

# PRESTOP<sup>®</sup>

The biological fungicide

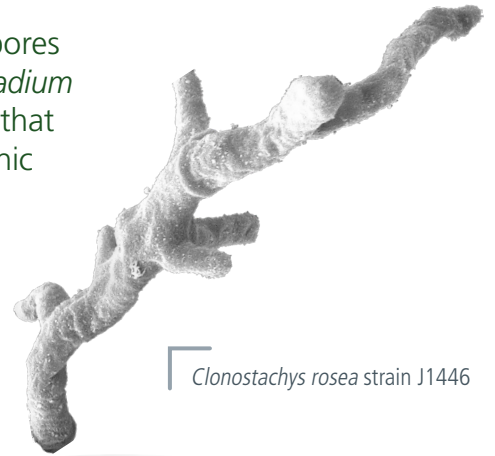


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## What is PRESTOP®?

PRESTOP® is a concentration of mycelium and spores of *Clonostachys rosea* (previously named *Gliocladium catenulatum*) strain J1446 ( $2 \cdot 10^8$  CFU\*/g), a fungus that is naturally present in soil and decomposing organic matter.

The strain J1446 is the result of research by Lallemand Plant Care and has been isolated for its fungicidal properties.



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Clonostachys rosea strain J1446



Clonostachys rosea J1446 on a Petri dish (SDA medium)

\*CFU: Colony Forming Units. Living units able to multiply.



## Benefits

PRESTOP® effectively controls a wide variety of pathogenic fungi.

- ✓ **Grey Mould** caused by *Botrytis cinerea* on strawberries, tomatoes, cucumbers and peppers.
- ✓ **Gummy Stem Blight of cucumbers** caused by *Didymella bryoniae* or *Mycosphaella* sp.
- ✓ **Seedling damping-off and root diseases** caused by a complex of pathogenic soil fungi on vegetable crops and ornamental plants (*Pythium* spp., *Fusarium* spp., *Phytophthora* spp. and *Rhizoctonia* spp.).

“ The biological fungicide that revolutionizes the protection of vegetable and ornamental crops ”



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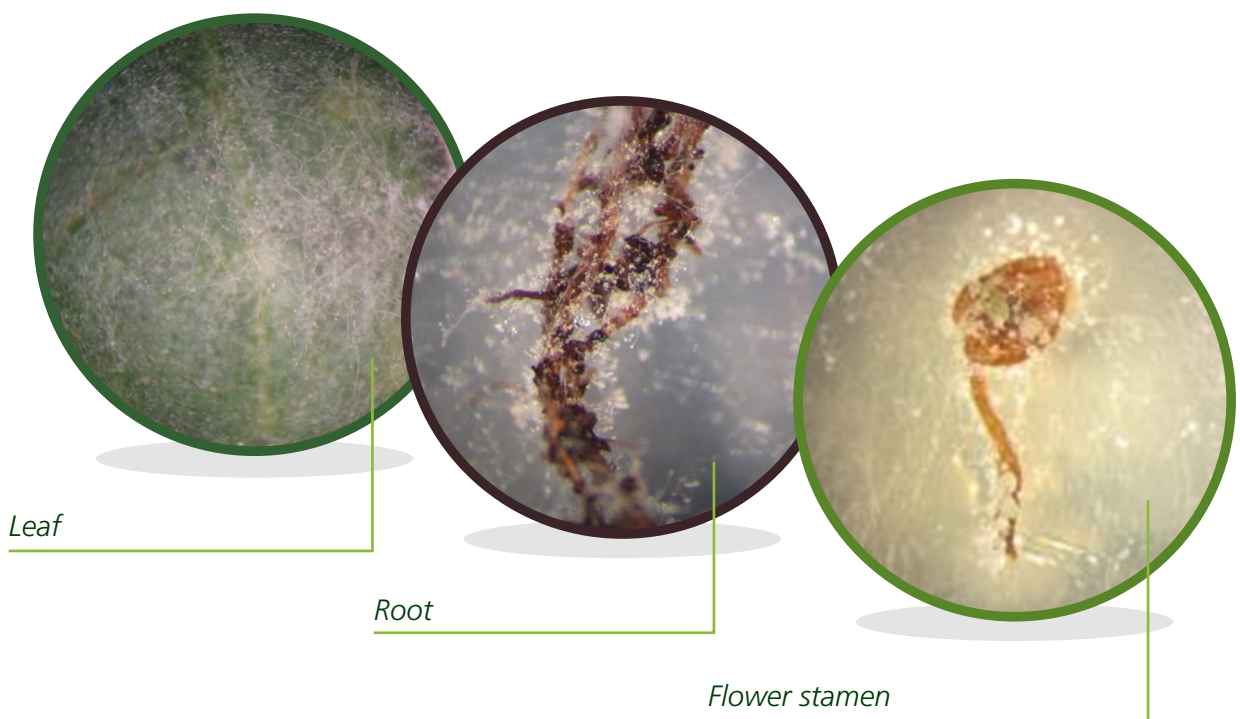
## Modes of action

### Rapid colonisation and competition

*Clonostachys rosea* J1446 has the capability to **rapidly colonise** the roots and aerial parts of a plant (leaves, stems and flowers).

In just a few hours after spraying, the fungus becomes physically attached to the plant, it starts its germination process and the growth of its mycelium.

Consequently it first provides protection against pathogens through spatial and trophic **competition**.



Colonisation of plant organs  
by *Clonostachys rosea* J1446

### Saprophytism

*Clonostachys rosea* J1446 is a **saprophytic** fungus. It develops on dead tissues, usefully acting as a protective barrier against the entry of pathogenic fungi.







