NEBRASKA
POTATO EYES
Technical News Reports for the Nebraska Potato Industry

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Alexander D. Pavlista, Editor
Extension Potato Specialist

Editor's Note

USA Now Fifth--According to the United Nations (Food and Agricriculture Organization), the USA ranked fifth in potato production after Russia and Ukrania were considered separatly. The USA produced 7% of the world's potatoes in 1993. The rankings are Russia, China, Poland, Ukrainia and then the USA. India is not far behind and is increasing its potato production.

Potato Exports--About 6% of U.S. potato production is exported. This represents over 27 million cwt and translates to $450 million in sales during the 1993-94 market season. Funding to promote potato exports comes primarily from the U.S. government through the Market Promotion Program. Sales represents about a 100-fold return on funding. However, under new political-financial pressure this program is being reduced to lower the Federal deficit.

Volume of Potato Exports (in million cwt)

1989/90	1990/91	1991/92	1992/93	1993/94
15	17	21	23	27

Returns on Research Investment--About $2.5 billion is spent on agricultural research each year by Federal and State governments. This investment is for future productivity. What is the return? Over the past 30 years, the annual rate of return from research investment have been 20 to 60%. A recently published study (Norton and Ortiz. 1992. Jour. Production Agric. 5:203-209), stated a 30% rate of return for agriculture. The marginal product, i.e., the effect on output of a $1 increase in research expenditures, is $4.9. That is, for each additional dollar invested on production agriculture results in $4.90 of additional value of production over the following several years.

More on Production Agriculture--In the past 10 years, the Cooperative Extension Service has been gradually reducing its emphasis on production agriculture and increasing it toward community concerns. Community concerns include health, food safety, rural development, and youth programs. USDA figures show that only 35% of the Extension staff are involved in agriculture while 60% work is community programs.

Who does what? The percent of Extension staff in each program group are: Production Agriculture = 35%, 4-H Youth = 18%, Family = 12%, Environment & Natural Resources = 11%, Nutrition & Health = 10%, Leadership = 8%, and Community Growth = 6%.

Nebraska Potato Council Awarded

Gene Kershner, President of the Nebraska Potato Council, receiving award from Tony Merrigan, Box Butte County Extension Educator.

On November 16, 1994, the Nebraska Cooperative Association presented their "Certificate of Appreciation" to the Nebraska Potato Council. This recognized the Council's "meritorious public service" to Extension education programs on potatoes throughout Nebraska.

CONGRATULATIONS !

(Note – At the same meeting, the Editor received a "Certificate of Achievement" from the National Honorary Extension Fraternity.)

Alexander Pavlista

In This Issue...

Passages

A Nebraska Leader Passes

John Faessler died on December 27, 1994 at Morrill County Community Hospital, Bridgeport, Nebraska. John had just turned 71 on the first of December. He was born in Bridgeport to Jacob and Elise (Kubler) Faessler. While at Bridgeport H.S., he was an All-State football player. After school, he joined the U.S. Navy and served on the USS Sicily. On December 30, 1950, John and Mary Jane Stevens married in Fort Morgan, Colorado. He began farming and ranching at the Greenwood Ranch and continued both until his death. He was an owner of West Nebraska Potato Shippers before it sold to Diamond Hill Farms, a Director of Dinklage Feed Yard, Inc. and officer in the National Cattlemen's Assoc. John was a shaker and mover in our community when his sudden illness came. Burial was in the Oregon Trail Memorial Cemetry. He is survived by his wife, Mary Jane; his children and their spouses -- Marci and Tom Paulson (Fremont), Randy and Terri Faessler (Sidney), Susan and Jeff Neely, Bobbi and Kent Wright, Kurt Faessler, Todd Faessler, Jan Stark, and Bruce and Lori Faessler (all of Bridgeport); siblings -- Gary Faessler (Bridgeport) and Elsie Carlson (Cortez, CO), and 18 grandchildren and one great-granddaughter. He was preceded in death by his parents and brother, Jake.

"Cab driver, drive by Mary's place.
I just want a chance to see her face.
Don't stop the meter; let it race.
Cab driver, drive by Mary's place!"

Idaho Potato School (1994)

Alexander D. Pavlista
Extension Potato Specialist
University of Nebraska, Scottsbluff

Hollow Heart/Brown Center, Nitrogen and Irrigation (Ojala & Stark, Univ Idaho) -- Early-season (before July 1) application of nitrogen increased the incidence of hollow heart/brown center in Russet Burbanks. Six percent of the tubers from plants exposed to less than 200 lb N/ac before July 1 had hollow heart. This number triples with plants exposed to more nitrogen. The higher nitrogen rates also increased the number of tubers with brown center.

