Funding Request:

Factors Influencing the Development of Shatter Bruise and Air Checking in the San Luis Valley

Submitted by:

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March 27, 1987

INTRODUCTION

This proposal is being submitted in response to a request by the SLV Potato Research Committee for work on shatter-bruise (air checking, "thumbnail cracks", and/or tuber-surface cracking) in the San Luis Valley. This proposal was developed in collaboration with Agro Engineering, Inc., Alamosa, Colorado, and incorporates ideas from individuals participating in the SLV Shatter Bruise Survey mentioned below. Agro Engineering, Inc. will be a cooperator in this study.

STATEMENT OF THE PROBLEM

Shatter-bruise has been identified as a serious tuber defect problem in the San Luis Valley during the last two seasons. In a "first-step" effort to better identify factors influencing this defect, a grower survey was made by the SLV Research Center, SLV Potato Growers Assn., Agro Engineering, Inc. and West Consulting, Inc. in December 1986 (attached). While the survey failed to identify a single critical underlying factor, it did show that 87% of the respondents felt that shatter-bruise had an economic impact on their production. Survey results also reinforced published information that a number of factors associated with tuber hydration and/or dehydration influenced the extent of shatter-bruise experienced by individual growers.

OBJECTIVE AND GOAL

The objective of this study is to identify some specific cultural and environmental factors influencing the development of shatter-bruise and determine their relative importance in the San Luis Valley. The goal is to use this information so recommendations can be made to minimize shatter-bruise. The information can also be used to suggest more basic research approaches.

MATERIALS AND METHODS

A "data base" approach will be used to identify factors influencing the amount of shatter-bruise observed in storage. Information will include, for example, soil type, water table, fertility and irrigation practices. Specifically, a correlation of shatter-bruise on ca. 50 fields will be done with the date of last irrigation and fertilizer application, moisture level at harvest, total amount of nitrate and phosphate applied and end of season soil fertility levels. In addition, more intensive studies will be done on several selected fields with different soil types throughout the day in an attempt to correlate soil temperature, moisture, specific gravity and percent dry matter with shatter-bruise severity.

Data will be statistically analysed and a final report submitted to the SLV Research Committee.

BUDGET REQUEST

A significant portion of the budget request will be sub-contracted to Agro Engineering, Inc. in return for their services. Agro Engineering, Inc. will maintain irrigation and fertility management programs on ca. 100 center pivot fields during 1987 as part of their normal operation. This data base will be provided on a "worksheet file" at no cost for use in this study. It is anticipated that data from ca. 50 selected fields will be used to determine correlations. Additional costs needed to be recovered are:

A.	Agro Engineering, Inc.		
	1. Labor		
	- measurement of shatter-bruise incidence for ca. 50 fields.	$1,300.00	
	- soil collection for "end of season" soil fertility measurements.	$ 600.00	
	- measurement of shatter-bruise incidence throughout the day versus specific environmental factors.	$ 480.00	
	2. "End of season" soil fertility assay costs (Agro Engineering)	$1,000.00	
	SUBTOTAL (Agro Engineering)		$3,380.00
B.	G. D. Franc, SLV Research Center		
	1. Travel	$ 250.00	
	2. Labor (dry matter and specific gravity, final data summary)	$ 900.00	
	3. Statistical consultation, data analysis, literature review	$ 350.00	
	SUBTOTAL (G. D. Franc, SLVRC)		$1,500.00
	GRAND TOTAL		$4,880.00

Agricultural Experiment Station

Colorado State University
San Luis Valley Research Center
0249 East Road 9 North
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SLV SHATTER BRUISE SURVEY

Conducted by:

SLV Research Center
SLV Potato Growers Assoc. ✓
Agro Engineering ✓
West Consulting, Inc. ✓

Shatter bruise has been a serious problem in the San Luis Valley, especially the last two seasons. This type of harvest damage can severely affect market quality and grower returns. This disorder has been studied in other potato growing areas. However, practices developed to reduce shatter bruise damage in these regions do not necessarily decrease the problem as it accurs in the SLV.

The following survey is designed to gather information on factors associated with shatter bruise damage in this area. The results of this survey will be kept confidential and will only be used to design a research project to identify cultural or other management practices which can reduce shatter bruise.

Shatter bruise type damage is often referred to as "air checking or thumbnail cracks", but for the purpose of this survey any surface cracking, whether caused by an impact or not will be referred to as shatter bruise. Please check the appropriate answers on both pages of the following survey and return the form in the enclosed envelope to:

SLV Potato Growers Association
305 Morris
Monte Vista, CO 81144

Name: 54 responses out of 94 sent (57%)

Address: _____

_____

1. Do you feel that shatter bruise has cost you money by reducing pack out , increasing storage rot and shrink, etc.?
Of the 7 no votes, 3 had no shatter bruise at all.

