

NORWEGIAN INSTITUTE OF BIOECONOMY RESEARCH

Varieties, spring covers and biostimulants for faster reestablishment of winter-killed greens

ICE-BREAKER Final seminar, Quality Airport Hotel, Gardermoen, Nov. 3rd, 2023 Trygve S. Aamlid, Trond Pettersen, Anne F. Borchert & Michael Bekken, NIBIO Turfgrass Research Group



<u>1. Varieties:</u> Germination of creeping bentgrass varieties at 7.2 °C

Trials in Minnesota



N

Germination of creeping bentgrass varieties **and seed lots** at 10 °C



Carroll et al. 2020



Trials conducted by ICE-BREAKER partner Michelle DaCosta in Massachusetts differentiated between germination and seedling growth



Germination at 10 vs. 20 °C

- Declaration and Luminary were fast at both temperatures
- □ Memorial was fast at 20°C, but slow at 10°C
- Proclamation did not show the same advantage at low soil temperature as in the former experiments in Minnesota

% of final germination		
Germination rate: 3 d @ 20°CGermination rate: 10 d @ 10°C		
Declaration (78.4%)	Declaration (86.1%)	
Luminary (76.2%)	Luminary (84.4%)	
Memorial (72.9%)		
Penncross (64.6%)	Penncross (85.8%)	
Barracuda (65.0%)	Barracuda (72.3%)	
T-1 (49.3%)	T-1 (77.4%)	
Penn A-4 (41.2%)	Penn A-4 (74.8%)	
Proclamation (50.1%)	Proclamation (70.4%)	
L-93 (50.4%)	L-93 (57.6%)	
	Memorial (46.4%)	



Seedling growth of creeping bentgrass varieties at two different nutrient concentrations

- N availability most important factor impacting shoot, root biomass
- Higher N compensated for limitations at low temp (# roots per plant, root length)
- At higher N, less differences among varieties

A significant effect of fertilizer type and N-rate on establishment of creeping bentgrass Luminary was confirmed at Landvik in 2023



Our US partners also conducted field trials in Massachusetts and Minnesota

 12 creeping bentgrass varieties were seeded with and without spring covers when the soil temperature was close to 10°C





→Independence significantly slower than the other varieties



Reestablishment rate was more affected by the use of spring covers than by creeping bentgrass variety

Drone photo, Minnesota



At cover removal 3 weeks after seeding

8 days after cover removal

38 days after cover removal

Seeding date x creeping bentgrass variety for reseeding of a simulated winter-killed Poa green at NIBIO Landvik in spring 2023



Cultivar

- Declaration
- 007
- Pure Distinctio
- -- Pure Select
- ••• Two Putt
- Unseeded:
 Poa from
 seed bank

RESULT

- No significant differences in the coverage of creeping bentgrass 'Declaration', '007', 'Pure Select' or 'Pure Distinction' or Poa annua 'Two Put' when seeded on the same date in early spring
- Earlier seeding of bentgrass into a winter killed annual bluegrass green increased coverage, but because Poa came back, the effect was significant only for a maximum of three weeks
 Michael Bekken



How important is Establishment Rate at Low Soil Temperature versus Overall Turfgrass Quality ?



Turfgrass quality, 1-9 / Establishment rate

Conclusions, creeping bentgrass varieties for faster reestablishment

- Yes, there are variety differences, but the effects should not be overrated. The effect of individual seed lots may have been overlooked in the early results coming put of Minnesota (Heineck et al. 2019)
- Rather than a few days earlier emergence, greenkeepers should pay attention to the varieties's overall rating in SCANGREEN.
- High-ranked varieties that also have been documented to have reasonably fast emergence at low soil temperatures are Tripleseven (777), Luminary and 007. So far, we don't have any documentation for the highest ranked varieties Matchplay and L-93XD.
- Reestablishement rate is more affected by fertilizer type and N rate than by creeping bentgrass variety
- $\circ~$ Spring covers also have a greater impact than variety



2. Spring covers

Why do we use spring covers ?

- Increased soil temperature
- Protection against
 - Hard rains (erosion)
 - \circ Dessication
 - $\,\circ\,$ Strong winds
 - High light intensity(photoinhibition)





Sping covers tested at Landvik in 2021











Agryl



Soil temperature at 3 cm depth relative to sunshine / cloudiness during first three weeks after seeding CRB 'Luminary' on 29 Apr. 2021



Average temperature increase relative to uncovered

- Evergreen: + 1.5 °C
- Agryl: + 0.9 °C
- Norgro: + 0.6 °C

- → Evergreen most effective in increasing soil temperature in early spring
- → Effect depends om sunshine. Little temperature effect of covers on cloudy days.