## Population Management



Populations of *Clonostachys rosea* J1446 are able to grow in many environmental conditions (humidity and temperature). This ubiquitous ability gives it a clear advantage in combatting pathogenic fungi.

In adverse conditions, the beneficial fungus is able to maintain a sufficient population awaiting more favourable conditions for its growth.

## Persistence of action

*Clonostachys rosea* J1446 survives on all organs of the plant.

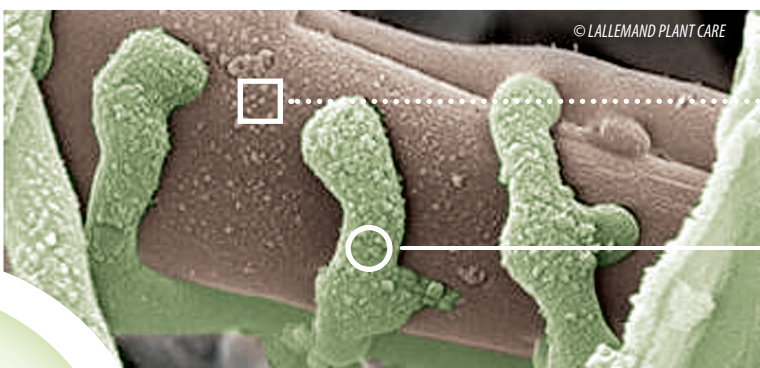
A concentration of  $2 \cdot 10^8$  CFU/g has been determined by Lallemand research to ensure a **sufficient population**, for optimal protection over:

- > 3 to 4 weeks on aerial plant parts.
- > 4 to 6 weeks in the soil and different solid growing media (peat, rockwool, coir, etc.).

## Hyperparasitism

*Clonostachys rosea* J1446 is a **hyperparasitic** fungi. It develops at the expense of pathogenic fungi.

The hyphae of *Clonostachys rosea* J1446 wrap themselves around the pathogenic fungus and degrade its cell walls by secretion of enzymes ( $\beta$  1,3 glucanase, chitinase).



Pathogenic fungus  
*Rhizoctonia solani*

*Clonostachys rosea* J1446



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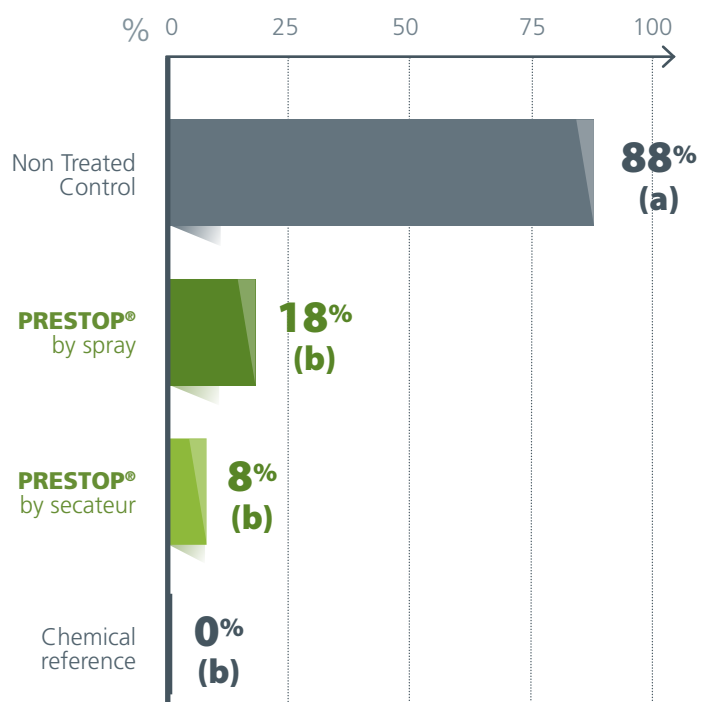
# Results



## Grey Mould of tomatoes (*Botrytis cinerea*)

<b>Year</b>	2010
<b>Place</b>	CATE, Experimental Station of Vézendoquet. Saint Pol de Léon (29), France
<b>Variety</b>	Admiro (De Ruitter) two heads grafted on Beaufort (De Ruitter)
<b>Layout</b>	Fisher Blocks with 4 repetitions Artificial inoculation of <i>Botrytis cinerea</i> on 9/07
<b>Treatments</b>	Non Treated Control Chemical reference PRESTOP® applied by spraying 3 kg/ha (600 L/ha) PRESTOP® applied by secateurs 0.25 kg/ha (50 L/ha)

**% of contamination on 15/07  
(6 days after inoculation)**



*Newman and Keuls Test significant at the threshold of 5%*

PRESTOP® shows an efficiency close to the chemical reference.