Early season (before July 1) nitrogen effect on hollow heart and brown center.

Nitrogen lb/ac	Hollow Heart % tubers	Brown Center % tubers
175-199	6	3
200-224	17	20
225-249	28	15

Early soil moisture was also associated with hollow heart. The number of tubers with hollow heart from fields that were relatively wet during June averaged 34%. Ten to 14% of the tubers from drier fields had hollow heart. High soil moisture tends to reduce soil temperature which, in turn, promotes hollow heart and brown center.

Early season (June) soil moisture effect on hollow heart and brown center.

Relative Soil Moisture	Hollow Heart % tubers	Brown Center % tubers
Wet	34	24
Moderately Wet	12	11
Moderately Dry	10	13
Dry	15	13

Fungicide-resistant Dry Rot (Nolte, Univ. Idaho) -- Strains of *Fusarium sambucinum* that are resistant to benzimidazole fungicides have been isolated in Idaho for the past five years. Benzimidazole include thiobendazole (TBZ, Mertect), thiophanate-ethyl (topsin) and thiophanate-methyl (TOPS). Tests have been conducted on cut Russet Burbank seed in Aberdeen with resistant and susceptible strains of dry rot. These led to the Idaho Fungicide Resistance Management Program whose guidelines include using benzimidazole-EBDC combination seed dusts. Holding cut and treated seed at 50-55 F, high relative humidity and good ventilation to allow for wound healing is recommended. Cut seed should not be stored for *over* two weeks.

Percent dry rot (evaluated 6 weeks after planting) in cut Russet Burbank seed inoculated with either susceptible (S) or resistant (R) strains of *F. sambicinum*.

Treatment	S-strain % decay	R-strain % decay
None	6.1	8.2
TBZ	0.4	11.5
TOPS 5D	-	3.1
TOPS 2.5D	-	12.8
TOPS MZ	-	1.1
TBZ-Mancozeb	0	-
(no inoculation = 7.7% decay)		

Bag test for Dry Rot strains (Seyedbagheri, Univ of Idaho) – A kit was developed for growers to identify whether the strain of *Fusarium* present on seed tubers is resistant to fungicides. The procedure is:

1. Select 3 samples of 25 tubers weighing 6-8 oz. Cut them in quarters.
2. Place each of the 3 samples of 100 quarters into a paper bag and roll gently.
3. Spread TOPS-MZ dust over the seedpiece from one bag and shake for 30 seconds. Do likewise with TBZ on seedpieces from another bag. The third bag is the untreated check.
4. Place the 3 bags into a large plastic bag. Do not seal but let air enter. Store at 60-70 F and evaluate decay in each bag after 3-4 weeks.

If the TBZ bag shows little decay then a susceptible strain is probably present. If the the TOPS-MZ bag shows less decay then the TBZ bag then a combination fungicide treatment will probably be needed as the strains may be resistant.

Some actual examples of % seedpiece decay from growers in 1993.

Grower #	Check	TBZ	TOPS-MS
1	10	8	1
2	6	4	0
3	9	6	1
4	63	47*	4
5	35	31*	3

*probably a resistant strain of dry rot.

Alternative Sprout Inhibitors (Kleinkopf & Lewis, Univ of Idaho) – Two alternative compounds, DMN and DIPN, are being tested against CIPC as sprout inhibitors for Russet Burbank. DMN and DIPN, not yet registered, are derivatives of naphthalene. These are applied at 100 ppm in a fog and show promise against CIPC applied at 22 ppm, its labelled rate. Application was in December of 1992.

Average sprout length in inches per R. Burbank tubers after a December treatment of an inhibitor.

Treatment	March	May	July
none	0.2	4.8	-
CIPC	0	0.1	0.3
DMN	0	0.9	1.5
DIPN	0	0.7	0.7

Miscellaneous Tidbits –

Colorado potato beetles that are resistant to insecticides have been reported in Idaho, North Dakota, Minnesota, Michigan, Maine, New York, New Jersey, Virginia, and North Carolina. (Mowry)

Fumigating fields every year with a dichloropropene (e.g. Telone II) plus chloropicrin increased R. Burbank yields 15 go 32%. The average gain was 39 cwt US #1/acre. But fumigating every other year had no effect on yields. (Davis)

Management guidelines to minimize black leg (*Erwinin carotovora*) include planting in well-drained soil at 55F and not irrigating before plant emergence. (Cappaert & Pawelson)

Michigan Potato Research '94

Alexander D. Pavlista
Extension Potato Specialist
University of Nebraska, Scottsbluff

Management Profile Studies (Chase et al)--

Ranger Russet: In 1993, the mean yields were 12% above that in 1992. Over the two years, there was no response to nitrogen added at 150 to 250 lbs/ac. Plant spacing between 9-15 inches within 34-inch rows showed no impact in US #1 yield, size distribution of tubers or specific gravity. The number of tubers with hollow heart was greatest with 12 and 15 inch spacings. The Michigan researchers suggest a spacing of Ranger Russet of 10 to 12 inches and a nitrogen rate of 150-200 lbs N/ac depending on the previous crop.

