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Potatoes are one of the major crops grown in southwestern Idaho. In 1969, 1970 and 1971, the 10 southwestern counties harvested 30,000, 34,000 and 31,000 acres of potatoes with an average yield of 320, 300 and 310 cwt per acre, respectively (6).

Of the total potatoes produced in Idaho over the 1966-1970 period, 18 to 25% were marketed as fresh pack, 43 to 57% were processed for food, 2 to 8% processed for non-food, 7 to 9% were used for seed and 12 to 21% were used for feed or lost as shrinkage (6). Consequently, potato growers, shippers and processors are interested not only in total yield, but also in grade and other quality factors which affect French-fry color and texture of products.

Although average yields in the 10 southwestern Idaho counties are the highest in the state, the percent of U.S. No. 1 grade is usually lower than the average in the other potato-producing counties. The average yield of about 310 cwt per acre is well below the 400 to 500 cwt per acre produced by some of the top potato growers in this area.

Yield and quality of tubers vary from field to field and from year to year because of many factors such as temperature, disease incidence, available moisture, soil fertility, insect infestation, frost damage, seed quality, soil tillage and other cultural practices. Some of these factors can not be entirely controlled by the grower; others can be controlled. Little research has been conducted in southwestern Idaho on the effects of these factors on yield and quality of tubers. To provide this information, a three-year study was conducted under southwestern Idaho soil and climatic conditions to determine how yield and quality of potatoes are affected by:

1. Planting date, seed spacing, nitrogen rate and harvest date.
2. Nutrients in the soil and plant.
3. Soil temperature during the growing season.

LITERATURE REVIEW

Scientists in many regions have studied effects of certain cultural practices on yield and quality of potatoes. Early planting, which provides for a longer growing season, usually results in larger yields of tubers (2) but may also produce more malformed tubers (5). Potatoes planted early for early harvest need less fertilizer than those planted early for late harvest (4). With closer seed spacing, total yield increases but size of tubers decreases (1). With low soil fertility different plant populations cause little difference in total yield (4).

Total yield usually increases with increased nitrogen rates (3,4,7). However, increased nitrogen rates lower specific gravity of tubers and increase the number of malformed tubers (3,5,7). Nitrogen fertilizer has not affected the color of potato chips or French fries (4). Delayed potato harvest matures and sets potato skins and reduces skinning and bruising at harvest. Delayed harvest also produces over-sized and malformed tubers, and increases the hazard of late-blight rot and the spread of virus diseases in seed stock (2). Nitrate-nitrogen in plant petioles above 12,000 ppm has been considered sufficient to produce maximum potato yields. This was based on petiole samples collected at early tuber set or 4 to 8 weeks after plant emergence (8).

PROCEDURE

This study, covering the period 1969 through 1971, was located at the University of Idaho Research and Extension Center at Parma. The soil at the study site is a Greenleaf silt loam which had a compacted layer 14 to 18 inches deep. This layer restricts water movement and potato root penetration. This soil holds about 2 inches of available moisture per foot of soil depth. Moisture infiltration from furrow irrigation ranged from 0.1 to 0.2 inch per hour, depending on the time of the year and the amount of potato veins in the irrigation furrows.

The fields on which the experiments were located had been in barley from 1 to 3 years before potatoes were planted. There was no record of potatoes having been grown. Grain stubble and volunteer green barley were plowed under each fall. Nitrogen fertility in soil was similar between years. About 120 pounds nitrogen per acre were applied to grain stubble in the fall of 1968. This application was used for the low nitrogen rate treatment during the 1969 experiment. No nitrogen fertilizer was applied to grain stubble before fall plowing in 1968 and 1970. Thus the only nitrogen fertilizer applied to the 1970 and 1971 plots was applied in the spring.

Treatments consisted of 3 planting dates, 3 seed spacings, 3 nitrogen rates and 3 harvest dates. The experiment was laid out in a split plot design with 4 replications per treatment. The harvest dates were the main plots with planting dates randomized within each harvest date. Seed spacings were randomized within each planting date and the nitrogen rates were randomized in each spacing. Spacing sub-plots were divided by border rows having 9-inch seed spacing within rows.

Planting dates each year were:

P_1 - April 14
P_2 - April 28
P_3 - May 12

Seed spacings, all in 36-inch rows, were:

S_1 - 6-inch
S_2 - 9-inch seed drop
S_3 - 12-inch seed drop

Nitrogen rates were:

	Pounds nitrogen per acre		
	1969	1970	1971
N_1	120	240	240
N_2	240	360	360
N_3	360	480	480

Harvest dates were:

1969	1970 - 1971
H_1 - Sept. 1	H_1 - Sept. 15
H_2 - Sept. 15	H_2 - Sept. 29
H_3 - Sept. 29	H_3 - Oct. 13

Vine removal dates for all years were:

V_1 - Sept. 1
V_2 - Sept. 15
V_3 - Sept. 29

Results in 1969 indicated that fertilizer application of 120 pounds N/acre was insufficient and 360 pounds N/acre had not reached maximum yields. Consequently, the 120 pounds/acre rate was dropped and the 480 pounds/acre rate added in 1970 and 1971.

The potato vines were removed and the tubers harvested the same day in 1969. In 1970 and 1971, the tubers were harvested 14 days after vines were removed.

In 1969, 240 pounds/acre of P_2O_5 and 240 pounds/acre of K_2O were applied with nitrogen treatments on all plots. All fertilizer was applied April 30 in a band about 6 inches to the outside of the row and 8 to 10 inches deep. In 1970 and 1971, 160 pounds P_2O_5 per acre were applied with all nitrogen treatments in bands about 6 inches on either side of the row and 8 to 10 inches deep. The fertilizer was applied before the first planting date on April 14. Fertilizers were applied as ammonium sulfate, treble super phosphate and potassium chloride.

