A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI

PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

March, 1992
ISSN 1188-4770

Research Update 668

Air Seeder Damage to Pulses

(Funded by: ADF and SPCDB)[1]

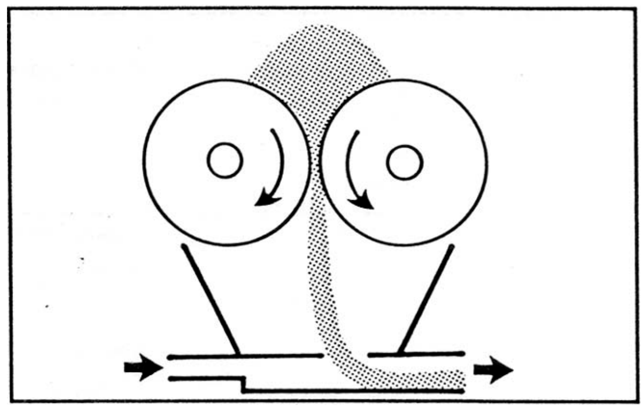
INTRODUCTION

Over the past decade, air seeder usage has increased. In an attempt to reduce equipment duplication, the diversified farmer sees the need for using an air seeder to seed pulse crops.

Previous research has shown that some grain drill meters will damage pulse seeds. Also, PAMI/AFMRC (Prairie Agricultural Machinery Institute/Alberta Farm Machinery Research Centre) evaluation reports have shown that air seeders damage canola seeds.

PAMI has completed a study comparing the crackage and germination of Princess Peas, Trapper Peas and Laird Lentils through the various isolated components of typical air seeder systems.

NOTE: The reader is cautioned that the following information is only a summary of the test results. For complete information, contact PAMI at 1-800-567-PAMI and ask for Report #RH0289 (cost: $5.00).



WHAT WAS TESTED

An air seeder system can be broken into various components. PAMI tests involved choosing the components and the work rates at which crackage and germination problems could be observed.

Meters, manifolds and seed boots were classified by their general physical characteristics. It must be appreciated that the selected components may differ in their damage characteristics from others of a similar type, due to design or operation differences. Also, components when tested in isolation may react differently than those incorporated in a mechanical system. The component classes (and specific examples) selected for testing are provided in TABLE 1.

HOW DAMAGE WAS DETERMINED

Three varieties of pulse seeds (Princess Peas, Trapper Peas, and Laird Lentils) were chosen for testing. Each sample was tested for initial crackage and germination. All test runs, in all conditions, were duplicated. From each pair of test samples, three separate germination and three separate crackage samples were taken.

Crackage was evaluated by manual inspection of a 100 seed sample taken from each of the triplicate samples.

Germination tests were done on a representative sample taken from each triplicate sample. Fifty seed germination trays were used. Germination tests were done quickly to minimize variations in the sample's moisture content.

IN BRIEF

- Air seeder components cause notable damage to pulse crop seeds.
- Variations of seeding rates and airflow rates affected the extent of damage for each component.
- PAMI test results did not indicate a trend that could be used as an overall "rule-of-thumb" for either specific components or their settings.
- PAMI test results indicated that visually observed crackage could not be used as a gauge to determine the success or failure of future germination.
- Presently, there is no explanation for increases or decreases in germination due to mechanical handling. PAMI recommends that more research be done in this area.
- Existing information linking crackage of pulse seedsto moisture content, when conveying or handling, may not apply to these test results. There appears to be no consistent relationsthip be tween crackage and germination change.
- Producers are encouraged to beaware of potential pulse seed damage. Air seeders should be selected and operated with the goal of minimizing potential damage. Producers should make thorough field checks to determine germination success.
- Princess Peas are "generally" less prone to germination damage at medium seeding rates and medium airflow rates.
- Trapper Peas damage more easily than Princess Peas. Optimum settings vaded from one component to the other. No trend was observed.
- Laird Lentils damage very easily. Settings for lentils are "generally" more favourable at medium seeding rates and medium airflow rates.

[1]Funding for this research project has been provided by the Agriculture Development Fund and the Saskatchewan Pulse Crop Development Board.

HOW IT WAS TESTED

The five metering systems were run, with three crops, at selected seed flow rates through the meter systems only. The seed flow rates were set to provide the seeding rates at a travel speed of 5 mph (8 km/h) (TABLE 2).

The manifold systems and seed boots were tested using the Flexi-coil 1110 because its delivery system could provide four outlets. The Flexi-coil 1110 was also used to provide three seed flow rates and three fan speeds (2750, 3250, and 3500 RPM) for each of the three crops (TABLE 3).

The seed boots were tested by running each of the three crops through the Steel Manifold at the medium seed flow rate and the low airflow rate.

TABLE 1. Component Classification.

