

**DEVELOPMENT OF A NOVEL SPRAYABLE  
PHEROMONE PRODUCT FOR PINK  
BOLLWORM CONTROL**

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**Abstract**

The company biosys, was founded in 1983. Its purpose was to develop entomopathogenic nematodes as commercial insect control products. This effort has been achieved with products now being sold world-wide for control of a variety of insect pests in diversified commodities. biosys is now positioning itself to be the world leader in the development and commercial sales of biological control products. A recent merger with Crop Genetics International brought a portfolio of three, EPA registered insect control Baculoviruses. Two virus products, Spod-X® (for beet armyworm control) and GemStar® (for bollworm and tobacco budworm control) are now sold commercially in US cotton. In early 1996, biosys will merge with AgriDyne, a leader in the development of Azadirachtin, extracted from Neem Oil. This botanical insect growth regulator has insecticidal properties on a number of insect pests.

In 1993, biosys purchased the company AgriSense, one of the world's leaders in the development of insect control pheromone products, traps and lures. AgriSense began in 1989 as a joint venture partnership between Phillips Petroleum Company and Dow-Corning Inc. This joint venture led to the development of a Metathesis Chemical Route Technology for the production of active ingredients in certain insect control pheromones. After the acquisition of AgriSense, biosys started production of Gossyplure (the active ingredient in pink bollworm pheromone products), using this Metathesis Route Technology. biosys is now a world-wide supplier of Gossyplure.

Insect sex pheromones have been used successfully as insect control strategies for a number of insects, including pink bollworm on cotton. However, for these products to be successful, effective controlled release systems had to be designed. Pheromone controlled release technology, simply put, is the prolonged release of an effect chemical from a device to its environment between certain predetermined rate limits and for a desired length of time. To achieve this, several companies have made significant advancements using technologies such as complex formation, emulsions, suspensions, slowly dissolving coatings, bioerosion, compressed solids, osmotic pumps, iontophoresis and polymeric devices.

Biosys has used two different release technologies based on Polymethacrylates for sprayable formulations and Polyvinyl Chlorides for hand-placed devices. Decoy PBW® (based on methacrylates) is a commercial sprayable bead like product for pink bollworm control. This product contains 63% active ingredient, ranging in size from 200-600 microns in diameter. The product can be applied by ground or aerial liquid application equipment. This was the first commercial sprayable pheromone product introduced in Arizona cotton. Rates are 2-10 grams of active ingredient (ai) per acre.

To improve product performance, biosys and Advanced Polymer Systems, began research on new sprayable formulations. A patented formulation was selected called Microsponge®. Microsponge is a highly cross-linked poly-methacrylate copolymer that is an ultralight, free-flowing, white spherical powder. The powder is unique in its structural morphology and consists of spherical particles of approximately 25 microns, which are composed of clusters of submicron spheres within a porous membrane. These spherical particles, held within an interstitial network, are not sensitive to shear. Microsponge is compatible with most types of mixing and application equipment. This product is very conducive to the effective release of Gossyplure.

In 1995, biosys began a series of field demonstration trials in Arizona with this new Microsponge formulation. Microsponge was loaded with Gossyplure at 40%. These trials began in July in cotton fields ranging in size from 40-80 acres with a history of pink bollworm problems. The summer of 1995 was atypically hot and humid compare to previous years.

In fields with high infestation of pink bollworm adults, the following results were observed:

A rate of 7.2 gram ai/acre disrupted mating for 7 days under extreme population pressure.

- A rate of 10 gram ai/acre disrupted mating for 17 days.
- Rates of 14.4 or 22 grams' ai/acre disrupted mating for 17 days.

In fields with moderate infestation of pink bollworm adults, the following results were observed:

A rate of 7.5 gram ai/acre disrupted mating for 28 days.

- A rate of 15 gram ai/acre disrupted mating for 30 days.
- A rate of 22 gram ai/acre disrupted mating for 32 days.

These field trials demonstrate the superior performance of the Microsponge formulation over the original Decoy PBW methacrylate beads. The Microsponge formulated product will be introduced in the United States in 1996 under the new name trade name Frustrate PBW®. Recommended field rates will be 7.2-14.4 grams ai/ac or 18-36 grams of formula/ac. Frustrate PBW, will be supplied in 180 gram bottles.

This new Microsponge formulation is also being tested with two other mating disruption pheromones. Field trials in Mexico against tomato pinworm (*Keiferia lycopersicella*, Lepidoptera: Gelechiidae) has demonstrated field performance for up to 30 days. Field studies in Chile against European Pine Shoot Moth (*Rhyacionia buoliana*, Lepidoptera: Tortricidae) in Monterey Pine Plantations had demonstrated field performance for up to 35 days. The product, Decoy RB<sup>®</sup>, was introduced in 1995 as a commercial control product.