

GET THE MOST OUT OF INVIGOR.

A GUIDE TO OPTIMIZING YOUR YIELD POTENTIAL.

InVigor[®]
RATE

□ - BASF

We create chemistry



MAXIMIZE PERFORMANCE

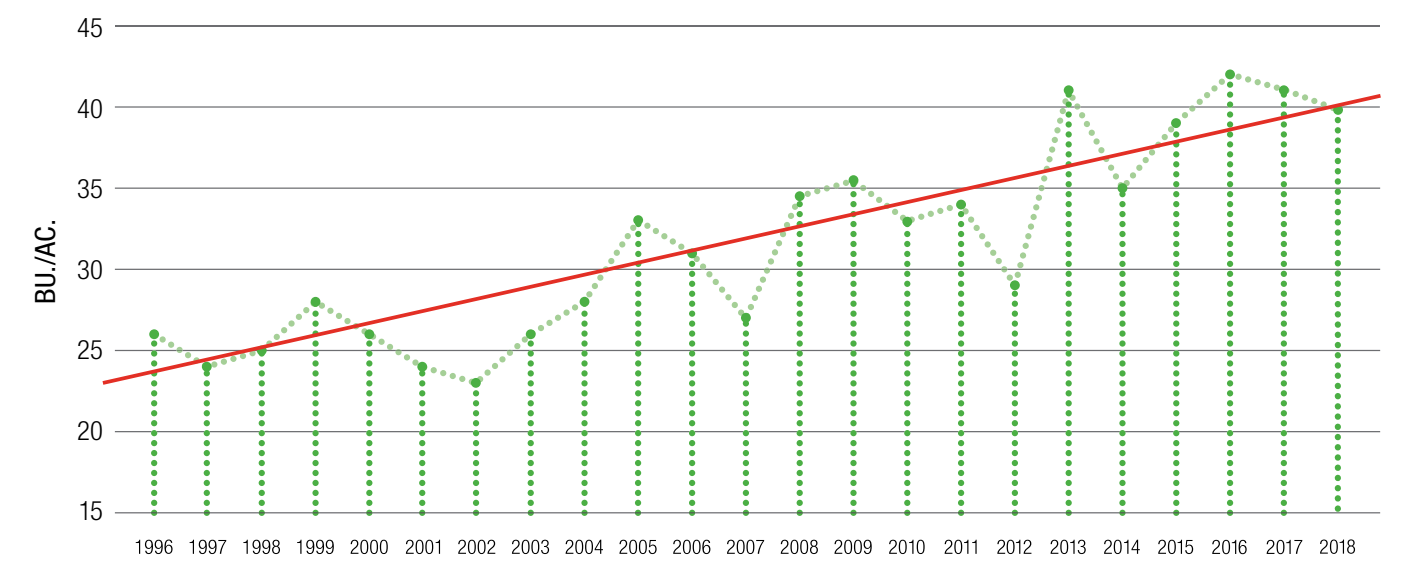
WITH A TARGET PLANT POPULATION OF 5 TO 7 PLANTS/FT².



MAXIMIZING THE CANOLA ACRE.

Over the past 22 years, Canadian growers have done an amazing job meeting the steadily increasing global demand for canola. As the number of canola acres has grown, producers have continued to take advantage of the improved yield capabilities and trait technologies of InVigor® hybrid canola.

22-YEAR CANOLA YIELD TREND.



The Canola Council of Canada, in association with various industry partners, has set a yield goal of 52 bushels per acre to be realized by the year 2025.

In support of this initiative, BASF is committed to helping you reach that goal by maximizing the yield potential, agronomic performance and consistency of your InVigor canola hybrids. Through InVigor's agronomic research, this guide is designed to do exactly that.

