Coating of Hulled Extra-large Confection Sunflower Seeds for Precision Planting

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Introduction

- Current advances in confection breeding have resulted in extra large (XL) hybrid confection sunflower seeds (Fig. 1)

Fig. 1: XL confection sunflower seeds

- Planting XL confection sunflower seeds results in skips and doubles during planting
- Process test in 2014 led to the development of a hulling system for XL seeds that consist of a roller mill inclined 45°, rectangular slit hopper with feed tray, and a grooved extension attached to feed tray at 45° as shown in Fig. 2.

Fig. 2: Almond Huller

- This hulling system achieved a 74% intact kernel yield in three passes while retaining germination of hulled kernels >90%.
- However, naked hulled seeds are damaged by planters during planting; hence, coating is necessary to protect the germplasm.

Objectives

- Coat the in-house hulled kernels with different materials and technologies.
- Evaluate the performance of the coated hulled kernels.

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Materials and Methods

- Coating of the hulled kernels were done in-house and from 3 companies.
- In-house coating was simply hand-painted onto hulled kernels. The in-house coating process include:
  - 3 different coating thickness (single layer, double layer, and tips)
  - 5 drying conditions (room temperature, box fan, 30 °C, 40 °C, and 50 °C).
- Coated seeds from the 3 companies were labelled A, B, and C.
- The coated kernels were analyzed for germination, water inhibition, flowability, dust off using a MeterMax air seeder test stand (Fig 3), and accelerated aging test.

Fig. 3: MeterMax test Stand

Results

Table 1: Performance of in-house coating trials

Coating Type	Drying time (h) [1]	Germ (%)[2]	Singulation (%)	Germ (%)[3]
Coating A – Single layer (15% Coating)	3	91	82	84
Coating A – Double layer (23 % Coating)	3	86	86	83
Coating A – Tips (4% Coating)	1	92	75	83
Coating B – Single layer (17 % Coating)	3	90	83	81
Coating B – Double layer (23% Coating)	3	87	85	84
Coating B – Tips (3% Coating)	1	92	73	82
Coating C – Single layer (18 % Coating)	2	91	80	81
Coating C – Double layer (25% Coating)	4	86	84	82
Coating C – Tips (5% Coating)	1	90	76	80

[1]Drying in front of box fan at room temperature; [2]Germination of coated seed under standard conditions; [3]Germination after the coated kernels went through the air seeder

Results

Table 2: Impact of accelerated aging on germination (%) of coated kernels

Seed Coating	Control	Accelerated Aging for 48 h @ 45C, 100% RH
XL hybrid F1 Seed	**85^{b}**	**72^{c}**
Naked kernel	**92^{a}**	**80^{b}**
Company A – Sample 1	**47^{f}**	**32^{g}**
Company B – Sample 1	84^{b}	75^{c}
Company B – Sample 2	74^{c}	66^{d}
Company B – Sample 3	61^{d}	54^{e}
Company B – Sample 4	60^{d}	52^{e}
Company C – Sample 1	**95^{a}**	**81^{b}**
Company C – Sample 2	**92^{a}**	**78^{c}**
Company C – Sample 3	87^{a}	73^{c}
Company C – Sample 4	83^{b}	68^{c}

Same letters signifies means are not statistically different

Table 3: Field trial emergence of some coated kernels

Treatment	Germination (%)
Hybrid Seed	62^{b}
Naked Hulled kernels	70^{a}
Sample 1 – Company B	75^{a}
Sample 2 – Company B	73^{a}
Sample 1 – Company C	68^{a}
Sample 2 – Company C	62^{b}

Same letters signifies means are not statistically different

Conclusions and Current Work

- Use of box fan at room temperature retained the highest germination (>85%). Also, the coated kernels that went through the air seeder had lower germination rate than under the standard conditions
- Kernel coated from Company A had the lowest germination rate while Company C had the highest germination rate.
- More study is done on coated kernels that retain high kernel germination. The kernels are evaluated for viability, storability, plantability, and seed singulation.