Soil samples were taken at the O - to 9-inch soil depth before fertilizer was applied in spring. The samples were analyzed for N, P, K, Zn, Fe, Cu, pH, organic matter and soil salinity. Soil samples at 1-foot increments were taken down to 2 feet and analyzed for nitrate-nitrogen. Following harvest in 1970, soil samples were taken from each nitrogen rate plot at 1-foot increments down to a depth of 5 feet to determine the residual nitrate-nitrogen in soil. All samples were dried and ground and sent to the University of Idaho Plant and Soil Analytical Laboratory for analysis. Analyses were: nitrate-nitrogen, extracted with saturated calcium sulfate solution, 1:4, and determined by phenoldisulfonic acid method; phosphorus and potassium, 1:20 sodium bicarbonate extract; zinc, iron, manganese, and copper, DTPA-TEA extractant; boron, hot water extractant.

Tensiometers were placed 8 to 10 inches deep in the soil about 3 inches to the side of the row in 3 locations in the plot area to measure moisture tensions that developed before each irrigation. At most locations, tensions of about 0.4 atmospheres were shown before each irrigation.

Frequency and amount of water applied were determined by estimating percent available moisture by feel, by sampling soil for total percent moisture and by measuring water applied and amount of runoff from the plots at 3 locations in the experimental area. Irrigations were planned to maintain available moisture above 65% at the 8- to 10-inch soil depth. The moisture level was maintained until 10 to 14 days before vine removal. Water was applied in each furrow at each irrigation using ¾-inch siphon tubes. The length of irrigation run was 285 feet.

Soil thermographs were placed on the early planting (April 14) and late harvest date (October 13) plots to record soil temperatures at the 6-inch soil depth throughout the growing season.

Foundation whole potato seed about 1 1/2 to 2 ounces in size was planted with an Acme cup-type press wheel planter about 4 to 6 inches below soil surface. In 1969, potato seed was received from the seed source April 10 and placed in storage where temperatures increased steadily from first to last planting. In 1970 and 1971, potato seed was stored at 40 to 45 F until 10 to 14 days before each planting, then removed to 60 to 65 F storage until planting.

Di-syston was applied at 3 pounds per acre with fertilizer in 1969, and to the side of tubers at planting in 1970 and 1971 to control potato beetles and aphids. Foliar sprays were applied in 1969 to control aphids, cabbage loop worm and early blight. The foliar sprays were not applied in 1970 and 1971. Early blight appeared to be causing early dying of some potato vines in 1971.

Date of plant emergence was recorded when about 90% of the plants had emerged from the soil. A count of stems per plot was made after 100% plant emergence.

Petioles were collected from all plots at early tuber set for nutrient analyses. The 4th or 5th petiole from the top or terminal branches was selected from 30 plants. Plants were 15 to 18 inches high and tubers were 1/4 to 1/2 inch in diameter. Methods for analysis were: nitrogen and phosphorus, 2% acetic acid extractable nitrate-nitrogen and phosphate-phosphorus; and total potassium, zinc, iron, manganese, copper and boron. All samples were analyzed at the University's Plant and Soil Analytical Laboratory.

Tubers from each plot were weighed, counted and graded to obtain yield and quality data. Factors evaluated were total yield, total U.S. No. 1, percent U.S. No. 1, large U.S. No. 1 (10 ounces and over), small U.S. No. 1 (over 4 and under 10 ounces), total U.S. No. 2 and culls (tubers 4 ounces and under).

Tuber quality evaluations included specific gravity and French-fry color. Specific gravity was determined by weight in air and weight in water method and French-fry color was based on scale of 1 to 5 units, very light to very dark reading. External tuber color was evaluated on 10-pound samples of No. 1 tubers in 1970 and in 1971 for the second harvest date only. An index rating was calculated by separating tubers from each sample into 3 classes:

1 — All tubers having desirable color and net

2 — Tubers having distinct two colors, white and dark or medium dark

3 — Light skinned or white tubers.

A value of 5, 10 and 15 was given to each class, respectively. The number of tubers in each class was multiplied by the class value. These products were totaled and the sum was divided by the number of tubers in sample. A high index reading indicates more light-colored tubers.

In 1969, French-fry colors were evaluated on tubers harvested from each plot. French-fry colors were run by Western Farmers, Potato Division, in Nampa.

All yield differences discussed under planting date, nitrogen rate, seed spacing and harvest date are significant at the 5 percent level or higher.

RESULTS

General Observations

In 1969, the fall application of 120 pounds N/acre was not sufficient to maintain vigorous healthy growing vines to first vine kill (Sept. 1). All rates higher than 120 pounds N/acre appeared to maintain plant growth until the last vine kill (Sept. 29). In 1970 and 1971, vine killing frosts occurred about the middle of September.

Since soil conditions varied in the experimental area, diffusion or "subbing" of moisture across the beds from furrow irrigation was not uniform. In areas where "subbing" was poor, tubers were more malformed and were lighter in skin color. Potato roots penetrated into soil 14 to 16 inches or to the compacted hard pan.

Soil Analysis

Soil analyses showed that all nutrient levels except nitrogen were sufficient to produce the desired yield of potatoes. Phosphorus fertilizer was applied each year over the entire experimental area to insure that phosphorus would not limit production. Accumulative nitrate-nitrogen in the top 2 feet of soil in 1970 and 1971 was 6 and 10 ppm, respectively. In 1969 the soil nitrate-nitrogen level was 18 ppm. This higher level was due in part to the nitrogen fertilizer applied in the fall before spring sampling in 1969.

