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Morris Air Seeder--Chickpea Seeding

Introduction

Chickpea production across the prairies has increased dramatically over the past number of years and there is a concern that air seeder metering/air delivery systems may damage fragile chickpea seed. Seed cost is substantial with chickpea due to high seeding rates, so prevention of seed damage by optimizing the operation of the air seeder could result in more efficient pulse production.

Morris provided an air cart/air delivery system to determine operating parameters that will minimize chickpea damage.

Project Procedure

A Morris 7240 air cart with an air kit mounted on a 40 ft (12 m) disc drill with 7.5 in (19 cm) spacing was used for the test. Seed was metered from the cart by spiral fluted metering wheels into seven delivery hoses. Each hose ran to a flat fan divider head on the seeding unit. There are seven divider heads; six divider heads have 9 runs each, and one divider head has 10 runs. Individual seed meters were factory configured to accommodate differences in manifold outlet numbers. Delivery hoses from the divider heads were 15/16 in (2.4 cm) inside diameter (ID).

Certified CDC Yuma, CDC Xena, and Desiray were obtained for the air tank/air delivery tests. Moisture content was approximately 13.5% for CDC Yuma and 13% for CDC Xena and Desiray. CDC Yuma was chosen as the main variety for the tests due to a combination of factors including damage susceptibility, potential market value, and high seed costs.

At a Glance...

Chickpea metering and distribution damage was very low at less than 3% with the Morris system for all tested varieties at all tested ground and fan speeds.

Check seed samples were collected prior to transferring the seed into the air cart. Metering samples were collected using the standard Morris calibration method at a simulated ground speed of 4 mph (6.4 km/h). Air tank/air distribution samples were collected in plastic tubs at the end of each delivery hose. Samples were combined from each outlet and divided down for damage assessment.

Chickpea damage was evaluated by two different methods. The first method was by visual inspection of physical seed damage including splits, cracks, or any seed coat penetration. Physical seed damage was quantified by removing damaged seeds from the sample and expressing this weight as a percent of the original sample weight. The second assessment method was to quantify hidden damage to the seed. Hidden damage was determined by sending the good, undamaged seeds to an accredited seed lab for germination tests. Total damage was calculated as the sum of percent physical damage plus the percent reduction in germination. Net damage due to seed metering and distribution was calculated by comparing the difference between the physical and germination damage of the treated samples with check samples.

The seed damage tests were conducted with the air tank/air delivery system on a level surface. The manufacturer's seed boots were replaced with a "standard" boot to ensure machine performance was not affected by boot design. A rubber hose was attached to the discharge end of the boot to direct seed into plastic catch tubs.

The air tank/air delivery was calibrated at a simulated ground speed of 4 mph (6.4 km/h) and seed rates of 160 lb/ac (179 kg/ha) for CDC Yuma, 80 lb/ac (90 kg/ha) for Desiray, and 180 lb/ac (202 kg/ha) for CDC Xena.

Metering system damage was measured separately from overall system damage by running samples through the meter at a simulated ground speed of 4 mph (6.4 mph).

Minimum fan speeds were determined at 4, 5, and 6 mph (6.4, 8, and 9.6 km/h) simulated ground speed. Fan speeds were reduced until unacceptable seed flow (pulsed distribution), or line plugging occurred. The fan speed used prior to plugging was determined to be the minimum or base fan speed for a given machine configuration, ground speed, and seed rate.

A series of 12 runs was made to determine the effect of fan speed and ground speed on CDC Yuma chickpea damage. Simulated ground speeds of 4, 5, and 6 mph (6.4, 8, and 9.6 km/h) were run at fan speeds of baseline, baseline plus 15%, baseline plus 25%, and manufacturer's maximum recommended fan speed. Samples from each outlet were collected, combined, and assessed for damage.

Table 1. Morris Fan and Ground Speed.

Machine	Ground Speed (mph)	Fan Speed	Actual Fan (rpm)	Fan Under Load (rpm)
Morris	4	Base	3,010	3,030
		Base +15%	3,460	3,470
		Base +25%	3,760	3,770
		Base +67%, Max. Fan	5,020	5,120
Morris	5	Base	3,410	3,430
		Base +15%	3,920	3,940
		Base +25%	4,250	4,290
		Base +47%, Max. Fan	5,010	5,380
Morris	6	Base	3,800	3,850
		Base +15%	4,370	4,400
		Base +25%	4,750	4,870
		Base +32%, Max. Fan	5,000	5,400

One test run was made with Desiray at a seeding rate of 80 lb/ac (90 kg/ha), ground speed of 5 mph (8 km/h), and a fan speed of base plus 25%. Similarly, a single test run was made with CDC Xena at a seeding rate of 180 lb/ac (202 kg/ha), ground speed of 5 mph (8 km/h), and maximum fan speed.

Results and Discussion

Metering system damage with CDC Yuma at 6.4 km/h (4 mph) simulated ground speed with the Morris system was very low at 0.2%.

Baseline fan speeds for the Morris system with CDC Yuma at 160 lb/ac (179 kg/ha) seed rate were 3,000, 3,420, and 3,800 rpm (no load) at respective ground speeds of 4, 5, and 6 mph (6.4, 8, and 9.6 km/h). All combinations of ground and fan speeds are listed in **Table 1**.

