50 Fast Facts about DiPel®

Bacillus thuringiensis subsp. *kurstaki* strain ABTS 351

1. In 1902, *Bacillus thuringiensis* was first discovered in silkworms by Japanese sericultural engineer Ishiwatari Shigetane.
2. Several dozen recognized subspecies of *B. thuringiensis* exist. Subspecies commonly used as insecticides include *B. thuringiensis* subspecies *kurstaki* (Btk), subspecies *israelensis* (Bti), and subspecies *aizawai* (Bta).
3. DiPel contains the *bacillus thuringiensis kurstaki* ABTS-351 strain, which is a naturally occurring gram-positive soil bacterium.
4. The ABTS-351 strain was received by Abbott Labs from Howard Dulmage in the early 1960s and then optimized into a production strain and commercialized.
5. DiPel was registered by the U.S. Enviromental Protection Agency (EPA) in 1971 and is celebrating its 50-year anniversary as a tool growers have depended upon for dependable lepidopteran control.
6. DiPel is the world's best-selling brand of *bacillus thuringiensis* insecticide.
7. DiPel is active on a broad spectrum of lepidoptera larvae and is labeled for use on more than 200 agricultural crops in more than 60 countries.
8. DiPel is also labeled in many countries for use on turf, ornamentals (greenhouse, field, and landscape), and retail garden and landscape applications.
9. The DiPel trade name is based upon lepid (lepidoptera insect class) spelled backwards.
10. DiPel stops caterpillar damage very quickly; larvae will stop feeding within one hour of ingesting a lethal dose of DiPel.
11. DiPel must be applied to the foliar portions of the plant where the insect feeds.
12. Once DiPel is dried on the leaf, it becomes rainfast.
13. Beyond normal spray equipment, DiPel can be applied through irrigation systems such as center pivot, lateral move, end tow, side (wheel) roll, traveler, big gun, solid set, or hand move irrigation systems.
14. DiPel is not transgenic or genetically modified.
15. All DiPel granule and powder formulations are certified for use in organic crop production systems.
16. DiPel's effectiveness can be assured by using a crop-approved spreader/sticker for application on hard-to-wet crops such as cabbage, or to improve weather-fastness of the spray deposits.
17. DiPel's mode of action is categorized by the Insecticide Resistance Action Committee (IRAC) as group 11 – microbial disruptors of insect midgut membranes.
18. DiPel's multiple Cry proteins provide multiple modes of action in the caterpillar gut, making it a key integrated pest management tool for preventing resistance.
19. DiPel is a great rotational or tank-mix partner to reduce the potential of worms developing resistance to insecticides with other modes of action.
20. It is common for growers to use DiPel in a program with Class 28 products, such as chlorantraniliprole.
21. Valent BioSciences discovered and patented synergies between DiPel and Class 28 insecticide chlorantraniliprole.
22. DiPel has never shown cross-resistance with any chemical insecticide.
23. DiPel consists of an optimized blend of four potent insecticidal Bt proteins and a spore. Many other Bt strains lack the volume and balance of insecticidal Bt proteins that DiPel delivers.

DiPel®
BIOLOGICAL INSECTICIDE

24. The spores in DiPel are not toxic to pests alone, but contribute to killing the insect by causing sepsis.
25. The spore in DiPel can only germinate and spread in the high-pH environment of the caterpillar gut.
26. DiPel protein crystals can only dissolve at a pH of 10 or higher.
27. DiPel also contains secondary products, VIP3A and Zwittermycin, which may contribute to mortality and enhance activity.
28. Although VIP3A is a protein with similar activity to Cry crystal proteins, it does not form a crystal.
29. DiPel is not harmful to humans, wildlife or the environment, providing growers with much-needed flexibility.
30. DiPel is non-toxic to pollinators and other beneficial insects.
31. DiPel has a caution signal word assigned by the U.S. EPA, indicating the relative precautions a user should take. A caution signal word is the lowest level the EPA assigns.
32. DiPel has a four-hour restricted entry interval (REI), meaning workers should not enter the treated areas until four hours after application. This is the lowest REI the U.S. EPA allows.
33. DiPel can be applied up to the time of harvest and is exempt from residue tolerance (zero pre-harvest interval (PHI); regional regulations may vary).
34. There are no countries that have a residue tolerance requirement for DiPel.
35. DiPel has multiple modes of action – multiple insecticidal protein and Bt spores that all contribute to insect mortality.
36. DiPel has higher and more varied insecticidal protein levels than competitive products, which translates to superior performance in the field and excellent resistance management.
37. DiPel Btk contains four different insecticidal proteins: the Cry1 protoxins – Cry1Aa, Cry1Ab, Cry1Ac – and the Cry2 protein.
38. When ingested, DiPel cry proteins bind to the midgut of pest larvae and cause cell death, inhibiting further insect feeding just one hour after a lethal dose.
39. Each batch of DiPel is tested on lepidopteran larvae via bioassay to ensure the highest quality and performance standards. This is a step that most competitors do not take.
40. DiPel quality control tests on lepidopteran use tens of thousands of larvae per month.
41. Cabbage looper is the most commonly used lepidopteran pest to measure potency.
42. International units found on Bt product labels are not an accurate way to compare Bt products. Quality manufacturing is the primary means to compare products and their effectiveness in field conditions.
43. Biopotency is measured in LC50, but is a quality control measurement and does not correlate to field performance.
44. Protein content and coverage over the plant leaves determines efficacy.
45. DiPel DF (dry flowable) is the top-selling formulation. It provides easy measuring, dissolves quickly, and is compatible in tank-mixes with other products.
46. DiPel is formulated with an ingredient that encapsulates the Cry protein and spore to provide some ultraviolet protection.
47. DiPel is manufactured in the world's first purpose-built facility solely dedicated to the fermentation production of biorational technologies.
48. When stored under normal warehouse conditions, DiPel has a shelf life equal to most synthetic insecticides.
49. DiPel is produced through fermentation processes that require foodstuffs to grow, primarily soy flour, cornmeal, and corn syrup. Soybeans and corn are crops that can be treated with DiPel, creating a very sustainable and connected system.
50. The effectiveness and safety profile of foliar applications of Bt led to the development and inclusion of Bt gene traits in many agricultural crops starting in 1995.