CHIPRO PLANT
SUSTAINABLE AGRICULTURE

ALL-NATURAL PLANT ELICITOR

GENERAL INFORMATION

Due to its **antibacterial** and **antifugal** properties, chitosan hydrochloride is successfully used in **plant protection**, as an **elicitor**, **growth promoter**, enhancer of secondary metabolites production, and in soil correction and restoration. *ChiProPlant®* is an **all-natural**, **organic** compound and is made from left over or unused food industry crab shells and stands for **environmentally friendly plant care**. Not only does it help to reduce chemical pest and disease management applications, but it is also an effective defense mechanism elicitor in plants, **enhancing the plant's health**, appearance and resistance against phytopathogens. *ChiProPlant®* is beneficial for the **growth of mycorrhiza**, improves the rhizosphere, and supports growth of other beneficial microorganisms in the soil. Application is versatile: as a seed coating or dip, directly onto the soil, or by foliar spraying. A better nutrient supply for your plants with less fertilizer needed.

ChiProPlant® is listed as a basic substance according to actual law of the European Union. EU no. 1107/2009

Registered as Basic Substance: Chitosan hydrochloride
SANCO/12388/2013-rev.2 20 March 2014

www.chipro.de

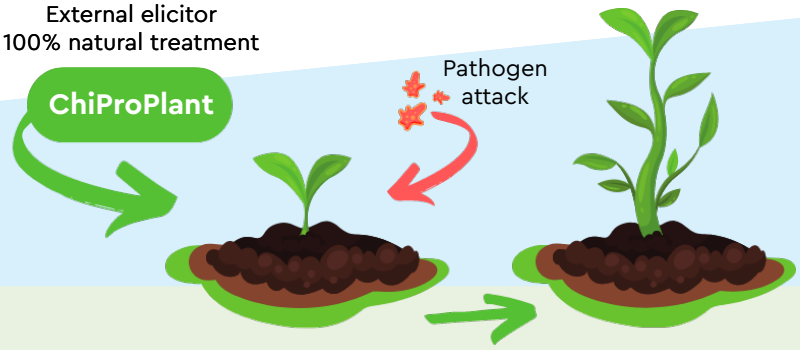
CHIPRO PLANT
SUSTAINABLE AGRICULTURE

MODE OF ACTION

ChiProPlant potentiates the plant's defense mechanisms against bacterial and fungal infestation. The application of the formulation increases root growth, boosts resistance against stress factors and improves germination and early plant development.

The positive influences on plant's health and growth have a yield increasing effect.

External elicitor
100% natural treatment



Complex and integrated reactions of **plant defence**

- Expression of chitinases and chitosanases leads to destruction of the fungal cell wall
- Synthesis of phytoalexins with antibiotic properties
- Production of toxic hydrogen peroxide
- Lignification of cells walls of the plant strengthens the physical barrier
- Changes in the ultrastucture of roots and leaves prevent the intrusion of some types of fungi
- **ENHANCED GROWTH**

KEY FACTS

- Water-soluble powder
- Strong prophylaxis against infestations
- Enhanced plant growth
- Healthy plants
- Effects scientifically proven
- Increases germination rate
- Increases yield

ANALYSIS	SPECIFICATION
Appearance	White /light yellow, fine powder
Matter insoluble in water (%) *Drying method*	≤ 0,5
Particle mesh	40/60
pH value (1% solution)	4.0 – 6.0
Viscosity (mpa.s)	80–120
Deacetylation (%) *P.V.S.K. Titration*	70.0 – 90.0
Chloride (%) *Potentiometric*	10.0 – 25.0
Heavy metals (Total, ppm)	≤ 40
Sulfated Ash (%)	≤ 1.0

ChiProPlant – EFFECTIVE AGAINST:

powdery mildew *(Erysiphe cichoracearum, Sphaerotheca fuliginea)* Cucumber, Melon, Pumpkin, Cucurbit & Watermelon	**brown patch, damping-off, black scurf, root rot, belly rot, sheath blight**, etc. *(Rhizoctonia solani)* Potato, Rice, Sugar Beet, Cucumber, etc.
bacterial Wilt *(Ralstonia solanacearum)* Potato & Tomato	**grey mould / botrytis bunch rot** *(Botrytis cinerea)* Tomato, Grape, Strawberry, Potato, etc.
corky root rot *(Pyrenochaeta lycopersici)* Tomato	**black bread mould** *(Rhizopus stolonifer)* Strawberrry, Sweet Potato, Papaya, etc.
downy mildew *(Plasmopara viticola)* Grape	**late blight / potato blight** *(Phytophthora infestans)* Potato & Tomato
common scab *(Streptomyces scabies)* Potato, Beet, Carrot, etc.	**bacterial canker** *(Pseudomonas syringae pv. actinidiae)* Kiwi
rose black spot disease *(Diplocarpon rosae)* Rose	**fire blight** *(Erwinia amylovora)* Apple
leaf spot diseases *(Stagonospora nodorum , Septoria nodorum)* Tomato, etc.	**canker** *(Colletotrichum gloeosporioides / Glomerella cingulata)* Mango, Apple, Quince, etc.
brown rot *(Monilinia laxa)* Peach	**verticillium wilt** *(Verticillim albo-atrum)* Cucumber, Cucurbit, etc.
downy mildew *(Sclerospora graminicola)* Millet	

