SUMMARY RESEARCH PROGRESS REPORT FOR 1997

AND RESEARCH PROPOSAL FOR 1998

Submitted to:

SLV Research Center Committee

and the

Colorado Potato Administrative Committee (Area II)

TITLE: Cultural and Physiological Studies

PROJECT LEADER: Asunta (Susie) Thompson-Johns, Research Horticulturist, San Luis Valley Research Center

PROJECT JUSTIFICATION:

The focus of the current program is threefold, with objectives of developing cultivar specific management profiles for advanced selections and new releases, providing cultural management information for nuclear seed producers, and investigating physiological factors related to potato production. While the information is specifically geared toward aims and associated problems with production in the San Luis Valley and Colorado, much of what is learned may be applicable to other growing areas.

Tailoring production practices for individual cultivars is the focal point of the research project. These cultivar specific management profiles provide producers and industry personnel information related to proper cultural practices in areas such as nutrient management, plant population, water use patterns, disease and pest susceptibilities, and storage requirements. Development of these strategies can mean a more successful experience for growers and the industry, as well as the breeding and development team, when a new cultivar is released. Studies aimed at understanding the physiology and biochemistry of the potato provide not only this basic information, but also impact many management considerations. These aspects of this research project provide information with direct applicability in developing cultivar specific management profiles for new cultivars of importance to the SLV and Colorado.

An area not focused on much in this project yet is the development of cultural practices for nuclear seed production. Cultural management strategies for greenhouse producers would aid them in rearing recalcitrant genotypes and maximizing production of those more easily produced. Greenhouse space is at times difficult to obtain; however the opportunity to utilize space nearby and to renovate the old range at the SLVRC will aid

logistically in addressing the industry needs. Areas of work in 1998 if possible will be related to dormancy and enhanced production.

PROJECT STATUS: Ongoing

SIGNIFICANT ACCOMPLISHMENTS FOR 1997:

The scope and number of projects increased in 1996. Trials were conducted to continue investigation of the development of vine, roots and tubers of several advanced selections and cultivars, nitrogen rate for advanced selections, effect of precutting seed during storage months compared to fresh cutting at planting, seed piece spacing for advanced selections and the effect of losing the seedpiece at various times during the growing season on yield and quality parameters. A new trial initiated in 1997 begins inquiry of phosphorus rates for advanced selections and cultivars. Significant highlights from these experiments are documented below.

Other research was directed at improved Alpha production, early blight management, hail recovery and metribuzin tolerance, nitrogen use efficiency, phosphorus forms and application methods, precision farming, and soil test recommendation comparisons. Results from these projects have been chronicled elsewhere.

Growth Analysis – Five advanced selections and one cultivar were followed during the course of the growing season for canopy, root and tuber development. Fresh weight of each is utilized to develop a growth curve for each plant component. This information is important in providing agronomic and architectural characteristics giving clues for production and management practices.

Nitrogen Rate – Twelve advanced selections and cultivars were produced using three rates of nitrogen (0, 50 and 90 pounds applied). Clones responded differently to the rates. As in previous years, Centennial performed poorly under the differing rates. Sangre was the highest yielding clone overall and Russet Norkotah – S3 the next. Some clones may not have reached full yield potential due to sensitivity to metribuzin, however foliar damage was very low (less than 5%) in all cases. As expected, specific gravity declined with increasing nitrogen application.

Phosphorus Rate – A trial was initiated in 1997 with the objectives of determining optimum phosphorus fertilizer rates for advanced selections and to begin work on development of critical petiole P levels for maximum yield, grade and quality. Three advanced selections from the CO breeding program and Russet Nugget were grown under three rates (0, 60 and 120 lbs./acre) of phosphorus banded at planting. Two of the genotypes, CO87009-4 and AC87084-3, were very sensitive to a pre-emergence application of metribuzin. Total yield and grade suffered because of this. AC88042-1 performed similarly under all rates of P. Russet Nugget was the highest yielding entry. It performed best at the high and low rates of P, however the highest percentage of US No. 1 tubers was with the high rate of P.

