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United States Biopesticide Active Ingredients Market Assessment, By Ingredient Type [Trichoderma Viride, Beauveria Bassiana, Pseudomonas Fluorescence, Verticilium Lecanii, Bacillus Thuringiensis, Others], By Source [Plants, Insects, Microorganisms], By Pest Type [Insecticide, Fungicide, Nematicide, Others], By Application [Soil Treatment, Foliar Treatment, Seed Treatment, Others], By Crop Type [Cash Crop (Cereals & Grains, Fruits and Vegetables, Turf and Ornamentals], By Region, Opportunities and Forecast, 2016-2030F

https://marketpublishers.com/r/UE167DD925CFEN.html
Date: February 2025
Pages: 127
Price: US$ 3,300.00 (Single User License)
ID: UE167DD925CFEN

Abstracts

United States biopesticide active ingredients market size was valued at USD 728.8 million in 2022 and is expected to reach USD 1453.2 million in 2030 with a CAGR of 9% for the forecast period, 2023-2030. United States has adopted significant steps to reduce the usage of synthetic chemicals in agricultural practices. They have implemented various Integrated Pest Management (IPM) programs under which they have successfully minimized the use of conventional pesticides while crop yields remain high. The excellent properties of biopesticides make their usage effective even in a small proportion and follow decomposition rapidly while preventing land pollution. To facilitate and regulate the proper authorization of biopesticides in 1994, the Biopesticides and Pollution Prevention Division was established, which ensures and promotes the biological ones, replacing the conventional chemicals.

Around 299 active biopesticide ingredients are registered by the Environmental

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Protection Agency (EPA), which comprises three categories, but among these ingredients, only 40 are labeled for application in greenhouse gases. The active ingredients are generally effective in pest prevention and formulation, with different approaches to suppressing pest growth and initiation. The Bacillus thuringiensis active ingredient alone or in combination with others can attack its parasite, followed by killing it. B. Thuringiensis belongs to the microbial community attacking beetles, caterpillars, mosquitoes, and others. Various formulation technologies are extensively used to prepare biological pesticides using B. thuringiensis. Thus, the increasing use of biopesticides is expected to increase the active ingredients market in the United States.

Biopesticides for Organic Disease Management

There are various substances present in the biopesticides that control diseases and provide conditions to grow crops. Those components include potassium bicarbonate, phosphorous acid, plant extracts, hydrogen peroxide, and botanical oils. These biopesticides have proven effective in controlling diseases affecting vegetable crops. There are several organic methods for preventing diseases of leafy vegetables using biopesticides. Products such as Actinovate AG, from Novozymes A/S, comprise of around 0.0371% Streptomyces lydicus strain WYEC 108, which is extensively used for suppressing various soil-borne and foliar diseases. For soil and seed treatment, pathogens such as Fusarium, Phytophthora, etc., in leafy vegetables provide a specific target to attack the pests. Similarly, Bio-Tam comprises 2% Trichoderma asperellum strain ICC012 and 2% Trichoderma gamsii strain ICC080, which are very effective and have extreme potential to attack over different temperature ranges and prevailing environmental conditions.

Likewise, various biopesticides effectively treat bacterial diseases caused in vegetable crops, mainly in the northeastern United States. AVIV comprises 0.08% of Bacillus subtilis strain and is very effective biopesticide for brassica crops, carrot, leafy vegetables, pepper, and tomato where it attacks at the specific target. Small companies and startups producing biopesticides lack sufficient R&D funds to run field trials and collect efficacy data for validation. IR-4 Biopesticide and Organic Support Program assist such companies by providing funds to practice indispensable trials and register their products with proper efficacy. These small collaborations are essential to develop specific crop biopesticides which have tremendous market potential where expansion can be attributed.

Organic and Minimum Risk Pesticides

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Agricultural pesticides are regulated by collaborating with prominent government agencies such as the United States FDA, USDA, EPA, each with functional approval. According to the EPA framework, the minimum-risk pesticide products are exempted from federal insecticides, fungicides, and rodents. Six stringent conditions must be followed for a product to lie under the minimum risk category. Castor, cinnamon, corn, cottonseed, rosemary, and other food-grade oils can be classified as a minimum-risk pesticide product. Despite possessing natural characteristics, these products should be considered toxic for human organs and may lead to severe reactions.

Like conventional crops, organic crops are equally vulnerable to pest attacks, which justifies the myth that organic crops are always pesticide-free. The USDA's National List of Allowed and Prohibited Substances categorizes the components as synthetic or organic will be considered as an organic pesticide where the list comprises hydrogen peroxide, sodium hypochlorite, pyrethrins, diatomaceous earth, etc. Contrary to their positive impacts, organic pesticides have some harmful effects as they can create hurdles for bees, butterflies, and significant crop pollinators, and insects.

Impact of COVID-19

The outbreak of COVID-19 pandemic has aggravated the consumption of biopesticides in agricultural practices. The pandemic has disrupted various functioning operations, the closure of biopesticides manufacturing facilities, labor mobility across multiple states in the United States, etc. A decrease in demand for active biopesticides by the farmer resulted from a decline in food demand. Consequently, revenue from biopesticide sectors dropped significantly, discouraging investors from investing. To restrain the market, the government introduced various effective measures such as the constraints that would reduce the production rise to normal. The optimistic behavior of the market encouraged various production facilities to develop biopesticides and create market opportunities for expansion.

Impact of Russia-Ukraine War

The annexation of Russia over Ukraine led to severe consequences, including trading with the United States. The United States has imposed various sanctions on Russia to restrict its trade opportunities such that a series of bans disrupted the economy. In 2021, the Russian Federation purchased around USD 872 million of biopesticides from various countries, among which the United States had contributed significantly. The production of biopesticides has grown tremendously in the United States after the amendment in government regulations to build indigenous technologies for

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incorporating active ingredients in pesticides. Implementing stringent norms for the biopesticide market in the United States has remarkable potential to explore more impulsive opportunities.

Key Players Landscape and Outlook

Companies in the United States are investing in innovations to find ingredients for biopesticides that effectively replace conventional compounds in various agricultural practices. Arbico Organics is widely known for recognizing the importance of active ingredients and their specific applications in biopesticides. A series of Bacillus fungi like B. thuringiensis, B. amyloliquefaciens, etc., that are extensively used in making effective biopesticides is developed by Arbico Organics.

Their objective in implementing Integrated Pest Management (IPM) was to assist in making target-specific pest products suitable for closely related organisms. The ingredients have proven effective in increasing crop yields by reducing residual impacts even when used in small quantities. Likewise, many companies with keen potential to generate suitable biopesticide components are opening markets for the United States to expand.

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