**+3BU./AC.
PLANT ESTABLISHMENT**

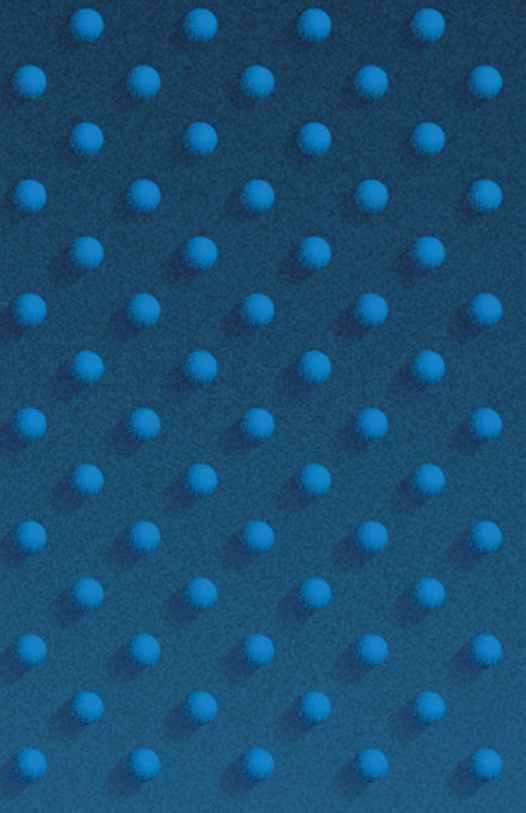
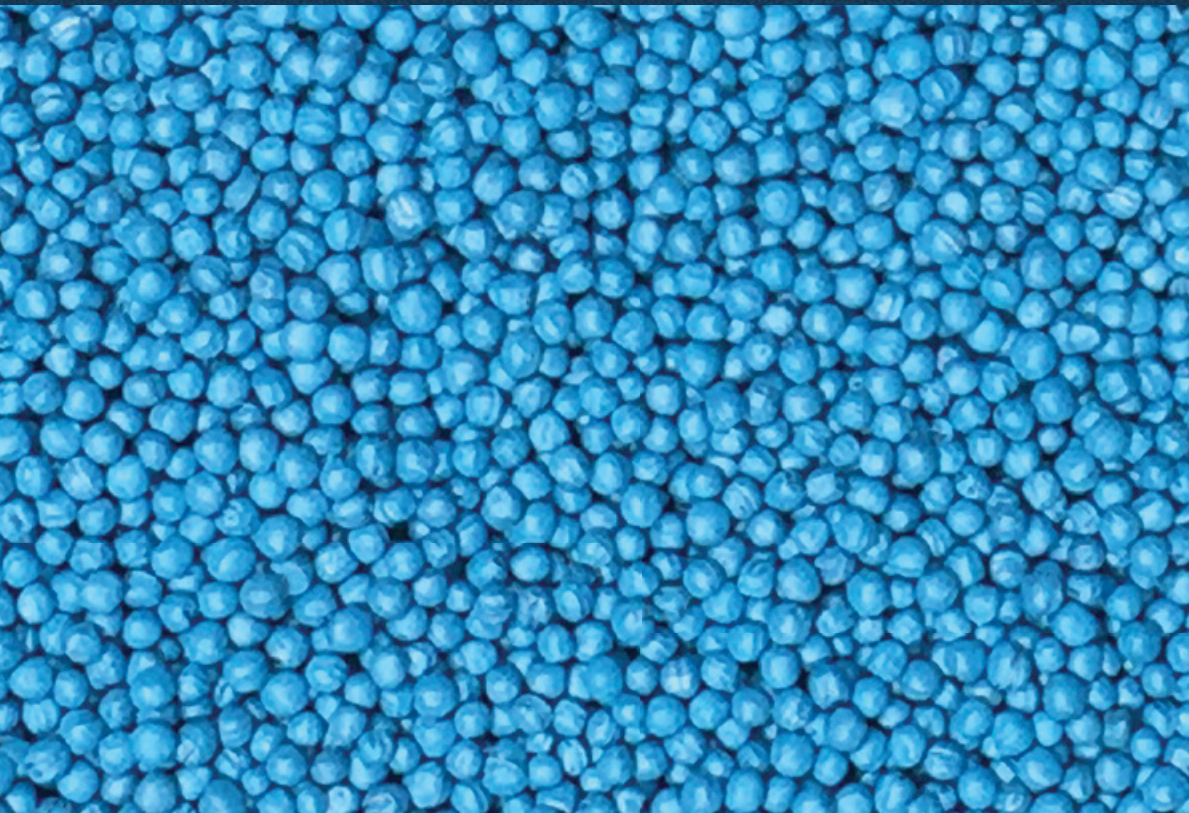
The Canola Council of Canada estimates that improvements in seeding and plant establishment alone can increase average yields by 3 bu./ac. – often with no additional input costs.

MORE THAN A BAG OF SEED.

We are invested in helping you produce a better crop, and that goes far beyond delivering consistent yield increases and genetic improvements. As a leader in the North American canola industry, BASF remains dedicated to providing real value to our partners by investing in cutting-edge cropping solutions to help meet your most difficult challenges.

For this reason, the **BASF Agronomic Excellence team** was created to focus on providing value for growers beyond our genetics. The team conducts large-scale replicated field trials across Western Canada with plots that are 15 times larger than those used by traditional breeding programs. Additionally, rigorous trial protocols are followed to produce data that fairly and accurately reflects on-farm conditions across the Canadian Prairies in order to help maximize the performance of your InVigor hybrids.

The first outcome of the Agronomic Excellence research is InVigor RATE — a targeted plant population recommendation based on achieving 5 to 7 plants/ft² that helps maximize the potential of your InVigor canola.



