

## RESEARCH PROPOSAL

Submitted to:

SLV Research Center Committee  
and the  
Area II Potato Administrative Committee

**TITLE:** Application of Fourier Transform Infrared Spectroscopy to identify biochemical differences responsible for seed vigor and to distinguish potato cultivars and variants within cultivars.

**PROJECT LEADERS:** C. Stushnoff, D.G. Holm and K. Knutson

**PROJECT JUSTIFICATION:** The potential application of Fourier Transform Infrared (FTIR) spectroscopy is based on two primary objectives, to determine the biochemical basis for potato seed vigor and to develop a reliable and sensitive fingerprinting technique to provide positive cultivar identification based on tuber samples.

Research on seed vigor at the University of Saskatchewan, since 1986, has revealed that potato yields of marketable tubers increased as much as 40% when seed was produced in northern Saskatchewan compared to Becker, Minnesota. This observation was verified in 1989 with data obtained from a replicated yield test in Weld county CO. The results have been consistent and most striking for Russet Burbank, but in some years the same trend was also noted with Norland.

The physiological and biochemical basis for the increased vigor is presently unknown and is under investigation. FTIR is a relatively new type of spectroscopy that has very high resolution power with capability to distinguish very minor molecular differences in a non-invasive manner. A scan of wave number characteristics is shown in Fig.1 for freeze dried potato tuber flour comparing Russet Burbank and Norland. Each wave number represents a characteristic emission for a specific molecule and its peculiar bonding characteristics with other molecules. Some of these patterns should reflect molecular differences that can perhaps be attributed to the reason for increased vigor.

The precise and sensitive wave number pattern should be very stable for those molecules that determine the genetic differences between cultivars and perhaps as well for differences between clonal variants. The differences between cultivars are very obvious in Fig.1, but at this point it is unknown if much smaller differences, such as those found in different variants of one cultivar can be detected.

**OBJECTIVES FOR 1990:** We plan to compare seed grown in northern regions and at the higher elevation site at SLV with seed produced at Becker, Mn and in Weld county CO. This type of analysis should provide clues to the molecular basis of the vigor response.

Samples are presently being prepared to determine if variants of a specific cultivar can be distinguished with tubers of Sangre grown in 1989 at SLV, by Dave Holm. We also propose to test other cultivars at different stages of growth from the 1990 crop.

**FUNDING REQUEST :** Funds are requested for laboratory reagents, primarily for replenishment of gases, computer disks and student hourly labor to prepare the samples. Funds are also needed for travel to collect samples, for plot establishment and harvesting of the seed vigor plots that comprise about one half acre, and to reimburse the grower for maintenance and purchase of the crop.

**Estimated Budget**

Laboratory expenses \$1000.  
 Field plot expenses \$1000.

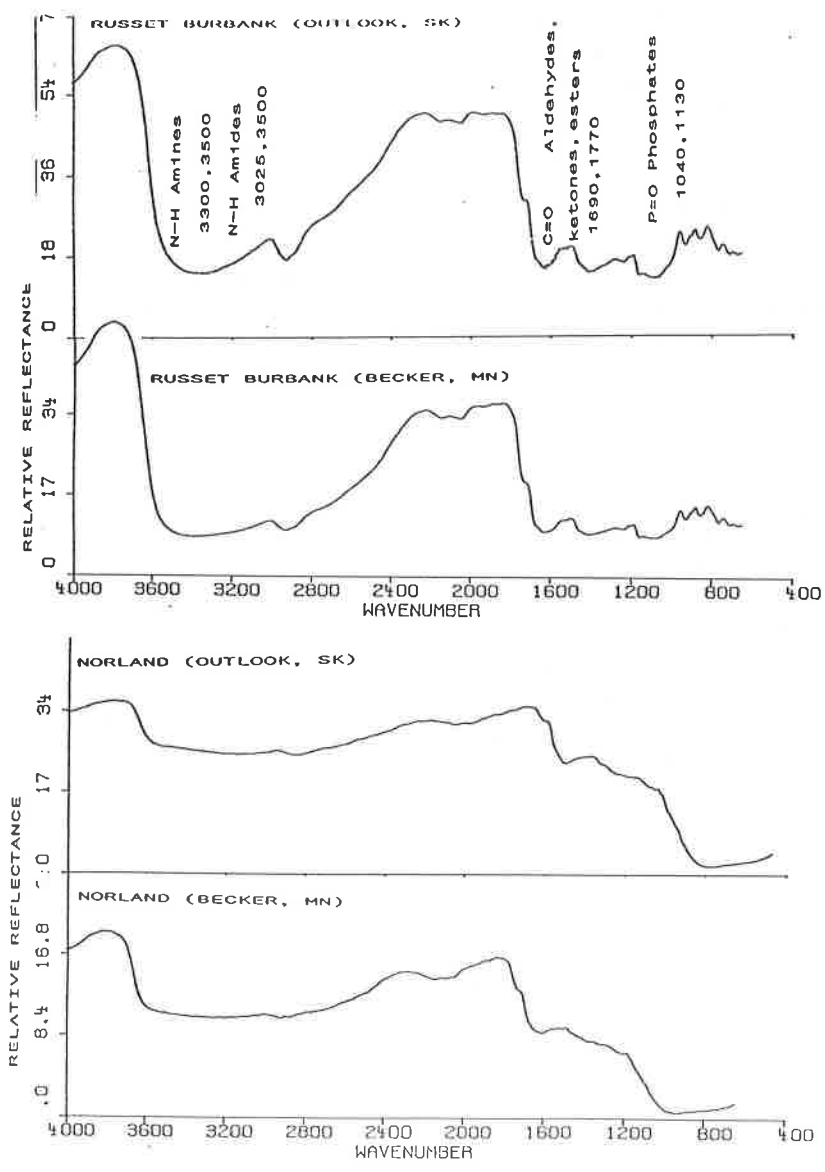


Figure 1. Infrared spectra of freeze dried potato bud tissue.