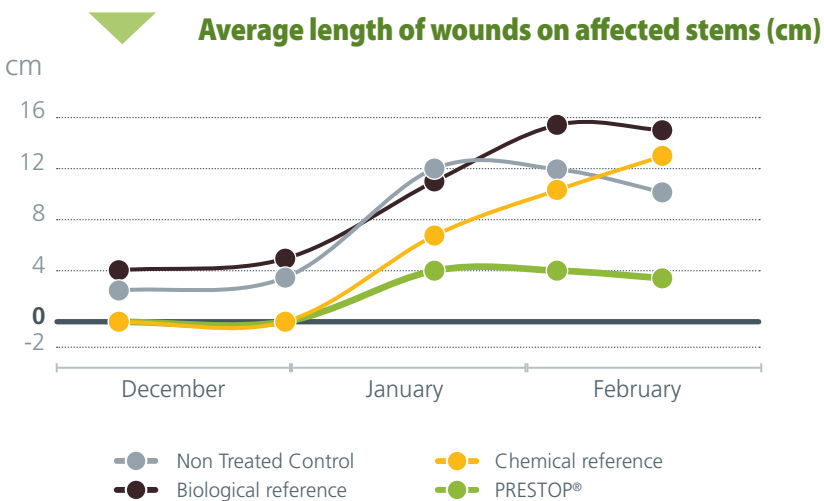
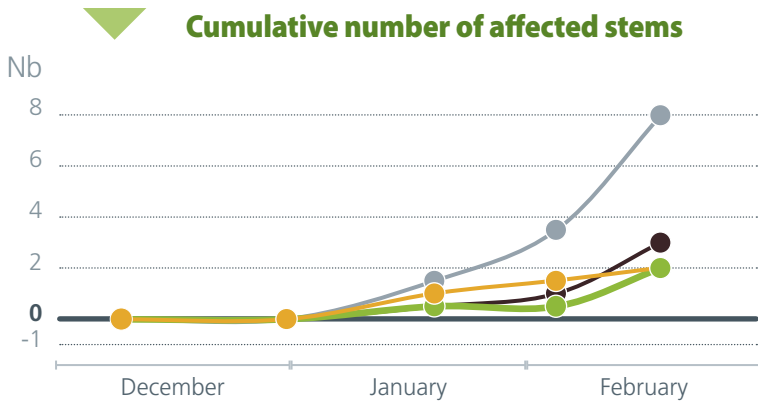


# Aerial diseases



## Grey Mould of tomatoes (*Botrytis cinerea*)

Year	2015	
Place	Mazarrón, Spain	
Layout	8 blocks of 25 plants	
Treatments	Non Treated Control Chemical reference Biological reference PRESTOP® 6 kg/ha (1200 L/ha)	4 applications at the first symptoms of <i>Botrytis</i> then every 15 days



PRESTOP® reduces the number of stems affected and the length of wounds.



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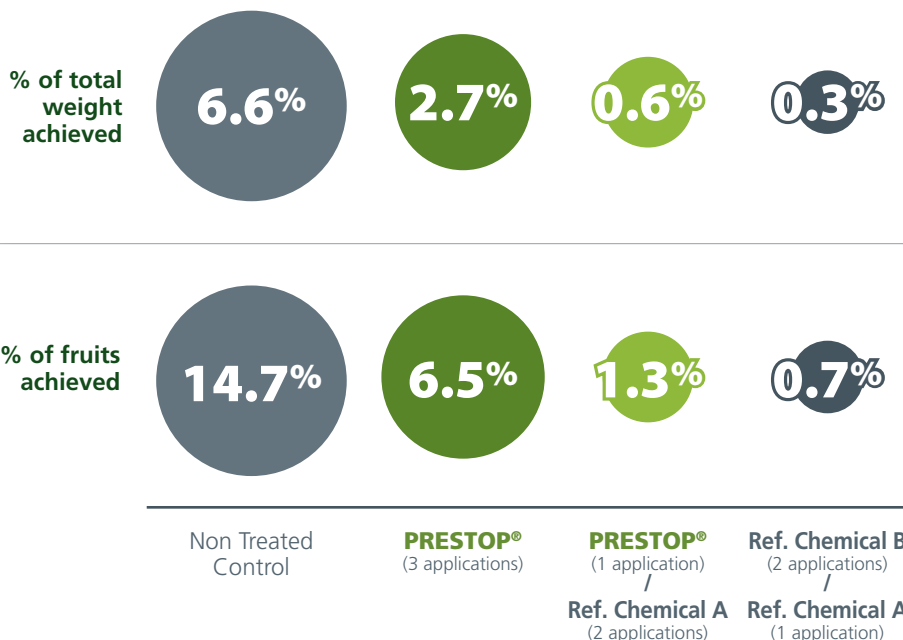
# Results

## Grey Mould of strawberries (*Botrytis cinerea*)



Year	2002
Place	Kotkaniemi Research Centre. Ojakkala, Finland
Variety	Jonsok
Layout	Randomized Blocks with 4 repetitions
Treatments	Non Treated Control PRESTOP® (3 applications) PRESTOP® (1 application) / Chemical reference A (2 applications) Chemical reference A (2 applications) / Chemical reference B (1 application)

**Incidence of grey mould on the berries**



PRESTOP® shows efficacy in integrated biological protection and in combination with chemical specialties.