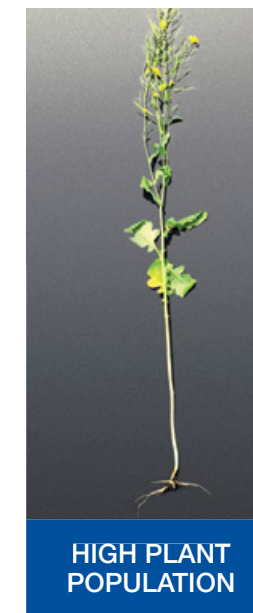
CANOLANOMICS.

In the past, many growers have followed the traditional practice of seeding five pounds per acre and regarded a strong emergence as the primary indicator of how well their canola crop would perform throughout the season. However, this approach overlooked the adverse effects of competition within the crop itself. Intra-crop competition between plants plays a major role in both plant productivity and plant survivability. In this regard, by targeting an optimal plant population of 5 to 7 plants/ft², it will further improve the performance and consistency of your InVigor hybrid canola.

Optimal plant populations maximize the use of available resources (sunlight, moisture and nutrients) and space within the seedbed. Additionally, they are critical for helping to reduce intra-crop competition.

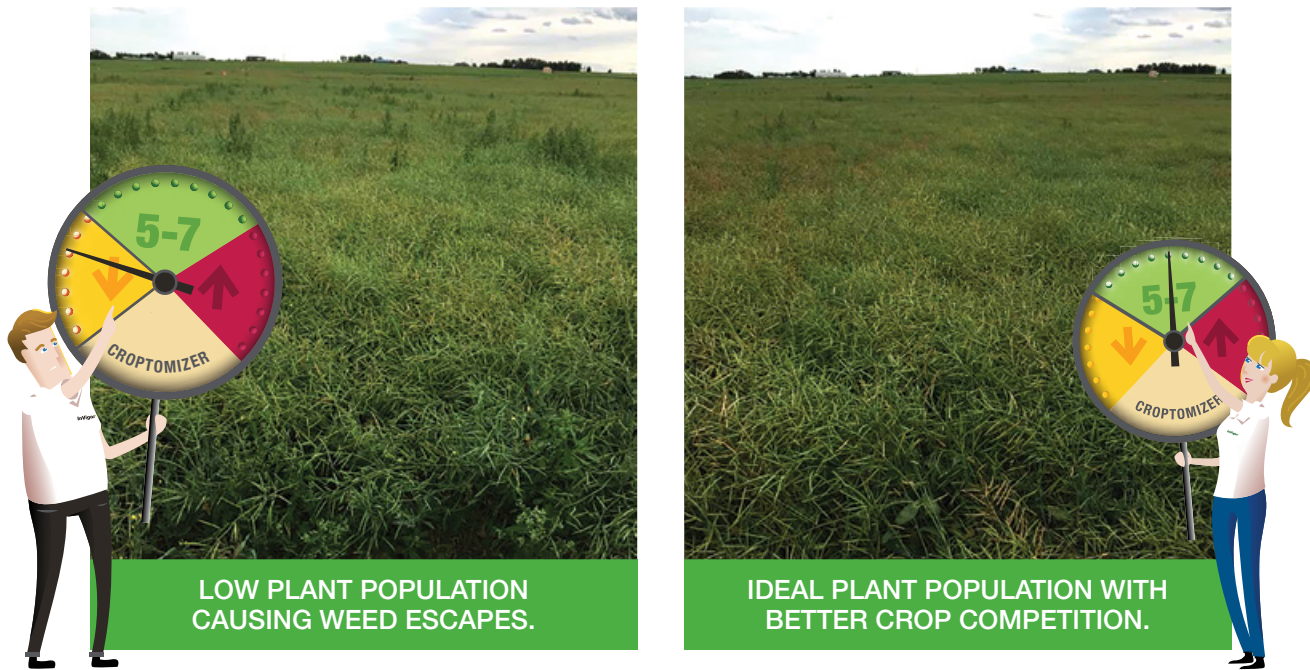
SEEDING RATE STUDY.

INCREASED SEEDING RATE REDUCES DAYS TO MATURITY.



Source: Agronomic Excellence Trial, Carman MB. Results may vary on your farm due to environmental factors and preferred management practices.

PROBLEMS WITH LOW PLANT POPULATIONS.