ChiPro GmbH I info@chipro.de I Tel: +49 (0)421 3651 7074 I Admiralstr. 7–11 I 28215 Bremen / Germany

CHIPRO PLANT
SUSTAINABLE AGRICULTURE

LIST OF APPLICATION

Water-soluble powder, recommended dilution 1:2000. Usable for all plants and soils.
Mixing with other pesticides or fertilizers is not recommended.

Please note: The information presented in the following table is supported by different research reports from the literature. To obtain full reports and more details regarding the uses of ChiProPlant on the treatment of a specific disease, please contact us for further discussion.

Plant	Application mode	Results	Disease / Pathogen
Apple	0.1% ChiProPlant fruits coating	Protection against *Erwinia amylovora*	Fire blight
Apricot	0.1% ChiProPlant fruits coating	Direct inhibition activity	Fruit rot
Artichoke	Seed coating	Enhance seedlings growth	Healthy Plants
Asparagus	Seedlings dipped into 2 g/L ChiProPlant	20% higher yield in treated asparagus	
Banana	Fruit dipping in 1% ChiProPlant solution	Treated banana have improved firmness, and percentage weight loss with respect to controls.	Embul
Barley	0.1-1% germinating seeds	Higher phenolic content	Mildew
Basil	0.02-0.04% foliar spaying	Increase in plant growth and total phenol content	
Bean	Sterilized beans treated at the beginning of growth with 0.5-3% ChiProPlant.	ChiProPlant has positive impact on leaf surface, stem length, root length and chlorophyll concentration in plants	
Bell pepper	0.3-0.5% leaves and fruits spraying	Increase in fruit weight, fruit diameter, and yield	
Camellia	0.05% foliar spaying	Accumulated H_2O_2, defense-related enzymes and soluble proteins	Anthracnose
Carrot	2-4% coated carrot roots	Antifungal activity	*Sclerotinia sclerotiorum*
Celery	Soil addition	Decreased disease severity	*Fusarium wilt*
Chilli	0.4-0.8% Seed treatment	Seed treatment reduces infection and improve seedling performance. Increased lignin content.	*Colletotrichum sp.*
Corn	Sprayed with 0.05% ChiProPlant	High performance. Early germination and emergence, resistance to damage, reinforcement against pathogens	
Cucumber	Cucumber seeds grown with a nutrient solution containing 0.01 -0.04% ChiProPlant	At 0.01% ChiProPlant reduced mycelial dry weight by 75% and 0.04% ChiProPlant completely inhibits fungal growth. Increases concentrations of chitinase, Chitosanase and β-1,3-glucanase activity in roots and leaves	*Verticillim albo-atrum* *Rhizoctonia solani* *Erysiphe cichoracearum* *Sphaerotheca fuliginea* *Rhizopus stolonifera* *Colletotrichum spp.*
	Foliar spraying with 1% or 2.5% ChiProPlant solution	Increase in cumulative yield, fruit size, fruit number and root fresh and dry weight of plants	
Dragon fruit	1% ChiProPlant spraying on plants	Antifungal activity	*C. gleosporoides*
Eggplant	0.5% ChiProPlant seed treatment	Enhanced the germination percentage and seedling growth such as shoot length, root length, fresh weight and dry weight	*Ralstonia solanacearum*
Grape	Apply ChiProPlant at berry set, bunch closure, veraison and 3 weeks before harvesting	Reduces natural gray mold incidence. Chitinase, peroxidise and PAL activity are increased, enhances phytoalexins and phenolic compounds, stilbenes	*Plasmopara viticola* *Botrytis cinerea*
Green bean	0.025-0.2% seeds soaking and foliar spraying	Increased vegetative growth characters, yield and quality of green bean pods	*Fusarium solani* *Rhizoctonia solani*
Jute	1.25% spraying	Enhanced the activity of defense-related enzymes	Stem rot *M. phaseolina*
Kiwi	0.005% Spraying on plants	Protection against bacterial canker	*Pseudomonas syringae pv. Actinidiae*
	Fruit coating with 1%	Extension of fruit commercial life	
Maize	0.04-0.16% Seed coating and plant spraying	Increase plant growth, grain weight, and biomass.	Healthy plants
Mango	0.5-1% ChiProPlant solution applied on fruits	lower rate of disease progression proportional to ChiProPlant concentration.	

