COMPREHENSIVE REPORT FOR 1997

Submitted to:

SLV Research Center Committee

and the

Colorado Potato Administrative Committee (Area II)

TITLE: APPLICATION OF FOURIER TRANSFORM INFRARED SPECTROSCOPY
TO IDENTIFY POTATO CULTIVARS

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PROJECT STATUS:

This is intended to be the final year of research on this project. Results from previous
years suggested a need to expand the scope of our libraries, especially the minituber
library. Twenty eight cultivars of minitubers were obtained from SLV, freeze dried,
ground, passed through a 400 mesh sieve and analyzed with FTIR in 1997. Data from
this study will be added to that obtained in 1995 and 1996 for preparation of a
manuscript.

SIGNIFICANT ACCOMPLISHMENTS:

1.   When treated as unknowns, each one of the 28 new minituber samples were
identified correctly (Table 1).

2.   A rating system adapted last year, based upon specific Hit Quality Indices (HQI),
was tested for all entries of Sangre obtained during the last three years, including
variants and standards. In the past we could not distinguish variants from each
other nor from the standard Sangre cultivar. When minitubers were examined
using the new HQI approach, the standard was identifiable from the variants
(Table 2).

3.   Visual examination of spectral peaks, independent of computer library analyses,
revealed that potato samples had twelve major peaks which did not vary in wave
number position among cultivars. We assume these are common in potato (Fig.
1,2). Another group of ten to twelve shift in wave number position for different
cultivars. These spectra can be used to provide an archive fingerprint to
supplement the HQI computer library for future identification exercises.

Table 1.   Minituber library for 1997 accessions from San Luis Valley showing a rank of 1 or 2, and a corresponding Hit Quality Index (HQI) when each entry was tested as an unknown against the entire library. A perfect match is = 0 and a perfect mismatch is = 1.4.

CUTLIVAR	RANK	HQI
All Blue	1	0.000
Alpha	1	0.022
Atlantic	1	0.033
Bintje	1	0.000
Centennial Russet L1	1	0.016
Chipeta	1	0.022
Crestone	1	0.000
Dark Red Norland L2	1	0.027
Frontier Russet L2	2	0.022
Itasca	1	0.027
Kennebec	1	0.027
Norchip	1	0.000
Norgold Russet L2	1	0.016
Ranger Russet	1	0.000
Red LaSoda L2	1	0.000
Red McClure	1	0.000
Red Pontiac	1	0.027
Russet Burbank L3	1	0.033
Russet Norkotah L5	1	0.000
Russet Nugget L3	1	0.000
Sangre Std	1	0.000
Shasta	1	0.000
Shepody	1	0.000
Snowden	1	0.000
Tejon	1	0.000
Ute Russet L1	1	0.000
White Rose	1	0.027
Yukon Gold	1	0.049

Note: HQI = Hit Quality Index; <0.3 = same; 0.3-0.7 = be careful; >0.7 = different

Table 2. Hit quality indices for Sangre variant selections searched individually against Sangre standard. HQI data indicate a mismatch suggesting that the standard differs form the variant selections.

SELECTION	HQI (600-2000)	HQI (850-1800)	HQI (1200-1800)
Sangre Std (8/97)	0.000	0.000	0.000
Sangre 10 L1 (7/94)	0.582	0.493	0.471
Sangre 14 (10/94)	0.704	0.643	0.709
Sangre 11 (10/94)	0.654	0.549	0.720
Sangre 10 (10/94)	0.587	0.654	0.781

