



Planting Accuracy Guidelines for Corn

PREPARING FOR A SUCCESSFUL CORN PLANTING SEASON:

Best practices to improve seed flow and singulation

Several factors, such as air and seed temperature, relative humidity, seed treatment recipe, as well as seed size and shape impact seed flow and plantability.

Excellent planting accuracy and plant stand establishment can be achieved with all seed sizes and shapes, regardless of seed treatment recipe and environmental conditions, through careful planter aid usage and planter adjustments.

This guide highlights environmental conditions that result in challenging planting conditions, as well as best practices to optimize planting accuracy.

The challenge: Spring weather is unpredictable

Warming spring temperatures signal the beginning of the crop planting season. However, weather in spring is unpredictable with cold, dry conditions often followed closely by warm, humid conditions. Rapid fluctuations in weather can create condensation on the seed, causing poor seed flow, increased seed bridging and reduced planter accuracy.



While all LumiGEN® treated seeds leave the production plant dry, when the dew point outside is above the temperature of the seed

(i.e., when it is removed from cold storage into warmer, humid conditions), condensation will start to occur.

An example from the graph below, when seed is stored at 50°F, condensation can start to occur as soon as the seed is moved into warmer, more humid conditions common during the Spring planting season. When condensation accumulates on seed, planting accuracy can be impacted if not managed properly.

The opportunity: Be prepared for Spring weather

1. Planter aids: diligently and thoroughly apply planter aids **as recommended by your planter manufacturer**. Data has shown that priming the planter unit with graphite or a talc/graphite blend, as well as mixing the planter aid properly with the seed, can greatly improve seed flow and singulation (see details below).

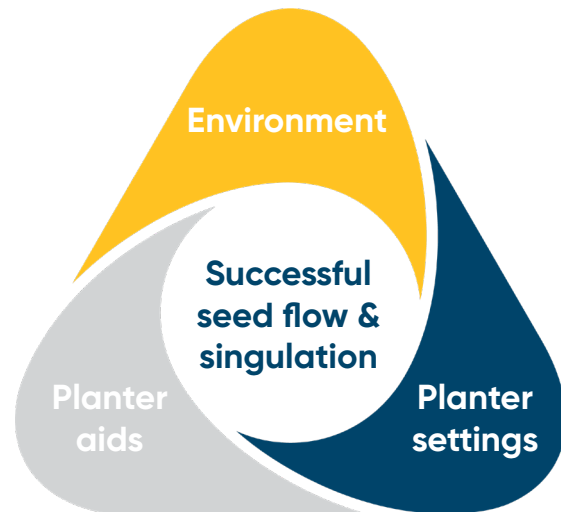
Talc: a naturally occurring mineral that acts as a **drying agent**, while reducing static electricity.

Graphite: a crystalline carbon **lubricant** that helps reduce equipment wear, improves seed flow and reduces static electricity. Not a drying agent.

Fluency Agent: a polyethylene wax-based **lubricant** used to aid seed flow. Not a drying agent.

2. **Contact your local Corteva sales representative** for precise recommendations on planter settings, and access batch-specific information for individual planters. Adjust settings to planting conditions following manufacturer instructions.
3. **Environment**: slowly increase seed storage temperature and provide increased air flow to minimize seed condensation. When using boxes or large pallets of seed bags, warming the seed should be done over numerous days (ideally, 1-2 weeks) if feasible.

Relative Humidity	Air Temperature			
	60°F	70°F	80°F	90°F
80%	Seed Condensation	Seed Condensation Talc	Seed Condensation Talc	Seed Condensation Talc
75%				
70%	50°F Seed Temp.	Seed Condensation Talc	Seed Condensation Talc	Seed Condensation Talc
65%	No Condensation			
60%		50°F Seed Temp.		
55%		No Condensation		
50%		50°F Seed Temp.		
45%	No Condensation	50°F Seed Temp.	Seed Condensation Talc	Seed Condensation Talc
40%	No Condensation	No Condensation		
35%	No Condensation	No Condensation	Seed Condensation Talc	Seed Condensation Talc
30%	No Condensation	No Condensation		



Three key management strategies for successful seed flow and singulation.

A team of experts designed two research trials to better understand the science behind planting and develop management tips.

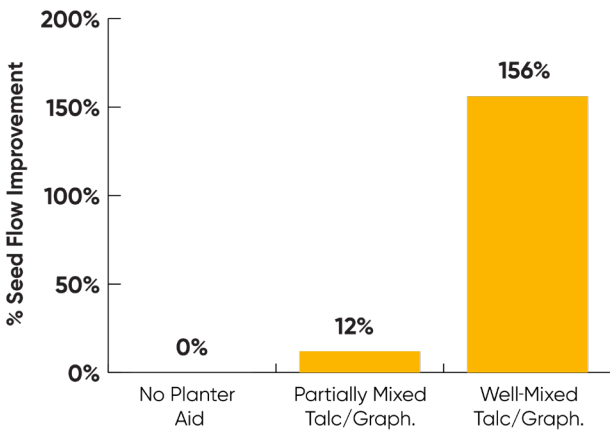
Bottom Line

Excellent planting accuracy and stand can be achieved with LumiGEN® seed treatments on all seed sizes through appropriate planter aid mixing and planter setting adjustments. Managing condensation on the seed, mixing planter aids well and maintaining and adjusting planter settings will ensure seed flow and singulation are optimized for a successful planting season.

