Microbial by nature

BIOLOGICAL ALTERNATIVES IN GREENKEEPING

VERDERA/LALLEMAND PLANT CARE

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BENEFITS OF BIOLOGICAL GREENKEEPING

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- Completely safe for greenkeepers and golf players
- Harmless to the environment
- Application allowed also in ground water areas
- Does not harm the natural microflora of soil
- No risk for resistant pathogens
- Wide range of activity
- Enhanced root growth

WHEN USING LIVING MICROBES

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- Microbes work mainly preventively
- The first treatment as early as possible and repeated treaments later on – not for occasional use
- Microbes can be used on infected areas, too, but then a longer application period is needed to see efficacy
- The effect is not immediate, because the microbes need time to adapt to the new environment and to spread out onto the surface of the roots and foliage
- The effect is longer than that of chemicals
- Repeated use decreases disease pressure in long run, which gradually makes it easier to control pathogens

Clonostachys rosea strain J1446

PRESTOP BIOFUNGICIDE

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- Biofungicide for the control of fungal pathogens in greenhouse, tunnels and open field/turf
- Active microbe: *Clonostachys rosea* J1446 (>1x10^{9} cfu/g)
  (Formerly *Gliocladium catenulatum* J1446)
- Formulate: water soluble granule WP
- Package size: 1 kg
- Storage: In unopened package 12 months below +4°C

CLONOSTACHYS ROSEA J1446

- A common soil fungus
- *C. rosea* J1446 is an antagonistic strain isolated from Finnish field soil
- Original pot trial screening of the strain was done at the temperature of 15^{0}C
  - *Fusarium culmorum* was the test pathogen
- Effective against both root and foliar diseases
- *Clonostachys* works in various soil types and under various pH values

Healthy, *Fusarium*, *Fusarium*+*C. rosea*

HOW DOES PRESTOP BIOFUNGICIDE ACT?

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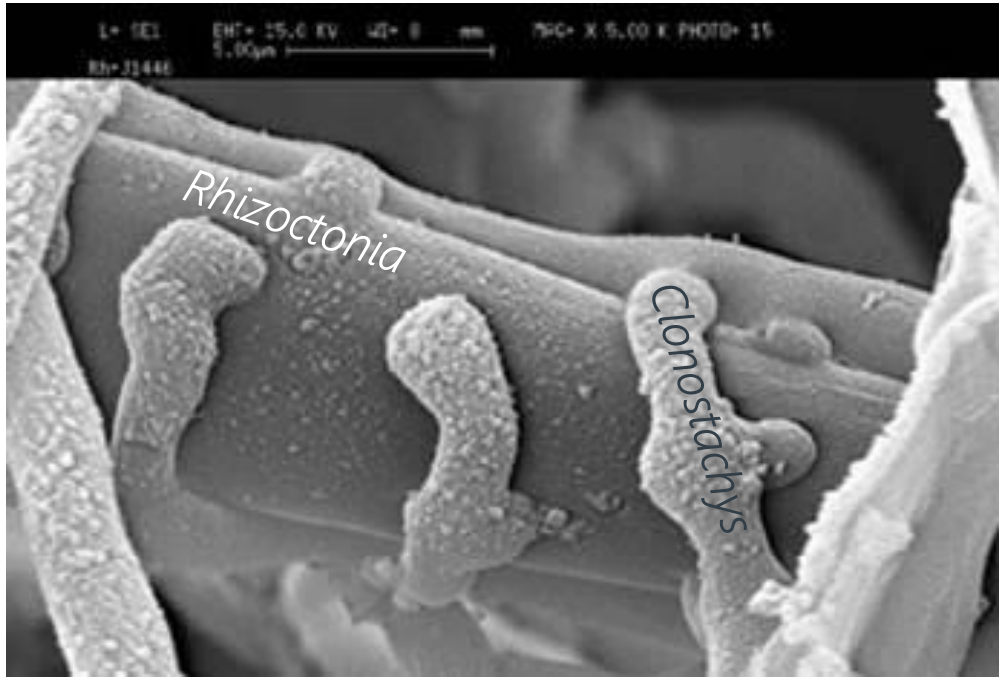
- Various modes of action → No risk for resistance
- Colonization of roots and foliage
- Competition for nutrients and space
- Hyperparasitism
- Enzyme activities
- Induced resistance