Soil samples collected following harvest in 1970 indicated that residual nitrate-nitrogen was present in the soil from the 360- and 480-pound nitrogen rates. Very little residual nitrage-nitrogen was found

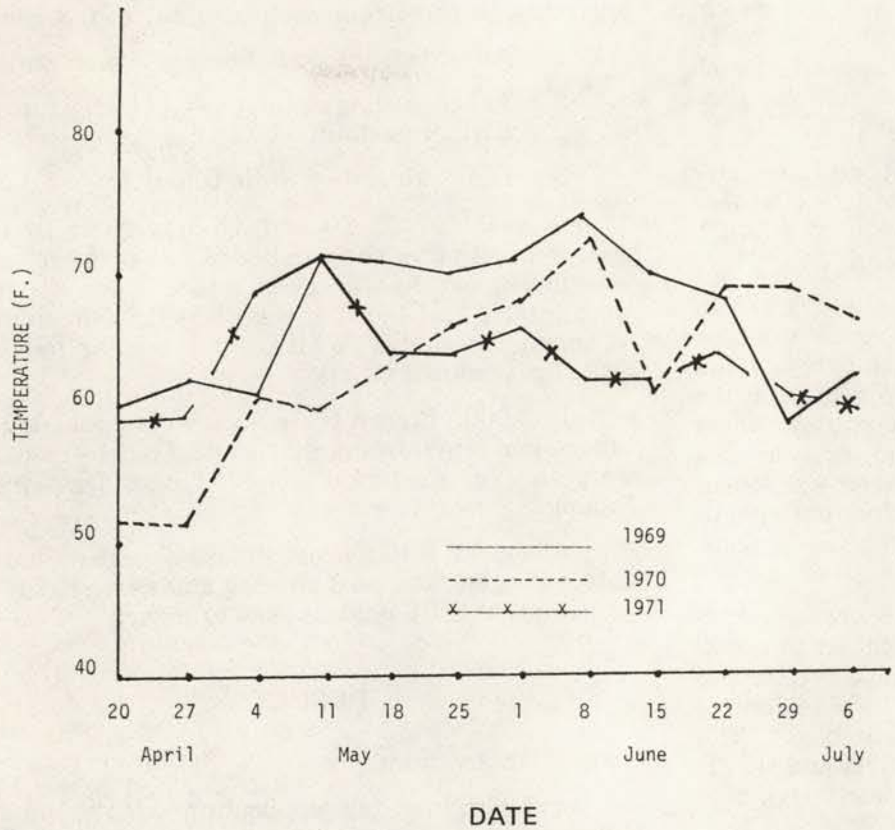

Fig. 1. Weekly mean maximum soil temperatures at 6-inch soil depth from April 20 through July 6.

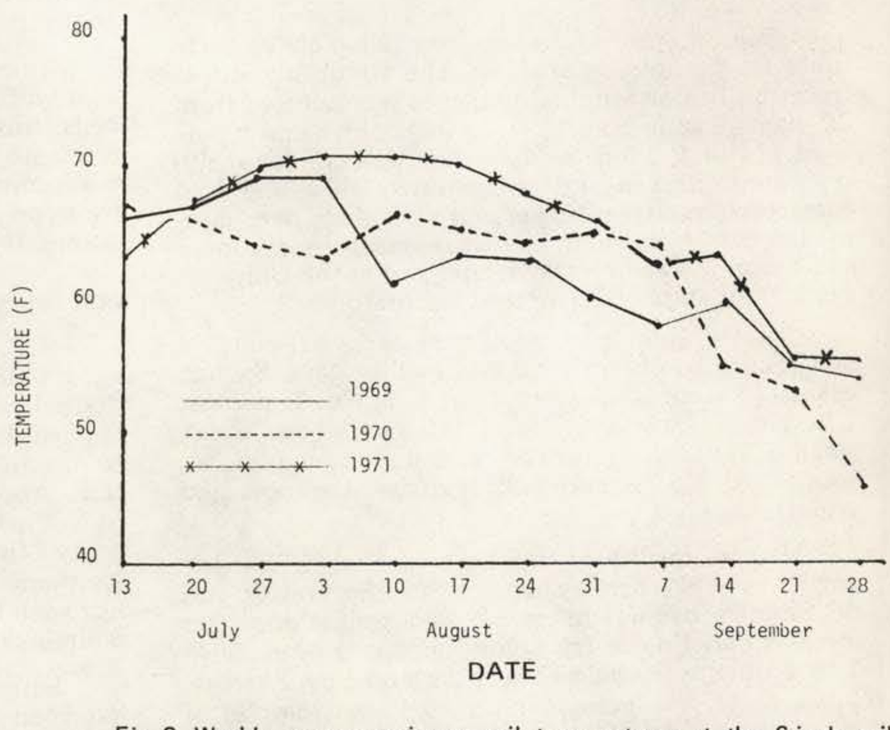

Fig. 2. Weekly mean maximum soil temperatures at the 6-inch soil depth from July 13 through September 28.

in the top 24 inches of soil. These data indicate that most of the 240-pound nitrogen rate was used in potato production. The higher rates build up nitrate-nitrogen, mostly in the top 2 feet of the profile where it is available for use by the following crop.

Irrigation

The first irrigation was applied to all plots approximately 30 days after the first planting date. Subsequent irrigations were applied at 5 to 12 day intervals depending on available soil moisture as influenced by temperature, wind and plant use. The last irrigation was applied 10 to 14 days before vine removal. Each year, 16 irrigations were applied to the crop, and a total of 24 to 26 inches of water was applied through irrigation and precipitation.

Soil Temperature

Soil temperatures at 6-inch depth during April, May and June were lower in 1970 and 1971 than in 1969 (Fig. 1). The lower temperatures resulted in delayed plant emergence. This was most evident in 1970 when emergence of plants from the early planting date (April 14) was 9 days later than 1969.

Temperature differences were also evident later in the growing season. August and early September mean high temperatures were the lowest in 1969 and highest in 1970 (Fig. 2). Higher soil temperatures in 1970 and 1971 may account for increased growth cracks and malformed tubers that resulted in a lower percentage of U.S. No. 1 tubers.

In 1969, vine growth was maintained through the final vine removal date on Sept. 29. Vine killing frosts occurred about the middle of September in 1970 and 1971. The frost free growing season was approximately 168 days in 1969 compared to 154 days in 1970 and 1971.

