

# SYSTEM ACQUIRED RESISTANCE

**Chitosan, Salicylic Acid & Harpin**



Systematic Acquired Resistance (SAR) is an unfamiliar topic to many growers, but it is one that is of great value. If you take the time to learn about these additives, you will be well on your way to having a garden unlike anything you have ever experienced before. This is a discussion of the three main additives that can create a SAR effect and act as the Natural Plant Defenders within your plants.

A SAR is triggered and promoted in plants through a complex series of reactions. This Resistance is elicited through the foliar and/or root zone application of a variety of additives which create a phantom pathogen invasion - a sort of alarm signal is then sent throughout ALL of a plant's cells. This alarm heightens the natural defenses; creating defensive enzymes, antibiotics, proteinase inhibitors...in the process it activates oxygen, increases growth hormones, increases nutrient uptake, and in general speeds up a plant's metabolism. This response is because the plant is preparing for an attack. . .This phantom enemy in actuality does NO harm to the plant, and the plant in turn reaps the benefits of its razor sharp internal systems.

## **Chitosan**

Chitosan is a plant defense booster derived through the breaking down of chitin found in shellfish and mollusks. In general Chitosan can help improve the efficiency of a nutrient or fertilizer. Chitosan will increase the quantity, size and shelf life of a harvest product. Chitosan is also effective at providing insect and disease control. The chitosan molecule triggers a defence response within the plant, leading to the formation of physical and chemical barriers against invading pathogens. Chitosan possesses a high growth stimulating efficacy combined with antifungal and antibacterial activity of systemic character. Chitosan cause no damage to the plant whatsoever.

Chitosan inhibits the reproduction of pathogens. Once applied either via foliar spray or through watering, it provides plant protection against fungal infection by rapid expression of a number of defense responses, including forming structural barriers at sites of attempted fungal attacks. It also protects against insect attack by activating genes which produce protease inhibitors. Lastly, chitosan stimulates the plants hormones responsible for root formation, stem growth, fruit formation and development.

In addition to promoting growth and protecting against attacks, using chitosan in a garden can help to improve the beneficial microbial activity of a growing medium. This increase in microbial activity helps in conversion of nutrients to bio-available form. Chitosan improves the root system, allowing plants to absorb more nutrients from a medium. We expect Chitosan to become one of the top plant health and yield products as awareness of its value grows.

## **Salicylic Acid**

The next additive in this new class of Natural Plant Defenders is Salicylic Acid. This specific plant molecule has two major functions. In the first it acts as a promoter letting the entire plant know (through the use of intercellular mechanisms) that pathogens are near. The second way in which Salicylic Acid works is as an activator. It actually heightens the alarm signal a plant experiences.

In plants, Salicylic Acid serves the function of ringing the alarm bell when a pathogenic organism begins to invade plant tissues. A whole web of immunity-enhancing processes unfold after the plants are exposed to Salicylic Acid - when that initial alarm is rung. A whole range of proteins and enzymes become activated as soon as Salicylic Acid is released and absorbed into plant cells. Salicylic Acid also promotes DNA-binding proteins that initiate new protein synthesis.

## **Harpin Protein**

The final additive we would like to discuss is the Harpin protein. Harpin, like the other SAR products on this handout, acts by eliciting a complex natural defense mechanism in plants, analogous to a broad spectrum immune response in animals. Harpin simultaneously enhances a plant's own growth systems and natural defense mechanisms to ward off attacks by insects, common diseases and plant stresses.

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Unlike Salicylic Acid or Chitosan, Harpin uses a protein for its main mode of action. It can be safely used in a synergistic way with both Salicylic Acid and Chitosan. Harpin is a naturally occurring bacterial protein present in a number of species of plant pathogenic bacteria. The first harpin protein was isolated from the bacterium *Erwinia amylovora*. To sum up Harpin's benefits: Along with its plant inducing immune system response, Harpin accelerates plant development. It increases root and shoot biomass, early flowering, early fruit set, early fruit maturation, and increases fruit number.

## A list of our Preferred Products

**Heavy Foliar** hits all the bases for a dynamic SAR spray that will suppress fungus as well as provide a contact kill on insects. Foliar also allows for plants to survive up to 145 deg. F., 1 hour after application. This allows growers to turn their AC off and get the room to 120-130 deg. F. for 30 - 45 minutes. This will basically cook any mold spores and bug larvae while keeping the plants in homeostasis.

**Heavy Roots** has a few SAR triggers built into its chemistry and is great at both disease suppression and root promotion.

**Axiom** is the Harpin Protein and elicits a SAR response in plants after being sprayed. Axiom causes a natural reaction in the plant. It turns on your plants' own immune system! Plants treated with Axiom are healthier than untreated plants and have less disease, bigger root systems, more flowers / fruit.

**Great White** has Trichoderma Fungi which bind to the same sites on the leaf level that Powdery Mildew and other airborne spores bind to. Once they are there first it is very hard for the pathogen spores to take hold!

### Foliar Recipe with Heavy Foliar, Heavy Roots and Heavy Fire:

#### Application Instructions:

*Apply this spray every 3 days.*

Quart Sprayer - Mix 30 mL of Heavy Foliar, 1 mL of Heavy Roots and 1 mL of Heavy Fire per quart in a spray bottle filled with purified (reverse osmosis) water. Spray the canopy in a fine mist, then spray through the column on the stems and media tops to kill both powdery mildew and fungus gnats.

This is an all around metabolism boosting, immune system building, pathogen-warding off tonic that will keep your plants standing strong and growing faster than you have seen before. We can't talk highly enough of this potent concoction.

### Foliar Recipe with Axiom, Great White and Coco Wet:

#### Application Instructions:

*Apply this spray every 2 weeks.*

Quart Sprayer - Mix ¼ tsp of Axiom, .06 gram of Great White and a few drops of Coco Wet in a quart-sized spray bottle filled with purified (reverse osmosis) water.

Gallon Sprayer- Mix 1 tsp of Axiom, ¼ gram of Great White and Coco Wet at ¼ tsp per Gallon in a spray bottle filled with purified (reverse osmosis) water.

**ATTENTION!** This handout provides general information and is not to be taken as advice or a recommendation. Before using any product described in this handout, you should verify the information to determine the product's efficacy and safety, and to learn of any laws or regulations applicable to the product. The handout uses descriptions, such as "pesticide", in an informal, familiar way, and these descriptions are not intended to convey whether products are subject to particular laws or regulations.