



**Chitosan and Quillaja
Act Synergistically
to Fortify and
Stimulate Seedlings**

Manufactured Exclusively For
The Pioneer in Agricultural Chitosan Technology



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What is OmniCoat?

OmniCoat is an EPA-registered (# 92032-1) seed treatment product from the Organisan Corporation. OmniCoat is a unique biochemical seed treatment formulation that features Chitosan and Quillaja Extract. OmniCoat must be used only in accordance with use instructions on the label utilizing conventional acceptable seed treatment techniques, provided that the equipment can be calibrated to accurately and uniformly apply the product to the seed. OmniCoat is for both commercial and on-farm application. If OmniCoat is used for commercial seed treatment, treated seed must be labeled in accordance with the requirements of the Federal Seed Act and applicable state seed laws. If this product is intended for seed treatment at planting, treat only those seeds needed for immediate use, minimizing the interval between treatment and planting.

OmniCoat provides early season protection against many plant parasitic nematodes and plant diseases to give your young crop the proper start it needs. OmniCoat also helps establish a vigorous root system that results in greater yields, more uniform foliage, and overall enhanced plant health.

Seed Treatment

Chitosan and Quillaja are the active ingredients and function in synergy. The saponins of Quillaja facilitate Chitosan to coat the seed. The coating is achieved by the saponins reducing surface tension, allowing Chitosan's natural film-forming ability to effectively coat the seed surface. Chitosan is cationic and this cationic nature, as well as other properties, allow this material to chelate and/ or bind to nutrients. This association delivers these valuable compounds in the close vicinity of the seed so they are immediately available at the onset of germination. Chitosan coating forms a barrier around the seed, protecting it from dehydration. Dehydration is a threat to seeds during storage, potentially causing loss in seed tissue integrity and a decline in germination potential and seed viability. A Chitosan coating ensures a more uniform water retention and reduces dehydration during storage. For those seeds that are treated with the intention of storage, this Chitosan coating is a tremendous benefit.



Germination

The chemistry of Chitosan on the seed surface being hydrophilic and, in conjunction with Quillaja saponins, attract water molecules to enhance water absorption. More uniform water uptake results in more synchronous germination and uniform emergence of seedlings and promotes the regular metabolic activities associated with germination events. During germination, some of the Chitosan and Quillaja extract permeates the seed coat and enters the interior of the seed. The presence of Chitosan in the seed interior creates a virtually built-in added capability of future plant health and capacity to overcome future stresses. Chitosan contributes to protecting the seed and increasing resilience to biotic (i.e. pathogens) and abiotic stresses (e.g. drought, salinity, temperature) and enhancing germination induction and progression. A general feature of these abiotic stresses leads to disruption of normal cellular function and cellular damage largely through the production of reactive oxygen species (ROS). Chitosan in its eliciting/ biostimulant function activates the activities of antioxidant enzymes, protecting delicate cellular structures and processes.

Chitosan and Quillaja extract being hydrophilic can diffuse into the spermosphere, adding extra protection. This mobility of Chitosan and Quillaja not only enhances the seed itself but also promotes a favorable microenvironment for seedling establishment. Chitosan that diffuses in the spermosphere encounters beneficial chitinase-producing microbes. These chitinases are antagonistic to pathogenic bacterial and fungal species. Chitinases are also active against the chitin containing eggshells of parasitic nematodes.



The importance of pH

pH is a numerical scale describing acidity (or alkalinity) in aqueous solutions. pH is a term utilized by many and perhaps not understood by all what the term or values mean. pH is an indication of the concentration of hydrogen ions (H^+) generally in an aqueous solution. The pH scale runs from 0 (most acidic) to 14 (most alkaline). The smaller the pH value the more acidic a solution is, so the pH scale is an inverse relationship with H^+ concentration. pH values are determined from a logarithmic scale where a pH change in one whole value is a 10-fold increase (or decrease) in H^+ concentration and vice versa. This relationship is expressed as follows:

$$pH = -\log_{10}[H^+]$$

square brackets indicate concentration and the negative sign indicates the inverse relationship between pH and H^+

As well as providing defenses against various stresses, Chitosan also contributes to plant growth and productivity. Chitosan enhances the uptake of several minerals essential to the germinating seed/ seedling. These include nitrogen, potassium and phosphorus. Chitosan is involved in hormonal regulation and influences the synthesis and distribution of auxins, cytokinins and gibberellins. Chitosan enhances chlorophyll synthesis, a key component of photosynthesis. With increased photosynthetic capacity comes increased energy and accumulation of biomass in the form of root and shoot growth. Chitosan promotes root elongation and branching as well as the development of root hairs, increasing the surface area for water and nutrient capture.