Plant Development Data

Days between planting and emergence of plants varied with planting date and among years. Part of this variation may be attributed to judgment of when the emergence took place and part to the depth of seed piece in the soil. The biggest difference occurred on early planting date in 1970 when cool spring temperatures delayed emergence of plants by 8 to 9 days compared with 1969 and 1971. Earlier emergence of plants from late planting date was partly due to advanced stage of sprouting of seed caused by warming temperatures in storage. In contrast, the 1970 and 1971 seed was stored at 40 to 45 F until about 10 days before seeding. No sprouts were visible at planting time in the latter two years.

Days from planting to tuber set appear to be consistent among years for a given planting date. This period was 56 to 59 days for the early planting date (April 14), 49 to 50 days for the middle planting date (April 28) and 44 to 47 days for the late planting date (May 12). By contrast, the time from emergence to early tuber set was not consistent between years. This period varied from 25 to 34 days for the early planting date and from 24 to 29 days for the later planting dates. Thus, the number of days between planting and early tuber set, when petiole sampling is recommended, decreases with late planting.

Time between planting and vine removal ranged from 112 to 168 days; between plant emergence and vine removal, from 97 to 143 days. In 1970 and 1971 the period between planting date and potato vine kill was reduced about 15 days by the vine killing frosts in mid-September.

Planting Date vs. Yield

Early planting produced highest total yield and yield of U.S. No. 1 tubers each year (Fig. 3), because the tubers were larger. Later plantings produced greater numbers of stems and tubers per acre but the shorter growing period resulted in smaller tubers and lower yields. Later plantings also produced tubers with lighter skin color. This effect was most noticeable at the high nitrogen rates. Variations in planting dates did not affect percent U.S. No. 1 tubers, specific gravity, French-fry color and percent peel loss in processing. These data suggest that potato growers should plant early for maximum yield and quality. A 30-day delay in planting reduced total yield by 156 cwt per acre.

Seed Spacing vs. Yield

Total yield and yield of U.S. No. 1 tubers increased as seed spacing was reduced (Fig. 4). Six-inch seed spacing within rows 36 inches apart produced 598 cwt yield over the 3-year study compared to 556 and 528 cwt per acre for 9- and 12-inch spacings, respectively. Yield of U.S. No. 1 tubers also increased with closer spacing — 316, 335 and 355 cwt per acre for the 12-, 9- and 6-inch spacing, respectively. Wider spacings produced larger tubers but closer spacings meant increased numbers of stems and tubers and higher yields. Percent peel loss, tuber skin color, French fry color, specific gravity and percent U.S. No. 1 tubers were not affected by seed spacing.

Nitrogen Rate vs. Yield

The effect of nitrogen rates on total yield and yield of U.S. No. 1 varied from year to year (Fig. 5). In 1969, the highest total yield was produced with 360 pounds N/acre. In 1970 and 1971, total yields were slightly less at rates above 240 pounds N/acre. In 1969, high nitrogen rates produced more large tubers. The shorter growing seasons during 1970 and 1971 (by about 15 days) may have contributed to the lower yield with high nitrogen rates.

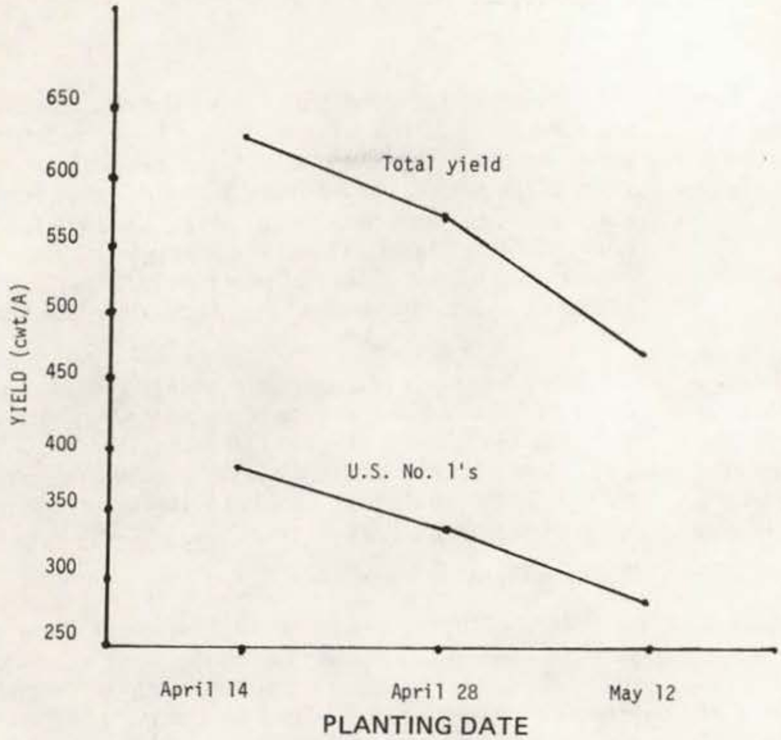

Fig. 3. Effects of planting date on total yield and yield of U.S. No. 1 tubers. Average for three years.