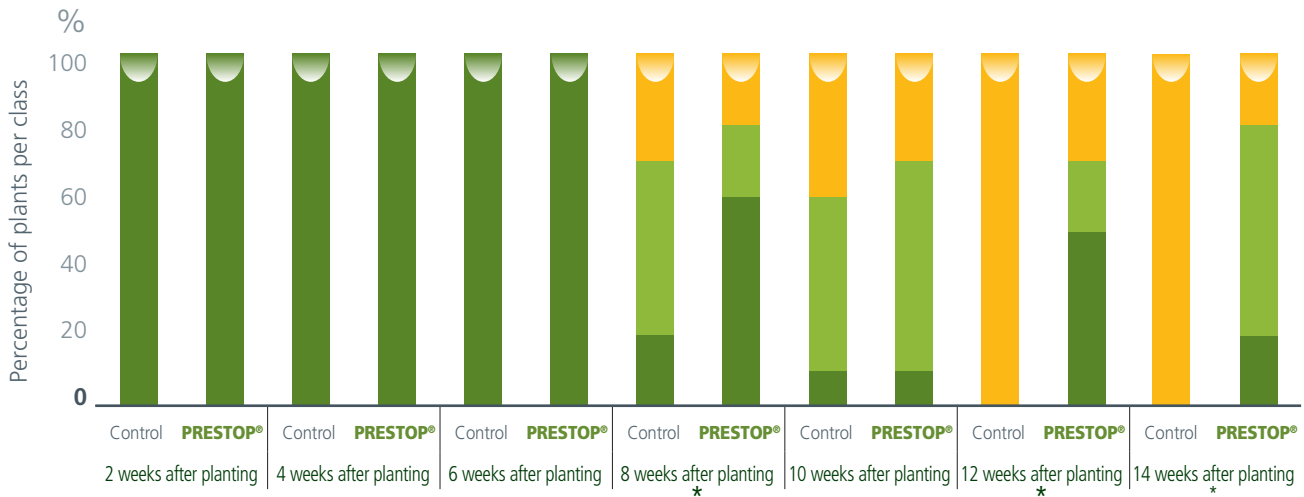
# Aerial diseases



## Black Rot of cucumber (*Didymella bryoniae*)

<b>Year</b>	2014
<b>Place</b>	Comité Départemental du Développement Maraîcher (CDDM). Carquefou (44), France
<b>Variety</b>	Proloog
<b>Layout</b>	Greenhouse divided into 2 zones of 5000 m <sup>2</sup> each

### ▼ Symptoms of *Didymella bryoniae* on fruits



\* significant difference at 5% with the Chi<sup>2</sup> test

≥ 10 fruits reached on 10 plants  
 2 to 9 fruits reached on 10 plants  
 1 fruit reached on 10 plants  
 Healthy plant

PRESTOP® significantly reduces the symptoms of *Didymella* on the fruits.



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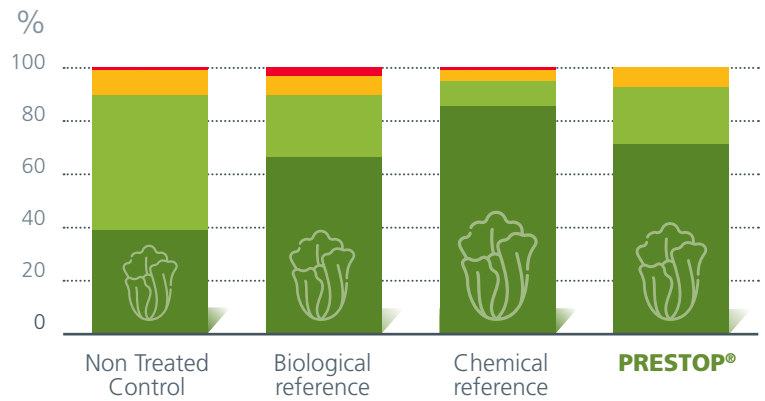
# Results



## Collar Rot of leafy salads

Year	2017
Place	Station d'Expérimentation Rhône-Alpes Information Légumes (SERAIL). Brindas (69), France
Variety	Panukia (Syngenta)
Treatments	Non Treated Control Biological reference programme Chemical reference programme PRESTOP® programme

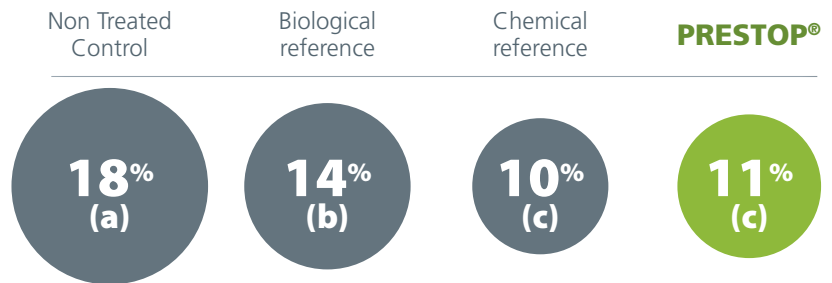
Levels of attacks at harvest



Marketable lettuce

- Grade 4 – very strong attack: non-marketable lettuce
- Grade 3 – strong attack: many affected leaves
- Grade 2 – weak attack: collar and basal leaves affected
- Grade 1 – healthy lettuce

% trimming from gross weight



Newman and Keuls Test significant at the threshold of 5%

PRESTOP® shows an efficiency comparable to the chemical reference.



# Root diseases

## *Fusarium on courgettes*



Year	2016	
Place	Granada, Spain	
Layout	Artificial inoculation of <i>Fusarium solani</i> on courgette plants in pots	
Treatments	Non Treated Control Chemical reference at 3 L/ha PRESTOP® at 4 kg/ha	3 treatments at 14 day intervals

### Non Treated Control 2 weeks after infection



### Chemical reference 2 weeks after infection



### PRESTOP® 2 weeks after infection



PRESTOP® visibly reduces the symptoms associated with the presence of *Fusarium solani*.



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# Results



## *Pythium ultimum* on pansies

Year	2011		
Place	Technical Institute of Horticulture (Astredhor) Terre de Caux (76), France		
Variety	Colossus		
Treatments	Artificial inoculation of <i>Pythium ultimum</i> on 09/08 :		- D0 : Not inoculated
	Non Treated Control		- D1 : dose 4 g/L
	PRESTOP®		- D2 : dose 8 g/L
	Chemical reference		

