

Fertilizer experiments in European blueberry

European blueberry, Bilberry
(*Vaccinium myrtillus* L.)



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Blueberry project: Propagation, cultivation and berry production.

- Funded by Danish Food Agency. Participants: AU and 4 specialised growers.
 - A nursery with experience in cultivating blueberries (Gl. Sunds Nursery)
 - A seed company to procure seeds for future production (Levinsen & Abies)
 - The largest Danish highbush blueberry grower (Halskenbjerg).
 - A specialist advisor and grower of highbush blueberries. (S. Ramborg)
 - 3 year project, started summer 2010.
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- *Activities*
 - Propagation experiments with cuttings and seed pretreatment
 - Fertilizer experiments to obtain rapid growth of propagated plants
 - Ecological engineering – direct sowing of seeds in nature/semi-nature
 - Established first berry orchard experimental systems in autumn 2011.

Fertilizer experiments



- Development of a standard liquid fertilizer composition.
- Literature review – Ingestad paper , plant tissue content,
- Liquid fertilizer for continuous use at every irrigation event
- One standard solution for dilution

NH4%	HCO3	EC	N	NO3	NH4
45,2	1	2,48	400	219	181

Collected rain water for irrigation

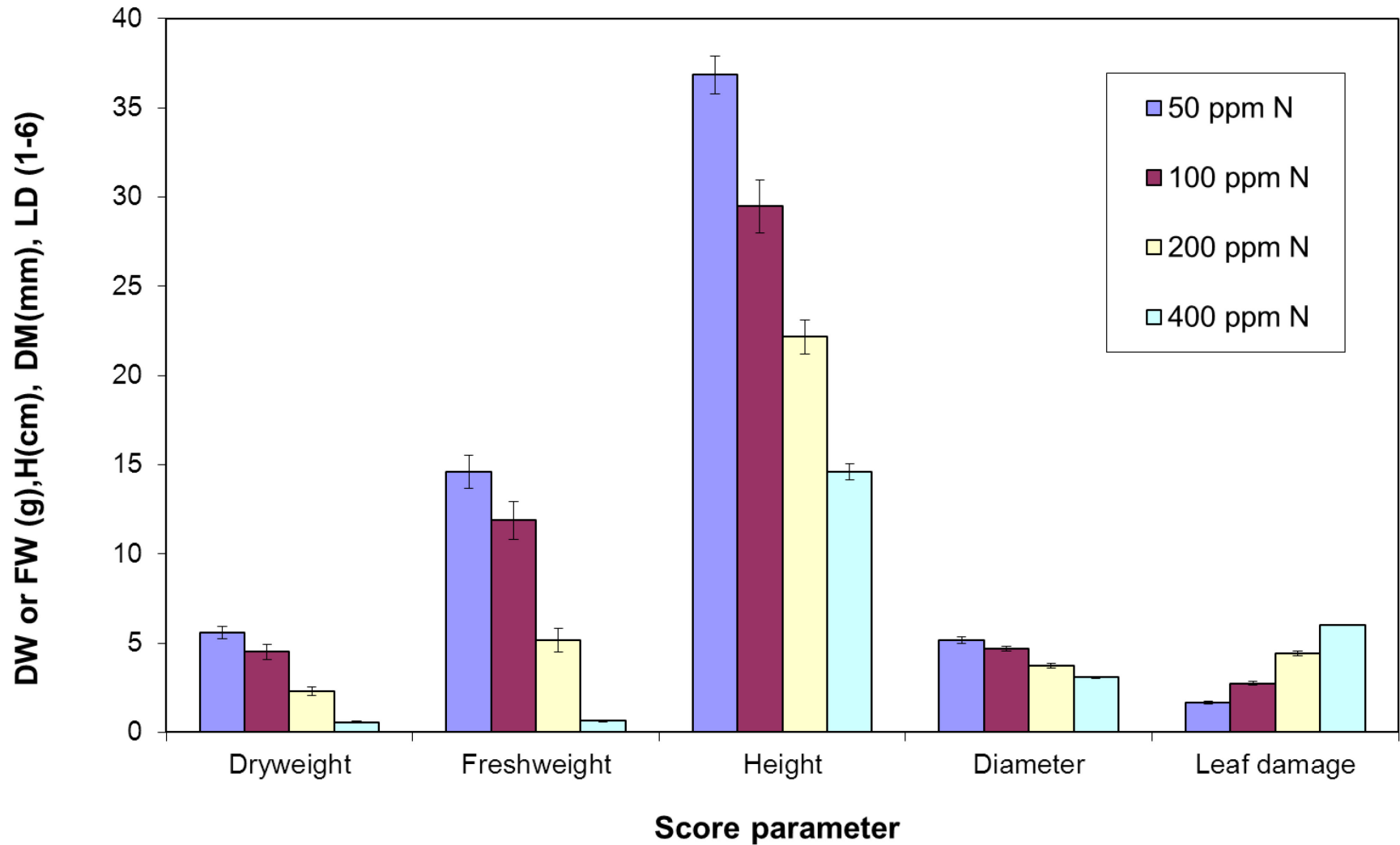
PPM concentration of each element

pH	NH4 %	N	P	K	Mg	Ca	Na	Cl	SO4	Fe	Mn	B	Cu	Zn	Mo
4,5	45	50	6,5	25	2	4,25	0,5	0,5	6,25	0,35	0,2	0,1	0,015	0,0175	0,005
4,5	45	100	13	50	4	8,5	1	1	12,5	0,7	0,4	0,2	0,03	0,035	0,01
4,5	45	200	26	100	8	17	2	2	25	1,4	0,8	0,4	0,06	0,07	0,02
4,5	45	400	52	200	16	34	4	4	50	2,8	1,6	0,8	0,12	0,14	0,04

Low in Ca, Mg and Fe

Exp. 1. Fertilizer experiments – high levels

- Test effect of 50, 100, 200 and 400 ppm N fertilizer on growth of cuttings in greenhouse (EC values of 0,31, 0,62, 1,24 , 2,48). Eb-flood irrigation, fertilizer every time. 3 replicates (12 separate tables).
- Effect of growing medium with increased pore volume/rapid drainage tested within each fertilizer treatment.
- Raw peat moss, addition of 10 % or 25 % medium sized vermiculite (vol/vol) compared to control with no vermiculite.
- Cuttings propagated plants from two origins tested, plants cut back to 10 cm height at beginning
- 6 plants for each treatment replicated 3 times.
- Early May – End of July, growth evaluated after app. 3 months.
- 20 °C, 20 hour daylength.



Effect of 4 levels of fertilizer on shoot growth of plants. Data are mean of 3 media and 2 origins (108 plants /each mean).