Meters	Sample Tested
1. Rubber Cup (Externally Fluted Rubber Roller)	Flexi-Coil 1100
2. Plastic Cup (Externally Fluted Plastic Roller)	CI 1150
3. Steel Auger	Chinook 1203
4. Double Rolls (Double Smooth Rubber Roller)	Wilrich 4150
5. Conveyor Belt (Conveyor Belt with Air Lock)	Leon S-45
Manifolds	**Sample Tested**
1. No Manifold [2.5 in (6.3 cm) plastic hose]	No Brand
2. Horizontal Manifold (fan shaped)	Morris
3. Cushion Manifold (vertical)	Victory
4. Steel Manifold (vertical-cushioning material removed and replaced with steel)	Chinook 1203
Seed Boots	**Sample Tested**
1. Straight Hose	No Brand
2. Simple Divider	Blanchard
3. Paired Row Boot	Clark
4. Split Divider Boot	Vern

TABLE 2. Seeding Rates.

	Low lb/ac (kg/ha)	Medium lb/ac (kg/ha)	High lb/ac (kg/ha)
Princess Peas	120 (136)	140 (160)	160 (182)
Trapper Peas	90 (102)	110 (125)	130 (148)
Laird Lentils	50 (57)	70 (80)	90 (102)

TABLE 3. Airflow Rates.

Airflow Rate	Low	Medium	High
Fan Speed (RPM)	2750	3250	3500

PRINCESS PEAS - OBSERVATIONS

Princess Peas - Crackage (TABLE 4).

Meters: No notable increase in crackage was observed in Princess Peas. Double Rolls caused a minimal amount of damage.

Distributor Evaluation - Seeding Rate: No notable increase in crackage was observed in Princess Peas.

Distributor Evaluation - Airflow Rate: No notable increase in crackage was observed in Princess Peas.

Seed Boots: No notable increase in crackage was observed in Princess Peas.

Princess Peas - Germination (TABLE 4).

General: In Princess Peas, visual crackage determination in this case did not indicate future germination. There is no explanation for increases or decreases in germination due to mechanical handling. More research is required in this area.

TABLE 4. Summary of Test Results for Princess Peas. (Note: All results shown are rounded to the nearest 1%. All "minus" crackage is assumed to be of zero value).

Meter Evaluation

Princess Peas	% Increase Crackage			% Change Germination		
Type:	Low Seed Rate	Medium Seed Rate	High Seed Rate	Low Seed Rate	Medium Seed Rate	High Seed Rate
Steel Auger	0	0	0	- 18	1	4
Plastic Cup	0	0	0	7	1	- 14
Rubber Cup	0	0	0	1	2	5
Double Rolls	1	2	1	- 7	- 3	- 29
Conveyor Belt	1	0	1	- 2	- 17	- 29

Distributor Evaluation - Seeding Rate

Princess Peas	% Increase Crackage			% Change Germination		
Type:	Low Seed Rate	Medium Seed Rate	High Seed Rate	Low Seed Rate	Medium Seed Rate	High Seed Rate
No Manifold	0	1	0	9	9	- 1
Horizontal Manifold	0	0	0	- 14	- 3	6
Cushioned Manifold	0	0	0	3	- 6	4
Steel Manifold	1	0	1	- 2	- 1	0

Distributor Evaluation - Airflow Rate

Princess Peas	% Increase Crackage			% Change Germination		
Type:	Low Airflow	Medium Airflow	High Airflow	Low Airflow	Medium Airflow	High Airflow
No Manifold	1	0	0	9	8	5
Horizontal Manifold	0	0	1	- 3	6	0
Cushioned Manifold	0	0	1	- 6	- 5	- 8
Steel Manifold	0	0	0	- 1	8	- 5

Seed Boot Evaluation

Princess Peas	% Increase Crackage	% Change Germination
Type:	Medium Seed Rate	Medium Seed Rate
Straight Hose	0	8
Simple Divider	0	8
Paired Row	0	9
Split Boot	0	6

Meters: Princess Peas had decreased germination with: Steel Augers (low rate), Plastic Cups (high rate), Double Rolls (all rates) and Conveyor Belts (all rates).

Increased germination was observed with: Steel Augers (high rate), Plastic Cups (low rate) and Rubber Cups (high rate).

The Rubber Cup Meter did the least harm in Princess Peas. Medium seed rates are advised as a starting point.

Distributor Evaluation - Seeding Rate: Princess Peas had decreased germination with: Horizontal Manifolds (low to medium rate) and Cushioned Vertical Manifolds (medium rate).

Increased germination was observed with: No Manifold (low and medium rate), Horizontal Manifold (high rate) and Cushioned Vertical Manifold (low and high rates).

High seed rates gave better results with most distributors.

