

SUMMARY

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Avermectins are a group of compounds defined as macrocyclic lactones; they originally were isolated from the mycelia of Streptomyces avermitilis from soil in Japan. Although originally developed as anthelmintics, the avermectins were soon found to be highly active as systemic insecticides/acaricides against parasites of animals. Subsequently, investigations in the plant protection area with cotton revealed that the avermectins were highly effective against the boll weevil, tobacco budworm, and bollworm.

The mode of action of the avermectins in certain parasitic nematodes and arthropods involves interruption of nerve impulses at neuromuscular junctions which results in paralysis and death. The neural transmissions are mediated by gamma-aminobutyric acid (GABA) and the avermectins act as GABA agonists. Flukes or tapeworms which do not have GABA as a nerve impulse transmitter are not affected. Apparently the principle peripheral neurotransmitter in mammals, acetylcholine, is not affected. Also, the blood barrier system in mammals prevents penetration of the avermectin into the central nervous system where GABA acts as a neurotransmitter.

The discovery of the effectiveness of ivermectin, one of the avermectin chemicals, as an insecticide/acaricide for control of arthropod pests of livestock was a primary motivating factor that led to additional research thrusts against pests in other agro-economic systems. The possibility of broad spectrum activity based on avermectins' mode of action was initially established in these pioneering studies and development of critical bioassays in plant protection and other areas developed slowly thereafter.

Studies on the fate of the avermectin B_{1a} within the environment indicate that the degradation of avermectin under aerobic conditions occurs rapidly in different agricultural soils. Additional studies after application on cotton plants or on the soil indicate no appreciable problems with residues in plant materials. Studies on the animal health application of ivermectin demonstrate that each formulation intended for commercialization has been shown to have a wide range of safety.

The results presented in this symposium suggest that avermectins may represent a new generation of pesticides, based on a highly specific mechanism of activity, that can be utilized in animal, plant, and urban environments. The continuing potential for development of insecticide resistance in arthropod populations remains a constant threat in agricultural production. New chemistries and activities must continue to be a viable segment in agricultural research in conjunction with studies on basic mechanisms that regulate development and behavior. The research conducted thus far with avermectins indicate a broad spectrum of activity is present against many economic species on different crops and animals. Although this symposium did not address each situation, the emphasis was made that the avermectins represent one of the more exciting classes of chemicals developed recently with potential insecticidal properties.