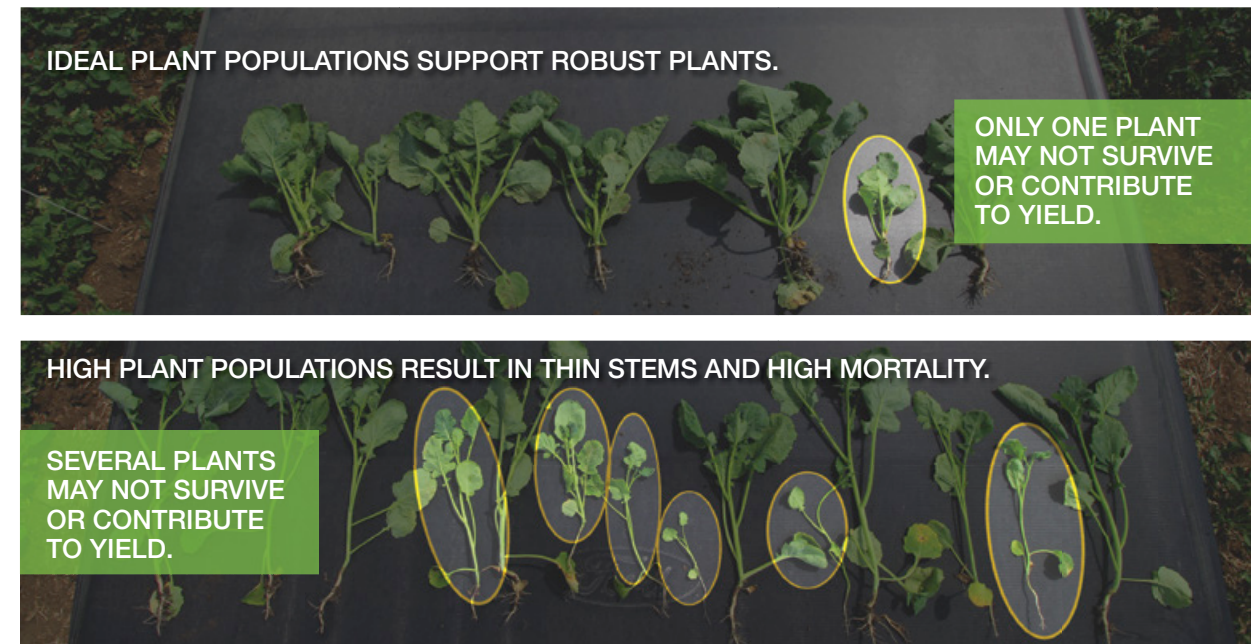
LOW PLANT POPULATION CAUSING WEED ESCAPES.

IDEAL PLANT POPULATION WITH BETTER CROP COMPETITION.

Source: Agronomic Excellence Trial, Cheadle AB. Results may vary on your farm due to environmental factors and preferred management practices.

- With an abundance of space and resources, lower plant populations allow weed competition to increase significantly
- Poor weed control due to reduced crop competition, decreasing the effectiveness of herbicide applications
- Not fully utilizing the seedbed, inefficient use of resources such as moisture, nutrients, sunlight and space
- Drastically affects the plant architecture, resulting in larger plants with delayed flowering and uneven maturity
- Difficult to stage for fungicide application, swathing and harvest
- Leaves no room for plant loss throughout the season

PROBLEMS WITH HIGH PLANT POPULATIONS.



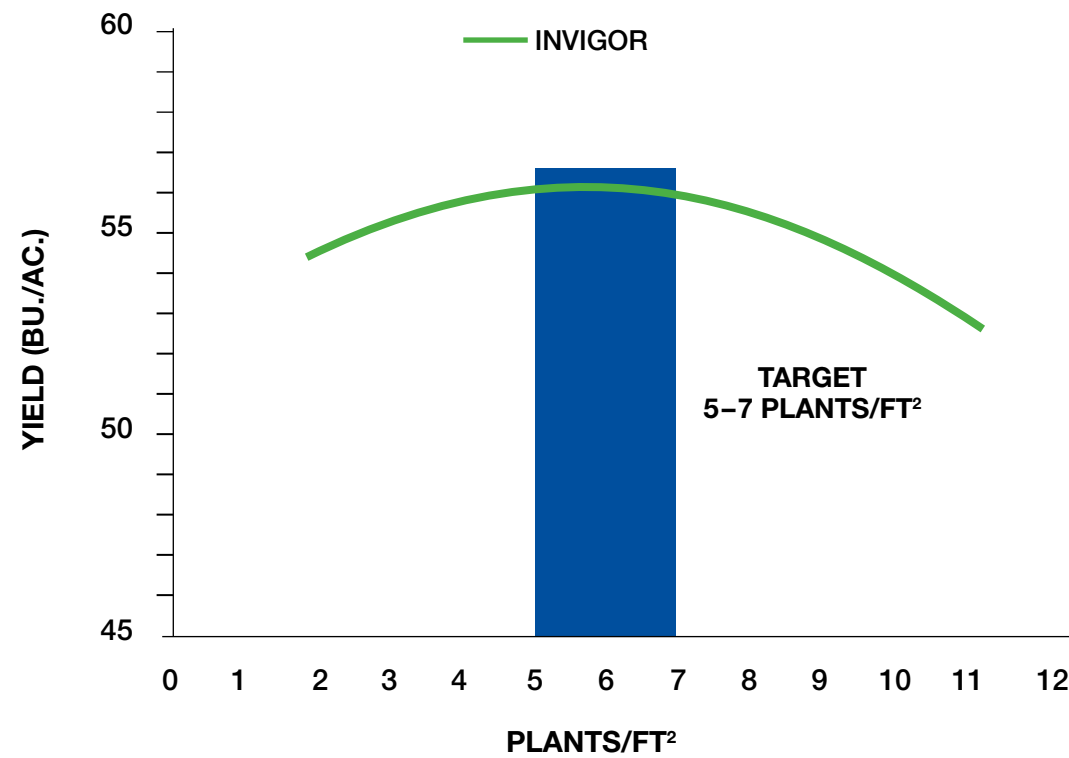
- Higher plant populations tend to produce taller, thinner canola plants that are less productive
- Increased intra-crop competition causes higher in-season mortality rates, whereby the seedlings will essentially choke each other out (reducing survivability)
- Like weed competitors, canola plants in over-populated crops fight amongst themselves for available resources and do not significantly contribute to yield

