



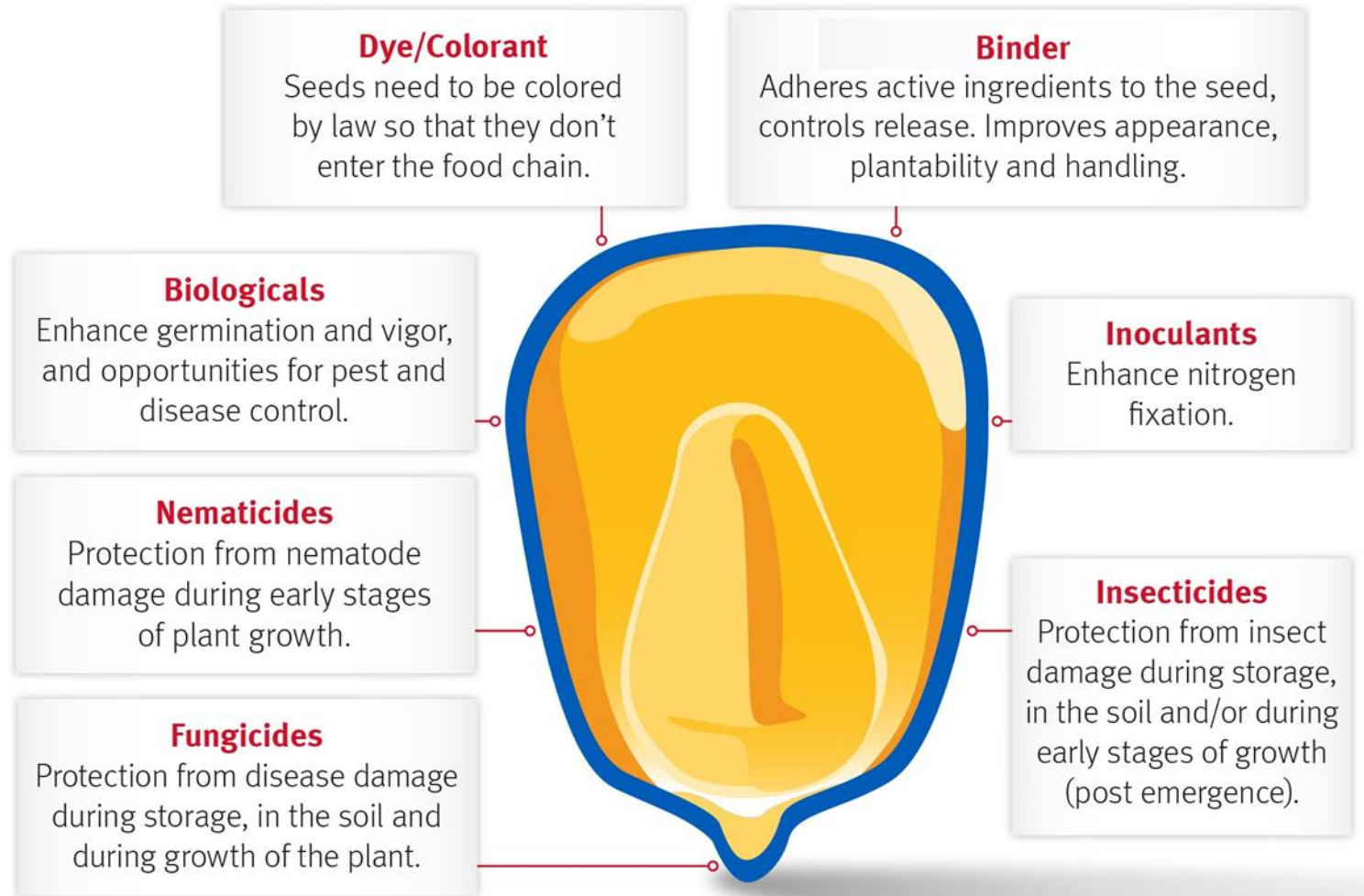
# Seed Treatment Technology

Efficacy & Economics

For VT Agricultural Innovation Board (AIB) Meeting – June 26, 2023

# Seed treatments

On a single treated seed, the treatment's formulation may combine multiple products to protect both the seed and young seedlings



### Did You Know?

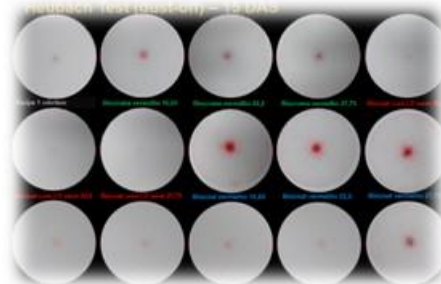
It's estimated that – without the availability of pesticide treated seeds -- for every pound of an insecticide used through seed treatment, up to five pounds would be required via traditional application techniques. This translates to a 375% increase in insecticide application rates per acre (AgInfomatics.com).