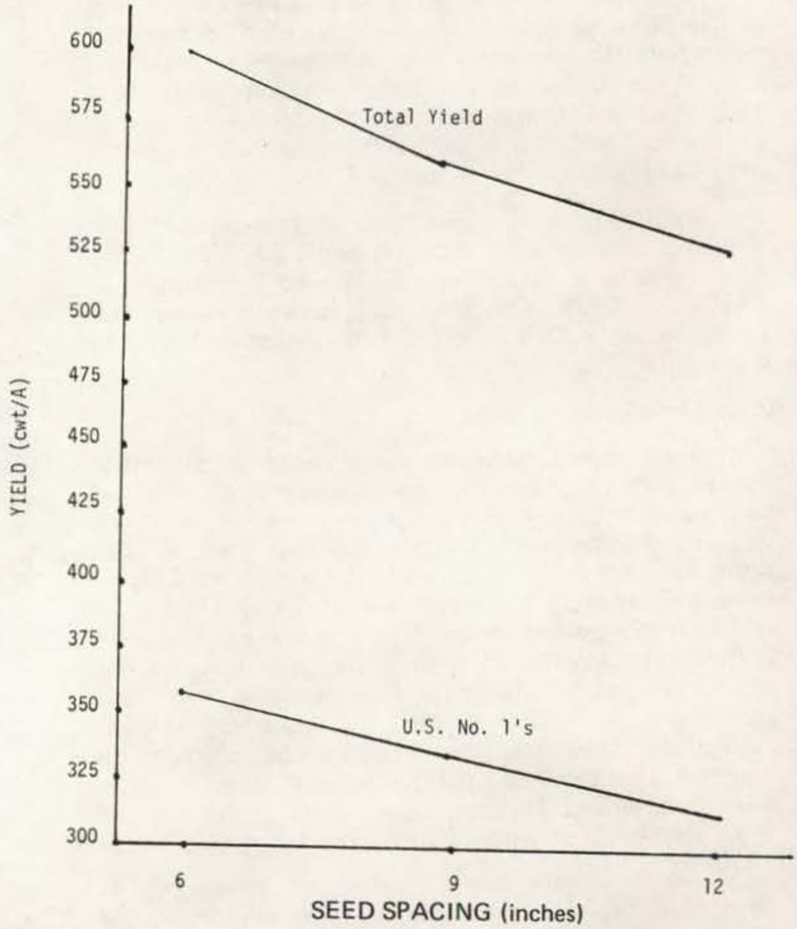

Fig. 4. Effects of seed spacing on total yield and U.S. No. 1 tubers. Average for three years.

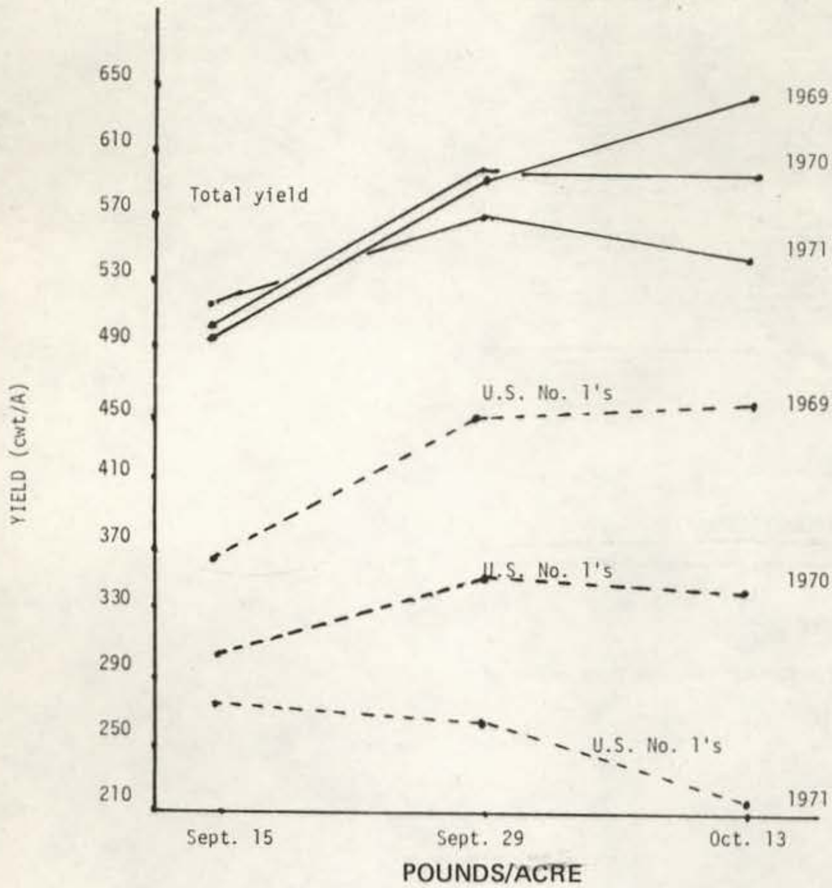

Fig. 5. Effects of nitrogen rate and year on total yield and U.S. No. 1 tubers.

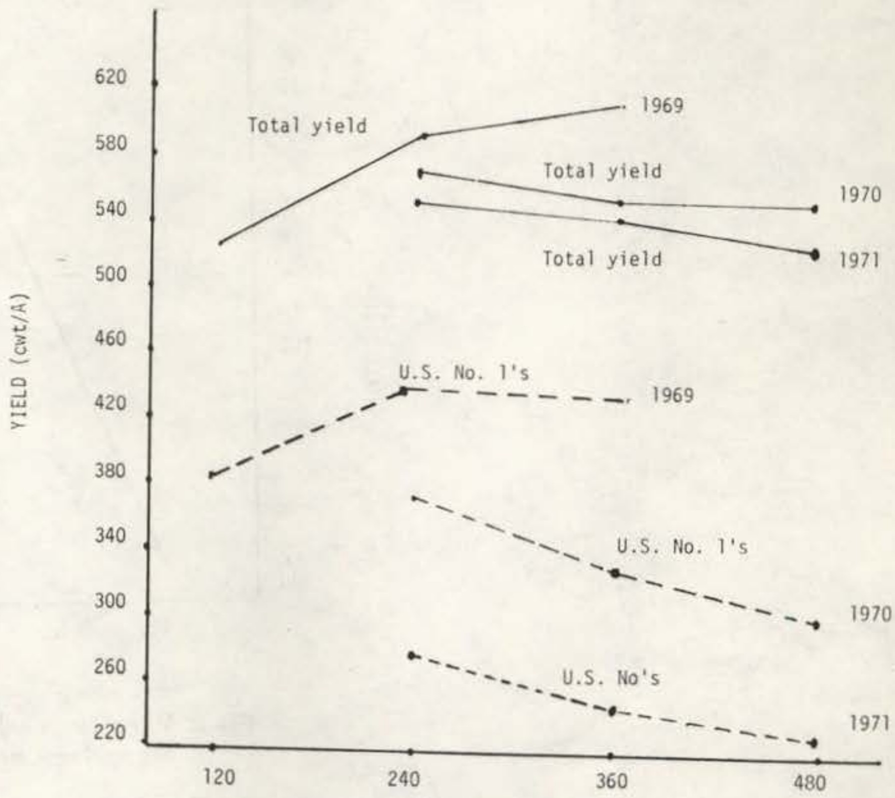

Fig. 6. Effects of harvest date and year on total yield and U.S. No. 1 tubers.