Development of turf coverage, 2021





→ Best effect of Evergreen in early spring, but Agryl and Norgro caught up from 4 weeks after seeding.



When is the Agryl tarp most efficient ?



\rightarrow When lifted slightly from the soil surface



2022 Experiment, Landvik

Covers tested

- A. Uncovered control
- B. Agryl fibre tarp
- C. Norgro
- D. Evergreen
- E. 90 % shade cloth





Why include the shade cloth ?

- A pot experiment in 2021 indicated that full sunlight could be stressful to creeping bentgrass seedlings
- We wanted to find out which covers combine temperature and light effects in the best way



In addition to their temperature effect, covers may also prevent light stress (phytoinhibition)

(Photos : Ove Hetland)



Uncovered



Agryl



Norgro



Evergreen



Soil temperature at 3 cm depth relative to sunshine / cloudiness during first three weeks after seeding CRB 'Luminary' on 11 April 2022



\rightarrow Dry and cold spring

→ Highest soil temperature with Evergreen during first two weeks after seeding, Agryl better after that



Turfgrass coverage (2022), %



→ Surprisingly good effect of 90% shade cloth during first three weeks despite no temperature increase. Light effect ?
 → As in 2021 good effect of Evergreen during first three weeks – then Agryl took over

 \rightarrow Poor effect of Norgro this year



Visual effects



18 April



5 May: Just after cover removal



Conclusions, spring covers for faster reestablishment

- Evergreen most efficient in increasing soil temperature and turfgrass coverage during first three weeks after seeding.
- Surprisingly poor effect of Agryl during first 2 weeks after seeding, but this cover caught up after 3-4 weeks
 - The white fibre tarp reflects light
 - Does Agryl have a negative effect on soil moisture uniformity ?
- Shade covers need further investigation. Bright sunlight combined with low soil temperature may be stressful to newly emerged seedings.



3. Seed priming, biostimulants og growth regulators for faster establishment of creeping bentgrass Luminary

Experiment at Landvik and in Massachusetts, spring 2022







Products applied 6 times after emergence (6 May - 8 June 2022)

Treatment		Formulation (Company)	Rate
1.	No biostimulant		
2.	Chitin-1	Omega Chitosan / Yucca extract (Plant Food Co)	3.2 L ha ⁻¹
3.	Silicon-1	Hydra-Fense 12% Si (Atlantic Golf & Turf)	6.4 L ha ⁻¹
4.	SA Defense Activator	Acibenzolar-S-Methyl / Actigard (Syngenta)	28 kg ha ⁻¹
5.	Seaweed Extract	Guarantee (Ocean Organics)	9.5 L ha⁻¹
6.	Seaweed Extract + Humic Acid	KelPlant 1-0-1 (Plant Food Co)	12.8 m L ha ⁻¹
7.	Trinexapac-ethyl	Primo Maxx II (116.4 g TE/L)	0.2 L ha ⁻¹
8.	Gibberellic acid	GIBB3 : Globachem nv, Belgium (lot 55443378)	Seed priming

4 reps

Treatment 8: Seed priming: 0.5 tablet (5 g) containing 10 % GA₃ (0.5 g a.i. GA₃) was dissolved in 2.5 L rinsed water at room temperature. 116 g of seed was added and the solution stirred regularly for 24 h. The solution was then sieved though a fine mesh to retrieve seeds. The seeds were rinsed in water and put in thin layer on paper cloths to dry for 24 h before seeding



Results, Landvik



---- Guarantee Seaweed ---- Primo Maxx

- Omega Chitosan/Yucca Extract
- --- Actigard
- ---- Kelplant 1-0.1 Seaweed
- -------------------------------GIBB3 Seed priming

→Significantly faster establishment with GA3-primed seed \rightarrow No effect of biostimulants or Primo Maxx



Photo taken 18 May, 5 weeks after seeding



Effect of seed priming with GA3 was surprising as the parallel trial in Massachusetts showed the opposite effect



Also, the trials by Carl Johan Lönnberg and Håkan Blusi in Northern Sweden indicated marginal effects only

Conclusions, seed priming, biostimulants and plant growth regulators at the seedling stage

- Experiments in Norway and Massachusetts indicated no effect of chitosan, Silicon, seaweed extracts or PGRs on creeping bentgrass seedlings at the rates tested.
- \circ Conflicting results from seed priming with gibberellic acid (GA₃). Further research needed.



Thanks for your attention !



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