# Seed Treatment – *what is critical for customers?*



**Coverage, Perception of Value**

**Flowability, Plantability**



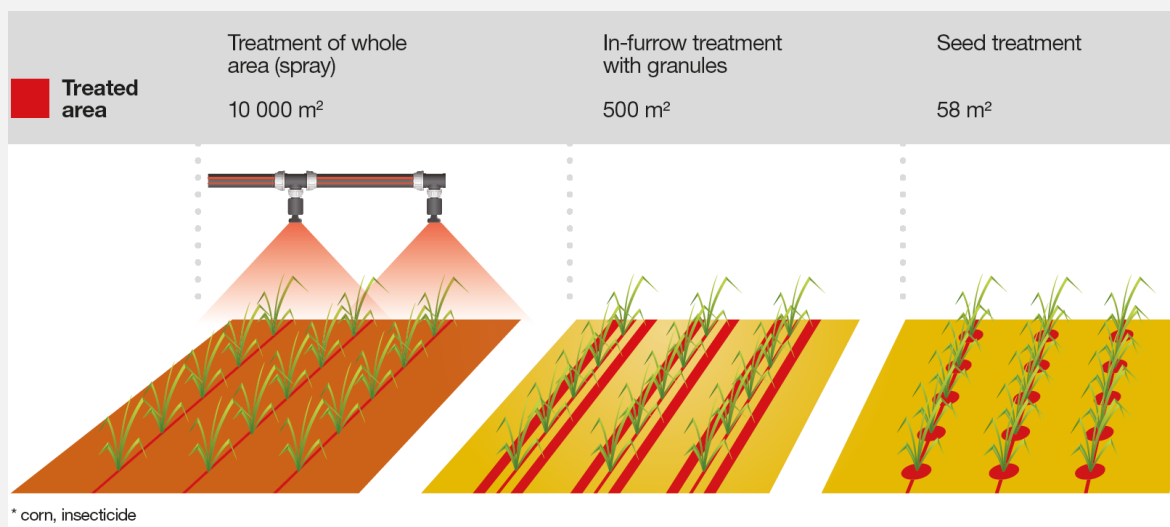
**Dust-off below prescribed level**

**Seed Germination**

# Treated Seed Benefits

Helping Reduce Potential for Exposure To People, Beneficial Insects and the Environment

Foliar or in-furrow application can use up to **10X higher** amounts of active ingredient than seed treatment.



Graphic source:  
<https://register.extension.msstate.edu/sites/register.extension.msstate.edu/files/2018%20MSU%20Seed%20Tech%20Short%20Course%20Proceedings.pdf>

- **Reduces the total amount of pesticide** used throughout the life of a crop<sup>1</sup>
- Enables selectively targeting pests that feed on the seed or emerging plant, while helping **minimize potential exposure to beneficial insects**, like pollinators
- Reduces need to handle chemistries directly, which **lowers operator exposure** to the measuring or mixing required through traditional pesticide applications
- Seed treatment active ingredients **effective at reduced rates**
- **Potential for less foliar sprays reduces carbon footprint** from fewer tractor passes and additional post emergent pesticide or fertilizer applications
  - More tractor passes may mean increased carbon releases, soil degradation and compaction from the tractor tires, and increased potential of inadvertent offsite movement.
- **Increases adoption of cover crops** since seeds are protected against soil pests that may be enhanced with cover cropping practices
- **Less packaging material use**

<sup>1</sup>Bayer study in 2014: Seed treatment involves exposure of a.i. to 58 m<sup>2</sup> of soil surface compared to 500 m<sup>2</sup> for an in furrow application and 10,000 m<sup>2</sup> for an over spray



# Key Benefits

- Broad spectrum crop protection against early pests of corn, soybean, rice, and cereals
- Excellent fit with insect resistance management plans to mitigate development of resistant insects
- Strong fit for integrated pest management strategies
- Robust protection of seeds, roots, and seedling from below and above ground pest damage
- Uniform and healthy plant stand establishment
- Promotes early season vigor and solid root structure under early season insect pressure