Quillaja extract is rich in triterpenic saponins. These saponins have nematicidal and fungicidal properties, including well-documented wetting agent properties. Quillaja saponins enhance water distribution and nutrient uptake in soils, allowing better penetration in the soil interstitial spaces. Enhanced water movement and access to soil ensures uniform moisture distribution and better nutrient absorption.

Quillaja extract also contains polyphenols and phytohormones. These materials play a largely biostimulant role, significantly promoting plant growth, stress resistance and root development. Additionally, Quillaja extract is an excellent seed treatment and soil amendment in its own right, helping to improve germination rates and early plant vigor. It facilitates the absorption of Chitosan in the dormant seed interior and furnishes it with an exterior coating of Chitosan. The interior tissues receive a supply of Chitosan ready to exert its effects upon germination. Quillaja extract also improves germination by enhancing water uptake during imbibition, increasing seed viability and vigor and improving establishment in the soil as the seedling emerges.

It is highly recommended that OmniCoat should be applied to naked seeds to fulfil the full potential of the product. This allows the Quillaja and Chitosan to form an intimate film with the seed coat. Applying OmniCoat on top of other additive coatings impedes Chitosan and Quillaja film-forming and subsequent entry to the seed at germination and beneficial actions are lost. OmniCoat does work well in concert with other natural and biological seed treatment ingredients like mycorrhizal spores, seaweed extracts, humic/fulvic acids, or bacterial biostimulants and biopesticides.

So, a solution of pH 4 has 10 times more H^+ than a solution at pH 5. Conversely it can be stated that a solution of pH 5 has 10 times less H^+ than a solution at pH 4. Likewise, a pH of 2 has a 10^3 (thousandfold) greater concentration of H^+ than a pH 5 solution. pH is an important consideration for agriculturalists with regards soil and spray tank mixtures. The same applies to Chitosan in seed treatment.

From a Chitosan perspective, pH is a very important consideration to a spray tank mixture. Chitosan is a polycation. This means it carries multiple positive charges along the length of the polymer chains. The degree of this cationic nature is dependent on pH. Basically, the more acidic, the more cationic Chitosan becomes. It is the cationic nature of Chitosan that is at the heart of its amazing variable functionality. Obviously, there has to be a balance between practicality, applicability and potential harm to target crops (very low pH). With Chitosan increasing the pH (i.e. becoming more alkaline) the positive charges along the polymer chain gradually disappear.

At around pH 6.2 - 6.3 a significant proportion of these charges have been removed and Chitosan solubility diminishes fairly rapidly. An important point to note is, if the polycationic property of Chitosan is deprived or reversed (for example by elevating pH), the corresponding antimicrobial (and so many other) capacities will be weakened or lost. Chitosan's effective cationic functionality occurs at pH below 5.0. This is an important consideration for the spray tank pH (Chitosan solubility) and one of the main reasons Organisan Corporation recommends acidifying spray tank pH to 5.0 or below (to ensure optimal Chitosan functionality).



About Our Company

There are a lot of things to understand about our company and its products. First, we are a market leader. We innovate. We are not a “me too” company, which seems to be the trend with our competitors. Numerous aspects separate us from others in the market. Since Chitosan is such an important raw material for us, we don't source from the cheapest vendor. Our Chitosans are manufactured from shellfish exoskeletons that are sustainably harvested. Our Chitosans are top quality food-grade material. In addition, our Chitosans enjoy a “Generally Recognized As Safe” (GRAS) status from the U.S. FDA. Our Chitosans are also compliant with California Proposition 65, that state's Safe Drinking Water and Toxic Enforcement Act of 1986. Chitosan quality has a significant impact on performance.

Unlike others, we do not view Chitosan as just a name or the latest trend or buzzword we have encountered. We have been in this industry since 2012, actively pioneering the way forward with our Chitosan Agricultural Technology. We are not at the cutting edge. Our competitors may claim to be there but we are out in front of that edge with a file, honing it, defining it with our collective technology, experience and expertise. Chitosan is a science and a technology with a history. Chitosan is not a monolithic, one size fits all material. Far from it. Organisan Corporation has understood this from the beginning and is at the forefront developing specific Chitosan-based products for a number of agricultural applications. We pioneered Chitosan Agricultural Technology.