ChiPro GmbH I info@chipro.de I Tel: +49 (0)421 3651 7074 I Admiralstr. 7–11 I 28215 Bremen / Germany

Onion	Not specified	Very significant decrease in damage and disease severities	
Orange	2% ChiProPlant post-harvest coating	Fungicidal effect	*Penicillium italicum* *Penicillium digitatum*
Peach	Not specified	Enhanced antioxidant and defense-related enzymes in fruits	Brown rot
Pear	1% ChiProPlant coating of fruits	Inhibition of fungal pathogens in storage	*Botryosphaeria* spp.
Pearl Millet	2.5g ChiProPlant solution per 1 kg of seeds prior to sowing	Increases germination rate up to 99%, very good resistance against *Sclerospora graminicola* (downy mildew), higher yield	Downy mildew
Pine	seedlings submerged in 0.1, 0.05 or 0.025% ChiProPlant solution	50% higher emerged pine seedlings as compared to the control Increased root and mycorrhizal development	Pitch canker
Pomegranate	1.5% ChiProPlant coating of fruits	Inhibition of fungal pathogens in storage	*Botrytis* spp. *Penicillium* spp. *Pilidiella granati*
Potato	ChiProPlant added to the semisolid microplant potato tissue culture medium	ChiProPlant maintains health of potato stock. ChiProPlant can be successfully incorporated into potato seed production from microplant stock.	*Rhizoctonia solani* *Streptomyces scabies* *Phytophthora infestans* *Rhizopus stolonifer* *Botrytis cinerea* *Ralstonia solanacearum*
	0.1% ChiProPlant combined seed and leaf treatment	Boosts Resistance against diseases (e.g. *Phytophtora infestans, Streptomyces scabies* and *Rhizoctonia solani)*	
	0.05% ChiProPlant sprayed on Potatoes while sowing	Yield increase up to 17.5%	
Purple passionfruit	Soil addition	Increased flowers number, fruit weight and juice production	Healthy plants
Radish	0.02% ChiProPlant as soil addition	Promoted to uptake of nutrients, nitrogen, potassium and phosphorus, decreased cadmium concentration	Cadmium stress
Rape	0.05-0.1% ChiProPlant in foliar spraying	Increase in plant growth and leaf chlorophyll content	
Rice	0.05% ChiProPlant solution for seed soaking and soil application	Significantly increased rice yields.	Leaf streak, leaf blight Sheath blight
	0.05% ChiProPlant solution for seed soaking and foliar spraying	Disease control and antifungal activity	
Rose	Not specified	Significant postharvest protection	*Diplocarpon rosae*
Soybean	0.5% ChiProPlant soil treatment	Stimulation of systemic antibodies production wit repellent effects	*Heterodera glycines*
Spinach	Seedlings submerged in 0.05% ChiProPlant solution	5 times more emerged spinach plants. Higher plants, increased root length, significantly bigger leaves and stems	
Strawberry	Dipping the whole plant for 10 minutes in 0.05% ChiProPlant solution directly before planting	Yield increase up to 13%	
	- Band spraying 2 days after planting: 20 cm width, 100ml 0.05% ChiProPlant solution per meter. - Leaf spraying from timepoint of sprouting: Dripping wet every 14 days until harvest, 0.05% ChiProPlant solution	ChiProPlant proves to significantly decrease the postharvest strawberry decay and disease severity.	
Sweet cherry	1% ChiProPlant 3 days before harvesting and shortly after harvesting	Decreases fruit rot by over 50 % Reduces brown rot, gray mold and total rot infection indices by 67 %, 88% and 75 %	
Sunflower	Seed treatment in 5% ChiProPlant solution	Induced resistance against *P. halstedii* in sunflower through the enhanced expression of genes for defense-related proteins.	Downy mildew
Tomato	- Seedlings submerged in 0.05% ChiProPlant solution - Soil addition 0.004% ChiProPlant - 0.4% Fruits spraying	25% higher emerged tomato seedlings Decreased disease severity	*Stagonospora nodorum* / *Septoria nodorum* *Phytophthora infestans* *Rhizopus stolonifer* *Ralstonia solanacearum* *Pyrenochaeta lycopersici*
Watermelon	Seedlings submerged in 0.04% ChiProPlant solution	Direct killing effect of the pathogen *Acidovorax citrulli*	Fruit blotch disease
Wheat	0.1-0.5% spraying ChiProPlant	Bacterial growth inhibition	*Fusarium graminearum* *Xanthomonas*

ChiPro GmbH I info@chipro.de I Phone: +49 (0)421 3651 7074
Admiralstr. 7–11 I 28215 Bremen / Germany