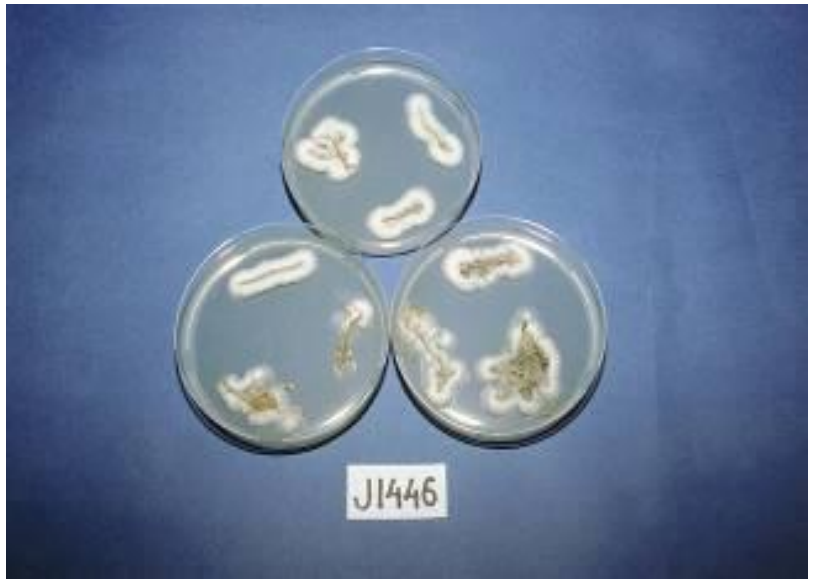


Clonostachys rosea parasitizes on the mycelium of *Rhizoctonia solani.*

EXAMPLES OF THE MODES OF ACTION OF *CLONOSTACHYS ROSEA*

Colonization of root surfaces inhibits the penetration of pathogens into plants.

Hyperparasitism on the pathogen.