### Classification of the aerial quality of plants on 23/08 (%)

■ Class 1    
 ■ Class 2    
 ■ Class 3    
 ■ Class 4    
 ■ Class 5



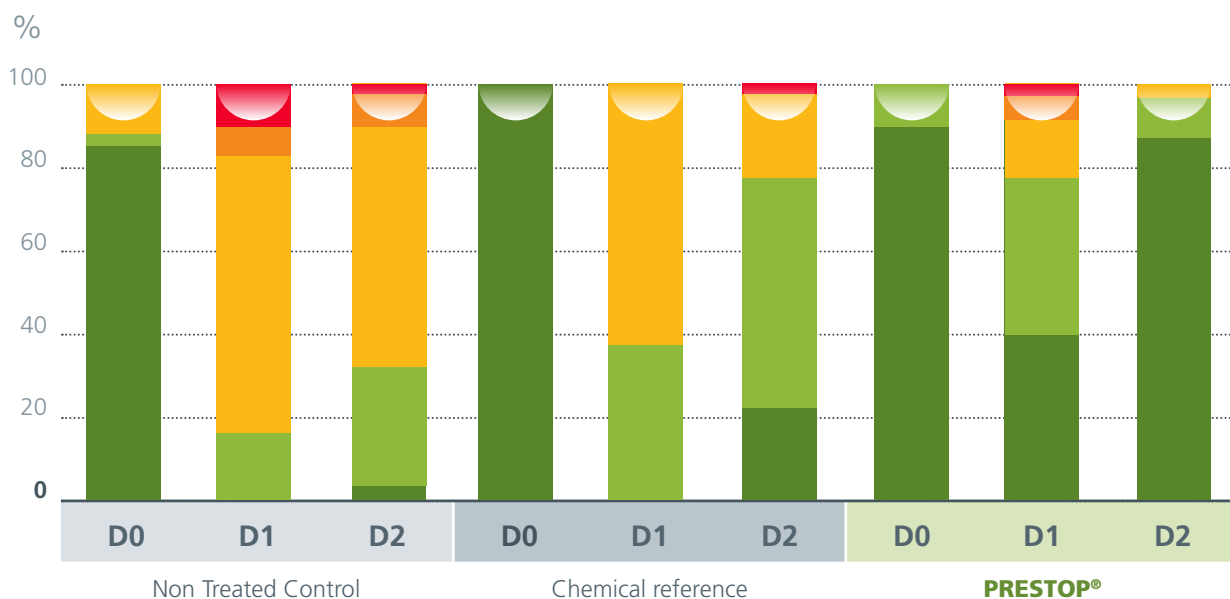
Large size without yellowing

Lower size without yellowing

Small size with presence of yellowing

Very small size with high yellowing

Dead

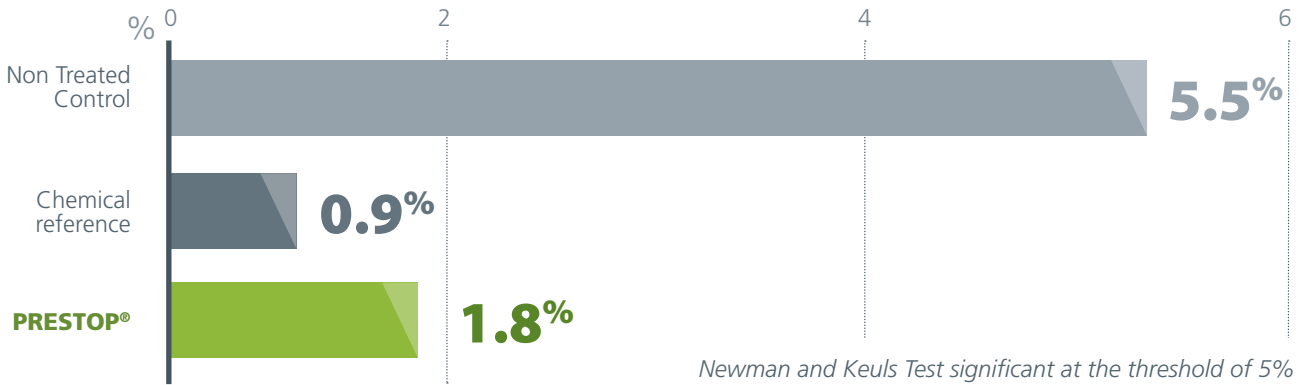




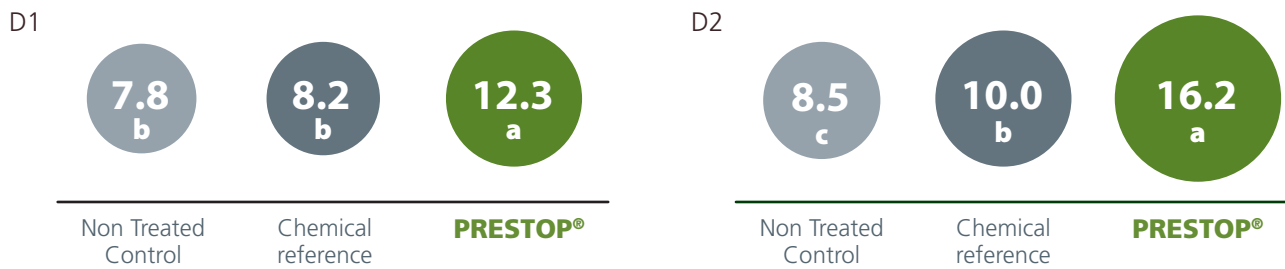


# Root diseases

## % dead plants inoculated on 14/09/2011

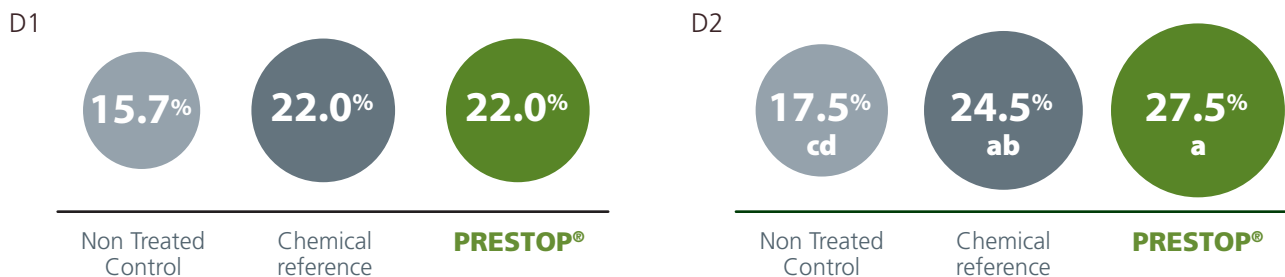


## Diameter of the plants (cm) on 16/09/2011



Newman and Keuls Test significant at the threshold of 5%

## Flamboyance of the plants on 16/09/2011



Newman and Keuls Test significant at the threshold of 5%

PRESTOP® provides significantly effective protection against *Pythium ultimum*.