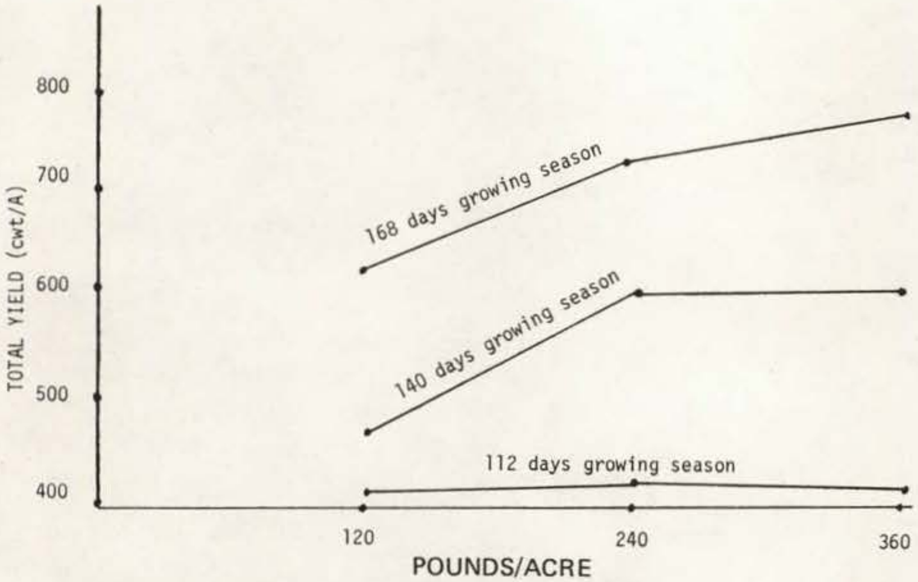

Fig. 7. The effect of growing season and nitrogen rate on total yield of tubers, 1969.

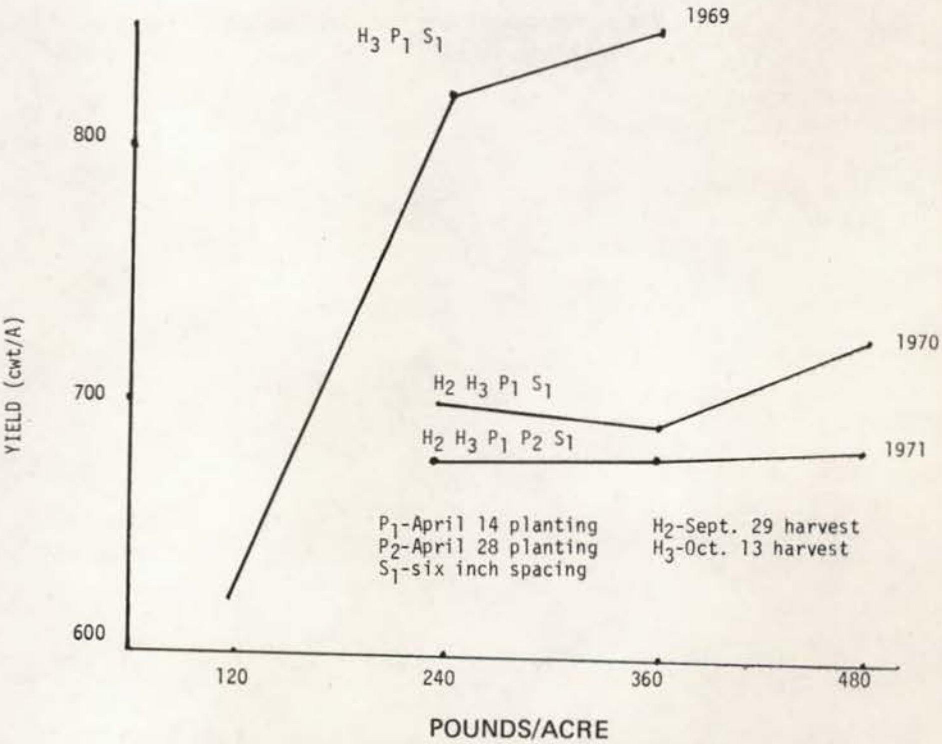

Fig. 8. Maximum yields as affected by planting date, seed spacing, nitrogen rate, harvest date and year.

The highest yields of U.S. No. 1 tubers were produced with 240 pounds N/acre each of the three years. In 1970 and 1971, nitrogen rates above 240 pounds/acre reduced yield of U.S. No. 1 tubers while in 1969 the reduction was very slight. The reductions were due to both undersized tubers and large malformed tubers.

Specific gravity of tubers decreased with increased nitrogen rates. Loss of net or an increase in tubers having light colored skins was evident with increased rates all three years. These effects were most evident at the later planting dates and in those portions of the study area where moisture stress was observed.

In 1969, nitrogen rates did not affect percent peel loss and French-fry color in processing.

These data indicate that high nitrogen rates are necessary to produce top yield of potatoes when temperatures and growing season are optimum for maximum potato production. When growing conditions are not optimum for maximum production, yield and quality are reduced by high nitrogen rates.

Harvest Date

Effects of harvest dates on yield and quality of tubers varied among years. In 1969, the later harvest dates produced the highest total yield of tubers (Fig. 6). In 1970 and 1971, total yields from the second (Sept. 30) and the last (Oct. 13) harvest dates were nearly the same. This was expected since vine-killing frosts occurred both in 1970 and 1971 about the time vines were removed for the second harvest date.