Precutting – Precutting was conducted beginning in October and culminating with a fresh cut at time of planting in May. Twelve cultivars were included in the study. Seed pieces were evaluated monthly for seed piece decay and breaking of dormancy. Clones varied in their response to cutting on different dates during the storage season. All clones responded negatively to cutting in October and December. Stands declined particularly for plots cut in these months. Best months overall to cut were February, November and April. For example, Russet Norkotah had highest total yield from the April cutting with January and February yields very close. Lowest total yield was for the December and October cuttings. Highest yield of US No. 1 tubers was produced in January, with February, March and November close behind. The November cutting date produced the highest percentage of US No. 1 tubers. Russet Legend produced the highest total yield from plots cut in November, with the March cutting close behind. Plots cut in February had the lowest total yield.

Seed Piece Spacing – Twelve advanced selections were grown in an experiment designed to compare yield and grade from production at 9 and 12 inch within-row spacing. Vine size and maturity remained about the same for clones at the two spacings. Tuber shape tended to lengthen out at the 12-inch spacing compared to the 9. Average tuber weights for spacing was very close. Average tuber size for some clones was larger at the 9-inch spacing, while others performed better at the wider spacing. Tubers per plant increased with the wider plant spacing, as did stem numbers per plant. Clones responded differently to the within-row spacings for total yield. Lowest total yields were for AC88375-3 and CO87009-4. Both of these selections are very sensitive to metribuzin and were somewhat affected by a pre-emergent application. Total yield of all other selections was excellent, with DT6063-1R averaging 585 cwt. at the 9-inch spacing and 569 cwt. at 12 inches. Yield of US No. 1 tubers varied by clone for the two spacings. For example, Crestone yielded more US No. 1's at 9 inches than at twelve. DT6063-1R and AC83064-6 responded similarly. Russet Legend and CO85026-4 produced higher yields of US No. 1's at the 12-inch spacing. Yield and percent undersized tubers varied for clones.

Seed Piece Severing – In 1997, Russet Burbank and Russet Norkotah were grown in a trial to evaluate the effect of losing the seed piece at various times during the growing season. Plots were disturbed, or seed pieces removed, at emergence, plant height of eight inches, or at bloom. For Russet Burbank, the highest total yield was produced by the check (no severing or disturbing at any stage). Severing at bloom had the most effect upon total yield. The same was true for US No. 1 yield. Tubers per plant were not different for the different treatments. Yield of tubers over 12 ounces was not significantly different for the treatments. Yield of tubers 6-12 ounces and 4-6 ounces, varied for treatments, basically following the distribution of total and US No. 1 yield. Yield of undersized tubers did not vary significantly for treatments. Vine size varied by treatment, however maturity was the same for all treatments. Highest total yield was affected by the severing treatments for Russet Norkotah. US No. 1 yield responded very closely to the total yield distribution by treatment. Severing and disturbing at the earlier

stages decreased tuber numbers per plant, however stems per plant were not significantly different for the treatments. Vine size varied little, and vine maturity was not significantly different for the treatments. Yield of tubers over 12 ounces was significantly different for treatments. Yield of tubers 6-12 ounces followed a similar distribution to total yield, with the severing treatments producing the lower yields. As with Burbank, yield of undersized tubers was not significantly different.

A final accomplishment for 1997 is the development of the cultivar specific management profile for Russet Legend (COO83008-1). This attractive, dual-purpose russet is being released by the Oregon program and is the result of a cross by Dr. David Holm. Much interest has been generated in the Northwest, primarily for fresh use.

OBJECTIVES FOR 1998:

1. Continue development of cultivar specific management profiles. Focusing on:
    a. Growth analysis
    b. Nitrogen applications and development of petiole profiles
    c. Phosphorus application
    d. Seed piece spacing

2. Continue development of cultural management guidelines for nuclear seed producer application.

3. Investigate physiological factors related to potato production. Directed at:
    a. Effects of precutting advanced selections during the storage season.

FUNDING REQUEST:

1997 Allocation: $8,500

1998 Request:

Supplies	$1,000
Sample Analysis	3,150
Support Personnel	5,760
Total	$9,910