The active ingredient in Lumisure™ is clothianidin, a neonicotinoid





Chinch bugs crawl from maturing grain fields (left) and thin seedlings corn stands in adjacent fields (right)

# Pest Spectrum

Lumisure™ seed treatment protects against a wide range of early season pests, including hard to control insects such as:

- bean leaf beetle (*Cerotoma trifurcata*),
- white grubs (*Phyllophaga* spp.),
- aphids (*Aphis* spp.),
- wireworms (*Melanotus communis*),
- rootworm (*Diabrotica* spp.), and
- chinch bugs (*Blissus leucopterus*)

Crop	Scientific Name	Common Name
corn 	<i>Melanotus communis</i>	Wireworm
	<i>Phyllophaga</i> spp.	White Grubs
	<i>Delia platura</i>	Seed corn maggot
	<i>Blissus leucopterus</i>	Chinch bug
	<i>Diabrotica</i> spp.	Corn Rootworm
	<i>Colaspis brunnea</i>	Grape colaspis
	<i>Frankliniella williamsi</i>	Thrips
soybean 	<i>Cerotoma trifurcata</i>	Bean Leaf Beetle
	<i>Aphis glycines</i>	Aphids
	<i>Melanotus communis</i>	Wireworm
	<i>Phyllophaga</i> spp.	White Grubs



Wireworm damage on early season corn



Seed corn maggots feeding on a young corn seedling



# Key Attributes

- Proven mechanism of action classified as Group 4A
- Fast acting activity for control of crop damaging pests
- Utilized on a wide range of crops, including corn, soybean, rice, and cereals
- Excellent activity against a broad range of early chewing and piercing sucking season pests
- Controls insect populations resistant to other insecticides (i.e. carbamates, organophosphates, & pyrethroids)
- Systemic uptake and translocation to seeds, roots, and shoots
- Efficacious at low application rates
- Favorable mammalian safety profile



Adult bean leaf beetle feeding on young soybean plant



Chinch bug infestation at the base of a corn plant



Corn field with severe lodging due to southern corn rootworm feeding

# Implications if seed treatment technologies are lost

- Growers would need nearly five pounds of older chemicals to replace one pound of neonicotinoid insecticide, resulting in an increase in application rate per acre of 375%
- U.S. cropped land would need to increase more than 340,000 ACRES to offset losses in yield and quality from not using seed treatments
- Economists estimate that a loss of seed treatments would cost North American consumers in excess of \$4 BILLION annually in higher food prices



[https://www.betterseed.org/wp-content/uploads/Treated-Seed\\_Myths-vs-Facts-ASTA.pdf](https://www.betterseed.org/wp-content/uploads/Treated-Seed_Myths-vs-Facts-ASTA.pdf)

[https://aginfomatics.com/uploads/3/4/2/2/34223974/economic\\_assessment\\_benefits\\_neonicotinoid.pdf](https://aginfomatics.com/uploads/3/4/2/2/34223974/economic_assessment_benefits_neonicotinoid.pdf)



# Seed Treatment benefits beyond farming

- The ever-increasing demand for food is a global challenge.
- The U.S. Department of Agriculture (USDA) estimates that the demand for food will increase 70%-100% by 2050.
- At the same time this demand for food is increasing, our nation is losing millions of acres that grow it.
- Urban sprawl alone claimed 11 million acres of tillable land in the last decade.



**Along with contributing to higher yields and food quality, treated seeds have positive environmental benefits, too.**

[https://www.betterseed.org/wp-content/uploads/Treated-Seed\\_Myths-vs-Facts-ASTA.pdf](https://www.betterseed.org/wp-content/uploads/Treated-Seed_Myths-vs-Facts-ASTA.pdf)

# Seed Treatment benefits beyond farming

## Water:

- Because treatments are applied directly to the seed and planted beneath the soil, off-target movement is minimized.
- Advanced polymer coatings and the properties of the treatments themselves help ensure seed treatments stay with the seed.
- A recent [study from Vermont](https://www.betterseed.org/wp-content/uploads/Treated-Seed_Myths-vs-Facts-ASTA.pdf) confirmed that neonicotinoid insecticides used in seed treatments are not moving into waterways.



