



## Specialized Pheromone and Lure Application Technology: A Tool in Attaining Sustainability

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Specialized Pheromone and Lure Application Technology (SPLAT) emulsion is a unique controlled-release technology that can be adapted to dispense and protect a wide variety of compounds from degradation, including semiochemicals, pesticides, and phagostimulants, in diverse environments. Developed by ISCA Technologies. It is an effective measure to control invasive pest like *Spodoptera frugiperda*. SPLAT is a chemical controlled-release emulsion technology that has been used to dispense compounds to control a variety of insect pests. SPLAT formulations have been commercialized both domestically and internationally. Although most semio-chemical controlled-release formulations have taken the form of devices, such as aerosol dispensers and laminated polymers. ISCA has taken an alternative approach and commercialized a chemical formulation in the form of a controlled-release emulsion, SPLAT (Specialized Pheromone and Lure Application Technology).

### Introduction

SPLAT (Specialized Pheromone and Lure Application Technology) emulsion is a unique controlled-release technology that can be adapted to dispense and protect a wide variety of compounds from degradation, including semiochemicals, pesticides, and phagostimulants, in diverse environments. ISCA Technologies, Inc., in collaboration with colleagues in academia, government, and industry, has been developing SPLAT -based insect control products for close to a decade. This provides an overview of SPLAT technology and existing commercial formulations and describes ongoing efforts to develop new SPLAT mating disruption, attract-and-kill, and repellent products for pest control in agricultural and forest environments. ISCA Technologies, Inc. (Riverside, CA U.S.A.) acquired SPLAT (Specialized Pheromone and Lure Application Technology) in 2004. Additional advantages of SPLAT include the biodegradability of its inert ingredients and low manufacturing cost, which decrease environmental impacts and enable commercialization of affordable semiochemical-based control products. The earliest SPLAT formulations were created for mating disruption, principally of lepidopteran pests

### Application

SPLAT formulations typically have a paste or cream-like consistency. SPLAT is a non-Newtonian, shear-thinning, thixotropic fluid, which means that SPLAT viscosity decreases when the emulsion is placed under stress, such as when it is stirred or pumped, but increases again when the stress is removed. This property is advantageous in that the less viscous SPLAT can easily be manipulated (e.g., stirred or pumped), but quickly thickens upon application to a surface, aiding in product adhesion.

## Controlled-Release Technology

The aqueous component of the SPLAT emulsion gives the product its liquid character, allowing it to flow. The non-aqueous component of the emulsion is the controlled-release device. It comprises the active ingredients (e.g., semiochemical compounds or pesticides) and the additives that will protect these and fine-tune their release rates from the dispenser. Upon application, the aqueous component of SPLAT evaporates from the dispenser within 3 hours, leaving the rainfast, non-aqueous component firmly affixed to the substrate, where it will release the active ingredients until all available molecules are dispensed.

## SPLAT-Specialized Pheromone and Lure Application Technology

SPLAT is a “matrix-type” or “monolithic” diffusion-controlled release device. Diffusion-controlled release devices are ones where the diffusion of the active ingredient through the device controls its release rate. Monolithic dispensers are diffusion-controlled release devices where the active ingredient is dispersed or dissolved in a matrix. If the active ingredient is dispersed in the matrix, it must dissociate from the other molecules in its crystal cell and solubilize into the matrix before release can occur. If it is dissolved in the matrix, this first step is bypassed.

## Formulations

SPLAT formulations have been developed to release a variety of compounds, including sex pheromones, kairomones, attractants, repellents, phagostimulants, and insecticides. Several SPLAT mating disruption and attract-and-kill formulations are commercially available. SPLAT repellent formulations will also soon become available commercially.

## Mechanism

The mechanisms of mating disruption comprise: 1) competitive attraction (also known as “false trail following”), 2) camouflage, 3) desensitization, which includes both adaptation and habituation, and 4) sensory imbalance. Recent laboratory investigations have demonstrated that responses of females of some moth species to their own sex pheromone alters their behavior in ways that may also enhance mating disruption. Combinations of these mechanisms often function together in a mating disruption system and the mechanisms involved in mating disruption differ depending on both the species being controlled and the pheromone formulation used. Mating disruption research historically focused heavily on determining the efficacy of the technique for various insect species in field trials, with few studies to determine the mechanism by which mating disruption worked for the species and formulation being investigated.

## Conclusion

SPLAT (Specialized Pheromone and Lure Application Technology) emulsion is a unique controlled-release technology that can be adapted to dispense and protect a wide variety of compounds from degradation, including semiochemicals, pesticides, and phagostimulants, in diverse environments. ISCA Technologies, Inc., in collaboration with colleagues in academia, government, and industry, has been developing SPLAT®-based insect control products for close to a decade and it is one of the most influential method of pest control in today's world.

## References

1. Mafra-Neto, A., Fettig, C. J., Munson, A. S., Rodriguez-Saona, C., Holdcraft, R., Faleiro, J. R., ... & Villagran, K. M. (2014). Development of specialized pheromone and lure application technologies (SPLAT®) for management of coleopteran pests in agricultural and forest systems. In *Biopesticides: state of the art and future opportunities* (pp. 211-242). American Chemical Society.

2. Mevada, R. R., Sisodiya, D. B., Parmarand, R. G., & Prajapati, D. R. (2023). Mating disruption: An ecological step towards sustainable pest management. *Journal of Eco-friendly Agriculture*, 18(1), 144-150.
3. Onufrieva, K. S., Thorpe, K. W., Hickman, A. D., Tobin, P. C., Leonard, D. S., & Anderson Roberts, E. (2010). Effects of SPLAT® GM sprayable pheromone formulation on gypsy moth mating success. *Entomologia Experimentalis et Applicata*, 136(2), 109-115.
4. Pawar, U. A., Shinde, Y. A., & Datkhile, R. V. (2022). Specialized Pheromone and Lure Application Technology (SPLAT): A New Horizon in Pest Management. *Advances in Agricultural and Horticultural Sciences*, 94.
5. Praveenkumar, C. (2022). Chapter-19 Pheromone Technology for Sustainable Pest Management. *Modern Concepts in Farming*, 249.