Fusarium avenaceum *F.a. + Clonostachys rosea*

CLONOSTACHYS ROSEA COLONIZING LEAF SURFACE

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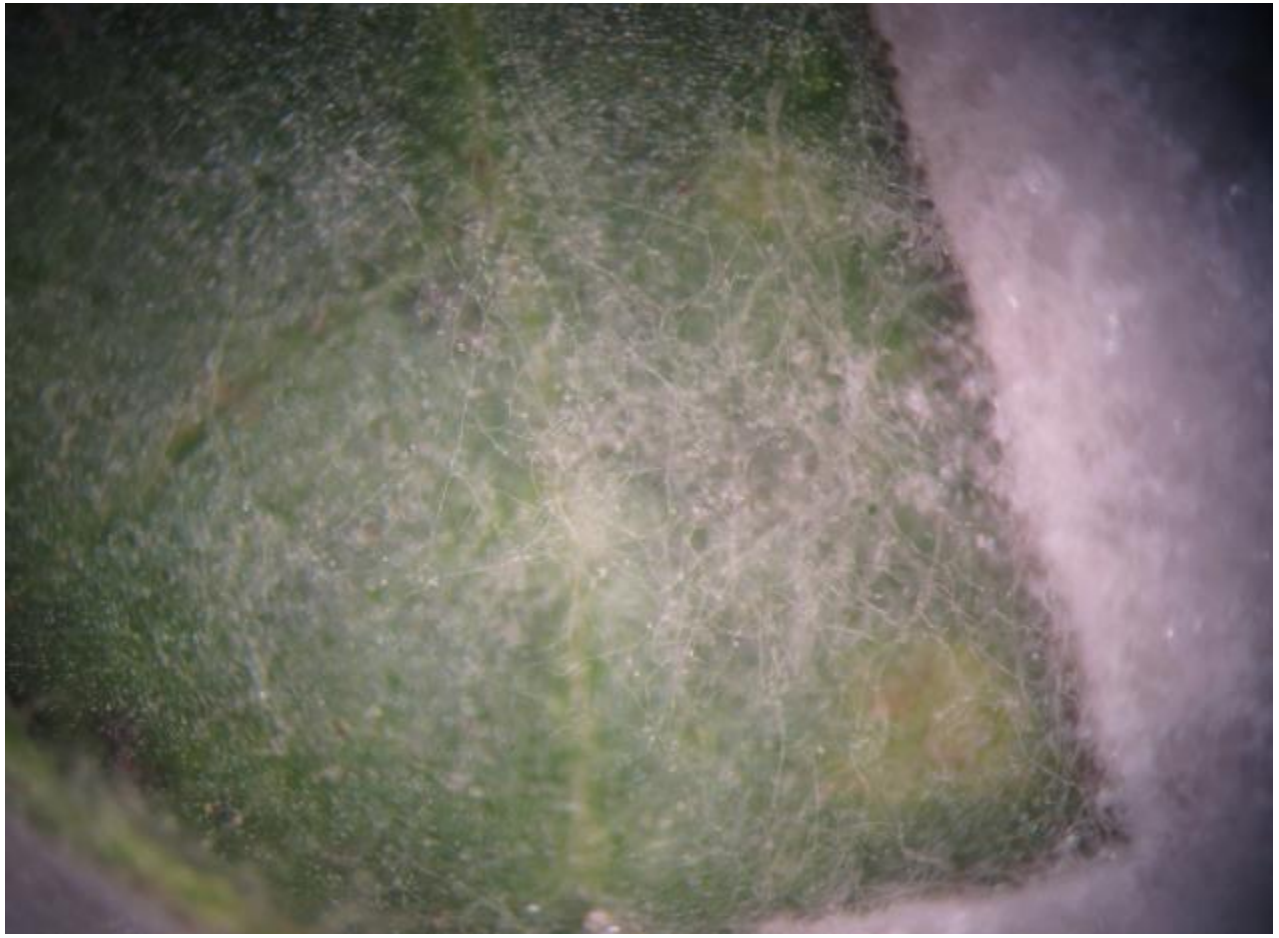

EFFECTS OF ON TURF GRASS

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- Improves the growth initiation in early season
- Strengthens the turf against winter damages
- For the control of:
  - Snow mould (*Microdochium nivale*)
  - *Fusarium*
  - *Pythium* and *Phytophthora*
  - *Rhizoctonia*
  - Anthracnose (*Colletotrichum*)
  - Take-all (*Gaeumannomyces*)
  - Fairy rings
  - Red thread

Microdochium nivale, an important target pathogen of *Clonostachys rosea*.

PRESTOP APPLICATION ON TURF GRASS

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- Effective against several root and foliar pathogens
- Application rate 1 kg/ha as a water suspension
- The first treatment after winter/snow melting
- 1-5 sprayings per season
- Application interval 3-4 weeks
- The use of adjuvants (e.g. Silwet Gold) is recommended in the spraying suspension of Prestop

CLONOSTACHYS ROSEA HAS A LARGE-SPECTRUM ACTIVITY

Disease	Country	Disease % in untreated control	Disease % in treated area	Efficacy %
Red thread	UK	21	11	48
Dollar spot	Holland	50	31	38
Snow mould	Germany	34	16	53
"	UK	26	14	46

SYDSJÆLLAND GC, DENMARK
MICRODOCHIUM OBSERVATIONS

Treatment	No. of treatments before observation	Brown surface area %	Dead surface area %
Untreated	-	42.5 a	1.5 a
Clonostachys	2	32.5 bc	0.8 b
Folicur EC 250	2	11.3 d	0.0 c

Plot size 6,25 m², 4 replications, disease observations at the end of November.

SNOW MOULD TRIAL IN UK
EUROFINS AGROSCIENCE SERVICES

Treatment	*Microdochium nivale* %				
	2. November	30. November	4. January	5. March	11. April
Untreated	8.7 a	9.4 a	9.0 a	10.0 a	0.4 a
Clonostachys	2.8 b	2.4 b	3.8 b	4.6 b	0.1 b
Clonostachys Efficacy %	68	74	58	54	68

Treatment dates: October 3, November 2, November 30, January 4, March 5 and April 11.

