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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OFFICE OF
PESTICIDES AND TOXIC
SUBSTANCES

**MEMORANDUM**

Subject: Biological Evaluation of Public Interest Finding Submitted by the Mycogen Corporation in Support of the Conditional Registration of MVP® Bioinsecticide on Various Crops to Control the Larval (Caterpillar) Stages of Various Lepidopteran Pests.

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Thru: Allen L. Jennings, Director
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## Introduction

### Purpose of Review

This analysis was conducted to determine if the conditional registration of MVP® bioinsecticide for the control of the diamondback moth, imported cabbageworm and the cabbage looper on cole crops and the European corn borer on field corn and sweet corn is in the public interest.

### Description of New Pesticide

Mycogen, in an attempt to overcome some of the limitations of the conventional Bacillus thuringiensis (B.t). products, has developed and patented a "Cell-Cap" encapsulation system in which a B.t. endotoxin is encapsulated into a killed bacterial cell wall. MVP® bioinsecticide was developed based on a delta endotoxin from B.t. variety Kurstaki and is targeted for the larval (caterpillar) stages of a variety of lepidopteran pests which attacks vegetable, fruit and grain crops (Gelernter, 1990a).

In order for MVP® bioinsecticide to be effective it must be consumed by a targeted pest. After consumption of foliage that has been sprayed with MVP®, the insect pest ceases to feed. This cessation in feeding is said to be due to paralysis of the digestive system which would also include the mouthparts (Gelernter, 1990b). Similar to other B.t. products, the endotoxin of MVP® bioinsecticide functions as a stomach poison in suspectible insects. Death of the infected insect usually occurs within 1 to 5 days (Gelernter, 1990b).

The label lists a variety of greenhouse and field grown crops that are susceptible to damage by various lepidopteran pests. In order to obtain maximum control with MVP®, the first application should be applied as soon as the larvae begin to hatch. Early applications can prevent extensive feeding damage caused by older larvae.

Application rates for MVP® bioinsecticide varies depending on the severity of the infestation, the insect pest and the type of equipment used. In general, however, using ground applications the label recommends that for light infestations (<1 larvae/5 plants) a rate of 1 to 2 quarts/A is used; for moderate to heavy infestations 2 to 3 quarts/A is recommended and for extremely heavy infestations the label recommends a rate of 3 to 4 quarts/A. No quantification of insect counts per plant was given for moderate to heavy infestations or extremely heavy infestations. For aerial applications, the higher rates are recommended.

Description of Data Submitted by Registrant

The efficacy data submitted by Mycogen consisted of field studies conducted in the states of Wisconsin, Illinois, North Carolina and Minnesota. A total of six studies were submitted. Four of these studies centered around the management of the diamondback moth (DBM), the imported cabbageworm (ICW) and the cabbage looper (CL) on cole crops (cabbage and collards). Two studies involved the control of the European corn borer (ECB) on field corn and sweet corn. No data were submitted on the other crops or pests listed on the MVP® label.

My review of the pests and sites in this document is limited to those pests and sites for which data were submitted. Thus, this document will address primarily the DBM, ICW and CL on cole crops and to a lesser extent the ECB on field corn and sweet corn.

**Current Situation**

The diamondback moth (DBM), Plutella xylostella (L.), the imported cabbageworm (ICW), Pieris rapae (L.) and the cabbage

looper Trichoplusia ni (Hbn.) are the major pests of cole crops (cabbage, broccoli, collards, cauliflower) in the United States. The only damaging stage of these pests is the larval stage. The larvae will feed on the leaves and "heads" of the plants rendering the crop unmarketable.

The European corn borer (ECB), Ostrinia nubilalis (Hbn.) occurs in almost all the major corn producing states in the United States and Canada (Davidson and Lyon, 1979). Damage to corn is caused by the larval stages feeding and damaging the leaves, stalks and ears of corn. The presence of the ECB in fields can sometimes be identified by the presence of cornstalks with broken tassels (Metcalf, et al., 1962).