0 % vermiculite

50 ppm N



100 ppm N



200 ppm N



400 ppm N



0 % vermiculite



50 ppm N



100 ppm N



200 ppm N

+ 25 % vermiculite





50 ppm N + 0 % vermiculite



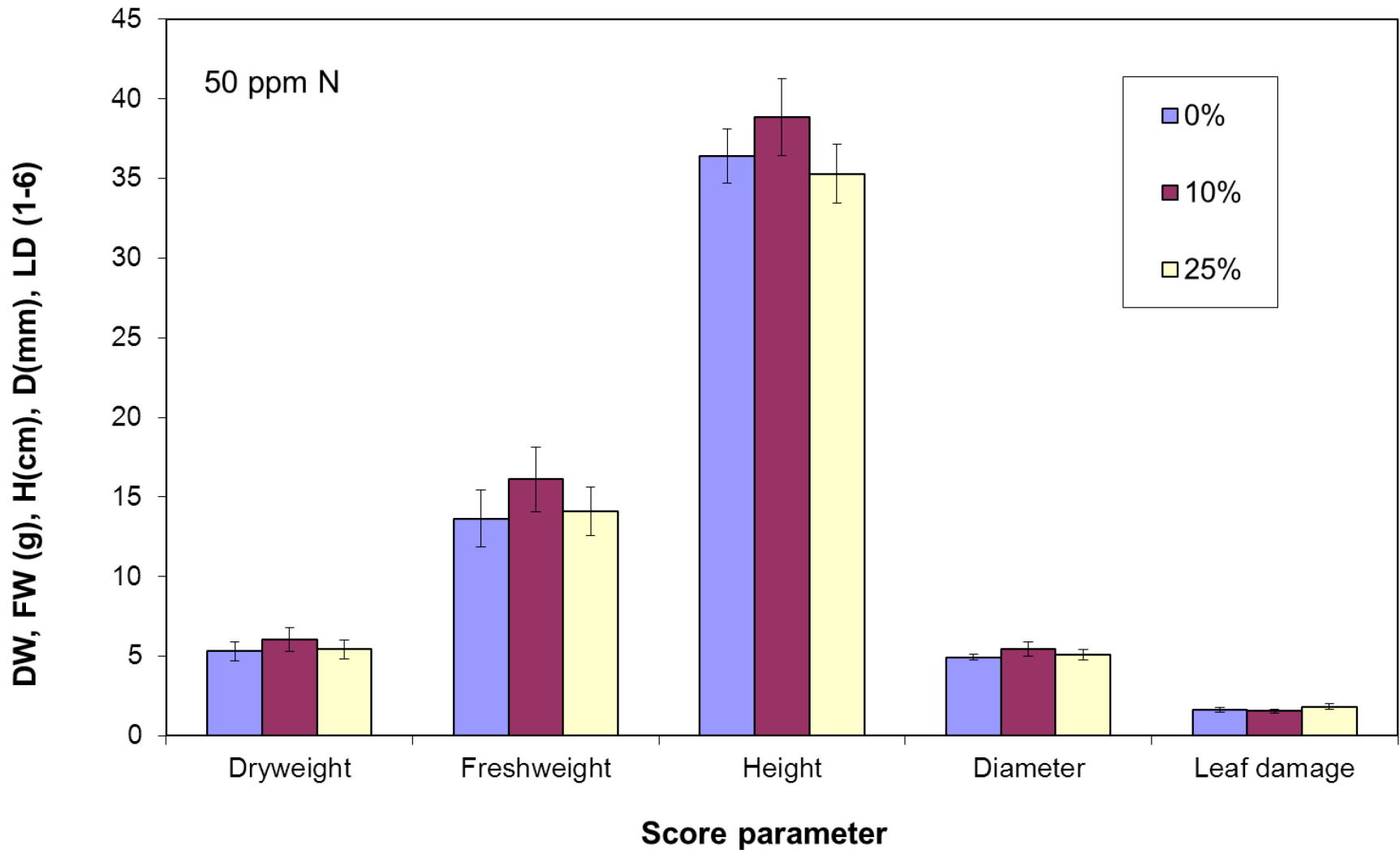
100 ppm N + 10% vermiculite



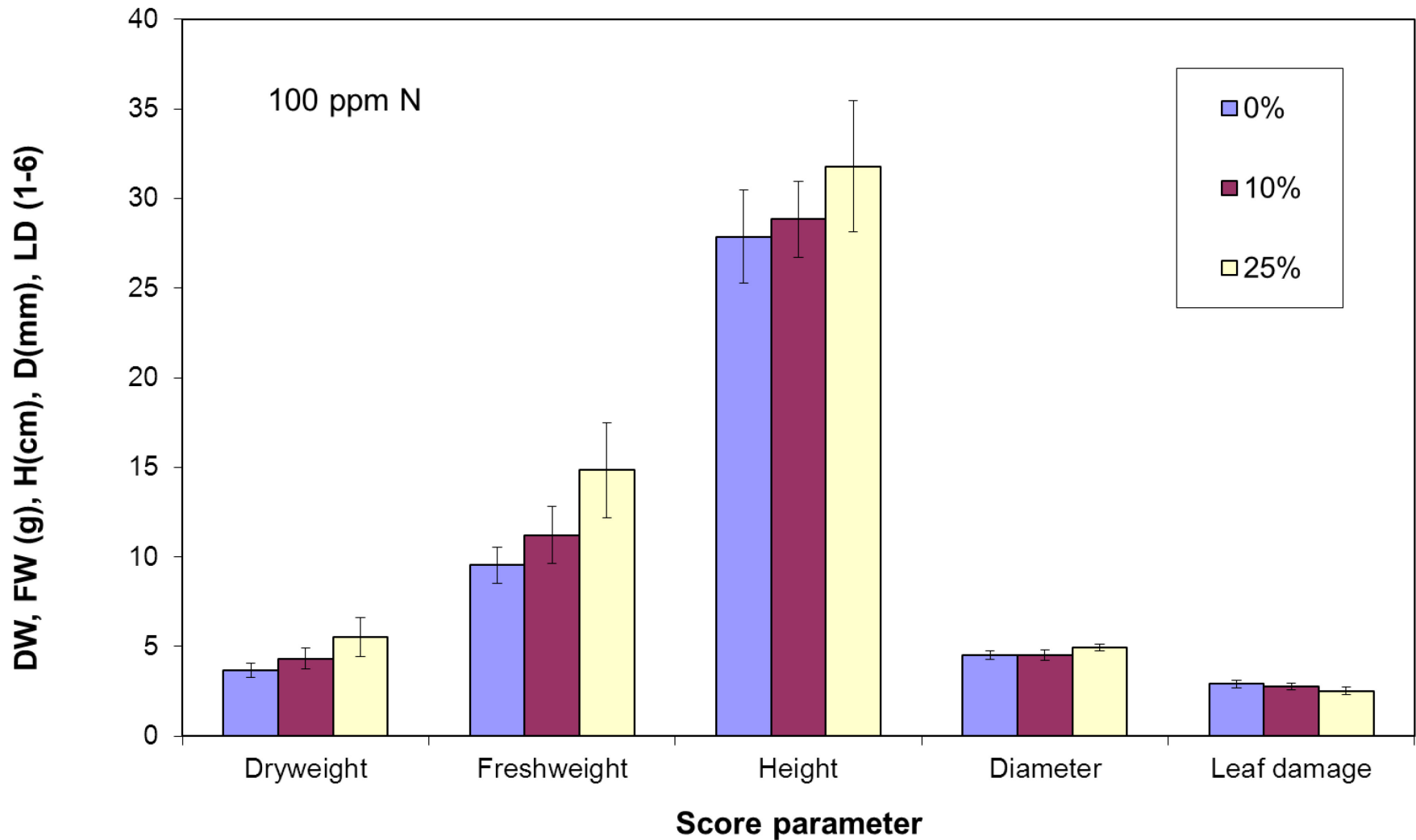
200 ppm N + 0 % vermiculite



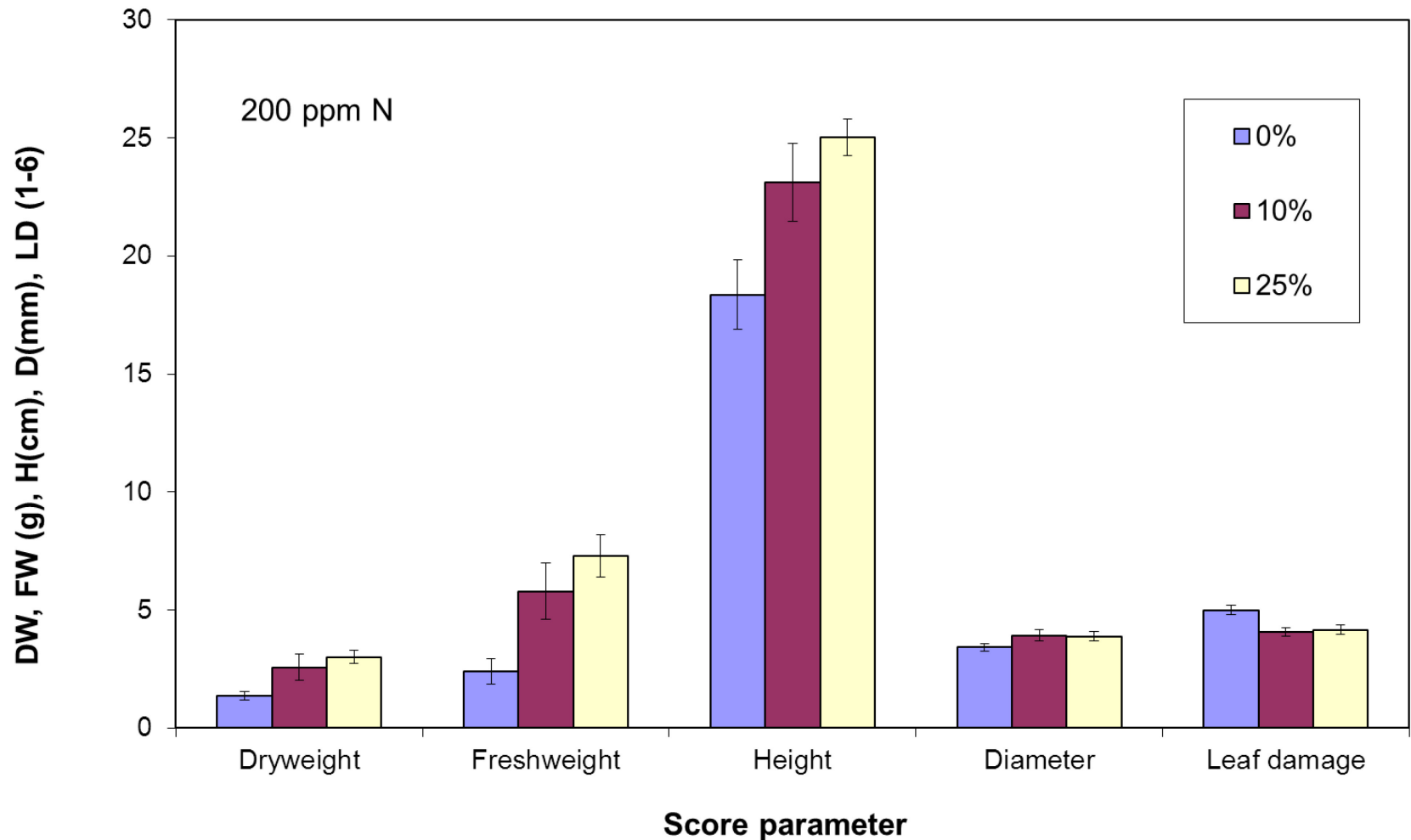
400 ppm N + 10 % vermiculite