- Competition for resources significantly reduces plant productivity, resulting in reduced yield potential
- Plants are less robust, thinner and have weaker stems; leaving plants more susceptible to lodging
- Lodging combined with an overly dense crop canopy traps moisture, creating the perfect environment for sclerotinia to spread
- Plants in an over-populated stand may be more susceptible to the negative impacts of heat stress and low moisture

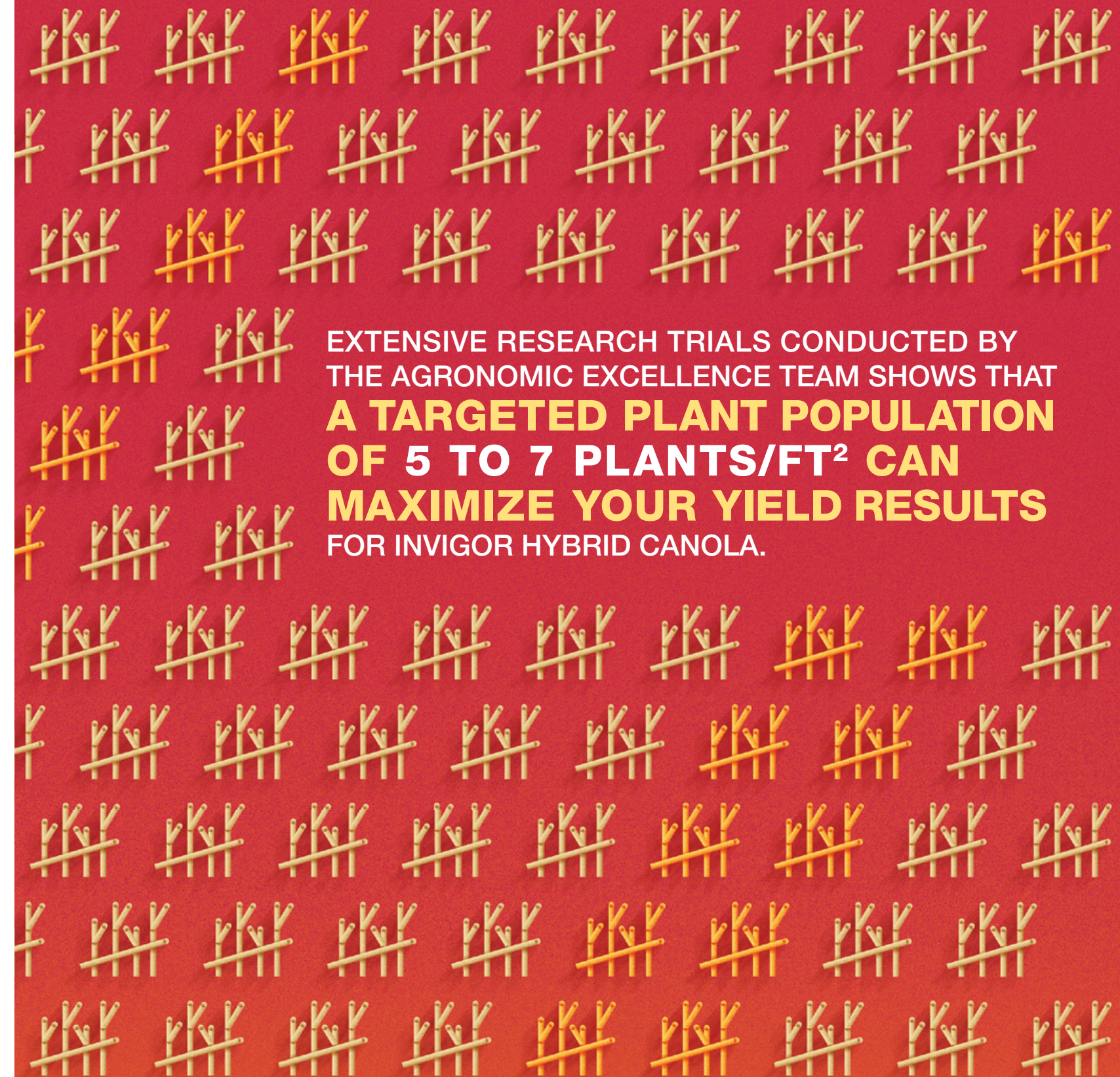
THE ADVANTAGE OF TARGETED PLANT POPULATION.

