



SYSTEMIC AQUIRED RESISTANCE

Chitosan, Salicylic Acid & Harpin

Systemic Aquired 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 mullosks. 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 the 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 inter-cellular 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.

Using Chitosan and Salicylic Acid Together

Compared to Salicylic Acid, Chitosan is slower and less effective at inducing plant cell immunity; in combination with a well formulated Salicylic Acid solution, chitosan has compounded effects as Salicylic Acid amplifies the "alarm" triggered by the chitosan. The most powerful products always use both of these ingredients. **Scorpion juice**, from Advanced Nutrients, is an example of a product that contains both Salicylic Acid and Chitosan. These two additives were made for eachother: Chitosan backs up the Salicylic Acid solution in perfect harmony, while it feeds reduced carbon and nitrogen to symbiotic microbes.

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Harpin Protein

The final additive we would like to discuss is the Harpin protein. Harpin, like the other SAR products on this hand-out, 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.

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

Scorpion Juice - Dr. Hornby's Scorpion Juice triggers a plant's defense mechanisms by inducing a systemic acquired resistance (SAR) in the plant cells. This acts as a vaccination for plants, which quickly build immune responses to a diverse variety of pathogens including viruses, fungi, and bacteria. This immunity response is particularly evident in resin producing plants which show substantial increases in resin production when the defense mechanisms are activated. In addition, a marked increase in flower / fruit production and size as well as fragrance is also seen. **Scorpion Juice** contains both Salicylic Acid and Chitosan and can be combined with **Messenger** (as well as **Emerald Shaman**) for an even more explosive cocktail with synergistic effects.

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

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

Yellow Bottle Line (Agricultural organics Bloom line) **Foliar A+B** is another exceptional SAR product that combines 5 different pathways of SAR initiation with all other necessary co-factors needed for perfect integration. Apply once every 2 weeks to illicit ideal Immune response in plants. *Helps build Oil and Resin content as well!*

Foliar Recipe with Scorpion Juice, Messenger, Piranha and Wet Betty:

Application Instructions:

Apply this spray every 2 weeks.

Quart Sprayer - Mix 2 tsp of **Scorpion Juice**, ¼ tsp of **Messenger**, 1/4 gram of **Piranha** and **Wet Betty** at ¼ gram **Piranha** in a quart-sized spray bottle filled with purified (reverse osmosis) water.

Gallon Sprayer- Mix 8 tsp of **Scorpion Juice**, 1 tsp of **Messenger**, 1 gram of **Piranha** and **Wet Betty** at 1 tsp per Gallon in a spray bottle filled with purified (reverse osmosis) water.



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 for Ag. Organics Foliar A+B

Application Instructions:

Apply this spray every 2 weeks.

Quart Sprayer - Mix 4tsp of **Foliar A+B** in a **Quart Bottle** - *no wetting agent is needed.*

Gallon Sprayer- Mix 16 tsp of **Foliar A+B** in a **Gallon** - *no wetting agent is needed.*

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