations -- Imperial and Wood River, NE.

Entries	Total yield cwt/ac	US #1 %	Specific gravity	Defect comments
Red LaSoda large As	401	96	1.063	dark center,
Dark Red Norland	274	93	1.065	
Fontenot	276	95	1.071	
ND1871-3R	324	94	1.062	
means:	319	94	1.064	
R. Norkotah	238	91	1.076	black scurf
Ranger R.	245	95	1.087	
Goldrush	189	88	1.066	shape defects
W1005	239	95	1.087	shape defects
means:	**228**	**92**	**1.079**	

Table 2. Yield averages of the 1993 chip entries, means of 3 locations -- Central City and Alliance (2), NE.

Entries	Yield US #1 cwt/ac	Specific gravity	Chip color	Defects comments
Atlantic scurf	297	1.091	61	scab, black
Chipeta	317	1.077	59	oversize, black
scurf Mainchip	231	1.090	65	
Monona	301	1.072	58	
Norchip	271	1.081	55	
Snowden	309	1.089	62	black scurf
A80559-2	190	1.090	59	
AC83306-1	325	1.073	61	black scurf
MN128232'	228	1.073	52	
NDA2031-2 scurf	229	1.077	61	small As, black
ND1995-1	206	1.086	58	small As
ND2417-6	283	1.080	60	black scurf
ND2471-8	293	1.087	60	
NYE55-35	184	1.094	58	
NYE55-44	253	1.086	63	

There were 14 entries in the 1993 NCR trials. In Nebraska, this trial was conducted in Box Butte County. The mean yields were higher than last year. R. Norkotah was the best russet and W1099 was close. The highest yielding red variety was ND1871-3R better than Norland and Red Pontiac; in the Nebraska trial, it was higher than Dark Red Norland and Fontenot but lower than Red LaSoda. The purple entry, MN 15220, tended to oversize. The entry W84-75R had the lowest yield and the least scab; tubers tended to be small. Specific gravities of white (chip) entries were low, averaging 1.079. The highest was 1.085 for ND2471-8 which was 1.087 and mediocre in the Nebraska trials. Yields were the highest for Norchip and MN15111. Chip color was lightest for ND2417-6.

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1993 Potato Trials In Nebraska
Continued from page 7

Table 3. Yield averages of the 1993 North Central Regional (NCR) entries in Nebraska -- one location, Alliance, NE.

Entries	Total yield cwt/ac	% US #1	Specific gravity	*Chip color	Tuber comments
red/purple:					
Norland	467	97	1.070	54	
Red Pontiac	456	97	1.065	37	
MN15220 (P)	411	97	1.065	24	oversize
ND1871-3R	508	98	1.070	32	
W1100R	396	92	1.070	42	
W84-75R	216	81	1.065	51	undersize
russet:					
R. Burbank	377	94	1.075	33	elongated
R. Norkotah	463	95	1.073	44	
W1099	437	97	1.073	51	
white:					
Norchip	460	97	1.080	58	goodshape
MN13540	433	96	1.073	62	
MN15111	474	96	1.075	61	
ND2417-6	339	91	1.081	66	
ND2471-8	393	95	1.085	62	
means	**416**	**95**	**1.073**	**52**	

*determined with an Agtron E-10

Pesticide Residue In Vegetables

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The Food and Drug Administration (FDA) recently released the results of their 1992 pesticide residue monitoring program. This program samples individual lots of US and imported foods. Detection of 313 pesticides are used by the FDA procedures. These include both US and foreign registered substances. Malathion and DDT are the two pesticides most frequently detected above tolerance. The findings, as in the past years, indicated that levels of pesticide residues in the US food supply are below established safety limits.

Percent of domestic and foreign vegetable samples found to be above tolerances for 1989, 1990 and 1992.
[Source: FDA]

	Domestic Samples	Foreign Samples
1989	1.5	4.5
1990	1.1	4.3
1992	1.7	4.6

SPUDDERS

Gary Leever
Manager
Potato Certification Assoc. Nebraska, Alliance, NE

The 1993 seed-potato growing season is over, and, for the most part, it was a very good season. The evening of September 13th saw temperatures in the Nebraska Panhandle drop to the mid to high 20s F in all counties. The season was unusually cool. No Panhandle city/town reported a temperature above 95 F the entire summer, and no county reported any drought condition. Seed potato quality for the most part should be excellent. As we do our final inspection in most fields, we dig a hill or two to determine tuber set and tuber quality. The statement above comes from my judgement of what I observed during final inspection.

The only uncalculated variable will be whether or not we have any problems with tuber breakdown in storage due to potato late blight. Late blight began to appear very late in our growing season, around mid-August, and most growers either applied a fungicide or vine desiccant. So, it is hard to determine at this juncture whether there was enough time for the spread of this disease to tubers.

Over eight thousand acres were entered under our seed certification program in Nebraska and Wyoming. The breakdown by county is Banner 274, Box Butte 4,977, Kimball 275, Lincoln 200, Morrill 796, Scotts Bluff 82, Cherry 270, Sioux 389, Sheridan 195, and Laramie 560. The good new was only 42 acres had to be rejected, and all rejections were due to either varietal mix or leaf roll. Due to the drown out and late blight in the Red River Valley as well as the spring and early fall frosts in areas of the U.S. Northwest, it looks like the 1993 nationwide seed crop will be shorter than last year. Nebraska seed growers should enjoy a favorable supply demand situation in most varieties. So good luck and good storage to all.