Yield of U.S. No. 1 tubers was highest at the later harvest dates in 1969 and 1970. In 1971 the first and middle harvest dates produced more U.S. No. 1 tubers than the later harvest. This may have been due to losses from water rot which were observed at the last harvest but not measured. Numbers of large tubers were increased by later harvest; however, malformed tubers (with cracks and knobs) were also increased, resulting in increased yield of U.S. No. 2 and reduced yield of U.S. No. 1 tubers. Since the later harvest increased total yield, but also increased yield of U.S. No. 2 tubers, the percent of U.S. No. 1 tubers was not greatly affected by harvest dates.

Specific gravity was the highest on the middle harvest date although differences were small. Tuber color, percent peel loss and French-fry color did not differ greatly between harvest dates.

Treatment Interactions

One of the major interactions between treatments which was evident in this study was the length of growing season x nitrogen vs total yield. With longer growing season, more nitrogen is needed to produce top yields (Fig. 7). In 1969, 120 pounds N/acre produced top yield of 415 cwt/acre for the 112-day growing season. With 140-day growing season, 240 pounds N/acre produced top yield of 600 cwt/acre. With 168-day growing season, 360 pounds of nitrogen produced the top yields of about 800 cwt/acre. This interaction was not evident in 1970 or 1971 when the growing seasons were shortened and higher nitrogen rates were used.

Plant Analyses

Seed spacing did not appear to affect NO_3-N concentrations in petioles collected at early tuber set.

Nitrogen fertilizer applications increased NO_3-N concentrations in petioles. Increases in petiole levels of NO_3-N from N fertilizer rates above 240 pounds/acre were insignificant. The NO_3-N under treatments giving maximum yields of 700 to 800 cwt per acre was about 22,000 ppm in petioles collected at early tuber set. The low 10,000 ppm of NO_3-N in petioles shown in 1969 at the 120 pounds N/acre rate produced over 600 cwt/acre of tubers. This suggests that potato vines will produce above average yields under low nitrogen fertility if they maintain growth throughout the growing season.

Based on previous experience, levels of phosphate-phosphorus, percent potassium and total zinc, manganese, iron, copper and boron in petioles taken at early tuber set appeared adequate for potato production. The mean values for all treatment were, phosphate-phosphorus, 4,831 ppm; potassium, 11.5%; total zinc, 42 ppm; total manganese, 53 ppm; total iron, 163 ppm, total copper 7.9 ppm; total boron 22 ppm.

DISCUSSION

Maximum total yield and yield of U.S. No. 1 tubers were associated with early planting, close seed spacing and the middle or late harvest date depending on date of vine-killing frosts. In 1969, the highest total yield of 839 cwt/acre was produced with early planting (April 14), 6-inch seed spacing, 360 pounds N/acre and late harvest (October 13), giving 168 days of frost free growing season (Fig. 8). Top total yields in 1970 and 1971 were 720 and 680 cwt/acre produced by early planting (April 14), 6-inch seed spacing, all nitrogen rates (no significant differences between nitrogen rates) and either the middle or late harvest dates, with a frost free growing season of approximately 153 days. These data indicate that the longer growing season and warmer spring temperatures in 1969 increased total yields by 119 and 159 cwt/acre compared with 1970 and 1971 yields. Especially significant is the fact that in 1969 vine growth extended through September and soil temperatures and moisture were satisfactory for growth of vine and tubers.

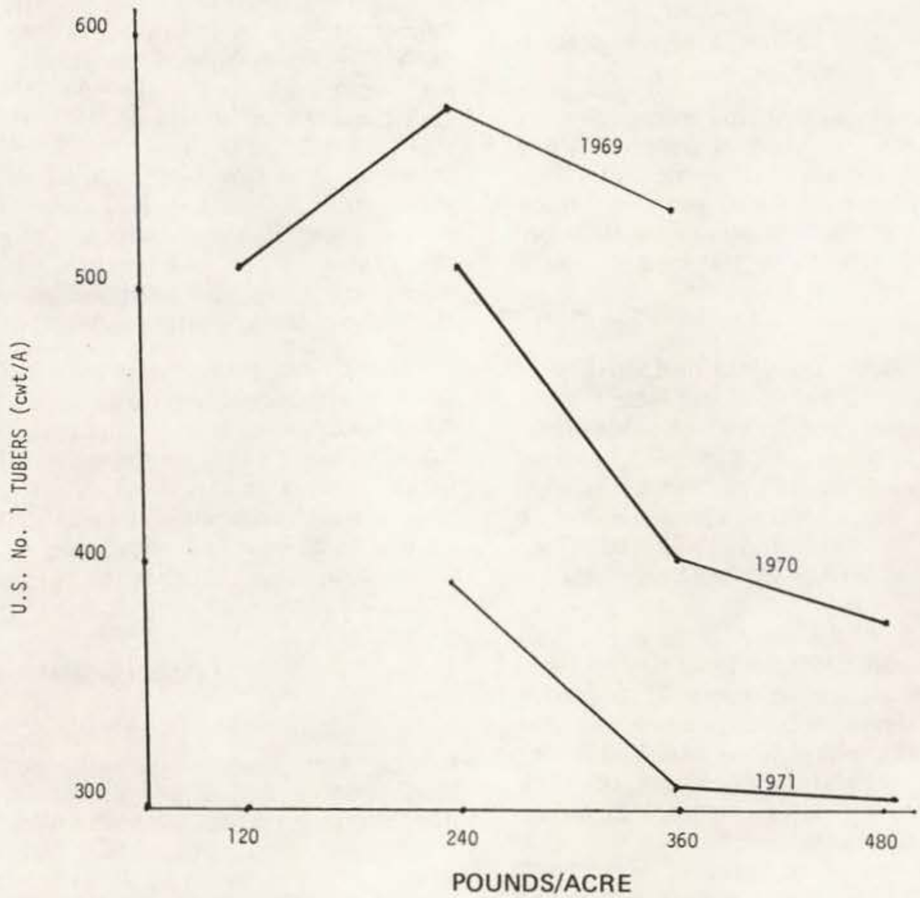

Fig. 9. Maximum yield of U.S. No. 1 tubers as affected by nitrogen fertilizer and year at April 14 planting date, 6-inch seed spacing, and September 29 harvest date.

