InVigor RATE
Frequently Asked Questions

What is InVigor RATE?

InVigor RATE is a targeted plant population (TPP) recommendation supported by seed-count packaging to help improve both the performance and consistency of InVigor® hybrid canola.

Why is BASF introducing InVigor RATE?

It is our desire that every customer has a great experience growing InVigor. By seeding InVigor at the optimal plant population of 5 to 7 plants/ft^2, growers will be able to maximize the genetic potential of each InVigor hybrid.

What are the agronomics behind InVigor RATE?

There is a lot of agronomic research behind InVigor RATE. The BASF Agronomic Excellence team was established to provide the best agronomic recommendations for growing InVigor, which helps growers take their InVigor hybrids to the next level.

(a) Years of research by the Agronomic Excellence team from BASF shows that the optimal target plant population to maximize yield, agronomic performance and consistency of InVigor hybrid canola is 5 to 7 plants/ft^2.

(b) The average survivability of InVigor canola across Western Canada is 50 to 70%.

In order to achieve the TPP of 5 to 7 plants/ft^2, growers will need to account for the thousand seed weight (TSW) of their seed when seeding InVigor hybrid canola and seed at the recommended seeding rate for the TSW range they are seeding. Growers will need to calibrate their drill for each range in order to achieve the recommended seeding rates.

How does a seeding rate of 10 seeds/ft^2 equate to 5 to 7 plants/ft^2?

The Agronomic Excellence team found that in Western Canada, the average survivability of InVigor hybrid canola is approximately 50 to 70%. By seeding approximately 10 seeds/ft^2, and assuming an average survivability rate of 50 to 70%, this will produce 5 to 7 plants/ft^2.

Plant Population Calculator: https://agro.basf.ca/invigorrate/?pid=plant-pop

What is survivability?

The term “survivability” is the percentage of seeds planted that survive to become yield-producing plants at harvest.

To determine survivability, we recommend growers conduct plant counts at both establishment (after first application of Liberty® herbicide) and by counting the stubble after swathing or harvest. Survivability is the percentage of seeds planted that produce plants that survive to the end of the season, contributing to yield.

Check out the survivability calculator: https://agro.basf.ca/invigorrate/?pid=survive

Do seed treatments and additives perform differently on larger versus smaller seeds?

No. The range of thousand seed weights present in the InVigor RATE packaging do not differ enough to result in any agronomic performance differences.

Does the seeding rate recommendation change with bags treated with Lumiderm?

No. The addition of Lumiderm® seed treatment is an option a grower has to provide additional protection against cutworms which is applied at a standard rate across all TSWs.

Thousand seed weight

How is seed size measured – by thousand seed weight?

The seed industry measures average lot seed size by measuring the weight in grams of 1000 seeds, which is called thousand seed weight (TSW).

Why does BASF use TSW versus TKW?

TKW stands for “thousand kernel weight” which is measured in grams and is a standard within the CFIA. Since canola is not a kernel, the common term used is “TSW” or “thousand seed weight”.

What is the difference between the TSW on the tag and the TSW range on the bag?

Every canola seed lot that is processed is assigned a TSW which represents the average seed size of that lot. The TSW indicated on the seed tag is the actual TSW of the lot which will fall into one of the 4 bag ranges (A, B, C or D).

Is TSW measured prior to treating or after?

The TSW of a given canola seed lot is measured before any seed additive or treatment occurs.

Does the addition of seed treatment and biologicals mean a bigger seed and affect seed size, weight and calibration?

No. The amount of product applied to a single seed is so low it does not significantly change the TSW, regardless of seed size.

Is seed from the C and D ranges better than seed from the A and B ranges when it comes to germination, vigor and yield?

Research from the Agronomic Excellence team shows there is no difference in the emergence, vigor and yield performance of InVigor hybrid canola in seed size ranges A through D.

There are several independent studies that support and show the same results as those observed by the Agronomic Excellence team.

Why does Neil Harker’s research suggest that bigger seed is better? Why are the results different from your findings?

Dr. Neil Harker, research scientist from Agriculture & Agri-Food Canada, published a study on seed size, which supports the work done by Agronomic Excellence showing that there are no differences in the emergence and yield performance of hybrids based on thousand seed weights.