[https://www.betterseed.org/wp-content/uploads/Treated-Seed\\_Myths-vs-Facts-ASTA.pdf](https://www.betterseed.org/wp-content/uploads/Treated-Seed_Myths-vs-Facts-ASTA.pdf)

# Seed Treatment benefits beyond farming

## Soil:

- Diseases and insects thrive in the cooler, wetter growing conditions found in no-till and cover crop fields.
- Unprotected seeds planted into these conditions confront significantly greater pressure than they do in conventionally tilled fields.
- With a protective coating, seeds are more resilient to the additional pressures of these sustainable farming practices, enabling farmers to adopt them more broadly.
- The U.S. Department of Agriculture reports that between 2012 and 2017 – as the use of seed treatments increased – use of cover crops planted to cropland grew 50% and conventional tillage decreased 24%.



[https://www.betterseed.org/wp-content/uploads/Treated-Seed\\_Myths-vs-Facts-ASTA.pdf](https://www.betterseed.org/wp-content/uploads/Treated-Seed_Myths-vs-Facts-ASTA.pdf)



# Seed Treatment benefits beyond farming

## Safety:

- When used according to the label, treated seeds are safe for those who handle and plant them, as well as for general public and the environment.
- The industry provides training for farmers about proper use of seed treatments and publishes user labels on every bag of seed.
- To learn more about the industry's efforts, go to [seed-treatment-guide.com](https://www.seed-treatment-guide.com).
- Learn more about pesticide safety here: [Safety Data Behind Pesticides](https://www.betterseed.org/treated-seeds/)



<https://www.betterseed.org/treated-seeds/>  
[https://seed-treatment-guide.com/?utm\\_source=bing&utm\\_medium=content-text&utm\\_campaign=treatments\\_page](https://seed-treatment-guide.com/?utm_source=bing&utm_medium=content-text&utm_campaign=treatments_page)  
<https://pesticidefacts.org/wp-content/uploads/2019/10/Infographic-6-Data-Transparency.pdf>

# The Guide to Seed Treatment Stewardship



[seed-treatment-guide.com](http://seed-treatment-guide.com)

- The guide is the product of industry-wide collaboration between seed companies, seed treatment providers and universities; it draws from data collected worldwide
- Jointly produced by the American Seed Trade Association and CropLife America
- Provides farmers and seed companies with critical information and up-to-date guidelines for managing treated seeds effectively to minimize the risk of exposure to non-target organisms
- Covers Best Management Practices for applicators & users of treated seed. Topics include:
  - Safe use and handling, selection of treatment product, locating hives and communication with beekeepers, planting of treated seed, application, storage and disposal

# What is the industry doing to make seed treatments safer for pollinators and other wildlife?

Seed treatments, such as those with neonicotinoid pesticides, undergo rigorous testing and review by the EPA prior to being permitted to be used commercially.

In addition, industry is constantly evolving to improve seed treatment processes such as:

- Using closed application systems and continuously improving mixing and drying processes to create a better application of active ingredients to the seed.
- Enhancing seed coating polymers to keep active ingredients on the seed and reduce dust-off.
- Creating new flow agents for use with planting equipment to help further minimize the amount of dust-off during planting.
- Implementing an ISO planting equipment standard to better control dust emissions.



[https://seed-treatment-guide.com/wp-content/uploads/2021/04/Pollinator\\_FAQ\\_Updated.pdf](https://seed-treatment-guide.com/wp-content/uploads/2021/04/Pollinator_FAQ_Updated.pdf)



# Dust off measurements for treated seed

The Heubach Dustmeters offer solutions to measure the dustiness of powders, granules, seeds and pellets, allowing to quantify and control dust release properties and improve on material characteristics