Gemchip: Yields were greatest at the closer plant spacings, 6-9 inches, in both years (1992-93). Disregarding spacing, the nitrogen levels, 100-200 lbs/ac, had no effect. There was no effect on specific gravity. The recommendation suggested to space Gemchip 6 to 9 inches and add about 150 lb N/ac.

Two-year summary of US#1 yield (cwt/ac) of 'Ranger Russet'

Seedpiece spacing(in)	Nitrogen rate (lbs/acre) 150	200	250	Mean
9	292	291	286	290
12	292	284	259	278
15	272	265	255	264
Mean	285	280	267	

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Two-year summary of US#1 yield (cwt/ac) of 'Gemchip'

Seedpiece spacing(in)	Nitrogen rate (lbs/acre) 100	150	200	Mean
6	416	380	384	393
9	338	361	345	348
12	304	301	286	297
Mean	353	347	338	

Nitrogen Fertilization Rates (Vitosh et al) --
Snowden showed a yield increase with 80 lb N/ac at planting and with 160 lb N/ac, half applied at planting and the other half at tuber initiation.

Nitrogen response of Snowden

Nitrogen application (lb/acre) At Planting	Tuber Initiation	Yields (cwt/ac) US#1*	2-3 1/4	>3 1/4 in
1993 data:				
0	0	390b	364	26
80	0	427a	392	36
80	80	439a	378	57
80	160	406ab	361	45
1992 data:				
0	0	185b	179	7b
60	60	234a	228	10b
60	180	265a	240	25a

*Within each year, yield followed by the same letter are not significantly different at the 95% level.

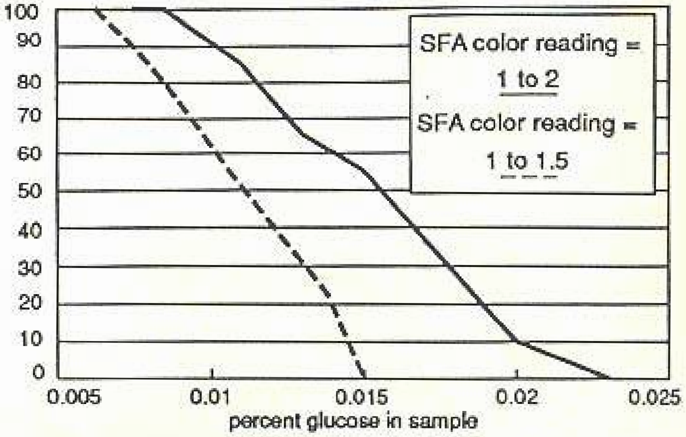
Seed Class Performance Studies (Chase et al) --
Atlantic: The 2-year study (1992-93) showed 13% higher yields from nuclear seed over either Generation I or II. In 1993, Gen II outyielded Gen I but not in 1992.
Snowden: As with Atlantic, nuclear seed outperformed Gen. I and II but the difference was less.

Two-year summary of US#1 yield (cwt/acres) of early seed classes of Atlantic and Snowden.

Seed Class	Atlantic	Snowden
Nuclear	447	321
Generation I	397	308
Generation II	396	304

Critical Sugar Level Guideline (Fick & Brook) --
Snowden tubers stored during the 1992-93 season were sorted by percent glucose content and then fried. Chip color was determined using the SFA chart with which readings of 2 or less are acceptable. The percent glucose was plotted against the percent of samples with a given glucose level that achieved either a color reading of 1 to 2 or a reading of 1 to 1.5. These resulted in two probability curves of predicting acceptable color from the glucose measurements. Using this graphic estimate, for example, Snowden tubers with a glucose level of 0.01% had a 90% probability of chipping with a SFA color color chart reading at 2 or less. Tubers with 0.015% have a 55% probability of a reading of 2 or less (see figure).

Figure (Michigan). Probability curves of predicting acceptable SFA chip color reading based on glucose content of samples.