TRIALS IN GERMANY

Take-all

Treat-ment	October		February	
	Disease %	Efficacy %	Disease %	Efficacy %
Un-treated	2.0	-	4.0	-
Clono-stachys	0.5	75	1.3	69

Dollar spot

Treat-ment	October		February	
	Disease %	Efficacy %	Disease %	Efficacy %
Un-treated	5.3	-	9.5	-
Clono-stachys	2.8	48	6.5	32

Clonostachys treatments were done monthly during August-February

BIOFORSK LANDVIK, NORWAY

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Clonostachys treatments:

March,
April and
October

Gaeumannomyces graminis (%)

Treatment	Observation times		
	August	October	November
Untreated	3.8	12.0	9.5
Delaro (prothioconazole and trifloxystrobin)	2.2	10.7	8.0
Clonostachys	2.7	7.2	7.0

CLONOSTACHYS ROSEA IN GOLF GREEN TESTING IN SWEDEN

Untreated reference

Clonostachys spraying in early spring

Observation one month after the treatment

COMPATIBILITY BETWEEN CHEMICAL PESTICIDES AND PRESTOP

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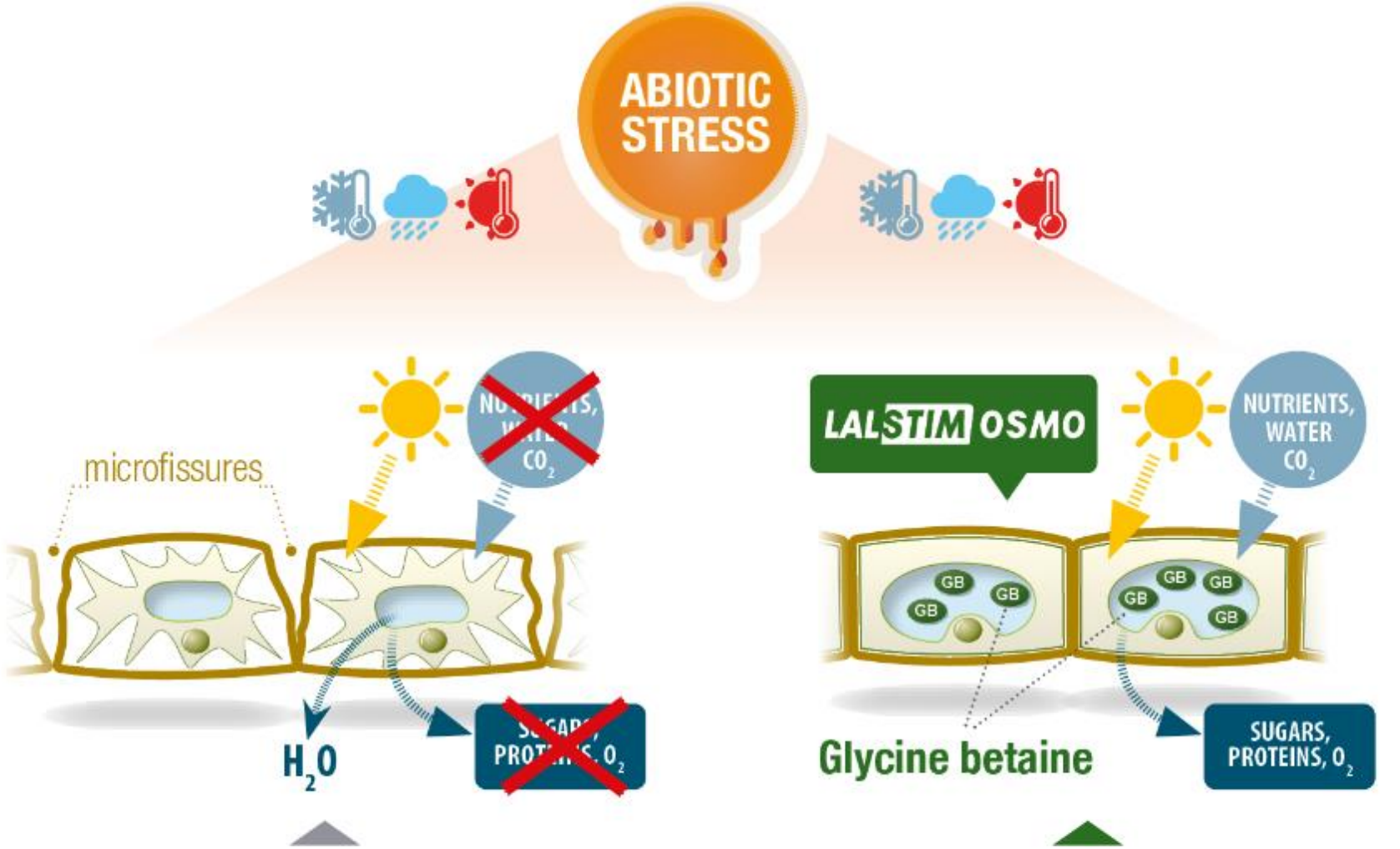
- Prestop suits to integrated control
- Biological and chemical products can be used in the same area
  - However, they are recommended to be given at their own times (alternating).
  - This way a longer protection will be achieved.
- If both chemical and biological substances must be used simultaneously, the chemical should be given first and the biological product when the leaf surface has dried
- Tank-mixing is not recommended, but in the case of a totally compatible substance combined use is possible
- Prestop can be combined with most fertilizers (not concentrated stock solutions)
- Chemical insecticides do not usually affect control microbes