According to the 1991 Insect Control Guide, carbaryl, malathion, diazinon, esfenvalerate (Asana®), endosulfan (Thiodan®), azinphos-methyl (Guthion®), cryolite (Kryocide®), methomyl (Lannate®), methamidophos (Monitor®) and permethrin (Ambush/Pounce®) as well as the B.t. products, Cutlass®, Javelin® and Dipel® are recommended for use to control the DBM, ICW and the CL. Information obtained through a conversation with Dr. Alton Sparks, Extension Entomologist from Texas, stated that the currently registered products that are used to control the DBM are no longer effective against this pest due to the buildup of resistance among the DBM population (Section 18 Request, 91-TX-04).

Efficacy studies reviewed (1990 Insecticide and Acaricide Tests) suggested that, in general the control of the DBM achieved with the synthetic compounds was less effective than control achieved using the B.t. products. In addition, when comparing the efficacy of the B.t. products alone, Cutlass®R was more efficacious than Javelin® which is more effective than Dipel®. Information from other experts supports these findings (Gelernter, 1991; Sparks, 1991).

Currently there are several synthetic compounds and the B.t product Dipel® registered on corn (sweet corn and field corn) to control the ECB (Insect Control Guide, 1991). Efficacy studies found in the Insecticide and Acaricide Tests, suggest that most of these compounds are effective at controlling this pest when compared to the untreated controls. However of these products the synthetic pyrethroids appear to be the most efficacious.

**Review of Data**

Methodology for Review

In order to make an accurate assessment of the performance of MVP® bioinsecticide, several sources were utilized. Product performance data submitted by the registrant as well as other

efficacy studies found in the Insecticide and Acaricide Tests, 1990 were evaluated to determine the performance of the subject product and its efficacy when compared to other registered products. Information from the product label, past registration applications, published state recommendations and other insect control guides as well as conversations with state specialists and company personnel were also used in the evaluation of this product. My objective was to collect and evaluate the best available information on the subject compound, to accurately assess its performance in controlling the insect pests, and to determine if the claim of public interest was supported from the analysis.

Analysis of Data

A). Registrant's Claim: The registrant claims that MVP® bioinsecticide has been demonstrated to be a host-specific pesticide, specific for the targeted pests only (lepidopterous pests).

Agency's Finding: Even though the label for MVP® bioinsecticide lists specific lepidopterous pests, the registrant did not provide the data to substantiate this claim. However, based on other available information the Agency finds that in general, the host range for each B.t. isolate is usually restricted to a small group of related organisms (Gelernter, 1990b).

B). Registrant's Claim: The registrant claims that MVP® encourages the flourishing of beneficial insects and insect predators, thereby reducing dependence upon other pesticides. The registrant also states the use of MVP® could lead to an increased acceptance of an Integrated Pest Management program.

Agency's Finding: Hutchinson and Bartel (1990) in a study using MVP® bioinsecticide, Dipel® and Ambush®, reported that the density of predaceous insects (lady beetles, minute pirate bugs and lacewing larvae) did not differ significantly among the B.t. treatments. However predator counts in the Ambush®-treated plots were significantly lower than in the other treated plots.

Thus, it appears that the use of MVP® in an integrated manner may lead to a more beneficial and economical approach to the management of some lepidopterous pests.

C). Registrant's Claim: The registrant claims that MVP® has a residual activity of about 7 days. The registrant also claims that MVP® has increased persistence which has increased its effectiveness.

Agency's Finding: Data comparing the residual activity and foliar persistence of MVP® to other comparable B.t. products were not submitted by the registrant. Therefore, an assessment based on these factors cannot be determined.

Efficacy data found in the Insecticide and Acaricide Tests, 1990, suggested that in general control of DBM achieved with MVP® was not statistically significant from the control obtained by esfenvalerate or permethrin. These studies also suggested that MVP® is also effective against the ICW and the CL.