Research from the BASF Agronomic Excellence team has shown that targeting an optimal plant population is critical to help maximize the performance of your InVigor hybrid canola through improved plant stand efficiency.

5 TO 7 PLANTS/FT² OPTIMUM TARGET PLANT POPULATION.



Source: 42 Agronomic Excellence Trials (2013-2016).



OPTIMAL SEEDING RATES AND PLANT SURVIVABILITY.

To achieve a targeted plant count of 5 to 7 plants /ft², the survivability of seeds planted needs to be taken into consideration. Over five years of agronomic focused research by the Agronomic Excellence team concluded that the average survivability of InVigor hybrids is between 50 to 70%, based on varying conditions across Western Canada. **BASF therefore recommends planting 10 seeds/ft² to achieve 5 to 7 plants/ft².** However, every field and season is different, so ongoing monitoring to understand the unique survivability of your fields is essential to your crop's success.



FACTORS THAT AFFECT SURVIVABILITY.

ABIOTIC OR MECHANICAL/ PHYSICAL STRESSORS.

- Equipment set up and calibration
- Crop residue
- Soil moisture
- Soil temperature
- Crusting and compaction
- Seeding depth and speed of planting
- Fertilizer placement

BIOTIC OR LIVING STRESSORS.

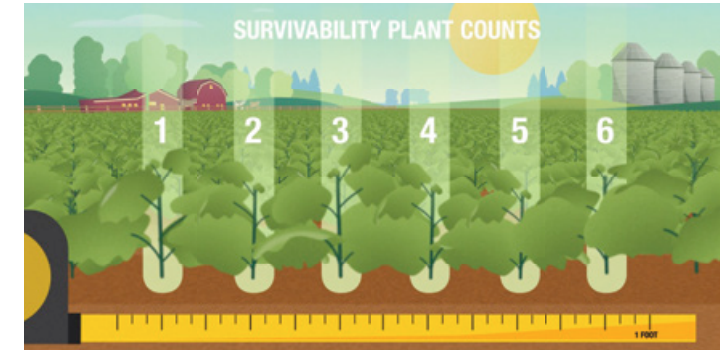
- Seedling and crop disease
- Insects
- Weeds

DETERMINING SURVIVABILITY THROUGH PLANT COUNTS.

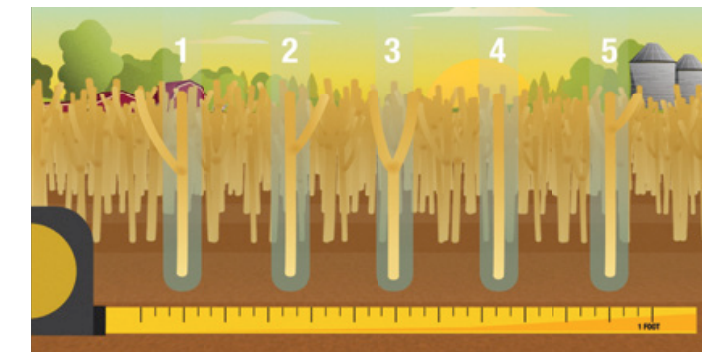
To accurately determine the survivability on your fields, there are two measurements that can be taken throughout the season.

OPTION 1: ESTABLISHMENT COUNT.

To give you an early indication of survivability, this count is performed following your first application of Liberty[®] herbicide (to remove potential weeds). Simply count the number of plants in a linear foot of a row and measure row width. **Plant density is determined by:**



$$\text{PLANTS/FT}^2 = \frac{\text{AVERAGE \# OF PLANTS IN LINEAR FOOT OF ROW}}{\text{ROW WIDTH (in.)}} \times 12$$



OPTION 2: FALL STUBBLE COUNT.