LALSTIM® OSMO
FOR STRESS MANAGEMENT OF TURF GRASS

- Contains high-quality plant-based glycine betaine (97 %)
- Crystallized, highly water-soluble formulate
- Separated from sugar beet molasses
- Reduces the negative effects caused by environmental stresses
  - Maintains the normal growth in stress conditions, during unfavorable temperature, light and moisture conditions

MODE OF ACTION OF GLYCINE BETAINE

- Maintains the normal water balance and normal activity of plant cells during stress conditions (osmoprotection)
    - Reduces the cell damage caused by cell dehydration
    - Improves the circulatory flow of water and nutrients
    - Enhances photosynthesis and reduces photorespiration
- Improves the growth in stress conditions and prevents the occurrence of physiological disorders in the canopy



During stress conditions, cell metabolism slows down, microfissures appear between cells and water is lost from the cell.

With the help of glycine betaine, normal cell metabolism and water balance are maintained.

THE EFFECTS OF LALSTIM OSMO ON TURF GRASS

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- Improves the tolerance of grass to stresses caused by:
  - drought
  - heat
  - cold
  - salinity (soil or irrigation water)

- Glycine betaine is an osmolytic compound, which keeps the water content of the cells normal also in stress conditions
- Helps turf grass to overcome environmental stresses
- Maintains the growth normal also under unfavourable conditions
- Enhances photosynthesis and reduces light respiration
- Increases the density of turf grass
- The need for irrigation reduces (note especially roll-out grass and areas sensitive for drying)
- In the case of iceburn, Lalstim Osmo helps the turf to tolerate reduced oxygen availability for longer periods

LALLEMAND

APPLICATION OF LALSTIM OSMO ON TURF

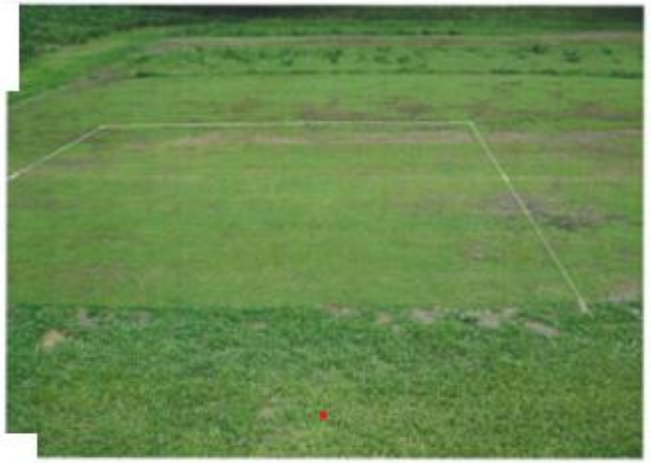
- Foliar spray just before and/or at the time of stress situation
- Glycine betaine is translocated throughout the grass (also in roots) within 12 hours
- The effect remains 3-4 weeks
- Spray early in the morning or late in the evening, when the relative humidity is high
- The application of a non-ionic adjuvant in the spray solution is recommendable
- Can be used together with fertilizers and biological and chemical pesticides (except those containing copper)
- The application rate
  - 2-4 kg/ha (water volume 200-400L/ha)