Harker’s research concluded that there was a difference in the early-season biomass seed in the small fraction versus medium and large fractions from within one seed lot. Harker’s findings also illustrated that the difference in seed sizes did not lead to differences in canola emergence or yield.

It is important to note that the methodology that Harker used was different than what the Agronomic Excellence team used. Harker took one seed lot and separated the lot into different categories of seed size and conducted the trials on each category of seed sizes within the lot. The Agronomic Excellence research used whole seed lots that were not fractioned into different sizes but measured based on the average TSW of the lot. However, the Agronomic Excellence team has performed similar work with fractioned seed, which demonstrates that the smallest seeds within a seed lot have less vigor than the balance of the seed lot. This is similar to the findings of Harker's research.

It is important to keep in mind that every seed lot has a distribution of seed sizes within it and does not contain just one size. However, the seed in a bag of InVigor has no detectable difference in performance between a TSW of 4.0 and 5.9 grams.

Reference: Harker, N. K., et al. "Seed size and seeding rate effects on canola emergence, development yield and seed weight." Canadian Journal of Plant Science. Volume 95, Number 1, January 2015. https://www.nrcresearchpress.com/doi/full/10.4141/cjps-2014-222#.XV2wP3dFy70

"I'm searching for smaller seed so that I can seed more than 10 acres/bag. BASF is just doing this to take away the financial advantage that growers have found."

One of the objectives of InVigor RATE is to create a more consistent product which includes providing the grower with the highest-performing seed and having the same amount of seed in each bag of InVigor.

Genetics and the environment where a seed lot is produced dictate the TSWs of a seed lot. When selecting hybrids to commercialize, BASF does not select based on TSW. Naturally, some hybrids tend to produce smaller TSW seed lots and others tend to produce larger TSW lots. Due to the variability in the environmental conditions present at seed maturation across all of our seed production fields, the interactions between genetics and the environment are unpredictable, and as a result, it is impossible for BASF to predict or control the thousand seed weight for InVigor hybrids

With the move towards Pod Shatter Reduction hybrids and straight cutting more of our seed production fields, we anticipate the TSWs of our hybrids will increase in the coming years. Additionally, there are times a hybrid has smaller TSWs one year and larger TSWs another year. The new packaging will reduce the variability in the number of seeds in each bag associated with all these unpredictable factors and ensure every bag of InVigor hybrid canola contains enough seed to seed 10 acres. This level of consistency and predictability is not possible with seed packaged into 50 lb bags.

The Agronomic Excellence team has proven that InVigor hybrids between a TSW of 4.0 to 5.9 grams perform exactly the same; and the goal of BASF is to provide only the best performing seeds in every bag of InVigor.

InVigor RATE in the field

How are the seeding rate recommendations determined?

Recommended seeding rates for InVigor are calculated to result in an end plant population of 5 to 7 plants/ft^2. By seeding approximately 10 seeds/ft^2 and taking into consideration an average survivability of 60%, the grower should achieve 6 plants per square foot, on average.

It's important to remember that results may vary on your farm due to environmental factors and preferred management practices. For best practice, growers should determine the survivability on each piece of land they farm to ensure they are achieving the desired 5 to 7 plants/ft^2.

For example: Range "A" contains TSWs between 4.0 g and 4.4 g. The seeding rate recommendation will be based on the 4.4 g TSW, assuming a planting rate of about 10 seeds/ft^2 targeting 60% survivability with the goal of achieving 6 plants/ft^2.

(Seeding rate (lb/ac) = (9.6 x 6 plants/ft^2 * 4.4 g)/60 = 4.2 lb/ac)

Seeding Rate Calculator: https://agro.basf.ca/invigorrate/?pid=seed-rate

"There are way more calibrations to do now."

By narrowing the TSWs down to four ranges, BASF has actually reduced the number of calibrations a grower will need to do.

In the past, a single hybrid could have over 20 different TSWs which would result in 20 different calibrations and seeding rates if targeting a plant population of 5 to 7 plants/ft^2. The four-range structure within the InVigor RATE packaging will reduce this complexity to just four different calibrations and seeding rates. Setting the drill to target 5 to 7 plants/ft^2 will help a grower get the most out of their InVigor.

What if the drill row spacing is wider or narrower than 12˝?