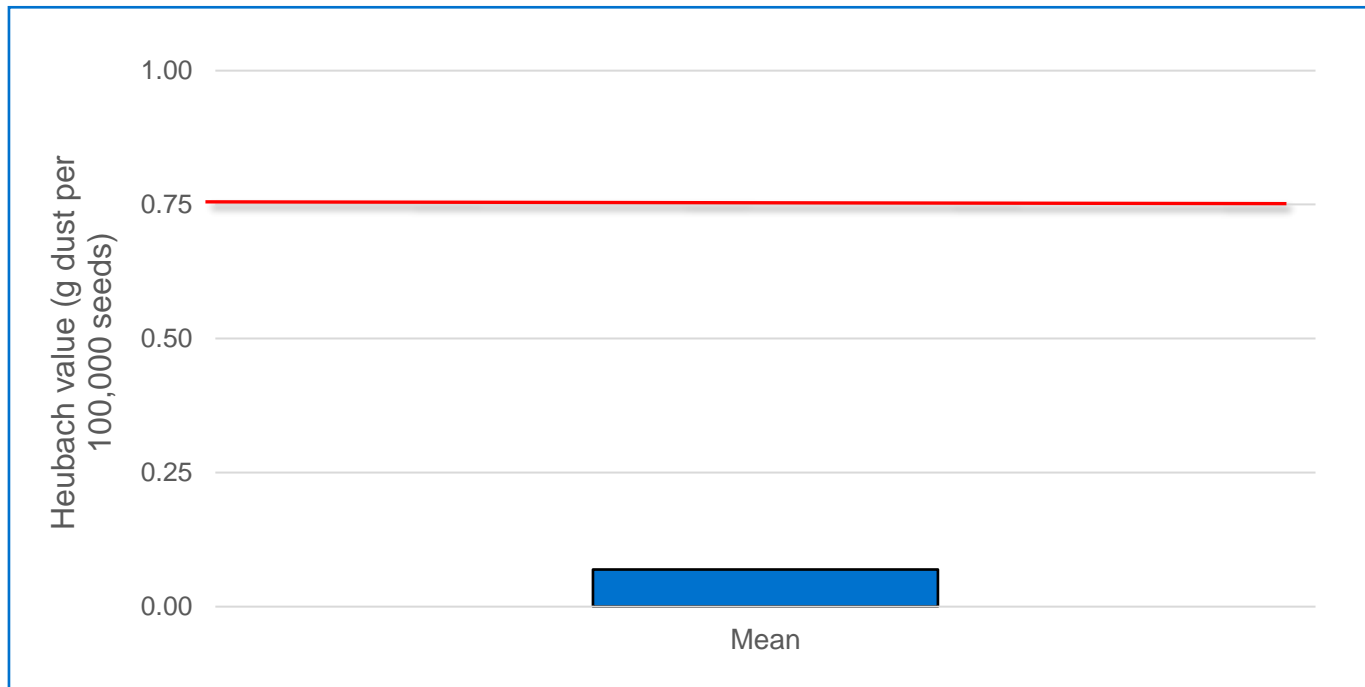
Dustmeter image:

<https://www.heubachdustmeter.com/>

Dust filter images:

<https://www.solvay.com/en/brands/peridiam/service>

# Heubach values from corn seed treated commercially at Corteva production facilities



Value is the mean of 552 measurements (276 seed batches sampled from 20 production locations across eight seed treatment recipes evaluated in duplicate).

Red line indicates EFSA regulation for corn.



[Keep Dust-Off Out of the Fields, and Out of the Headlines - Seed World](#)

<https://euroseeds.eu/esta-the-european-seed-treatment-assurance-industry-scheme/dust-reference-values-heubach-test-method/>

# Neonicotinoid insecticides do not impact colony health when used according to the label

When used in typical field applications and according to label instructions, neonicotinoids do not pose a significant hazard to bees, even though some neonicotinoids, like many insecticides, are toxic to bees.

This is because at normal field doses, the potential exposure to bees is far below levels that would cause concern.<sup>7</sup>

Large-scale studies in Europe and North America show that poor bee health correlates well with parasites and diseases, but not with pesticides, including neonicotinoids.<sup>1,2,3,4,5,6</sup>

Citations can be found at:

[https://seed-treatment-guide.com/wp-content/uploads/2021/04/Pollinator\\_FAQ\\_Updated.pdf](https://seed-treatment-guide.com/wp-content/uploads/2021/04/Pollinator_FAQ_Updated.pdf)





# Neonicotinoid insecticides do not impact colony health when used according to the label

Most experts agree that many factors such as parasites, diseases, inadequate nutrition or lack of available forage, adverse weather, pesticides and hive management practices play a role.

The Varroa mite is the “single most detrimental pest of honey bees,” according to the USDA.<sup>8</sup> This parasite weakens bees and helps transmit diseases that can wipe out entire colonies.

Beekeepers try to control the mite with insecticides, but effective control is difficult to achieve. Researchers are exploring many ways to help protect bee health, but there is much work yet to be done.