Distributor Evaluation - Airflow Rate: Princess Peas had decreased germination with: Cushioned Vertical Manifold (all flows), Horizontal Manifolds (low flow) and Steel Manifolds (high flow).

Increased germination was observed with: No manifold (all flows), Horizontal Manifold (medium flow), and Steel Manifolds (medium flow).

Medium airflows are recommended.

Seed Boots: Princess Peas had increased germination with all seed boots.

TRAPPER PEAS - OBSERVATIONS

Trapper Peas - Crackage (TABLE 5).

Meters: No notable increase in crackage was observed in Trapper Peas. Steel Augers and Plastic Cups caused minimal amounts of damage at high seed rates. Rubber cups caused minimal amounts of damage at low seed .rates.

Distributor Evaluation- Seeding Rate: In Trapper Peas, crackage increased with: Horizontal Manifolds (medium to high rate) and Cushioned Vertical Manifolds (low rate).

Distributor Evaluation - Airflow Rate: In Trapper Peas, no notable increase in crackage was observed. All components favoured higher airflow rates for reduced crackage.

Seed Boots: No notable increase in crackage was observed in Trapper Peas.

Trapper Peas - Germination (TABLE 5).

General: In Trapper Peas, visual crackage determination in this case did not indicate future germination. There is no explanation for increases or decreases in germination due to mechanical handling. More research is required in this area.

Meters: Trapper Peas had decreased germination with Steel Augers (all rates), Double Rolls (all rates), Plastic Cups (medium to high rate), and Conveyor Belts (low to medium rates).

Increased germination was observed with: Rubber Cups (all rates) and Plastic Cups (low rate).

Distributor Evaluation - Seeding Rate: Trapper Peas had decreased germination with: Cushioned Vertical Manifolds (low to medium rate) and Steel Manifolds (all rates).

Increased germination was observed with: No Manifold (all flows) and Horizontal Manifolds (low to medium flows).

Careful selection of seeding rates is advised.

Distributor Evaluation - Airflow Rate: Trapper Peas had decreased germination with: Horizontal Manifolds (medium flow), Cushioned Vertical Manifolds (low to medium flow), and Steel Manifolds (low flow).

Increased germination was observed with: No manifold (low to medium flow) and Steel Manifolds (medium flow).

All manifolds recorded an identical, small decrease in germination at the high airflow rate.

Seed Boots: All seed boots observed an increase in germination. The Paired Row Boot had the largest increase in germination.

LAIRD LENTILS - OBSERVATIONS

Laird Lentils - Crackage (TABLE 6).

General: Of the three crops, crackage due to mechanical handling by components was highest in Laird Lentils. The distributor (both with seeding rate and airflow rate) appeared to cause the greatest damage.

Meters: Laird Lentils experienced notable crackage with: Double Rolls (medium rate), Conveyor Belts (low and medium rate) and Plastic Cups (high rate).

TABLE 5. Summary of Test Results for Trapper Peas. (Note: All results shown are rounded to the nearest 1%. All "minus" crackage is assumed to be of zero value).

Meter Evaluation						
Trapper Peas	% Increase Crackage			% Change Germination		
Type:	Low Seed Rate	Medium Seed Rate	High Seed Rate	Low Seed Rate	Medium Seed Rate	High Seed Rate
Steel Auger	0	0	2	- 10	- 10	- 25
Plastic Cup	1	1	2	5	- 7	- 13
Rubber Cup	1	2	0	2	1	8
Double Rolls	0	0	0	- 14	- 10	- 24
Conveyor Belt	0	0	0	- 7	- 10	3
Distributor Evaluation - Seeding Rate						
Trapper Peas	% Increase Crackage			% Change Germination		
Type:	Low Seed Rate	Medium Seed Rate	High Seed Rate	Low Seed Rate	Medium Seed Rate	High Seed Rate
No Manifold	0	1	0	8	7	11
Horizontal Manifold	0	2	3	4	2	- 2
Cushioned Manifold	2	1	1	- 1	- 5	8
Steel Manifold	0	0	1	- 14	- 19	- 5
Distributor Evaluation - Airflow Rate						
Trapper Peas	% Increase Crackage			% Change Germination		
Type:	Low Airflow	Medium Airflow	High Airflow	Low Airflow	Medium Airflow	High Airflow
No Manifold	1	2	0	7	8	- 2
Horizontal Manifold	2	1	0	2	- 18	- 2
Cushioned Manifold	1	2	0	- 5	- 15	- 2
Steel Manifold	0	2	0	- 19	8	- 2

Seed Boot Evaluation		
Trapper Peas	% Increase Crackage	% Change Germination
Type:	Medium Seed Rate	Medium Seed Rate
Straight Hose	0	5
Simple Divider	1	6
Paired Row	1	10
Split Boot	0	8

TABLE 6. Summary of Test Results for Laird Lentils. (Note: All results are rounded to the nearest 1%. All "minus" crackage is assumed to be of zero value).