Ultimately, your overall survivability (number of plants that contribute to your yield) is determined from a stubble count after harvest. Simply count the number of canola stalks within a linear foot of a row and know your seeding rate.

Once complete, you can use the following equation to determine your unique plant survivability:

$$\% \text{ SURVIVABILITY} = \frac{\text{\# OF PLANTS/FT}^2 \text{ (FALL STUBBLE COUNT)}}{\text{\# OF SEEDS PLANTED (SEEDING RATE (lbs./ac.) / TSW (grams) / 0.096)}} \times 100$$

EVERY BAG SEEDS 10 ACRES.

New InVigor packaging will be available for the 2020 season to make it EASIER to achieve **5 to 7 plants/ft²** and features four different thousand seed weight (TSW) ranges and recommended seeding rates for planting 10 acres per bag.

Make sure you calibrate seeding equipment according to the TSW range listed on your seed bag.

BAG RANGE		A	B	C	D
RECOMMENDED SEEDING RATE* LBS./AC.		4.2 LBS./AC. (~10 SEEDS/FT ²)	4.7 LBS./AC. (~10 SEEDS/FT ²)	5.2 LBS./AC. (~10 SEEDS/FT ²)	5.7 LBS./AC. (~10 SEEDS/FT ²)
TSW RANGE		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 10 ACRES PER BAG					

* Recommended seeding rates are calculated according to seeding approximately 10 seeds/ft² and an average survivability of 60% to achieve 6 plants/ft². Results may vary on your farm due to environmental factors and preferred management practices.

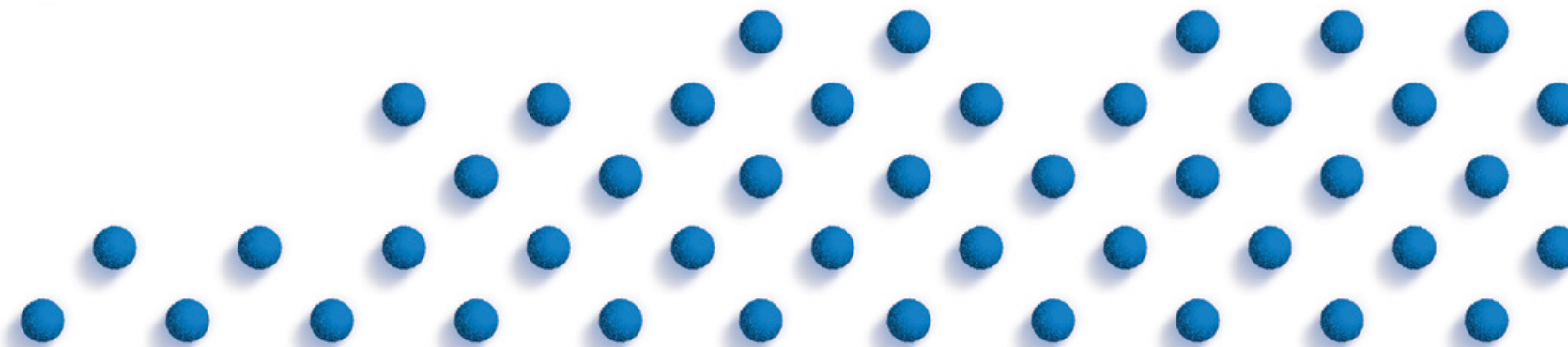
NEW SEED COUNT PACKAGING IN 2020.



THIS BAG WILL SEED 10 ACRES WHEN SEEDED AT 5.2 LBS./AC.
 TSW Range: 5.0–5.4 (For exact TSW please see seed tag)
 Minimum Seed Count: 4,250,000
 Net Contents: 23.5 kg (51.8 lbs)

SEE BACK OF BAG FOR MORE DETAILS ON RECOMMENDED SEEDING RATE

Hybrid Canola Seed



While not mandatory, for growers that may want to dial in their seeding rate further, identify the exact TSW on your bag of InVigor hybrid canola, choose your anticipated survivability and adjust your seeder to the lbs./ac. indicated.

SEEDING RATE LBS./AC.