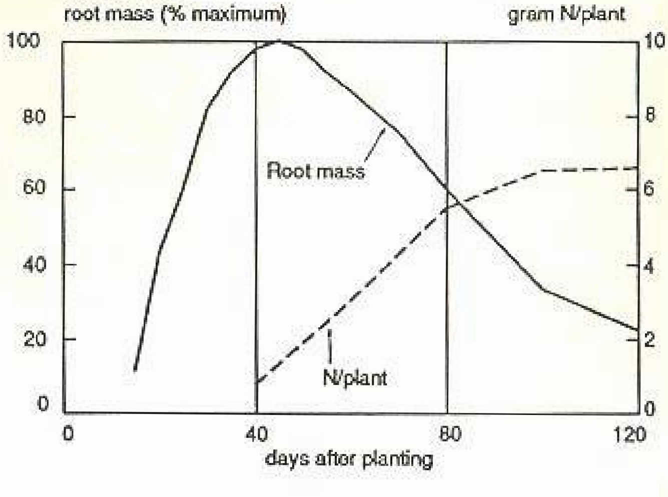


Washington Potato Conference '94

Alexander D. Pavlista
Extension Potato Specialist
University of Nebraska, Scottsbluff, NE

Root Growth and Fertilization (Pan et al, Wash. St. U) --
A 'rhizotron' was constructed to study root growth undisturbed in the ground. The observed patterns suggest that preplant and preemergent fertilization was critical for root development. Broadcast incorporation of nitrogen and phosphorus was recommended by these researchers. This should promote a prolific and well-distributed root system. The observed decline in root mass, 50 days after planting, and levelling off of nitrogen uptake, 100 days after planting, indicate that the benefits of late season nitrogen application may be limited (see figure).

Figure (Washington). Root mass as percent of maximum and nitrogen uptake as gram N/plant versus days after planting (Russet Burbank).



Rain and Late Blight (Johnson & Inglis, Wash. St. U.) -- In the Columbia River Basin, late blight has occurred in 11 of the past 24 years (1970-93). Years that had late blight had more rainy days and more periods with 3 or more consecutive rainy days. The appearance of late blight in one year favors a repeat appearance the following year. This is probably due to an increase of the inoculum in the environment. The inoculum survives the winter in infected living tissue such as cull piles. Severe winters disrupts the overwintering capability as does destruction of infected tissue such as mulching cull piles. With disease introduction from overwintered or seed-borne inoculum, rainy, cool weather will promote disease development and rapid spread.

Year	Rainy Days	Number of Wet Periods*
Non-Epidemic	17.9	1.5
Epidemic	24.7	3.8

*Wet period = 3 or more consecutive rainy days.

Irrigation and Early Dying (Powelson et al, Oregon St. Univ.) -- The influence of irrigation between emergence and tuber initiation on early dying was examined. Irrigation during this 4-week period was based on the estimated consumptive use (ECU) of Russet Burbank plants. Application was categorized as deficit (50-75% ECU), moderate (at the ECU) and excessive (150% ECU). Plants exposed to excessive irrigation between emergence and tuber initiation showed early senescence, severe early dying symptoms and reduced yields compared to the other two regimes. Lower soil moisture (70-75% available water) between emergence and tuber initiation can reduce the rate of plant death.

PAA Meeting Highlights

Gary D. Franc
Research Plant Pathologist
University of Wyoming, Laramie, WY

The 78th annual meeting of the Potato Association of America was held in Calgary, Alberta last July. Some of the research highlights that apply to our production areas are summarized below.

Nitrogen Management (M. Thornton et al., U. Idaho) -- In 1992-93, the effects of nitrogen (N) management on tuber storage characteristics were determined. Tubers harvested from plots fertilized with 80, 160, 240 or 286 lbs N/ac were placed into storage in September. After the initial curing period, tubers were cooled to 45°F and CIPC sprout inhibitor was applied to one-half of the samples in mid-December. Tubers grown at the high N rates had less dry matter than those grown at lower N rates. Nitrogen treatment affected dormancy and sprouting of non-CIPC-treated tubers. Tubers from low N treatments sprouted earlier and produced more sprout weight on every evaluation date than those from the high N treatments. CIPC residues were not affected by N treatment and ranged from 0.34 to 1.96 ppm in washed samples. CIPC suppressed sprouting in all samples, however, sprouting was closely related to N rate, with tubers from the low N rates sprouting earlier and producing higher sprout weight.

