

**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: Nitrogen Use Efficiencies of Potato Cultivars for the San Luis Valley

PROJECT LEADERS: Asunta (Susie) Thompson-Johns, Research Horticulturist, San Luis Valley Research Center, and James Sharkoff, Conservation Agronomist, USDA-NRCS

PROJECT JUSTIFICATION:

Proper nitrogen management is a key practice for maximizing yield and quality, minimizing production costs, and protecting natural resources such as water. Fertility recommendations are based upon expected crop yields, minus credits for residual soil nitrates, nitrogen mineralized from soil organic matter and other sources, and nitrate-nitrogen present in irrigation water. The application of cultivar specific management practices strengthens the probability of optimizing yield and quality. Potato cultivars vary in vine size, rooting depth and density, maturity, responses to timing of nitrogen applications, total yield potential, and response to environmental conditions. Furthermore, cultivars possess genetic variability for nitrogen use efficiency (Holm, 1982). Cultivars also vary in the amount of nitrogen they accumulate in tubers, roots and foliage (Delgado, et. al., 1996).

Locally popular cultivars such as Russet Norkotah and Russet Nugget differ considerably in the amount of nitrogen required for maximum yield and quality. It is assumed that R. Norkotah is an inefficient user of nitrogen due to its small vine type, susceptibility to environmental stresses, small and shallow root system, and early maturity. Conversely, R. Nugget is considered a scavenger for soil minerals due to its large vine type, rangy root system, late maturity and general resistance to environmental stress.

The proposed work is important in beginning a screening program for new releases and advanced cultivars in regard to nitrogen use efficiency. The information obtained has direct implication on the cultivar specific management guidelines established for these cultivars prior to, or just after, release. Due to the range of values obtained in the 1996 report by Delgado, et. al., the importance of isolating and minimizing differences in soil, management scenarios and effects, and the inherent genotypic nitrogen use efficiency abilities, becomes critical. Further advantages of such an effort would include guiding further nitrogen related research, encouraging

stewardship of the environment and resources, economic benefits related to potato production, and development and adoption of cultivars for the San Luis Valley which more efficiently utilize available mineral nutrients.

RELEVANT LITERATURE

Delgado, J.A., R.F. Follet, J.L. Sharkoff and M.K. Brodahl. 1996. Nitrogen Content and indices of selected crops grown in the San Luis Valley of south central Colorado and their use in simulating crop N uptake and soil N transformations. NLEAP FACTS Sheet 4/96. USDA-ARS and USDA-NRCS.

Holm, D.G. 1982. Nitrogen-use efficiency of potato clones. Progress Report 1. Agriculture Experiment Station. Colorado State University, Fort Collins, CO.

PROJECT STATUS: Second Year

SIGNIFICANT ACCOMPLISHMENT FOR 1997:

Four cultivars and advanced selections were grown in a trial at the farm of Keith and Art Holland. Three nitrogen rates were compared in the trial (total available and applied at ~140, 180 and 220 lbs/acre). Destructive harvests were conducted as vines approached senescence and maturity, in August and September. This material was dried, ground and is undergoing laboratory analysis at the CSU Soil Testing Laboratory. The results will be utilized to calculate nitrogen use efficiencies for the different genotypes. Yield data was taken for the remaining plants in the plots. Russet Norkotah performed best in terms of yield and grade at the mid-nitrogen level. The low level of nitrogen was optimum for Russet Nugget. These cultivars therefore, responded as experience has indicated. Russet Norkotah - S8 tended to produce most favorably at the mid-nitrogen level. AC83064-6 had very sporadic performance at the three levels. However, it consistently had poor yields at the lowest nitrogen level.

OBJECTIVES FOR 1998:

Continue efforts directed at:

1. Differentiation between the plant nitrogen-use efficiency and the nitrogen application (management) efficiency.
2. Providing producers with consistent information for cultivar specific nitrogen management profiles.
3. Identifying locally acceptable procedures (sampling protocol) for determining nitrogen-use efficiency.

FUNDING REQUEST:

1997 Allocation: \$5,500

1997 Requested:

Sample Analysis	\$5,100
Materials & Supplies	250
Support Personnel	<u>1,500</u>
Grand Total	\$6,850