SURVIVABILITY 50%	THOUSAND SEED WEIGHT									
DESIRED PLANT STAND (PLANTS/FT ²)	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9
	A LBS./AC.					B LBS./AC.				
5	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7
6	4.6	4.7	4.8	5.0	5.1	5.2	5.3	5.4	5.5	5.6
7	5.4	5.5	5.6	5.8	5.9	6.0	6.2	6.3	6.5	6.6

SURVIVABILITY 60%	THOUSAND SEED WEIGHT									
DESIRED PLANT STAND (PLANTS/FT ²)	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9
	A LBS./AC.					B LBS./AC.				
5	3.2	3.3	3.4	3.4	3.5	3.6	3.7	3.8	3.8	3.9
6	3.8	3.9	4.0	4.1	RECOMMENDED* 4.2	4.3	4.4	4.5	4.6	RECOMMENDED* 4.7
7	4.5	4.6	4.7	4.8	4.9	5.0	5.2	5.3	5.4	5.5

SURVIVABILITY 70%	THOUSAND SEED WEIGHT									
DESIRED PLANT STAND (PLANTS/FT ²)	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9
	A LBS./AC.					B LBS./AC.				
5	2.7	2.8	2.9	2.9	3.0	3.1	3.2	3.2	3.3	3.4
6	3.3	3.4	3.5	3.5	3.6	3.7	3.8	3.9	3.9	4.0
7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7

SEEDING RATE LBS./AC.

SURVIVABILITY 50%	THOUSAND SEED WEIGHT									
DESIRED PLANT STAND (PLANTS/FT ²)	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9
	C LBS./AC.					D LBS./AC.				
5	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7
6	5.8	5.9	6.0	6.1	6.2	6.3	6.5	6.6	6.7	6.8
7	6.7	6.9	7.0	7.1	7.3	7.4	7.5	7.7	7.8	7.9

SURVIVABILITY 60%	THOUSAND SEED WEIGHT									
DESIRED PLANT STAND (PLANTS/FT ²)	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9
	C LBS./AC.					D LBS./AC.				
5	4.0	4.1	4.2	4.2	4.3	4.4	4.5	4.6	4.6	4.7
6	4.8	4.9	5.0	5.1	RECOMMENDED* 5.2	5.3	5.4	5.5	5.6	RECOMMENDED* 5.7
7	5.6	5.7	5.8	5.9	6.0	6.2	6.3	6.4	6.5	6.6

SURVIVABILITY 70%	THOUSAND SEED WEIGHT									
DESIRED PLANT STAND (PLANTS/FT ²)	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9
	C LBS./AC.					D LBS./AC.				
5	3.4	3.5	3.6	3.6	3.7	3.8	3.8	3.9	4.0	4.0
6	4.1	4.2	4.3	4.4	4.4	4.5	4.6	4.7	4.8	4.9
7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7

* Recommended rates on the bags are based on seeding approximately 10 seeds/ft² to achieve 6 plants/ft² and assuming 60% survivability. Results may vary on your farm due to environmental factors and preferred management practices.

MAKING EVERY PLANT COUNT IN 4 STEPS.

AS SHOWN BY THE TEAM'S RESEARCH, IN MOST CIRCUMSTANCES, PLANTING APPROXIMATELY **10 SEEDS/FT²** WITH AN AVERAGE SURVIVABILITY OF 50-70% WILL HELP YOU ACHIEVE A TARGET PLANT POPULATION OF **5 TO 7 PLANTS/FT²**. HERE ARE A FEW SMALL ADJUSTMENTS THAT CAN BE MADE TO YOUR CURRENT PRACTICES:

- 1** Check the front of your InVigor bag for the TSW range (A, B, C, D) and recommended seeding rate.
- 2** Calibrate your drill to ensure you achieve the recommended seeding rate. (Most equipment manufacturers have detailed calibration instructions on their website. We recommend that you consult with yours in order to maximize results.)
- 3** Conduct establishment and survivability plant counts to better understand the exact survivability rate on your farm.
- 4** If you are unsure of your survivability, seeding approximately 10 seeds/ft² or following the recommended seeding rate on your InVigor RATE bag will in most cases result in achieving 5 to 7 plants/ft² with an average survivability of 50 to 70%.

NOTE: Ensure that you achieve an even seed distribution in each row.

FIVE ADVANTAGES OF THE NEW INVIGOR SEED COUNT PACKAGING:

- 1** **Optimizing yield:** Targeting an optimal plant population that will allow InVigor hybrids to perform more consistently
- 2** **Simple:** Seeding rate recommendations make it easy to achieve 5 to 7 plants/ft²
- 3** **Planning:** Easier to predict the number of bags needed and costs since each bag will seed same number of acres
- 4** **Consistent product:** Each bag will have the same amount of seed
- 5** **Clear packaging:** The TSW ranges and recommended seeding rates are clearly marked on the bag making it simple to calibrate my drill

FINE-TUNING PERFORMANCE.

No two fields are the same. Because of your specific environmental factors, field condition and/or farming practices; fine-tuning your seeding rates based on your particular situation could lead to even better results. Diligent record keeping, monitoring the survivability in your fields and making adjustments for specific abiotic and biotic factors when required could further maximize the performance of your InVigor canola.



We create chemistry

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

Always read and follow label directions.

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