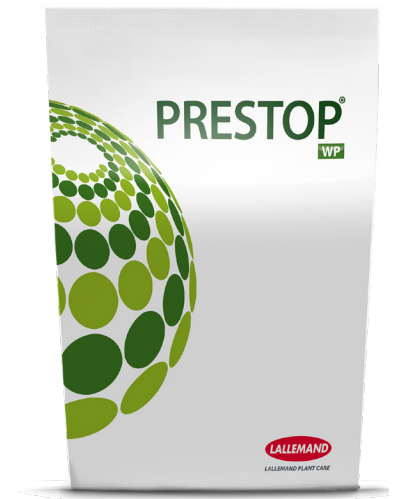


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## Characteristics

- > **Composition:** spores and mycelium of the fungus *Clonostachys rosea* strain J1446 at 2.10<sup>8</sup> CFU\*/g (320 g/kg of active ingredient).
- > **Formulation:** wettable powder.
- > **Storage:** can be stored unopened for 12 months in a cool and dry place below +4°C. It is recommended that all of the contents of the package are used immediately once opened.
- > **Organic Agriculture:** usable in organic production subject to certification body approval.
- > **Packaging:** sachet of 1 kg (5 x 1 kg per carton).
- > **Harvest interval:** none.
- > **Harmful residues:** none.

UK MAPP n° 17223  
IRELAND PCS N° 04367



Sachet of 1 kg

\*CFU: Colony Forming Units. Living units able to multiply.

## Summary

### PRESTOP®

<b>Multiple modes of action</b>	<ul style="list-style-type: none"> <li>– Hyperparasitism</li> <li>– Saprophytism</li> <li>– Colonisation and competition</li> </ul>
<b>Persistence of action</b>	<ul style="list-style-type: none"> <li>– 3 to 4 weeks on the foliage</li> <li>– 4 to 6 weeks in the soil and growing mediums</li> </ul>
<b>Environmental profile</b>	<ul style="list-style-type: none"> <li>– Capacity to <b>colonise wounds</b> protecting against the entry of pathogens</li> <li>– <b>No impact on beneficial fauna</b> (pollinators, beneficial insects...)</li> <li>– <b>Without toxicological classifications</b></li> <li>– <b>Absence of harmful residues</b> (MRLs)</li> </ul>



# Applications

	Maximum individual dose	Maximum total dose	Maximum number of treatments	Latest time of application
<b>Strawberry (Protected &amp; Outdoor)</b>	6 kg/ha	–	3 per crop See <u>Other Specific Restriction 1</u>	Before the end of flowering
<b>All Protected Edible Crops</b>	500 g/m <sup>3</sup> compost or soil (incorporated into growing medium)	–	–	–
<b>All Protected Non Edible Crops</b>	500 g/m <sup>3</sup> compost or soil (incorporated into growing medium)	–	1 per batch of Growing Medium	–
<b>All above See <u>Other Specific Restriction 2</u></b>	500 g/100 L water (applied as a spray/drench)	–	–	–

Other specific restrictions:

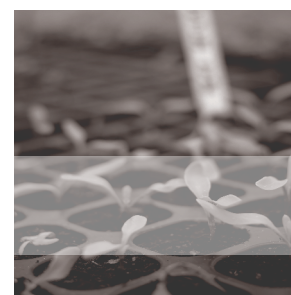
- (1) A minimum interval of 7 days must be observed between applications.
- (2) The maximum concentration must not exceed 500 g product per 100 litres water when applied as a spray or drench.
- (3) A minimum interval of 3 weeks must be observed between applications to crops other than strawberry.



Information provided above is compiled from details within the AUTHORISATION FOR A PLANT PROTECTION PRODUCT (PPP), PPP REGULATION (EC) N°1107/2009, Authorisation N°1583 of 2018, MAPP N°17223 (Registration holder: DANSTAR FERMENT AG).

There is a wide ranging Extension of Authorisation for Minor Use (EAMU) in the UK (Number: 2843/18 under MAPP Number: 17223) for PRESTOP®. For more details, refer to the appendix.

It is essential that the finer details of the EAMU are studied with great care in order to guide exactly how to use the product correctly.



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## Supplier Application Tips



### PRESTOP® against aerial diseases

- > **Foliar spray:** 0.5% of the volume of the spray mixture with respect to the approved rate (max 6 kg/ha).
- > **Spray onto wounds:** a solution of 2% for localized application.
- Renew the application every 3 to 4 weeks to maintain a sufficient population.



### PRESTOP® against root diseases

- > **Soil spraying:** 3 to 5 kg/ha (depending on the level of pressure).
- > **Localized application:** 3 kg/ha (via band or targeted application and drip irrigation).
- > **Incorporation into growing media:** 0.2 g/L to 0.5 g/L representing 200 to 500 g/m<sup>3</sup> (depending on the level of pressure).
- Renew the application every 4 to 6 weeks to maintain a sufficient population.

## Compatibility

### Crop beneficials:

- > Safe for pollinators and predatory insects.

### Treatments for crops:

- > **Synthetic fungicides:** recommended interval of 0 to 7 days\*.
- > **Synthetic insecticides:** recommended interval of 0 to 2 days\*.