Chickpea damage with the Morris system was very low at all tested fan speeds (**Figure 1**).

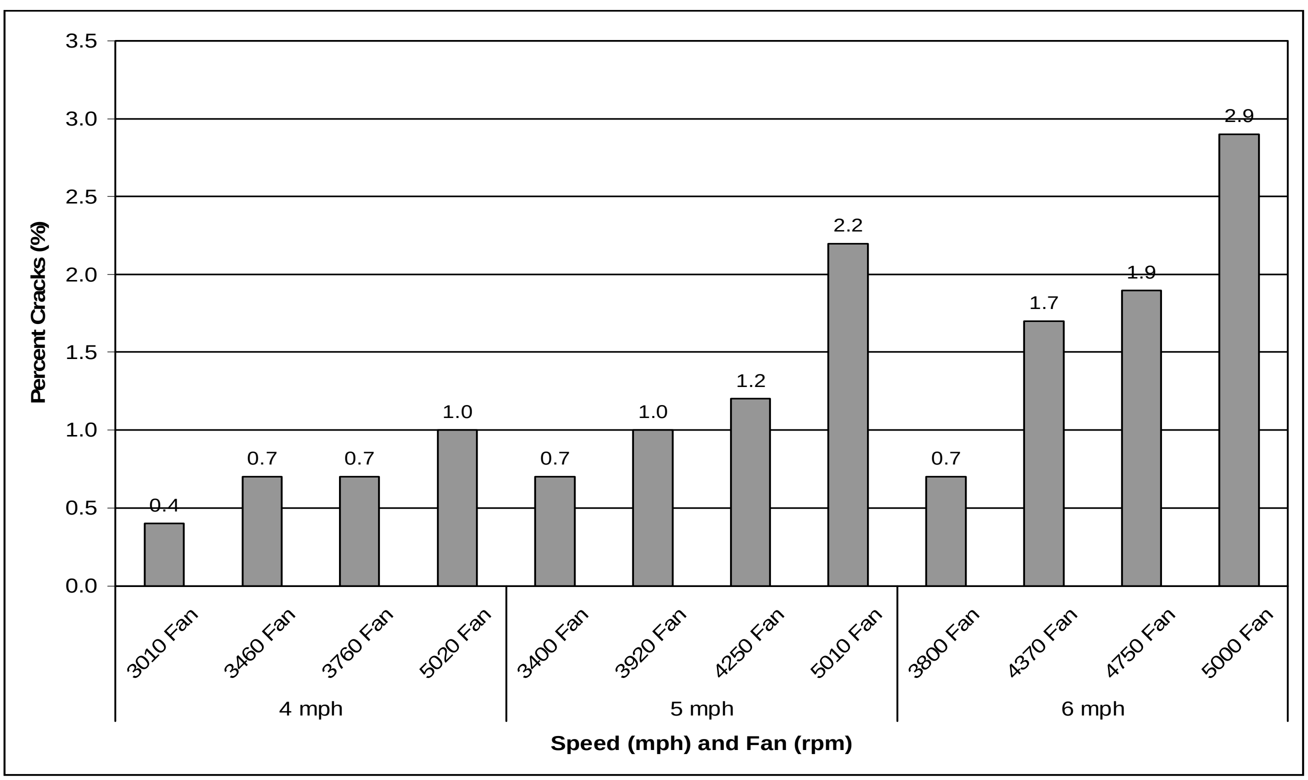
The base fan speed would only likely be used in ideal conditions. The base fan speed, plus 25%, would be a more typical operating fan speed for field conditions. Although seed damage increased at higher fan speeds, even at maximum fan speed total seed damage was less then 3%.

The single air tank/air delivery system test conducted with the two other varieties resulted in damage of 1.2% with CDC Xena and 1.6% with Desiray.

These results suggest that seed damage with the Morris system is very low with all tested varieties and should not be a concern to producers.

The seed delivery tubes on openers may also affect damage and those with sharper bands or impact points may increase damage. Openers should also be used that have openings to permit the easy flow of the larger chickpeas.

Figure 1. Effect of the Morris Ground and Fan Speed on Chickpea Damage.



Setting up the test.

Setting mph and rpm.

Collecting the test results.

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PRAIRIE AGRICULTURAL MACHINERY INSTITUTE
Head Office: P.O. Box 1900, Humboldt, Saskatchewan, Canada S0K 2A0
Telephone: (306) 682-2555 Toll Free: 1-800-567-PAMI Web Site: http://www.pami.ca

Test Stations:
P.O. Box 1150
Humboldt, Saskatchewan, Canada S0K 2A0
Telephone: (306) 682-5033
FAX: (306) 682-5080
email: humboldt@pami.ca

P.O. Box 1060
Portage la Prairie, Manitoba, Canada R1N 3C5
Telephone: (204) 239-5445
FAX: (204) 239-7124
email: portage@pami.ca

In Cooperation With:
Agtech CENTRE
Agriculture Technology Centre
3000 College Drive South
Lethbridge, Alberta, Canada T1K 1L6
Telephone: (403) 329-1212
FAX: (403) 328-5562

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