Meter Evaluation						
Laird Lentils	% Increase Crackage			% Change Germination		
Type:	Low Seed Rate	Medium Seed Rate	High Seed Rate	Low Seed Rate	Medium Seed Rate	High Seed Rate
Steel Auger	1	0	0	- 3	4	- 17
Plastic Cup	0	0	3	- 15	- 2	- 5
Rubber Cup	2	0	1	5	- 1	- 10
Double Rolls	2	14	2	1	- 8	0
Conveyor Belt	3	10	0	- 44	- 20	- 5
Distributor Evaluation - Seeding Rate						
Laird Lentils	% Increase Crackage			% Change Germination		
Type:	Low Seed Rate	Medium Seed Rate	High Seed Rate	Low Seed Rate	Medium Seed Rate	High Seed Rate
No Manifold	20	0	4	- 27	- 7	7
Horizontal Manifold	9	0	6	-22	2	- 17
Cushioned Manifold	3	18	3	- 18	- 4	- 25
Steel Manifold	10	10	5	-9	- 1	- 5
Distributor Evaluation - Airflow Rate						
Laird Lentils	% Increase Crackage			% Change Germination		
Type:	Low Airflow	Medium Airflow	High Airflow	Low Airflow	Medium Airflow	High Airflow
No Manifold	18	0	14	- 7	- 5	- 2
Horizontal Manifold	10	0	21	2	0	1
Cushioned Manifold	7	9	17	- 4	1	- 9
Steel Manifold	6	11	25	1	- 10	- 19

Seed Boot Evaluation		
Laird Lentils	% Increase Crackage	% Change Germintaion
Type:	Medium Seed Rate	Medium Seed Rate
Straight Hose	0	- 2
Simple Divider	0	- 1
Paired Row	8	- 18
Split Boot	0	- 1

Distributor Evaluation - Seeding Rate: In Laird Lentils, all distributors experienced crackage except: No Manifolds (medium rate) and Horizontal Manifolds (medium rate).

Distributor Evaluation - Airflow Rate: In Laird Lentils, a low to medium aidlow rate is preferred. All fan speeds caused lentil crackage except: No Manifold. (medium flow) and Horizontal Manifold (medium flow).

Seed Boots: In Laird Lentils, no crackage was observed except for the Paired Row Boot.

Laird Lentils - Germination (TABLE 6).

General: In Laird Lentils, visual crackage determination in this case did not indicate future germination. There is no explanation for increases or decreases in germination due to mechanical handling. More research is required in this area.

Meters: Laird Lentils experienced decreased germination with all meters at nearly all seeding rates.

Large decreases in germination were observed with: Steel Augers (high rate), Double Roils (medium rate), and Conveyor Belts (low to medium rate).

Increased germination was observed with: Steel Auger (medium rate) and Rubber Cups (low rate).

Distributor Evaluation-Seeding Rate: Laird Lentils experienced decreased germination with all distributors at nearly all seeding rates. The most acceptable seed rate for most distributors was at the medium seed rate.

Large decreases in germination were observed with: All Distributors (low rate), Horizontal Manifold (high rate), and Cushioned Vertical (high rate).

Increased germination occurred with: No Manifold (high rate), Horizontal Manifolds (medium rates), and Steel Manifolds (medium rate).

Distributor Evaluation- Airflow Rate: In Laird Lentils, all distributors produced decreased germination except the Horizontal Manifold which had a slight increase.

Large decreases in germination were observed with: No Manifold (low to medium flow), Cushioned Vertical (low and high flows), and Steel Manifolds (low flow).

Increased germination were experienced by: Horizontal Manifolds (all flows), Cushioned Vertical (medium flow) and Steel Manifolds (low flow).

Seed Boots: In Laird Lentils, all seed boots caused a decrease in germination. A large decrease was observed with the Paired Row Boot, while the others had minimal decreases.

ALBERTA FARM MACHINERY RESEARCH CENTRE

3000 College Drive South
Lethbridge, Alberta, Canada T1K 1L6
Telephone: (403) 329-1212
FAX: (403) 329-5562
http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html

Prairie Agricultural Machinery Institute

Head Office: P.O. Box 1900, Humboldt, Saskatchewan, Canada S0K 2A0
Telephone: (306) 682-2555

Test Stations:

P.O. Box 1060
Portage la Prairie, Manitoba, Canada R1N 3C5
Telephone: (204) 239-5445
Fax: (204) 239-7124

P.O. Box 1150
Humboldt, Saskatchewan, Canada S0K 2A0
Telephone: (306) 682-5033
Fax: (306) 682-5080