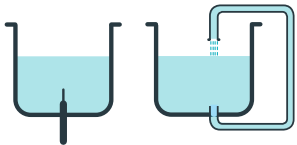
\*For more details, please refer to the biological compatibility sheet for PRESTOP® with crop treatments.






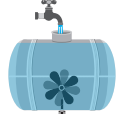

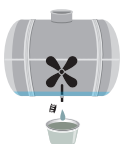


# Instructions for preparation

## With Agitation system



- Direct preparation in the tank
- Application on the crop

-  Fill the tank to halfway with clean water
-  Activate the agitation mechanism and maintain it until application of the mixture
-  Slowly pour PRESTOP® into the tank of the sprayer
-  Fill the remainder of the tank with clean water
-  Maintain agitation during application to maintain the uniformity of mixture
-  Drain the tank after spraying

## Usage recommendations

Once the product is mixed in water, the optimal activity is maintained as follows:

- > 7 days at temperatures  $\leq 4^{\circ}\text{C}$
- > 5 days at  $+8^{\circ}\text{C}$
- > 24 hours at ambient temperature ( $\leq 25^{\circ}\text{C}$ )

## Without Agitation system



- Pre-mix preparation
- Fill the tank
- Application onto the crop

-  Fill the mixing container to halfway with clean water
-  Slowly pour PRESTOP® into the mixing container
-  Mix vigorously for 5 minutes to obtain a homogeneous suspension
-  Let your mixture stand for 20 minutes
-  Complete the filling of your mixing container with clean water
-  Vigorously mix the suspension for another 5 minutes
-  Your pre-mix is ready
-  Pour the pre-mix(es) into the tank of your sprayer
-  Fill with clean water to reach the desired volume
-  Apply without delay

# Appendix

## EXTENSION OF AUTHORISATION FOR A MINOR USE OF A PLANT PROTECTION PRODUCT

### PLANT PROTECTION PRODUCTS REGULATION (EC) No. 1107/2009

Crops/situations	Maximum individual dose:	Maximum total dose:	Maximum number of treatments: (per crop)	Latest time of application:
Outdoor crops of almond, angelica, apple, apricot, asparagus, baby leaf crops, balm, basil, bay, beans without pods – fresh, bilberry, blackcurrant and redcurrant, blueberry, broad bean (fresh), broccoli / calabrese, Brussels sprout, bulb vegetables, cabbage, cane fruit, caraway leaves, cardoon, carrot, cauliflower, celeriac, celery, celery leaves, cherry, chervil, chestnut, chicory root, chives, choi sum, collard, coriander leaves, cranberry, cress, dill leaves, dwarf French bean, edible flowers, edible podded pea, endive, fennel leaves, Florence fennel, fruiting vegetables, Globe artichoke, gooseberry, hazelnut, herb – other, hops, horseradish, hyssop, Jerusalem artichoke, kale, kohlrabi, lamb's lettuce, land cress, leek, lentil (fresh), lettuce, lovage leaves, marjoram, medlar, mint, oregano, oriental cabbage, ornamental plant production, parsley, parsley root, parsnip, peach and nectarine, pear, plum, quince, radish, red beet, rhubarb, rocket, rosemary, runner bean, sage, salad burnet, salsify, savory, seakale, soya bean (fresh), spinach, spinach beet, swede, sweet cicely, table grapes, tarragon, thyme, turnip, vining pea, walnut, wine grapes.	6 kg product / ha (applied as a spray to bare soil)	—	1	Pre-crop emergence, pre-planting, sowing or drilling
Outdoor crops of almond, angelica, apple, apricot, asparagus, baby leaf crops, balm, basil, bay, beans without pods – fresh, bilberry, blackcurrant and redcurrant, blueberry, broad bean (fresh), broccoli / calabrese, Brussels sprout, bulb vegetables, cabbage, cane fruit, caraway leaves, cardoon, carrot, cauliflower, celeriac, celery, celery leaves, cherry, chervil, chestnut, chicory root, chives, choi sum, collard, coriander leaves, cranberry, cress, dill leaves, dwarf French bean, edible flowers, edible podded pea, endive, fennel leaves, Florence fennel, fruiting vegetables, Globe artichoke, gooseberry, hazelnut, herb – other, hops, horseradish, hyssop, Jerusalem artichoke, kale, kohlrabi, lamb's lettuce, land cress, leek, lentil (fresh), lettuce, lovage leaves, marjoram, medlar, mint, oregano, oriental cabbage, ornamental plant production, parsley, parsley root, parsnip, peach and nectarine, pear, plum, quince, radish, red beet, rhubarb, rocket, rosemary, runner bean, sage, salad burnet, salsify, savory, seakale, soya bean, spinach, spinach beet, swede, sweet cicely, table grapes, tarragon, thyme, turnip, vining pea, walnut, wine grapes.	500 g product / 100 litres water applied as a drench (See Other Specific Restriction 3)	—	3	—
Outdoor crops of almond, angelica, apple, apricot, asparagus, baby leaf crops, balm, basil, bay, beans without pods – fresh, bilberry, blackcurrant and redcurrant, blueberry, broad bean (fresh), broccoli / calabrese, Brussels sprout, bulb vegetables, cabbage, cane fruit, caraway leaves, cardoon, carrot, cauliflower, celeriac, celery, celery leaves, cherry, chervil, chestnut, chicory root, chives, choi sum, collard, coriander leaves, cranberry, cress, dill leaves, dwarf French bean, edible flowers, edible podded pea, endive, fennel leaves, Florence fennel, fruiting vegetables, Globe artichoke, gooseberry, hazelnut, herb – other, hops, horseradish, hyssop, Jerusalem artichoke, kale, kohlrabi, lamb's lettuce, land cress, leek, lentil (fresh), lettuce, lovage, leaves, marjoram, medlar, mint, oregano, oriental cabbage, ornamental plant production, parsley, parsley root, parsnip, peach and nectarine, pear, plum, quince, radish, red beet, rhubarb, rocket, rosemary, runner bean, sage, salad burnet, salsify, savory, seakale, soya bean, spinach, spinach beet, swede, sweet cicely, table grapes, tarragon, thyme, turnip, vining pea, walnut, wine grapes.	500 g product / m <sup>3</sup> growth medium (See Other Specific Restriction 4)	—	1	Pre-planting, sowing or drilling