*Citations can be found at:*

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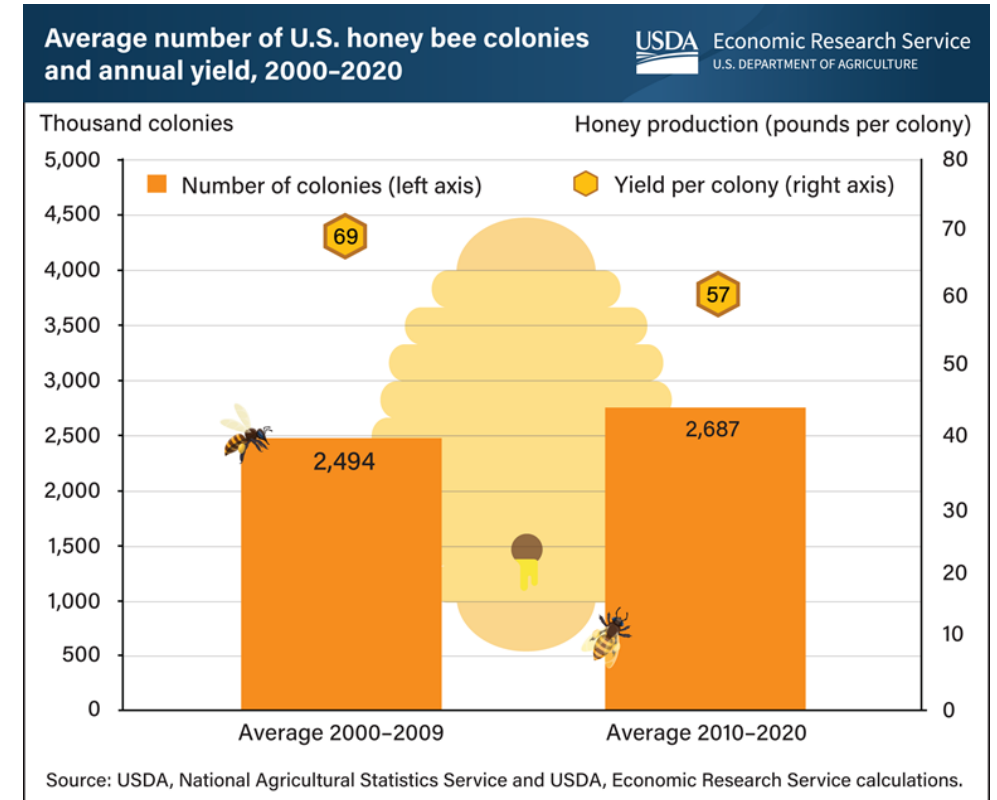


# The number of honey bee colonies is increasing

Most people are surprised to learn that honey bee colonies actually increased by 45 percent worldwide over the past 50 years.<sup>9</sup>

And in the past five years, as awareness of honey bee health has grown, the number of colonies in the U.S. and Canada has increased by 13 percent and 18 percent, respectively.<sup>10</sup>

Annual surveys conducted by the USDA show that the number of honey bee colonies has risen over the past 10 years.<sup>11</sup>