Snowden Storage (R.J. Fick & R.C. Brook, Michigan St. U.) -- Tuber sugar levels were measured at various times to determine if late-storage sweetening could be predicted. Late season rises in sucrose and glucose were detected about 6-8 weeks before glucose levels rose above 0.01%. Tubers stored at 50F sweetened and yielded unacceptable chips at least 4 weeks before tubers stored at 45F. Heat treatments at 80F for up to 4 weeks following harvest had a minimal effect on the start of late storage sweetening, however, longer treatments increased the rate of sugar increase. Cooling rates of approximately 0.5F/day down to 48F was used without causing chip discoloration or rises in sugar levels. Pile to plenum temperature differences should not exceed 3.6F to prevent excessive moisture loss. Storage at 40F resulted in low-temperature-induced sweetening. Reconditioning was successful during 1 of the 2 years studied. Reconditioning can be successful if temperatures above 50F are used and storage at temperatures below 45F was not recommended.

Late blight -- This disease continues to be a concern in our production areas because of the potential for introducing the pathogen on infected seed. The late blight fungus with which we are accustomed to dealing is the A1 mating type that is metalaxyl-sensitive. If the A2 mating type is introduced to our production areas, mating could potentially occur and a soilborne phase of the disease cycle could become established. This is believed to occur in Mexico, where the fungus evolved, and could greatly complicate our disease control picture.

(K.L. Deahl & S.P. DeMuth, USDA, Beltsville, MD) Isolates of the fungus were obtained from potato fields in 15 states and three provinces in 1992. The mating type, metalaxyl response and virulence patterns on potato were determined on them. From 69 commercial sites, 60 A2 isolates were detected (63%). There was a strong correlation between A2 mating type and metalaxyl sensitivity; over 90% of the A2 isolates were resistant to metalaxyl. The A2 populations were found to consist of isolates which were sensitive, intermediate or resistant to the fungicide. The frequency of finding the A2 mating type has increased since testing was initiated in 1991.

(D.A. Inglis & D.A. Johnson, Washington St. U.) Nine potato cultivars grown in the Pacific Northwest and Elba, a cultivar with known late blight resistance, were evaluated in 1993. Mount Vernon, WA, was chosen due to favorable weather for disease development and the presence of metalaxyl-insensitivity in the late blight population. The trial was planted May 24 and, beginning on July 13, plants were rated weekly for the percentage of blighted foliage until Aug. 24. The results were: 1. Superior, Hilite

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and Rus. Norkotah had significantly more infection than Rus. Burbank. 2. Shepody, Ranger Rus. and White Rose had similar infection. 3. Rosa, Kennebec and Elba had significantly less infection compared to Rus. Burbank. Rus. Norkotah and Shepody had a relatively high incidence of tuber infection at harvest whereas Shepody and Ranger Rus. had a high incidence of tuber infection after three months in storage.

Metam-Sodium (Davis et al., U. Idaho) -- Field trials in 1992 and 1993 showed control of Rhizoctonia disease, stem canker and black scurf, by metam-sodium at 50 gal/ac when injected into the upper six inches of soil. Spring versus fall applications at 29 and 100 gal/ac did not differ in controlling Rhizoctonia. Metam-sodium reduced stem canker and black scurf by 67 and 72%, respectively. With disease control, tuber appearance was improved and the average numbers of tubers per plant increased by 29%. Tuber size observed in July was increased by 66% following spring application of metam-sodium. In Sept., the incidence of malformed tubers was reduced by 43% resulting in increases of total and US #1 yields of 6.4 and 18.6%, respectively. Verticillium wilt and black dot were not reduced by these treatments.

White Mold (H.L. Carlson et al., U. California) -- In field studies on white mold, control of stem lesions was fair to poor with the registered fungicides Rovral and Botran. Good to excellent control was attained with experimental applications of Ronalin. Bravo actually increased the incidence of white mold stem lesions, possibly as a result of controlling early blight which improved the canopy. The healthier canopy may have created the humid conditions needed for white mold. No difference in control was detected between fungicide applications through sprinklers and broadcast sprays which were immediately followed by light overhead irrigation.

Storing Potatoes Symposium

Alexander D. Pavlista
Extension Potato Specialist
University of Nebraska, Scottsbluff, NE

At the 78th annual meeting of the Potato Association of America, an Extension Symposium was given under the heading of "Dynamics of the stored potato: A management approach." The following are highlights taken from the speakers' talks.

I. *Early storage: From field to holding temperature* (Gale Kleinkopf -- Univ. Idaho). Minimal respiration occurs when tubers are at 42-47° F. Cooling tubers going into storage should be at 0.2 - 0.7° F/day and 0.9 - 5.4° F/week. This rate is not so important for tablestock potatoes but it is for tubers that will be processed. Within the pile, temperature should not vary more than 1° F from top to bottom.