The highest yields of U.S. No. 1 tubers were produced from early planting, 6-inch seed spacing, 240 pounds N/acre and the middle harvest date (September 29) all three years (Fig. 9). These yields were 572, 505 and 389 cwt per acre for three years.

In contrast, lowest yields resulted from late planting, 12-inch seed spacing and early harvest. No significant difference was evident between nitrogen rates. Lower yields were approximately 50% of the maximum yields ranging from 354 to 430 cwt/acre over the 3 years.

SUMMARY

Planting Date

1. Early planting of tubers produced the highest total yields and the highest yield of U.S. No. 1 tubers. This was due to the increased production of large tubers.
2. Late planting produced more tubers having light colored skins than early planting. This effect was more noticeable at high nitrogen rates and in spots where plants showed signs of moisture stress.
3. Late planting produced more potato stems and tubers per acre than early planting. Late planting also resulted in small tubers at harvest.
4. Time of planting had little effect on percent solids (specific gravity).
5. Time of planting had little effect on French fry color and texture in 1969.

Seed Spacing

1. The closest seed spacing produced the highest total yield and the highest yield of U.S. No. 1 tubers because greater numbers of potato stems and tubers were produced per acre.
2. Wide seed spacing produced larger tubers but, with fewer tubers per acre, the resulting yields were lower than for closer spacing.
3. Seed spacing had little effect on percent solids (specific gravity).
4. Seed spacing had little effect on French-fry color and texture in 1969.

Nitrogen Rate

1. The rate of nitrogen fertilization producing highest total yield depended on the length of growing season. When vines remained green and active and were growing up to the vine removal date for the last harvest date, the 360 pounds N/acre rate was necessary to produce the highest yields. When vines were killed by disease, frost or removal in preparation for earlier harvest, 240 pounds N/acre were sufficient to produce the highest yields. With this shortened growing season, higher nitrogen rates reduced total yield.
2. The highest yields of U.S. No. 1 tubers were produced at the 240 pounds N/acre. Higher N rates reduced yield of U.S. No. 1 tubers and percent of U.S. No. 1 tubers.
3. Nitrogen fertilizer reduced percent solids (specific gravity) of tubers.
4. The number of tubers with light colored skins increased with increased nitrogen rates. This was more evident in tubers from late plantings and from soil areas where moisture stress on plants was observed.
5. Nitrogen fertilizer did not influence the number of stems produced per acre.
6. Vines showing nitrogen deficiency at the low N rate (120 pounds/acre in 1969) or toxicity from high N rates produced fewer tubers/acre.
7. French-fry color and texture were not affected by nitrogen fertilizer rate in 1969.

Harvest Date

1. Total yield of tubers increased with delayed harvest as long as vines continued to grow or remain active. In 1970 and 1971, vine killing frosts and some early blight infection reduced growing season by about two weeks. Delaying harvest beyond vine kill had no effect on total yield. Water rot resulted in the loss of some tubers at the last harvest date (September 29).
2. Late harvest reduced percent U.S. No. 1 tubers. This effect was due to increased yield of large (over 10 ounce) U.S. No. 2 tubers. These large tubers were graded U.S. No. 2 primarily because of growth cracks and knobs.
3. Percent solids (specific gravity) was slightly higher at the second harvest date.
4. French-fry color and texture were not greatly affected by harvest dates in 1969.

Temperature

1. Warm spring soil temperatures which gave the plants an early start and lack of vine killing frosts in the fall provided favorable conditions for high yield and quality of tubers in 1969.
2. Cool spring soil temperatures which delayed plant emergence and early vine killing frosts in the middle of September reduced total yield of tubers in both 1970 and 1971.
3. The warm soil temperatures shown in 1970 and 1971 from the last of July through August and

into the first week of September did not appear conducive to growing high yield of quality tubers.

Plant Analysis

1. About 22,000 ppm of nitrate-nitrogen in potato petioles taken at early tuber set appeared to be sufficient to produce 600 to 800 cwt/acre of tubers having acceptable quality.
2. Concentration of other nutrients in petioles appeared to be adequate at levels needed for producing potatoes.
3. Days from planting to time of early tuber set (recommended time for early plant sampling) decreases with delayed planting.

Maximum Yield and Quality

1. Based on these southwestern Idaho trials, maximum yield of high quality tubers was produced with early planting (April 14), close seed spacing (6 inch), 240 pounds N/acre and the middle harvest date (September 29).

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The State is truly our campus. We desire to work for all citizens of the State striving to provide the best possible educational and research information and its application through Cooperative Extension in order to provide a high quality food supply, a strong economy for the State and a quality of life desired by all.

Auttis M. Mullins
Dean, College of Agriculture
University of Idaho

TEACHING RESEARCH SERVICE

SERVING THE STATE

This is the three-fold charge of the College of Agriculture at your state Land-Grant institution, the University of Idaho. To fulfill this charge, the College extends its faculty and resources to all parts of the state.

Service ... The Cooperative Extension Service has active programs in 42 of Idaho's 44 counties. Current organization places major emphasis on county office contact and multi-county specialists to better serve all the people. These College of Agriculture faculty members are supported cooperatively by federal, state and county funding to work with agriculture, home economics, youth and community development.

Research ... Agricultural Research scientists are located at the campus in Moscow, at Research and Extension Centers near Aberdeen, Caldwell, Parma, Sandpoint, Tetonia, Twin Falls and at the U.S. Sheep Experiment Station, Dubois and the USDA/ARS Soil and Water Laboratory at Kimberly. Their work includes research on every major agricultural program in Idaho and on economic and community development activities that apply to the state as a whole.

Teaching ... Centers of College of Agriculture teaching are the University classrooms and laboratories where agriculture students can earn bachelor of science degrees in any of 20 major fields, or work for master's and Ph.D. degrees in their specialties. And beyond these are the variety of workshops and training sessions developed throughout the state for adults and youth by College of Agriculture faculty.