The BASF target plant population research is based off 10 to 12˝ row spacing. The targeted plant population of 5 to 7 plants/ft^2 remains consistent regardless of row spacing. It is important to note that increased row spacing can affect other factors, such as delayed maturity and weed management if spacing becomes too wide.

Does seeding by singulation impact the targeted plant population recommendation?

No, the recommended plant population for InVigor is 5 to 7 plants/ft^2, regardless of how it is seeded. However, the survivability of the seeds may be different using seed singulation planting methods. Please contact your seeder manufacturer for accurate calibration instructions.

Packaging

How will InVigor packaging change in 2020?

To support the target plant population recommendation of 5 to 7 plants/ft^2, for the 2020 growing season, InVigor will be packaged based on four TSW ranges called, "A", "B", "C" and "D".

BAG RANGE		A	B	C	D
RECOMMENDED SEEDING RATE* LBS/AC		4.2 (~10 SEEDS/FT^2)	4.7 (~10 SEEDS/FT^2)	5.2 (~10 SEEDS/FT^2)	5.7 (~10 SEEDS/FT^2)
TSW RANGE (GRAMS)		4.0–4.4	4.5–4.9	5.0–5.4	5.5–5.9
BAG WEIGHT	LBS	42.2	47.0	51.8	56.7
	KG	19.1	21.3	23.5	25.7
# OF SEEDS/BAG		MINIMUM 4.25 MILLION SEEDS			
SEEDS APPROXIMATELY 10 ACRES PER BAG					

How many seeds are in each bag of InVigor?

There are a minimum of 4.25 million seeds in each bag, regardless of the TSW of the lot.

How many seeds are in each mini bulk tote of InVigor hybrid canola?

There are a minimum of 85 million seeds in each tote, regardless of the TSW of the lot.

How many acres does each bag seed?

Every bag of InVigor hybrid canola is designed to seed 10 acres. This will provide more consistency in the number of seeds in every bag and the predictability in the number of acres that can be seeded with every bag of InVigor. Because every bag will contain a minimum of 4.25 million seeds, regardless of the TSW, you'll notice a difference in the size and weight of a range "A" bag (smaller) compared to a range "D" bag (larger), but the amount of seed is the same.

How do I identify which range I have?

The letter of the range (A, B, C or D) will be identified on the sides and front of the bag, along with the recommended seeding rate for the bag's particular range. In addition, ranges for mini bulk totes will also be clearly identified in the same way.

Will the ranges change from year to year?

No, BASF plans to maintain four ranges (A, B, C and D) and keep these ranges consistent between 4.0 and 5.9 g TSWs. The distribution of seed between the ranges however may vary by hybrid and year to year.

Will the bag provide a seeding rate in lbs/acre?

Yes, every bag will have a recommended seeding rate in pounds per acre based on seeding approximately 10 seeds/ft^2 and targeting 10 acres/bag.

What if a grower wants to fine tune their seeding rate based on the actual TSW on the certified seed tag?

The actual TSW of each seed lot will be printed on the seed tag, as in the past. This will allow the growers to calibrate specifically to the exact TSW and not the range listed, should they choose to do so.

In addition, seeding rates can also be adjusted based off of actual survivability of the field that the grower has determined. There are three charts on the back of every bag that a grower can use to further refine their seeding rate based off of 50%, 60% or 70% survivability. On each of the charts, the seeding rate can be further refined by choosing the desired plant stand of 5, 6 or 7 plants/ft^2.

All charts will display the recommended BASF seeding rate, which assumes 60% survivability and a desired plant stand of 6 plants/ft^2. This seeding rate will also be displayed on the front of the bag.

Retail logistics, ordering and pricing

Will growers be able to order by range?

No. A variety of factors, such as genetics and environment, influence the TSW of the seed lots available in a given year, which makes it impossible for BASF to predict the actual volumes of each range available.

It is important to remember that BASF research has shown that the performance of our hybrids is consistent between ranges "A", "B", "C" or "D", when seeded to target 5 to 7 plants/ft^2, so there is no need to seek out specific TSW ranges.

Will there be an effort to have distribution receive the same lots/sizes as much as possible for each hybrid?

When seed is shipped from BASF to our distribution partners, every effort will be put into minimizing the number of ranges that will be shipped. However, with some of our larger customers, this will be impossible due to the volume of seed they are purchasing. A great deal of effort has gone into educating our distribution partners on InVigor RATE. However, the internal strategy of distribution centers will determine their course of action.