Prior to going into storage tubers need to be "wound-healed" allowing bruises to form a protective barrier against diseases. There are three steps to wound healing. First is lignification, which involves the formation of lignin to inhibit water loss from the damaged surface. This takes a few hours and is followed by the production of suberin, suberization. The suberin layer temporarily protects the damaged area. At 68° F, it takes 4 to 24 hours. The final step is the formation of the periderm or outer skin. This takes 3 to 5 days at 68° F and the final protection against invasion by disease organisms. These steps are affected by temperature, relative humidity and air supply, all of which can be controlled by a grower. A few diseases such as silver scruf do not need a wound to penetrate a tuber, but most do.

Cold tubers, less than 45° F, are susceptible to bruising. Tubers whose temperature is greater than 54° F are prone to develop disease. The ideal harvest temperatures of tubers is between 50-54° F.

Pulp Temperature	% Tuber Bruised
35° F	50%
40° F	35%
45° F	25%

II. *Storage design and management principles* Roger Brook, Michigan St. Univ.) -- "Potato storage is a house; it is not a hospital." High temperatures at harvest will stress tubers and, during storage, tuber sweetening and aging will increase. Prepare the storage facility before piling tubers within.

Bin: The recommendation for bin size is small to medium, 15,000 to 25,000 cwt/bin. Store only one variety in a bin since varieties differ in their respiratory rates. A bin should be filled within three days. Bins should be separated with front walls (see diagram). Keep tubers off the outside walls. The work area can be used for very short-term storage.

Insulation: As the R-value of insulation increases, the insulation capability increases. Temperature needs to be maintained and condensation prevented. An R-value of 21 is the minimum needed and R25 is recommended. Fiber glass is not recommended for insulation. Use thermal breaks. Good insulation is critical in places such as corners. Remember that at 50° F and 95% relative humidity, the dew point is 48.6° F.

Vapor Barriers (Retarders): Nothing is a 100% barrier; water vapor will always move out of a storage facility. A six mil poly is recommended for a good permeability rating. Urethane foam, one inch, is not a vapor barrier. To avoid trapping moisture in walls, ventilate the area between the bin walls and outer wall to the outside.

Ceiling: Not having a ceiling exposes insulation and tresses, and requires a large area above the tuber pile. A ceiling protects the structure and insulation, and reduces the area needed above the pile. It can also make it easier to ventilate the bin thereby removing moisture. Ventilation rate should be one-seventh of the ceiling surface per minute. The ceiling should be painted or coated black to keep the top warmer and to avoid condensation.

Ventilation (Fans, Air Flow): The ventilation system needs to be balanced. Recommended air flows are:

Region	cfu/cwt	cfu/ton
Pacific Northwest	0.85	17
Red River Valley	1.0-1.5	20-30
Mid West	1.5	30
North East	1.1-1.3	22-26

More air flow is needed in the early part of the storage season (fall) than later (winter). This is accomplished with a 2-fan system.

The velocity shell is 10 to 12 feet in front of the fan and for a more even distribution, it should be in the area before reaching the tuber pile. The exact velocity is not the key; the right ratios between the parts are critical and are referred to as the Air Velocity Ration.

The following is an example:

Open Area	Velocity Ex. (ft/min)	Approx. Ratio
air inlet	1000-1500)	1
main duct	500-850	0.5
lateral duct	750-950	0.7
slot	1000-1200	1
exhaust	1000-1500	1

Common problems that change air flow are too small openings and laterals, and too large slot area(in-flow laterals). Guarded slots should be used: they should be 4.5 inches and be comprised of three openings. The ends of ducts need to be capped to back-force air through the ducts.

Things to check are: 1) size of slot area, 2) under-pile ducts, 3) recirculation system, 4) main air duct, 5) fan housing and 6) air ventilation ratio. A good ventilation control system will stabilize temperature, control relative humidity and be flexible (variable speed or multiple fans).

Miscellaneous:

Other items for storage are gas analyzers to check on carbon dioxide build up, sprout inhibitors, heating-cooling systems and humidification systems.

III.Economic of potato storage (Joseph Guenther, Univ of Idaho) – The history of potatoes is value plus ingenuity. The Inca civilization succeeded due to the ability to store potatoes. Chuno, a freeze-dried product, was the first processed potato developed by the Incas. As part of the conquest of these civilizations, the Spanish conquistadors surrounded potato storage facilities and prevented the food from being brought to the urban areas.