Bioassay studies using the DBM as the host showed that MVP®R generally provided better control than Ambush®. No significant differences were found when MVP® was compared to Dipel® or Javelin®.

Data submitted by the registrant suggested that MVP® was effective at reducing the population DBM, and ICW on cole crops. However, MVP® was not as effective when used against the CL. In general, the control achieved with MVP® was comparable to the control achieved by the B.t. products Cutlass®, Javelin® and Dipel®; no significant difference was reported.

**Major Concerns**

Limited data on the efficacy of MVP® to control the DBM, ICW and the CL were submitted. Very little information was submitted that reported efficacy of MVP® on the ECB. In addition, the studies submitted by the registrant appeared to have been conducted under ideal conditions (dry and warm). Thus, the degree of control achieved in these studies may not be indicative of that which might occur in the field.

In addition, no data were submitted that addressed the advantages claimed by encapsulating this B.t. product (i.e. increased residual activity, increased foliar persistence). Thus, in order to accurately compare this product with other conventional formulated B.t. products, more data are required.

**Conclusions**

The data submitted in support of the conditional registration of MVP® bioinsecticide appears to indicate that this

product when used in accordance with the label directions can be as effective as the currently registered products to control these lepidopterous pests. The data also indicate that this product is not harmful to insect predators or parasites. Thus, although the product appears to possess benefits, without additional data on residual activity, foliar persistence, and performance under less than ideal conditions, the registrant's claim can not be substantiated.

Attachment(s)

## References


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Texas Request for the Emergency Exemption to Use MVP® Bioinsecticide to Control the Diamondback Moth on Cole Crops (91-TX-04).

Addendum to: Biological Evaluation of Public Interest Finding Submitted by the Mycogen Corporation in Support of the Conditional Registration of MVP® Bioinsecticide on Various Crops to Control the Larval Stages (Caterpillars) Stages of Various Lepidopteran Pests.

Additional data were submitted by the Mycogen Corporation in support of the conditional registration of MVP® bioinsecticide. This information showed that MVP® had residual activity (foliar persistence) that last for about seven days after the initial treatment. Data showed that the other B.t. products, Dipel® and Javelin®, exhibit residual activity that was significantly shorter than that which was displayed by MVP®. Thus, the supplementary data supports the applicant's claim that MVP® has increased foliar persistence resulting in increased residual activity.

The applicant also submitted additional data on the efficacy of MVP® in controlling the various lepidopteran pests (diamondback moth (DBM), cabbage looper (CL), imported cabbageworm (ICW) and the beet armyworm (BAW)). Since statistical analysis was not submitted with this data a definitive conclusion of efficacy of this data could not be determined. However, the data appears to suggest that in general MVP® was more effective than Dipel®, Javelin® or Cutlass® in controlling the DBM and the CL. Data on the effectiveness of MVP® against the ICW suggests that MVP® was not better than Javelin®, Dipel®, Cutlass® or Ambush in controlling this pests. One study that compared the efficacy of MVP® to Javelin® showed that MVP® was better at controlling the BAW than Javelin®.

According to Gelernter (1991) the studies submitted previously as well as the additional studies submitted were conducted in several different locations within the United States. Thus, it is believed that these locations portray a range of conditions representative of the agro-ecological system of the United States and is indicative of the conditions that may exist in the field.

Additional data were obtained from the 1991 Insecticide and Acaricide Tests (13 studies) which compared the efficacy of MVP® to other compounds including the B.t. products Cutlass®, Dipel® and Javelin®. Results from these studies appeared to suggest that in general, MVP® performed as well as the other products in

controlling the various lepidopteran (DBM, ICW, CL, European corn borer (ECB), and the fall armyworm (FAW)) pests found on cabbage (3 studies), broccoli (1 study), collards (1 study), sweet corn (7 studies), and field corn (1 study).

Thus, based on the previous analyses and the current information, I believe that the applicant has satisfactorily supported the claims made concerning the use of MVP®. I also believe that MVP® will offer an added advantage to growers for the management of many lepidopterans pests.