Planter aid research from Corteva Agriscience's Center for Seed Applied Technology, Johnston, Iowa:

The benefits of planter aids are most evident under challenging environmental conditions, when flow and planting precision of large seeds are treated with a high-application rate recipe.

Large, flat corn seeds (F12) were treated with LumiGEN® seed treatments' enhanced corn rootworm package, dried and stored at 50°F (10°C) to mimic standard seed corn storage conditions. Seeds were moved directly from cold storage to our environmental chamber set at 80°F (27°C) with 80% relative humidity to evaluate both seed flow through bulk-fill planting equipment and planting precision. These seed and air temperatures are uncommon spring conditions, however can happen and may lead to challenging planting situations due to seed condensation. A talc/graphite (80:20) blend was applied at 0.25 cups per 80,000 seeds. Two levels of application quality were evaluated. In the poorly applied, planter aid was added to the middle and top of the seed pool with limited mixing. In the well-applied, it was added throughout the seed pool and mixed for uniform coverage.



Our relative seed flow assay predicts movement of treated seed through bulk-fill planting equipment. Larger values indicate better seed flow, whereas lower

values indicate poor seed flow and bridging within the system.

A quality, well-applied application of planter aid resulted in free-flowing seed from the bulk fill and through the meter, whereas a poor application was only a marginal improvement over no planter aid. The poor application was also prone to seed bridging as humidity from the warm air condensed on the cold seed to re-wet the high-application rate seed treatment recipe.



Planting precision was measured by using a Precision Planting Meter Max test stand to quantify singulation, skips and doubles.

Image: planter singulation unit used in environmental growth chamber trial

Planting precision of cold seed with no planter aid applied was poor. However, application of talc/graphite greatly improved singulation. Interestingly, acclimating the cold seed so that it was the same temperature as the environmental chamber resulted in the best planting precision.

Under these difficult planting conditions, quality application of a planter aid resulted in excellent seed flow through planting equipment and planting precision. To maximize plantability under challenging environmental conditions, our research suggests:

- Use a planter aid as recommended by the planter manufacturer. Take the time to apply it uniformly as you fill hoppers or bulk fill systems. Consider utilizing more talc as risk of seed condensation increases.
- If possible, acclimate seed to match the outdoor planting environment it will be planted in.



Image: This bulk fill test stand was developed by Kinze Manufacturing to replicate their air seed delivery system. The system includes a small, bulk fill chamber, entrainer, seed delivery tubing (length equivalent to a 24-row planter) and two individual vacuum meters.

Seed Singulation Trial from Corteva Agriscience and John Deere

Planter and meter maintenance is critical to seed singulation, spacing accuracy and planting the targeted population. Even spacing reduces competition between plants and maximizes ear count. It is recommended that meters be inspected and maintained prior to the planting season to allow for optimal performance.

Delivery of seed from the center-fill hopper to individual seed meters may be impacted by several factors, including planting time, environment, use of planter lubricant, ground speed, amount of seed treatment and seed size. The use of talc, graphite or a talc/graphite blend, specific to planter type, is critical. Thorough mixing of these lubricants in seed generally produces the best results.

The objectives of this trial were to evaluate the difference in seed singulation between:

- Poorly- and well-mixed talc/graphite (80:20) planter aid
- Small seed, 41 lbs/unit and large seed, 64 lbs/unit (PDF & F12, respectively)
- Two LumiGEN® seed treatment options (mid- and high-rate seed treatment load)
- High planting speed (10 MPH) and population (70k seeds/A) were used as additional challenges.



On-farm testing was conducted with a 36-row John Deere DB60 planter to observe singulation of the treated seed with poorly- and well-applied talc/graphite.

For each test, seed treatment and seed size were the same with well-mixed planter aid in one center-fill bulk tank and partially mixed planter aid in the other bulk tank. The partially mixed planter aid treatment followed the suggested label rate also, but was not mixed with the seed. The well-applied planter aid followed the label by adding a scoop to the bottom of the hopper, then planter aid was added to seed flowing into the hopper and thoroughly mixed with a John Deere AA99640 Scoop throughout the fill.



Image: Well-mixed treatment, adding planter aid to the hopper while seed is flowing.



Image: Well-mixed treatment, mixing seed with scoop

When talc/graphite was poorly-mixed, percent singulation (skips and doubles) decreased, indicating a less accurate planting experience. However, when talc/graphite was well-mixed, percent singulation increased and no difference was observed between seed size or seed treatment. Large seed treated with the higher seed treatment load, when talc/graphite was well mixed delivered >98% singulation at 10 MPH and planting rate of 70k seeds per acre.

In conclusion, both the environmental chamber data and on-farm experience with John Deere's DB60 planter demonstrated excellent planting accuracy with all seed sizes and shapes, regardless of seed treatment recipe and environmental conditions through careful planter aid usage and optimized planter adjustments.

Components of LumiGEN® seed treatments for corn are applied at a Corteva Agriscience production facility, or by an independent sales representative of Corteva Agriscience or its affiliates. Not all sales representatives offer treatment services, and costs and other charges may vary. See your sales representative for details. Seed applied technologies exclusive to Corteva Agriscience and its affiliates.