

**ASSAIL™: A NEW TOOL FOR INSECT  
PEST MANAGEMENT IN COTTON**

**M. D. Parrish  
Aventis CropScience  
Research Triangle Park, NC**

**Abstract**

Acetamiprid, formulated as Assail™ brand 70WP Insecticide will be commercially available for cotton growers in 2002. This foliar applied chloronicotinyl insecticide provides quick knockdown and is particularly effective against sucking insects, but also controls some worms and beetles. The product shows broad-spectrum ovicidal activity and has excellent translaminar movement. Toxicological and environmental indicators are favorable.

**Introduction**

The active ingredient in Assail™ brand 70WP Insecticide is acetamiprid, a new insecticide belonging to the family of chemistry known as chloronicotinyls. This compound is being developed by Aventis CropScience in North America, Europe, and many other parts of the world as a foliar insecticide. Acetamiprid (NI-25) was originally discovered by Nippon Soda in Japan and is already being sold in countries outside of the US and Canada as Mospilan® and Rescate®.

Assail™ brand 70WP Insecticide is particularly active on sucking pests such as aphids, whiteflies and plant bugs. Unlike other commercially available chloronicotinyls, acetamiprid has good activity on many worm species (Lepidoptera) and is extremely efficacious as an ovicide across many pest species and families. Activity against the many susceptible insect species is determined through a wide dose rate from 0.025 to 0.25 lb. ai/A.

Assail™ brand 70WP Insecticide is systemic and has excellent translaminar activity. The product provides quick knockdown of many pest species and is 100 times less toxic to bees than other commercially available chloronicotinyls.

**Translaminar Movement**

Although foliar applications of insecticides result in most of the toxicant on the upper surface of the foliage, acetamiprid exhibits excellent translaminar activity and controls pests on both the sprayed leaf surface and the opposite side. Translaminar movement is an important attribute since both aphids and whiteflies live and feed predominantly on the under side of leaves. This can also be an important characteristic for augmentation of beneficial predators and parasitoids where the leaf underside serves as an unsprayed refuge.

**Environmental Fate**

A complete battery of environmental fate studies has demonstrated that acetamiprid has a low environmental risk profile. Acetamiprid degrades rapidly in the environment while its major soil metabolite degrades somewhat more slowly. The soil metabolites have low to medium mobility with little potential to leach into ground water. Toxicity studies show that these metabolites are of no toxicological significance. The degradation of acetamiprid in the environment is primarily through degradation by soil microbes. Photolytic and hydrolytic degradation is minimal.

**Mode of Action**

Acetamiprid interrupts the function of the insect nervous system by acting as an agonist of the nicotinic acetylcholine receptor (nAChR) on the postsynaptic membrane of nerve cells. Biochemical radioligand binding studies show that acetamiprid interacts with high affinity at the insect nAChR binding site and with low affinity at the vertebrate nAChR. The differences in the affinities of acetamiprid between the insect and vertebrate nAChR indicate there are structural differences between insect and vertebrate nAChRs, which may account for acetamiprid's selective toxicity to insects.

**Mammalian Toxicity**

Acetamiprid has low mammalian toxicity. It is not oncogenic, mutagenic or genotoxic. It does not cause developmental or reproductive toxicity. It presents low neurotoxic potential, and does not have any cumulative effects such as cholinesterase inhibition. There is no indication of effects on the endocrine system. There is no indication of increased sensitivity of infants or children. Assail™ brand 70WP Insecticide is in Toxicity Category III requiring the use of the signal word "Caution".

**Environmental Toxicity**

The available environmental fate and ecotoxicity data along with conservative exposure and risk assessments show that acetamiprid presents low environmental and ecological risk concerns.

**Formulation**

Acetamiprid is formulated as a 70% wettable powder and is compatible with a wide range of adjuvants, fungicides and other insecticides. The use of spray adjuvants such as wetting agents or spreaders will enhance coverage and have been shown to improve pest control.

**Ovicidal Activity**

Assail™ brand 70WP Insecticide is active as an ovicide through direct kill of insect eggs. Laboratory studies have demonstrated that death is not due to ingestion of the treated shell. A variety of formulations tested have shown this activity indicating that it is not a solvent effect.

Ovicidal activity has been confirmed on the following insect pests:

**Lepidoptera**

Diamondback moth, *Plutella xylostella*  
Southern armyworm, *Spodoptera eridania*  
Fall armyworm, *Spodoptera frugiperda*  
Tobacco budworm, *Heliothis virescens*  
Bollworm, *Helioverpa zea*  
Cabbage looper, *Trichoplusia ni*  
European corn borer, *Ostrinia nubilalis*

**Homoptera**

Sweetpotato (cotton) Whitefly, *Bemisia tabaci*  
Glassy-winged sharpshooter, *Homalodisca coagulata*

**Coleoptera**

Colorado potato beetle, *Leptinotarsa decemlineata*  
Mexican bean beetle, *Epilachna varivestis*

**Hemiptera**

Green stink bug, *Acrosternum hilare*

### **Effect on Beneficial Arthropods**

The impact of acetamiprid on beneficial populations varies depending upon the arthropod evaluated. Trials conducted in laboratories should always be considered as worst case scenarios since dosages are made directly to the targets while being held in confinement.

Lab data indicated that acetamiprid can be toxic to certain lady beetles (coccinellids) and minute pirate bug nymphs (*Orius*). Effects were less on adult minute pirate bugs. Acetamiprid had no or little effect on predatory mites and wasp parasites evaluated in these trials. Typically acetamiprid on treated foliage does not have activity on hymenopterans (wasps and bees). This is particularly important in orchards and vineyards where parasitoids often play important roles in pest control.

### **Toxicity to Bees**

A two-day (48-hour) contact toxicity study with honey bees establishes that acetamiprid is in the EPA “moderately toxic to honey bees” category. The acute contact LD<sub>50</sub> is 8.09 µg/bee. A study on the toxicity of residues on foliage to honey bees was conducted, and there was no residual toxicity at 0.35 lbs. ai/acre (40% above the highest rates proposed for the label) after 3, 8, and 24 hours.

Acute contact toxicity data indicates that acetamiprid is at least 300 times less toxic to honey bees compared to commercially available chloronicotinyls: imidacloprid and thiamethoxam. It is more than 2,000 times less toxic via oral route.

### **Resistance Management**

Acetamiprid is the active ingredient in ASSAIL™ brand 70WP Insecticide. It is a member of a class of chemicals known as chloronicotinyls. Also present in this class of chemicals is the active ingredient imidacloprid (PROVADO® and ADMIRE®). The rotating of ASSAIL™ brand 70WP Insecticide with pesticides with different modes of action may delay or prevent insect resistance development. The use of ASSAIL™ 70WP should conform to resistance management strategies established for the use area. Consult your agricultural advisor, University contact or Extension Service for recommended pest management practices for your area. Use recommended integrated pest management practices so that you are not relying solely on chemical control in your crop production.