



## Germination Testing

### Germination in Ideal Conditions

Enzymatic activity and cell elongation are the beginning of germination. This starts when the soil temperature is 50°F, and the kernel has imbibed 30% of its weight in water.<sup>1</sup> Warm temperatures quickly make germination a visible occurrence with the radical root emerging at around three days post-planting (Figure 1).

Under less-than-ideal conditions, germination unfolds with slowness, pauses, and sometimes without emergence. Farmers cannot always wait for the ideal planting conditions. Therefore, high quality seed with some background performance information is needed. Performance information is in the form of seed tests.

### Warm Germination versus Vigor Test

The two major types of tests that Bayer uses are the:

#### Warm Germination Test (WGT):

- Standardized test using the protocols approved by the Association of Official Seed Analysts (AOSA) and is required by the Federal Seed Act and state seed laws.
- Determines the seed's ability to germinate in ideal conditions.
- Result of this test is required to be included on seed labeling and is only valid for a prescribed period of time.
- WGT results are comparable across seed providers because the test methods are standardized as prescribed by law.



**Figure 1. Germination becomes visible with the radical, seminal roots, and mesocotyl shown here.**

#### Vigor Test:

- Not required by law and is not standardized across the agriculture industry.
- Determines the seed's ability to germinate under less than ideal (typically cold or saturated) conditions.
- Test methods among seed providers and laboratories can differ.
- Results of these tests should not be compared against one another.

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## Seed Vigor Changes

Seed vigor is the sum of seed properties determining the level of activity and performance of the seed or seed lot during germination and seedling emergence.<sup>2</sup> Seed vigor is reduced over time, even in lots with high germination results. The reduction in seed vigor is a physiological deterioration or aging and eventually (after weeks or years) leads to seed incapable of germination.

Physiological aging is the result of changes to cell membranes, proteins, and enzyme activity. Although seed lots may have a high percentage of germination, the physiological age of the seed is unknown without a more stressful test. A vigor, or cold test, shows how seed would perform after the rigors of transit or storage, and in less-than-ideal planting conditions.

## When Vigor Ratings Matter

The vigor tests attempt to more closely simulate field conditions at planting time. With earlier planting dates, soil conditions are cooler and more variable. High-vigor seed emerges quickly and uniformly. This early stand establishment is critical to creating an environment for seedlings within and between rows to promote sunlight and nutrient capture.

Farmers can hedge early stand count risks by seeding at rates greater than those under ideal conditions. However, instead of planning for a poor stand, another way to reduce risk of poor stand counts is to compare vigor ratings and find seed with the best performance under a variety of field conditions. There is evidence a greater percentage of high vigor seeds in the planter hopper leads to plants with greater height, stem diameter, and leaf area index at the V4 and V8 corn growth stages.<sup>3</sup> These advanced characteristics have been shown to improve grain yield.

## Summary

Germination and vigor tests are two components of seed quality to consider when seeking out the highest quality seed. The warm germination test percentages give an idea for germination under ideal conditions. Vigor test results are used internally to gauge physiological health of seed and performance under stressful conditions. Bayer stands behind the quality of seed products, and farmers should have confidence in each bag of seed purchased.

### Sources:

- <sup>1</sup> Nielsen, R.L. 2019. Visual indicators of germination. Corny News Network. <https://www.agry.purdue.edu/ext/corn/news/timeless/GerminationEvents.html>.
- <sup>2</sup> Understanding seed vigor. 1995. International Seed Testing Association. <https://www.seedtest.org/>.
- <sup>3</sup> Vaz Mondol, V., Cicerol, S., Dourado-Netol, D., Pupiml, T., Neves Dias, M. 2013. Seed vigor and initial growth of corn crop. Journal Seed Science. [https://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S2317-15372013000100009](https://www.scielo.br/scielo.php?script=sci_arttext&pid=S2317-15372013000100009).

### Legal Statements

Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

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