Yes 47(87%) No 7(13%)

2. Was shatter bruise more of a problem on your farm during the 1985 and 86 harvest season than the previous 2 seasons?

Yes 34(79%) No 9(21%)

3. In which of the previous two years was shatter bruise most serious?

1985 34(74%) 1986 12(26%)

4. If you grow more than one variety of potato indicate which one was most severely affected by shatter bruise.

Centennial 35(92%) Russet B. 3(8%) Sangre -0- Other(name) -0-

5. Did you have fields which seemed to have more serious shatter bruise than others?

Yes 26(54%) No 22(46%)

6. If you answered yes to question 5 please provide the location of the field with the most serious problem.

_____

7. Does this field have heavier (clay) or lighter (sand) soils than you other fields?

Heavier 15(44%) Lighter 11(32%) No difference 8(24%)

8. Is the level of the sub higher or lower in this field compared to your other fields?

Higher 13(41%) Lower 2(6%) No difference 17(53%)

9. Was shatter bruise more of problem on early harvested (Sept 1-20) or late harvested (after Sept 21) potatoes?

Early 8 (17%) Late 22 (46%) No difference 18 (38%)

10. What method of vinekill do you use?

Dinitro 24 (33%) Diquat 22 (30%) Mechanical 10 (14%) Frost 17 (23%)

11. What method of irrigation do you use?

Furrow 5 (9%) Sprinkler 49 (91%) Sub -0- (0%)

12. What would you estimate is your soil moisture level (% field capacity) at vinekill?

< 50% 7 (14%) 50-70% 33 (65%) 70-90% 11 (22%) > 90% -0- (0%)

13. What would you estimate is your soil moisture level (% field capacity) at harvest?

< 50% 22 (41%) 50-70% 23 (43%) 70-90% 9 (17%) > 90% -0- (0%)

14. Was shatter bruise damage more apparent when tuber pulp temperatures were below 45° F?

1. Did not harvest below 45°F

Yes 28 (64%) No 16 (36%)

15. Would you be willing to participate in a research project on shatter bruise by allowing plant, soil and other samples and measurements to be taken from your fields during the 1987 growing season?

Yes 38 (81%) No 9 (19%)

8 no votes from growers answering yes on question 1, some because of concerns about growing certified seed.
5 yes votes from growers answering no on question 1.

If you have any additional comments about shatter bruise please provide them here.

1. Rocky soil may have more bruising, most of our damage occurs at colder temp. in wet conditions when we have trouble separating the dirt from the potatoes.
2. Maybe the sub does play a role.
3. Air checking, after loading bulk, seemed associated with wind during harvest. Reduced damage by not allowing tubers to lay on the surface more than 10 min.

4. I think it was worse after it rained and got cold.
5. The longer the potatoes were exposed to the sun, the worse damage.
6. We grow only Russet Burbank potatoes. We did have some severe problems 3 years ago, after which we slowed down chain speeds, plus started digging approximately 1 hour later in the morning.
7. We've had very little problems with shatter bruise so far.
8. I believe it is caused by wet conditions at killing and at harvest, precipitation after killing and cold temperatures (less than 45°F.
9. No shatter bruise and 42 ft to water.
10. Most problems in 1985 associated with higher sub and lighter soil. Most problems in 1986 associated with lower sub and heavier soil.
11. No shatter bruise, grow in sand and heavier soils.
12. No shatter bruise; grow only Centennial.
13. No shatter bruise; grow Centennial and Russet Burbank.
14. More a factor of time harvested than location.
15. Interested in research only if sanitation requirements are followed.
16. The sub level was much higher on this field than any of my others. I also had Banvel damage resulting from a neighbor's wind drift.
17. The more handling you have (shakers, etc.) and excess chain speeds on the harvester, the more shatter. Clods, roll back, drops, etc. cause some shatter. I also had 1 field with sandy type soil that I watered at 80% speed before harvest and had very few cracks.
18. We had less shatter bruise in the rocky soil N of Monte Vista; it was also drier at digging time.
19. Fields killed by frost with high moisture had the most serious problem.
20. Fields with late application of fertilizer had more shatter bruise.
21. Worse in hail damage to high N rates.
22. I feel it has a lot to do with soil moisture, tuber moisture and N levels late in the season.
23. Sandy soil, Alamosa County, worst problem.
24. Late harvest, cold conditions, we had to direct dig to not leave potatoes in windrows.
25. Because of the number of rocks in my fields, it's hard to tell what caused shatter bruise once in storage. I'm finding in the field my worst is when I windrow and they lay in the sun - especially following rainy weather.
26. Worse problem in 1986; 1986 sub level was higher than 1985, but still at about 5 ft. The most problem came on a day when there was a warm dry wind blowing which affected the potatoes in the windrow.

SUMMARY
FUNDING REQUEST

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This proposal is being submitted in response to a request by the SLV Potato Research Committee. This proposal was developed in collaboration with Agro Engineering, Inc., Alamosa, Colorado, and they will be a cooperator in this study. The basic approach to this study is to use as a "data base" the field records normally compiled by Agro Engineering and correlate various factors with shatter-bruise severity. In addition, a more intensive study of some specific factors will be made on several fields.

BUDGET*

A. Agro Engineering, Inc.		
1. Labor		
Shatter-bruise measurement	$1,300.00	
Soil Collection	$ 600.00	
"Intensive study" labor	$ 480.00	
2. Laboratory/assay costs	$1,000.00	
SUBTOTAL		$3,380.00
B. G. D. Franc, SLV Research Center		
1. Travel	$ 250.00	
2. Labor	$ 900.00	
3. Statistical consultation, etc.	$ 350.00	
SUBTOTAL		$1,500.00
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*See Funding Request for additional information.