EFFECT OF LALSTIM OSMO ON THE VIGOR AND DENSITY OF BENTGRASS (*Agrostis*)

Trial plot treated with Lalstim Osmo

- less drought damage

Photo I Drought Damage on App. Plot

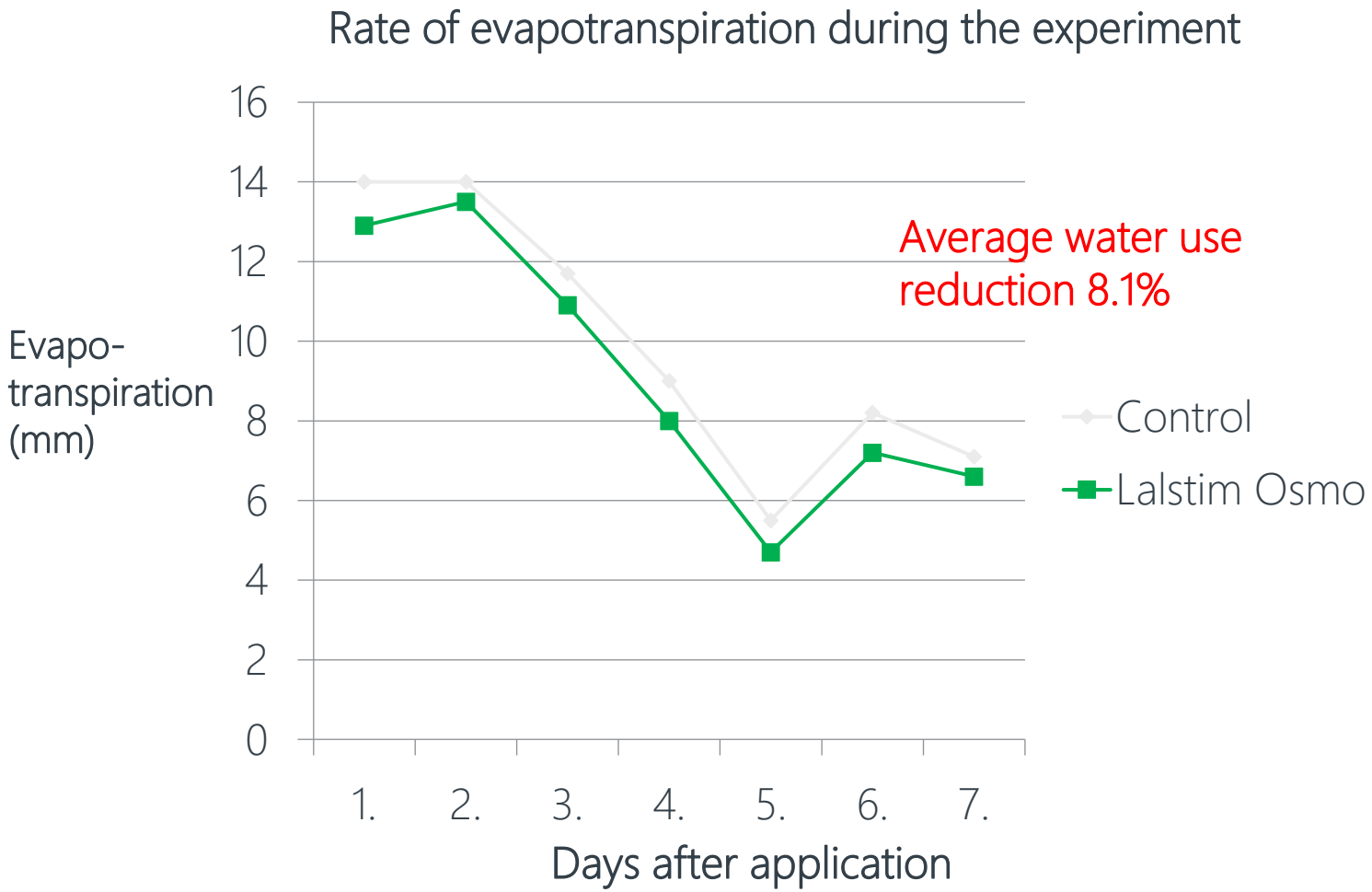


Drought Damage on Control Plot

Untreated reference plot

Lalstim Osmo trial on turf

Reduction of water use on Perennial ryegrass (*Lolium perenne*)



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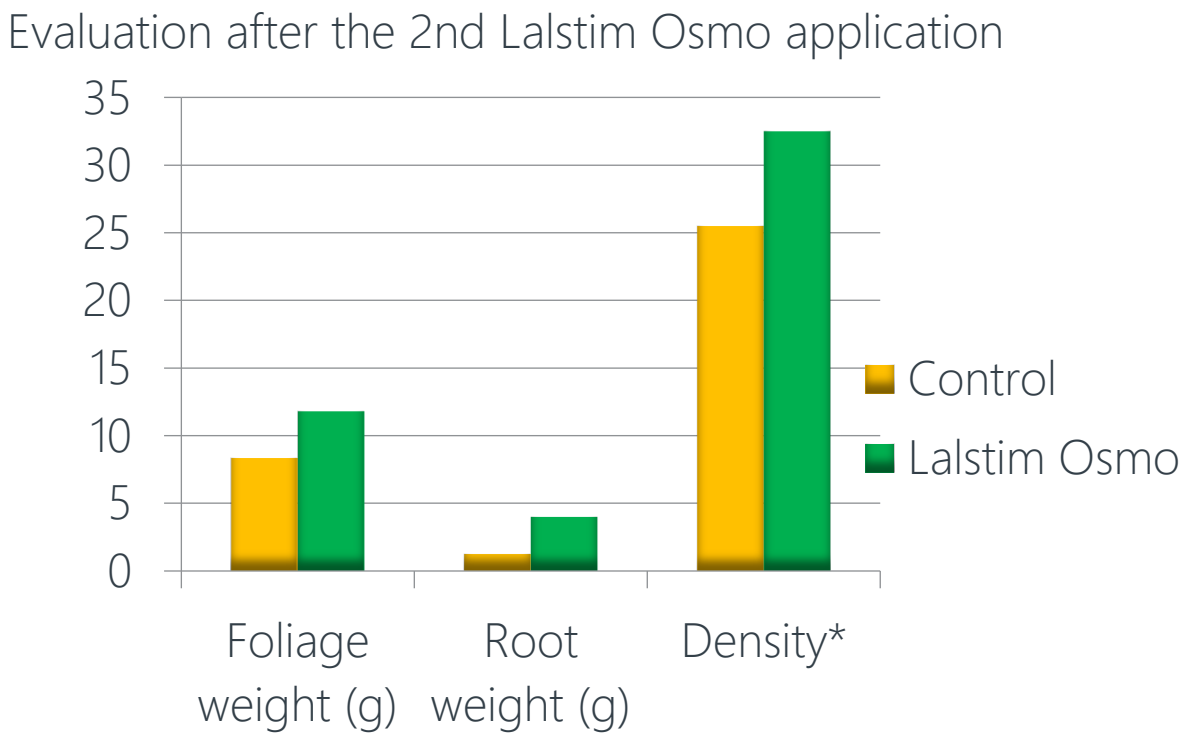

*Number of leaves in 1cm^2

PRESTOP AND LALSTIM OSMO IN A COMBINED PROGRAMME

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- **Prestop** right after winter and during early season
  - To guarantee a good start for the growth of turf grass
  - To control diseases preventively
- **LALSTIM OSMO** under unfavourable conditions during midseason
  - Against stress effects by drought and heat
- **Prestop** in late season
  - To strengthen the turf against winter damages
  - To prevent snow mould

THANK YOU FOR YOUR ATTENTION!

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