Weed Hit List

"Ag Consultant" compiles a 'weed hit list' by surveying weed control specialties around the country. The ranking is a 'guesstimate' by the respondents. The nutsedges (yellow and purple) were the #1 weed problem in the US with the pigweeds (smooth and redroot) being #2 in 1992. In the North Central Region, the #1 was the foxtails (giant, green and yellow).

CULTIVARS; CHIPETA

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The release of CHIPETA was announced in 1993 by Colorado State Univ., Univ. of Idaho and the USDA-ARS. CHIPETA is released for the potato chip market.

CHIPETA (AC80545-1) was selected in 1982 in Colorado from a cross made by the USDA-ARS in Idaho. One of the parents is Wischip and it has both Nooksack and Lenape in its lineage. Selection and early testing was done by D. G. Holm at the SLV Res. and Ext. Center, Colorado State U. at Center, CO. In 1992, 144 acres of certified seed were grown. Chipeta has been tested in the Western Regional Variety Trials and the Snack Food Assoc. Chipping Trials. The variety showed wide adaptation to the irrigated areas of Western USA. The following is a summary of its properties and the table summarizes some of the data.

Summary of Properties:

Purpose -- Potato Chips
Maturity -- medium-late, like Atlantic
Emergence -- quick
Vine -- erect, large vine
Leaves -- light green
Flowers -- abundant, reddish purple; purple buds
Eyes -- medium shallow, uniformly distributed
Tuber -- white flesh; light tan skin which may show a little russeting in some soils; oval to round shape
Set -- medium, can oversize and therefore suggest narrower than usual plant spacing and the use of less nitrogen
Dormancy -- medium long, longer than Atlantic
Yield -- greater than Atlantic and Norchip in Colorado (San Luis Valley) and Idaho (Aberdeen)
Specific Gravity -- slightly less than Atlantic and greater than Norchip
Sugar -- lower reducing sugar level than Atlantic or Norchip
Chip Color -- lighter than most; lighter (higher Agtron readings) than Norchip, similar to Atlantic after 50 F storage; occasionally chips out of 40 F storage indicating low sugar buildup
Tuber discoloration - none
Bruising -- moderately resistant to blackspot and shatter
External Defects -- sometimes rough especially if oversize; resistant to growth defects
Internal Defects -- resistant to hollow heart
Disease -- resistant to leafroll net necrosis; moderately resistant to early blight, early dying (Vert. wilt) and PVY; susceptible to common scab, dry rot (Fusarium), bacterial soft rot (Erwinia), PVX, and PVS.
Symptom Expression -- typical for leafroll, mosaic PVX, PVS and PVY, and bacterial ring rot
Herbicide Sensitivity -- none to metribuzin (Sencor/Lexone)
Fertilization -- lower nitrogen (N) needs than many chip varieties

Performance of CHIPETA in Colorado and Idaho compared to Atlantic and Norchip.

		Yield Total	(cwt/acre) US #1	Specific Gravity
1.	Colorado (6 years):			
	CHIPETA	473	404	1.094
	Atlantic	403	341	1.101
	Norchip	338	253	1.081
2.	Idaho (3 years):			
	CHIPETA	491	429	1.089
	Atlantic	371	294	1.090
	Norchip	356	253	1.082

Performance of CHIPETA in Nebraska compared to standards.

Variety	Yield, cwt/ac > 2in tubers	Specific Gravity	Chip Color[1] Agtron E-10
I. 1989 and 1990, 4 trials (Chipeta seed from private source)			
CHIPETA	349 b[2]	1.080 B[3]	59[4]
Atlantic	438 a	1.093 A	56
Norchip	350 b	1.082 B	60
Monona	351 b	1.072 C	57
Snowden	351 b	1.090 A	63
LaBelle	408 ab	1.080 B	56
II. 1992 and 1993, 5 trials (Chipeta seed from Dr. Holm, Breeder)			
CHIPETA	377 a[2]	1.083 B[3]	62 A[3]
Atlantic	325 ab	1.093 A	64 A
Norchip	274 b	1.085 B	57 B
Monona	285 b	1.074 C	61 AB
Snowden	296 b	1.092 A	63 A

[1] Data taken after harvest, less than one month storage at 60 F. In 1992, chip color was also measured three months later after storage at 50 or 40 F. Chipeta's chip color was acceptable like Atlantic and Snowden. It chipped out of 3 month storage at either 50 or 40 F.
[2] Numbers in columns followed by the same lower case letter are not significantly different at 90% confidence level.
[3] Numbers in columns followed by the same upper case letter are not significantly different at 95% confidence level.
[4] No significant difference at 90% confidence level.

Comments from Nebraska trials on CHIPETA: This variety tends to oversize and greening occurs. It skins easily. Tuber blight was evident in 1992. Vascular discoloration and common scab were apparent in 1990 and 1992. Black scurf colonies were plentiful in 1992 and 1993. In Eastern Nebraska (one trial in 1993), hollow heart occurred.

Editor's comments on Chipeta -- The variety has excellent yield potential with good solids and chip color but the tubers tend to have a lot of problems, most of which are due to or aggravated by its tendency to oversize. Narrow plant spacing could alleviate these problems. Plant spacing for the Nebraska variety trials in 1992 was 9 to 9 1/2 inch. Decreasing nitrogen and earlier desiccation may help as well. Under these conditions, however, yield may also decrease.

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