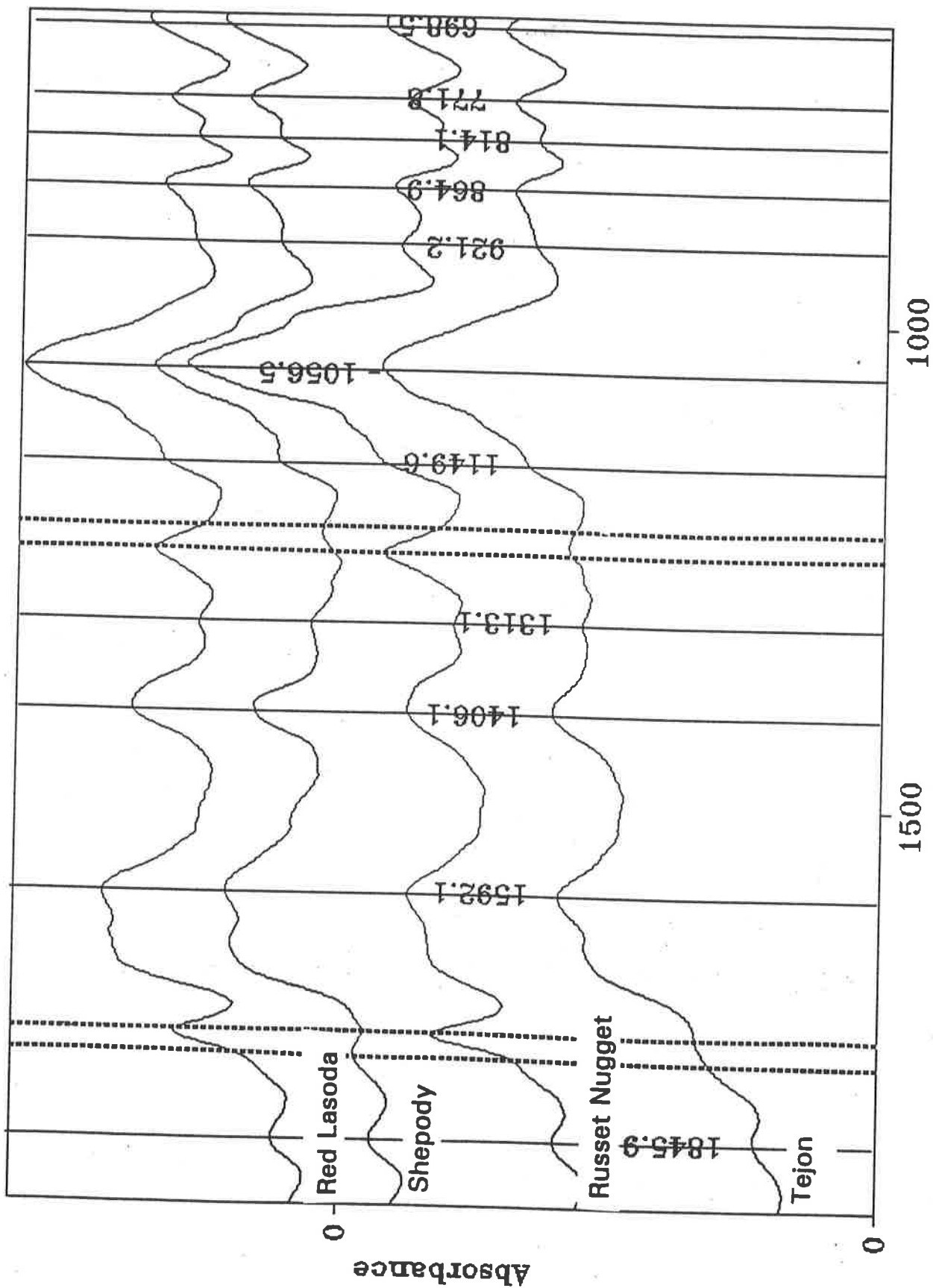Note: HQI = Hit Quality Index; <0.3 = same; 0.3-0.7 = be careful; >0.7 = different