Storage for processing has changed the location of major potato production regions. Production has moved from the east to the west and from the south to the north. Fall production became larger than spring/summer production.

In calculating the cost of storage, one should figure that the building costs between $3.25 to $7 per cwt. Larger buildings cost less per cwt than smaller ones. Ventilation systems run between 30¢ to 60¢ per cwt.

The following is a typical situation to consider. Let's take that 60,000 cwt potatoes are stored. The value of these at harvest were $5/cwt giving a value going into storage of $300,000. Storage rent may run 40¢/cwt or $24,000 and operation cost may be $10,000 for this load. Another $30,000 may be the cost due to storage losses such as shrinkage. At the end then, the value of the potatoes going out of storage from this load is now $364,000.

What does the future portend? Some of the possibilities are disease resistance through genetic manipulation, radiation for disease and sprout control, dormancy control, cold storage, shelf-life extension (eg., FLAVR SAVR tomato), and new food products (e.g., for the Chinese and Indian markets). Wild tuber germplasm may be added to the common potato to affect texture, taste, shape, and color.

Notes from the Land Down Under

Alexander D. Pavlista
Extension Potato Specialist
University of Nebraska, Scottsbluff, NE

Recently, I started receiving a newsletter published in Australia. "Peelings" is edited by Tony Myers, the Potato Officer of the Dept. of Agriculture, Ellinbank, Victoria. The newsletter has a similar philosophy as the 'potato eyes' and I thought that, from time to time, I'd write some tidbits of interest from this publication.

1. Looking over trial data on varieties for potato chips (they are called 'crisps'), I noticed an interesting difference in ratings. Atlantic potatoes yielded 420 cwt/ac versus 460 cwt/ac for Kennebec. The specific gravity for Atlantic and Kennebec was 1.090 and 1.077, respectively. Atlantic tubers fried lighter than the Kennebec although both were acceptable. Yet, the Kennebec was ranked higher or better than the Atlantics. Besides the at-harvest qualities, Atlantic chipped acceptably after a 6-month storage at 50F while Kennebec chipped poorly after 2 months. There is quite a difference here between what North America and Australia consider good chips or crisps.
2. In a survey on waste potatoes, growers in Victoria considered the major reason for waste was greened tubers followed by oversized, bruised, pest damaged, and poorly shaped tubers. Most of the growers fed waste tubers to livestock.
3. Ciba is releasing a triazole fungicide called 'Score' in Australia. Its active ingredient is difenoconazote and it is meant to control Target Spot. Score is a local systemic and acts within the leaf tissue preventing the growth of the fungus inside. Maximum uptake of Score is achieved in two hours and lasts for 14 days.

Oh! Target spot is Australian for Early Blight. By the way late blight is called Irish blight.

Physiological Age of Seed Potatoes

M. S. Grace
Dept. Agriculture, Tasmania, Australia

Observation on seed performance from different parts of Australia suggested that seed storage was the major contributing factor to performance.

Physiological age ('P-age') measures the potential vigor on growth of a potato plant from a particular seed tuber. P-age is acquired by tubers between dormancy break and planting. Mathematically, physiological age is expressed in degree day units.

P-age = (Average daily storage temperature - Base temperature) times the Number of days between dormancy break and planting.

Base Temperature = 4° C = 40° F

Many of the effects due to physiologically aging seed has been reported recently. Older seed emerge sooner, produce a bushy crop, set tubers rapidly and reduce potential maximum yield.

In a 1991 study on Kennebec in Tasmania, the tuber size-grade distribution from seed of different P-age was compared. Plants from older seed had fewer tubers but a greater mean tuber weight than plants from unaged seed.

Studies are continuing on Russet Burbank and include variables such as plant spacing.

Percent of total yield of tuber size grades as affected by the seed's physiological age (1991).

Tuber Size Grade (ounces)

P-Age*	4 -8	8 -12	12 -16	>16
0	65	15	5	0
420	60	15	5	5
840	50	20	10	10
1260	45	20	15	15

* Planted after 0, 15, 30, or 45 days at 68 F after storage at 40 F.

Report on Russian and Poland

Joseph Schon
Executive Vice President
Lockwood Corp., Gering, NE

In the fall of 1994, I had an opportunity to be part of a potato delegation to Russia and Poland. The following are some of my notes.