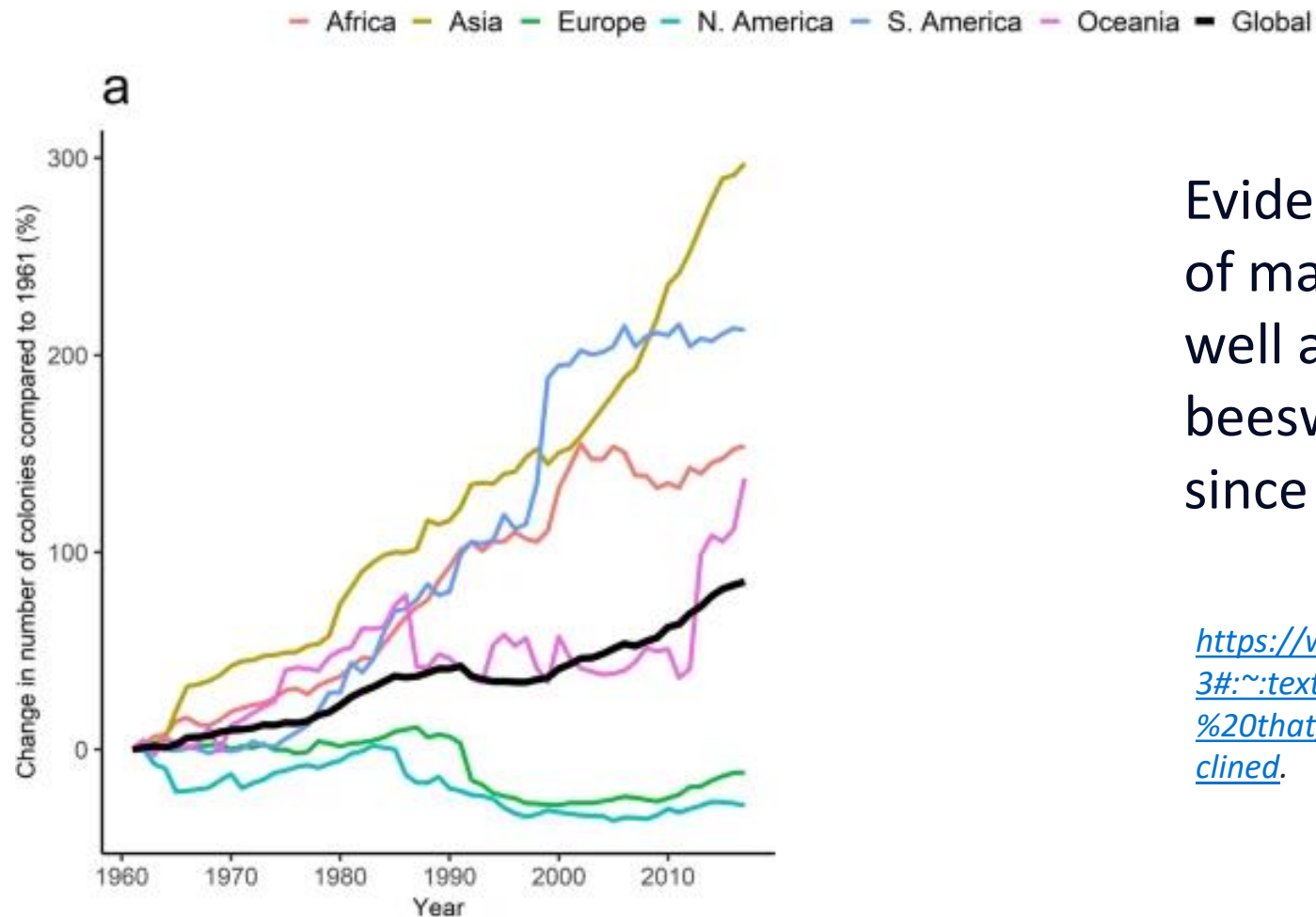
9. Aizen and Harder, *Current Biology* 19, 1–4, June 9, 2009 doi:10.1016/j.cub.2009.03.071.

10. Syngenta (January 19, 2015), *Bee population rising around the world*, AgProfessional.

11. USDA (2015) *National Honey Report*

<https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=102065>

# Uptrend in global managed honey bee colonies and production based on a six-decade viewpoint, 1961–2017



Evidence suggests that the number of managed honey bee colonies as well as the production of honey and beeswax globally have increased since the early 1960s.

<https://www.nature.com/articles/s41598-022-25290-3#:~:text=In%20conclusion%2C%20evidence%20suggests%20that,beeswax%20production%20per%20capita%20declined.>

Regional changes presented as percentages of the annual number of managed honey bee colonies compared to 1961 (a), 1961–2017.



# Many groups are working to improve bee health

The crop protection and seed industries are working in a number of areas to protect and improve the health of honey bees.

They are partnering with other organizations in the Honeybee Health Coalition which is working to improve pollinator habitat and forage, creating and disseminating hive management tools and developing strategies to control crop pests while safeguarding pollinator health.

Companies and organizations are also encouraging people to plant for pollinators in home gardens and other landscapes.

For more information about the Honeybee Health Coalition, visit:  
*[honeybeehealthcoalition.org/](https://honeybeehealthcoalition.org/)*



[https://seed-treatment-guide.com/wp-content/uploads/2021/04/Pollinator\\_FAQ\\_Updated.pdf](https://seed-treatment-guide.com/wp-content/uploads/2021/04/Pollinator_FAQ_Updated.pdf)

# Honey Bee Health Coalition <https://honeybeehealthcoalition.org/>



The Honey Bee Health Coalition brings together beekeepers, growers, researchers, government agencies, agribusinesses, conservation groups, manufacturers, and consumer brands to improve the health of honey bees.