Will retailers get the same ranges for each hybrid?

Seed is delivered to retail by one of two means: either directly from BASF or from a warehouse. When coming directly from BASF, we will work towards minimizing the number of ranges a retail may receive. Retails can help minimize the number of ranges they receive for a given hybrid by not splitting their orders into several smaller orders and trying to make larger orders.

However, having multiple ranges of a given hybrid at a retail will likely occur. This is not any different than what has happened in the past with the different lots for every hybrid. However, in 2020, the InVigor RATE concept will narrow down the TSWs into the four ranges. In past years, certain hybrids

have had seed lots with as many as 20 different TSWs. By transitioning to the A to D range system, BASF is simplifying inventory management for our retail customers, while adding value to the InVigor hybrid lineup.

Will this increase retail shoppers?

Growers in today's market already shop around for certain TSWs, and this will likely continue in the future. However, it needs to be understood that the performance of InVigor hybrid canola, in terms of emergence, vigor and yield, is consistent, regardless of the seed size within the four ranges.

How do we book seed? By acre or by bag?

Seed will continue to be ordered and forecasted by the number of bags. Instead of trying to make forecasting adjustments based on TSW, retails and growers can now have the confidence that each bag will seed 10 acres, regardless of TSW, making it easy to predict the number of bags required.

How is seed going to be distributed to retails? How early do we know what TSW a specific seed lot will be?

The ability to determine the available TSW lots does not happen until the seed has been harvested, processed and analyzed. For InVigor RATE, this is no different than what occurs today with the exception that seed will be separated into four ranges. Once ordered, seed will be sent to retail or distribution centers direct from BASF as it is processed. TSW ranges being sent will be communicated through lot numbers.

Packaging and stacking - how will this effect storage?

The total number of bags of seed per pallet will not differ. However, due to the different ranges and weights associated with InVigor RATE packaging, ranges A, B, C and D weights and dimensions will be different. Having said that, the footprint each pallet consumes will be identical and pallets can still be stacked two high.

What effect will InVigor RATE have on my seed costs?

InVigor RATE will provide consistency and better predictability regarding InVigor seed costs, since each bag will seed the same number of acres, making it much simpler to predict the number of bags required. The pricing of InVigor hybrids are independent of InVigor RATE.

Will there be price differences based on each range?

No, there will be no difference in price based on range. The performance is equal among all the ranges, therefore there will be no price difference between different ranges.

For more information, please visit **agsolutions.ca/InVigorRATE**, contact your BASF Retail Representative or call **AgSolutions®** Customer Care at 1-877-371-BASF (2273).

InVigor® RATE

Always read and follow label directions.

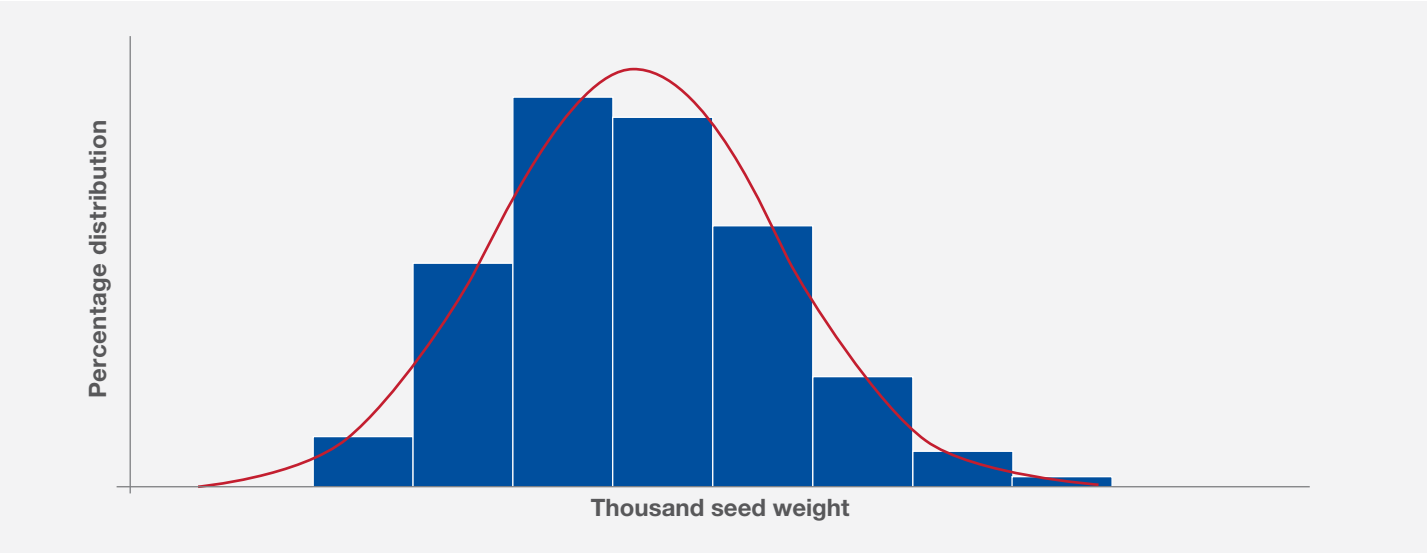
InVigor RATE and planters Frequently Asked Questions