Political Situation -- Since September 21, 1993, when Yeltzin unseated the Parliament, a period of stagnation began in Russia. It will continue until elections in 1996. Yeltzin has fulfilled his initial plan and has no strategy for going forward with the democratization of Russia. There is a vacuum of power and the Republics are on their own. Power continues to be decentralized, but there is no organizational strategy. The opposition to Yeltzin is becoming stronger and he is now facing the same situation as Gorbachev faced after several successful years of reform. The Agrarian Party headed by Mr. Restzin is quite strong and very conservative. The pluralism of corporate interest groups is being felt. Some of the "red nomenclature," the old communist leaders, have landed golden parachutes as directors of some of the major new corporations. More Mercedes 600's were sold in Russia last year than in all of western Europe. The new banking system is unregulated, and most new banks are associated with organized crime.

(Editor's note: Victoria, my wife, was in Turkey this past September and commented on the wealth of Russian tourists. They were buying big ticket items and paying in hard U.S. cash. They were also gambling heavily in casinos.)

In Russia, there is very little use of agricultural chemicals. For instance, they have no way of dealing with late blight. The result is that yields average less than 90 cwt/acre out of the field. Losses in storage are large.

Polish potato growers also rarely use chemical aids. Their yields average less than 115 cwt/acre. The potato market in Poland in 1993 was 48% for livestock, 11% for seed, 9% for human consumption, 8% for home use, 5% for industrial use, and 2% for export. Storage loss was reported at 17%. (Editor's note: I suspect that much of the 48% livestock field is storage loss. The 17% reported is probably not even fit for livestock.)

In the USA, it takes 3 years to transfer technology to growers. In western Europe, it takes 5 to 10 years while in eastern Europe, technology is transferred after more than 10 years. (The Cooperative Extension Service isn't doing too bad.)

World Potato Congress (UK)

Joe Schon
Executive Vice President
Lockwood Corp., Gering, NE

The second World Potato Congress was held in September, 1994 in Harrogate, England. Potatoes are grown in 150 countries. The following are some interesting notes.

1. Retail stores in the UK report the need of unblemished and unbruised potatoes. They also need to match cooking recommendations to specific varieties. But, consumers don't buy by variety but buy how potatoes will be used. Convenience foods are the fastest growing food products and pasta competes with potatoes. "Will consumers accept genetically-engineered potatoes?" is a big question in the UK.

2. McDonald's Corporation opened 900 outlets in 1993 and plan to average 900 to 1200/year. Half of these will be outside of the USA. England, France and Germany are McDonald's largest offshore markets. In these counties, 500 more outlets will be open in the next two years. There are 25 outlets in China, People's Republic of. Did you realize that McDonald's serves less than 0.5% of the world's population? "Over 120 countries are struggling without a McDonald's." McDonald's estimates that, by 1998, they will produce 1.5 million tons of French fries (McFry) and need 6 million tons (1 ton = 20 cwt) of raw potatoes to produce them. McFry is the quality icon for the corporation. Larger servings of McFries increased total outlet sales. French fry production increased 500,000 tons in the USA over the last two years. This increase is continuing but is growing even faster in other countries. Central Europe will be a major expansion area for McDonald's. Six thousand tons of McFries are sold now; expansion to 17,000 ton is predicted by 2000. The USA ships 100,000 tons of French fries to Asia.

3. McCain Foods has 50 plants in nine countries and they sell to 50 countries. They process 3 million tons of potatoes per year. McCain has one-fourth of the world's French fry market.

4. Potato chips sales in the USA was $4.5 billion in 1993. Frito-Lay has 45% of the snack market share with its closest competitor having 7%. The pretzel is growing as a healthy snack food and is the only potential challenge to potato chip's dominance of the snack food industry.

5. Processed potato production in thousand (x 1000) tons in four European countries is:

	Netherlands	UK	Germany	France
Pan-fried	1,750	960	5503	90
Dried	1,330	140	590	310
Snack	120	670	240	170
Other	17	0	280	100
Total	2,200	1,800	1,670	980

6. Potatoes and bread are the primary food of Russia. But the farmers that have good storage and harvesters have no idea what is good quality. They continue to put very damaged potatoes into storage.

McDonald's "Designer" Potato

White Flesh	Large, Oblong Shape
Dry Matter Content = 20.5-22.8%	Low Sugar Content After Storage
Excellent Processing Characteristics (Unspecified)	Minimal Exposure to Fertilizers
Minimal Exposure to Pesticides	High Yielding (raw and finished product)
Disease-Resistant	Bruise-Resistant
Low Costing	High Valued (?)

[Editor's note -- "(Israelis) can't grow potatoes? What is this? A potato is not high-tech." So said Batya Keinan, spokesperson of the Israeli Ministry of Agriculture to the McDonald's executives in 1993 as reported in "The Packer."]

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