Chitosan is known to be active in many areas. For example, Chitosan is recognized as a plant growth regulator, a plant defense booster, an elicitor, has fungicidal and antimicrobial properties and is also employed as a sticker agent in adjuvant formulations. Chitosan works well with the natural biology of the soil and has been employed with much success with several commercial beneficial biological agents such as *Beauveria bassiana* in combatting the deleterious effects of many plant pathogens.

We don't stop there. We constantly refine our manufacturing processes to give you top quality, functional products, tailored to your needs. We leverage our proprietary manufacturing, technical expertise and technology to modify our manufacturing processes to create specifically crafted products with tailored Chitosan properties. We constantly support and improve our manufacturing with lab work, testing formulas, testing new inerts and actives, and seeking efficiencies. All this builds on the already impressive experience we have with Chitosan. Unlike our competitors, our products are not just Chitosan solutions of various claimed concentrations. Chitosan is a functional foundational raw material for us. Our products are specifically formulated and feature Chitosan as a main active

component along with other actives and proprietary inerts. Our products feature Chitosan incorporated in a formulation that maximizes its bioavailability, its penetration in the soil and plant tissues. Our proprietary inerts maximally enhance Chitosan effectiveness that is not seen with Chitosan alone. Our Chitosan based products work in concert with many soil beneficials. Together, this combined synergy creates a far more rhizosphere-friendly environment, keeping pathogens and pests at bay. Our Chitosan products are the result of extensive research, product refinement and field testing. This means, all Chitosan products ARE NOT the same, especially products we manufacture. All of our products are manufactured at our Broussard, Louisiana, facility and shipped to you from there. We take the time and effort to consult and listen to our customers and formulate Chitosan-based products that suits their needs. And we don't walk away. We are committed to you, our customers and we work closely through all aspects of your crop's growing cycle. We listen to you, advise and recommend tailored strategies with tailored products to deliver the results you want.

By working with us, this is what you can expect, and we will deliver. We are your Chitosan experts. This is not a groundless claim. We are not newcomers. The Organisan team has over 80 combined years experience under one roof that comprehensively covers Chitosan from raw material acquisition, manufacturing, processing, product development, R&D, sales, marketing, agronomy, and application. We have sales support 24/7. We back that sales team with technical sales support. We have invested the last 12 years developing products and applying them with success all over the country and internationally, on various crop types, environments and geographies. Years of consistent results from the field attest to this. We know Chitosan. We know how to manufacture it, formulate products with it, sell in the markets we service, and we know how to apply it. We maintain an in-house library of over 6,000 publications gathered from the literature. This resource is available to our personnel and we are constantly searching the literature for applications, technology and other aspects of Chitosan that apply to our business. So when you do business with us, you are not just buying another Chitosan product, you are getting that specifically formulated product along with accessing our experience and expertise. We are on your side and want nothing more than to see your success. That is our commitment to you.

So, if you've tried “Chitosan” products and did not see the outcome you wanted, there's a good chance your product was not made specifically for your use or made by a company that knows what it is doing. That's why you should invest your hard earned dollars with a team of 80+ year's experience backing the right product to maximize your results. And you'll only get that knowledge and experience with the Organisan team and/or our authorized representatives.

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The Pioneer in Agricultural Chitosan Technology



Dr. André Blanchard,
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Vice President, Technology and Operations,
Organisan Corporation
Extensive Chitosan research and
application for 30 years.

Our proprietary manufacturing operations are located in Broussard, Louisiana, close to where our scientist lives. The “science” behind the formula was created, developed and is manufactured under the supervision of Dr. André Blanchard. Originally from south Louisiana, André spent most of his young life growing up in Inverness, Scotland (you'll be treated to both accents). He attended the University of the West of Scotland getting his bachelors in Applied Biology. André went on to gain his Ph.D. in Plant Molecular Biology at the University of Exeter in southwest England. From there, he returned home in 1992.

André brings a combined 30 years experience in academia and the private sector. André has worked with industrial scale recycling technologies and specialty chemicals manufacture. Within these industries, he has gained experience in directing product and process research and development. These efforts led to the technical

development of a process (now a U.S. Patent) for manufacturing a key raw material. André is also experienced in small business management, consulting, technology transfer, commercializing technologies, project management, process design and manufacturing strategies. He also initiated several collaborative projects with leading universities involving several external grant funded efforts from Federal agencies.

André's association with Chitosan over the past 18 years has involved researching and formulating new products, designing manufacturing processes, marketing and commercialization.

André is leveraging his experiences to leading future innovations of a variety of products, and constantly improving the manufacturing process.