Figure 1. FTIR spectra or freeze dried minitubers for Red Lasoda, Shepody, Russet Nugget and Tejon potato cultivars. Solid vertical lines indicate fixed peaks and broken vertical lines indicate two regions subject to wave number shifts for different cultivars.
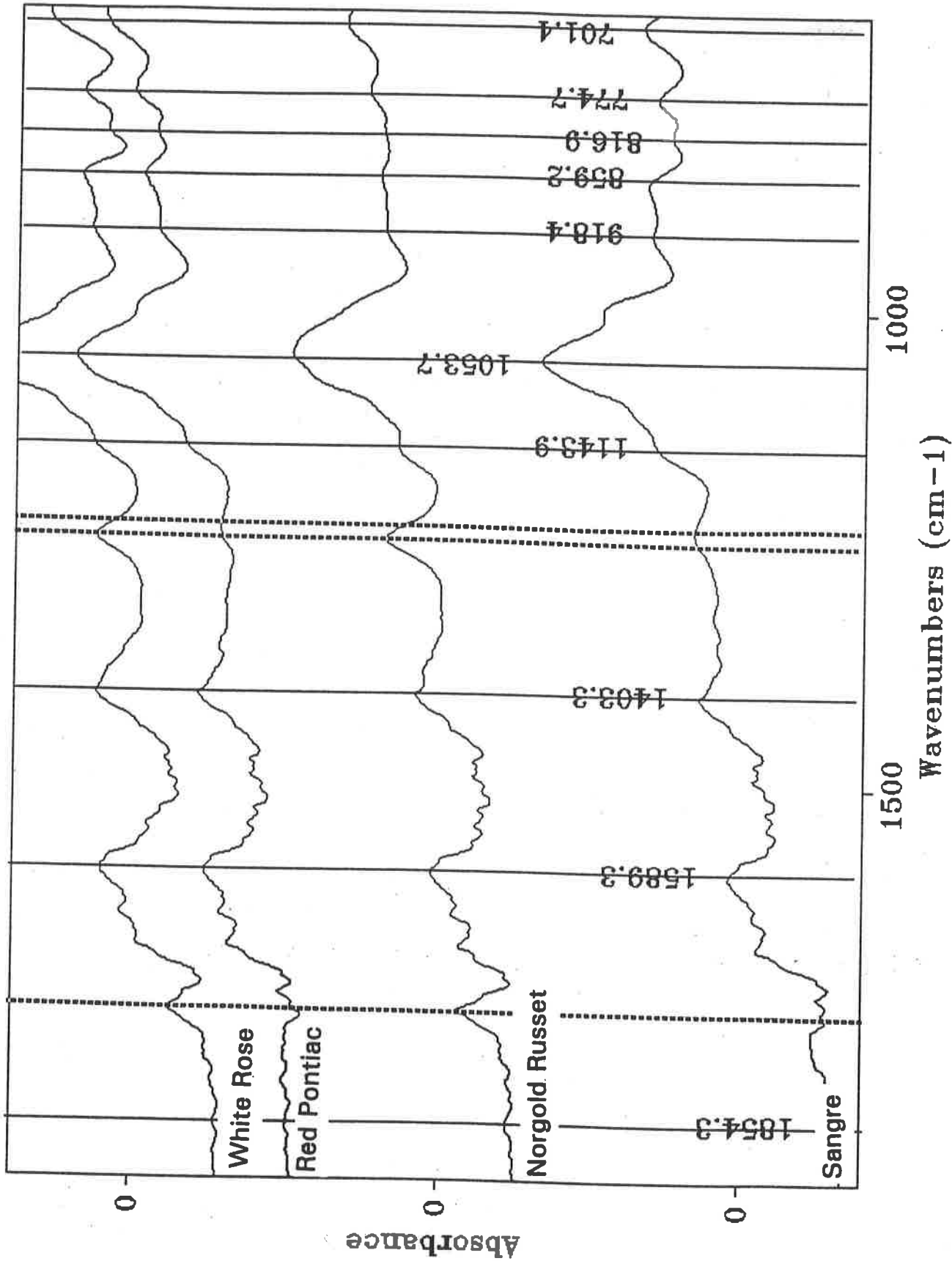
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