## Crop Best Practices

- Develops crop & product-specific Integrated Pest Management (IPM) practices & messaging to improve bee & pollinator safety.
  - (Apple, Canola, Corn, Soybean, Hive Health)
- Promotes communication & understanding among stakeholders to raise awareness of crop pest management issues for bee health.



# Equipping the next generation of pollinator advocates

Through the Corteva Grows Pollinator Habitat program, our goal is to instill awareness, passion and skills in our youth as responsible stewards of our planet in the generations to come.

**More than 31 pollinator habitats, consisting of approximately 90 acres, have been established across the U.S. through the program.**

## Corteva grows pollinator habitat program results\*

- ✓ Approximately 17,000 youth trained by 340 4-H pollinator ambassadors
- ✓ Approximately 1,500 pollinator curriculum bundles/kits distributed through key markets & open promotion aiding additional reach of 12,000
- ✓ 18,000 pollinator kits were provided to program participants in key markets





# Thank you



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# Summary: Benefits of Treated Seeds

Treated seeds help improve seed and plant health and reduce the potential for exposure to people, beneficial insects and the environment

## For Seed and Plant Health

- Increased and uniform germination which results in increased, healthier, and stronger crop stands
- Protection against soil borne pests and disease that can destroy the seed or plant before it emerges, which promotes stand establishment (plant growth) and vigor/yield
  - The list of pests that treated seeds help protect against includes – but is not limited to – cutworms, wireworms, maggots, thrips, beetles, and fungal plant pathogens like pythium, fusarium, rhizoctonia, and penicillium
- Serves as vital component of Integrated Pest Management (IPM)
- Increases likelihood of improved yields

## For People and Beneficial Insects

- Enables selectively targeting pests that feed on the seed or emerging plant, while helping minimize potential exposure to beneficial insects, like pollinators
- Reduces need to handle chemistries directly, which lowers operator exposure to the measuring or mixing required through traditional pesticide applications
- Seed treatment active ingredients effective at reduced rates

## For the Environment

- Reduces the total amount of pesticide used throughout the life of a crop<sup>1</sup>
- Potential for less foliar sprays reduces carbon footprint from fewer tractor passes and additional post emergent pesticide or fertilizer applications
  - More tractor passes may mean increased carbon releases, soil degradation and compaction from the tractor tires, and increased potential of inadvertent offsite movement.
- Increases adoption of cover crops since seeds are protected against soil pests that may be enhanced with cover cropping practices
- Less packaging material use

<sup>1</sup>Bayer study in 2014: Seed treatment involves exposure of a.i. to 58 m<sup>2</sup> of soil surface compared to 500 m<sup>2</sup> for an in furrow application and 10,000 m<sup>2</sup> for an over spray

# Summary

**What are seed treatments?**

Seed treatments are generally a mix of multiple products applied to a seed, safeguarding the seed and seedlings against insects, fungal diseases and soil-borne pathogens.

**What are some of the benefits of treated seeds?**

A few of the many benefits include:

- **Protection against soil borne pests and disease that can destroy the seed or plant before it emerges from the soil**, which promotes stand establishment (plant growth) and vigor
- **Reduces the total amount of pesticide** used throughout the life of a crop, while also reducing the carbon footprints that would accompany those later sprayer trips across the field.
- Enables selectively targeting pests that feed on the seed or plant, while helping **minimize potential exposure to beneficial insects**, like pollinators
- Reduces need to handle chemistries directly and the need for later sprayer applications, which **lowers the potential for operator or neighbor exposure**

**How does Corteva develop seed treatments?**

Corteva's seed applied technologies team evaluates hundreds of products each year, seeking out the right components and formulations to meet farmer needs. Once products are developed, our regulatory, technical services and commercial teams work to ensure successful market adoption.

**Are seed treatments regulated? How?**

Seed treatment pesticide products are highly regulated, just like foliar and soil-applied pesticides, under FIFRA. All pesticides must go through a rigorous data review and registration process via the U.S. Environmental Protection Agency (EPA), including extensive human health and environmental risk assessments.

Seeds treated with pesticides are considered "treated articles" if and only if the article (i.e., the seed) is treated with a pesticide registered for this use (meaning EPA has already assessed whether use as a seed treatment, meets FIFRA's registration standard); the seed treatment is intended to protect the seed itself.