Does a grower need a specific thousand seed weight (TSW) to seed canola with a planter?

Current planters have been developed for corn and soybeans and many have not been optimized to seed canola. The disk and size of the disk holes need to be considered when seeding canola with a planter. Having consistent seed size within the seed lot ensures the correct number of seeds are being planted. Each lot of seed contains a distribution of seed sizes within it, with the labeled TSW being the average seed size across the lot. This practice is used across all canola seed lots on the market today. Generally, the less variation in seed size within the lot, the more suitable it will be for planters. BASF has incorporated conditioning processes to reduce the amount of variability within a seed lot.

Seed conditioning is a multistep process involving seed separation by size, shape and density. BASF has refined their conditioning process to target seeds that do not perform as consistently as other seed within the lot. Conditioning of InVigor® hybrid canola seed largely removes the majority of the underperforming seeds from the lot.

The performance of the planter in relation to a specific TSW can't be predicted without testing.



Bigger seed is better? What is the smallest seed that can be used?

The size of the seed needed is dependent on the size of the holes in the planter disk. The size of a canola seed can vary from one seed to the next, regardless of the TSW listed on the bag. Planting consistency can be impacted by several factors, including the size of the holes in the planting disk, the amount of vacuum being drawn across the face of the disk, the speed of the disk and the material the disk is made of. Consequently, the grower needs to manage these factors to get precise delivery of canola seed, regardless of TSW.

Simply choosing a canola seed with a certain TSW versus another doesn't address all of these factors. Follow the recommendations of the planter manufacturer and ensure that it is backed up by good quality research on canola.

Does a grower still need to plant 10 seeds/ft^2?

Planting 10 seeds/ft^2 is a general recommendation based on average emergence of plants being 50 to 70% when seeded with an air drill. Many factors can influence seed emergence and using a planter does not impact emergence to the same extent as soil moisture and residue management.

Precise control of seed depth into available moisture combined with effective on-row packing can increase emergence.

Singulation of canola seeds with a planter lowers the importance of reducing seeding rate. If you combine singulation, precise control of depth and effective seed placement under ideal environmental conditions (ideal moisture and warm soil temperature), you can reduce your seeding rate. However, you should be targeting the same number of established plants (5 to 7 plants/ft^2).

If a grower seeds at 10 seeds/ft^2 and produces 6 plants/ft^2, this is 60% survivability. If seeding with a planter increases survivability by 15%, moving survivability to 75%, then they can reduce the number of seeds that they are seeding by 2, to 8 seeds/ft^2.

What is the relationship between row spacing and its effect on plant population within the row?

When comparing a narrow row (10”) to a wide row (20”), BASF research shows that there isn’t an advantage to reducing the number of plants per square foot. The lowest yielding combination from our trials have been with wide rows and low seeding rates. The conventional thinking is that if a grower doubles the row spacing, they can reduce the seeding rate by half, but our data suggests targeting 5 to 7 plants/ft^2 still delivers the highest yield, regardless of the row spacing.

What research have you done with planters?

Everything we research with an air drill we also research using a planter. It is important to note that we use drills with singulation meters on them, and it is not an actual planter.

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