## Extension of Authorisation Number: 2843 of 2018

Crops/situations	Maximum individual dose:	Maximum total dose:	Maximum number of treatments: (per crop)	Latest time of application:
<i>Outdoor crops of asparagus, cardoon, carrot, celeriac, celery, chicory root, Florence fennel, Globe artichoke, horseradish, Jerusalem artichoke, leek, parsley root, parsnip, radish, red beet, rhubarb, salsify, seakale, swede, turnip.</i>	<b>6 kg product / ha</b> (applied as a foliar spray)	—	<b>3</b>	—
<i>Outdoor angelica, outdoor baby leaf crops, outdoor balm, outdoor basil, outdoor bay, outdoor beans without pods – fresh, outdoor broad bean (fresh), outdoor broccoli / calabrese, outdoor Brussels sprout, outdoor cabbage, outdoor caraway leaves, outdoor cauliflower, celery leaves, chervil, outdoor chives, outdoor choi sum, outdoor collard, outdoor coriander leaves, outdoor cress, outdoor dill, outdoor dwarf French bean, outdoor edible flowers, edible podded pea, outdoor endive, fennel leaves, outdoor herb – other, outdoor hyssop, outdoor kale, outdoor kohlrabi, outdoor lamb's lettuce, outdoor land cress, outdoor lentil (fresh), outdoor lettuce, outdoor lovage leaves, outdoor marjoram, outdoor mint, outdoor oregano, outdoor oriental cabbage, outdoor parsley, outdoor rocket, outdoor rosemary, outdoor runner bean, outdoor sage, outdoor salad burnet, outdoor savory, outdoor soya bean, outdoor spinach, outdoor spinach beet, outdoor sweet cicely, outdoor tarragon, outdoor thyme, outdoor vining pea.</i>	<b>6 kg product / ha</b> (applied as a foliar spray)	—	<b>3</b> (See Other Specific Restriction 5)	—
<i>Outdoor bulb vegetables.</i>	<b>6 kg product / ha</b> (applied as a foliar spray)	—	<b>3</b> (See Other Specific Restriction 6)	<b>Before the development of harvestable vegetative plant parts stage (GS40)</b>
<i>Outdoor fruiting vegetables.</i>	<b>6 kg product / ha</b> (applied as a foliar spray)	—	<b>3</b> (See Other Specific Restriction 7)	<b>Before first fruit on main stem has reached typical size and form (BBCH 71)</b>
<i>Outdoor hops.</i>	<b>6 kg product / ha</b> (applied as a foliar spray)	—	<b>3</b>	<b>Before the beginning of cone development: 10% of inflorescences are cones (BBCH 71)</b>
<i>Outdoor crops of table grapes, wine grapes.</i>	<b>6 kg product / ha</b> (applied as a foliar spray)	—	<b>3</b> (See Other Specific Restriction 8)	<b>Before the ripening of berries stage (GS80)</b>

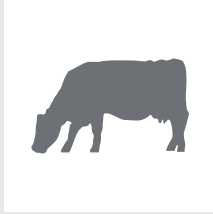
**Other specific restrictions:**

- (1) This product must only be applied in accordance with the terms of this extension of authorisation, the product label and/or leaflet and any additional guidance on extensions of authorisation.
- (2) A minimum interval of 7 days must be observed between applications.
- (3) When applied as a soil drench a maximum concentration of 500g product per 100 litres water must not be exceeded.
- (4) When applied as a growth media incorporation the maximum concentration must not exceed 500g product per cubic metre of growth media.
- (5) Applications to the above crops which fall in to the Parent Groups of 'brassica vegetable', 'leaf vegetables' and 'fresh herbs' and legume vegetables (fresh) as described in the 'Crop Definition List' must not be made until the start of the inflorescence emergence stage (BBCH 50).
- (6) Applications to bulb vegetables must not be made until after crop emergence (BBCH 9).
- (7) Applications to fruiting vegetables must not be made until after the start of inflorescence emergence stage (BBCH 50).
- (8) Applications to table and wine grapes must not be made until inflorescences are emerging (BBCH 50).



# LALLEMAND

Lallemand is a family owned, Canadian company that develops, produces and markets microorganisms and derivatives for applications in:



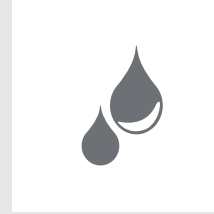
ANIMAL NUTRITION



BAKING



BREWING



BIOFUEL & DISTILLED SPIRITS



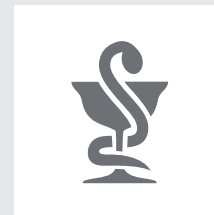
BIO-INGREDIENTS



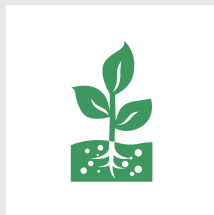
HEALTH SOLUTIONS



ŒNOLOGY



PHARMA



PLANT CARE



SPECIALITY CULTURES

## LALLEMAND PLANT CARE

**MICROBIAL  
BY  
NATURE**