Effect of addition of vermiculite to peat growth media on growth parameters. Data are mean of two origins (36 plants/each mean)



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Exp 2. Fertilizer experiment - low

Young seedling plants

Same liquid fertilizer
composition but lower
concentration range

25, 50, 100 and 150 ppm N



pH	NH ₄ %	N	P	K	Mg	Ca	Na	Cl	S	Fe	Mn	B	Cu	Zn	Mo
4,5	45	25	3,25	12,5	1	1	0	0	1,125	0,175	0,1	0,05	0,0075	0,0075	0,0025
4,5	45	50	6,5	25	2	2	0	0	2,25	0,35	0,2	0,1	0,015	0,015	0,005
4,5	45	100	13	50	4	4	0	0	4,5	0,7	0,4	0,2	0,03	0,03	0,01
4,5	45	150	19,5	75	6	6	0	0	6,75	1,05	0,6	0,3	0,045	0,045	0,015

3 blocks x 4 N levels = 12 individual trays with
separate irrigation and fertilizer

5+7 pots pr treatment

Automated eb and flood irrigation

Fertilizer every time irrigated, daily.

Growth for 3,5 months period

Single or multi seedling

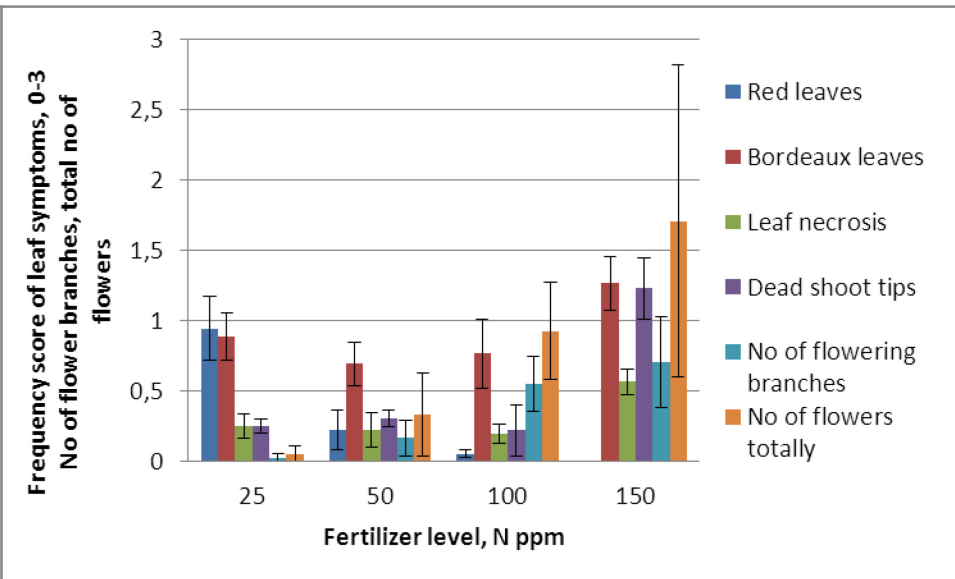
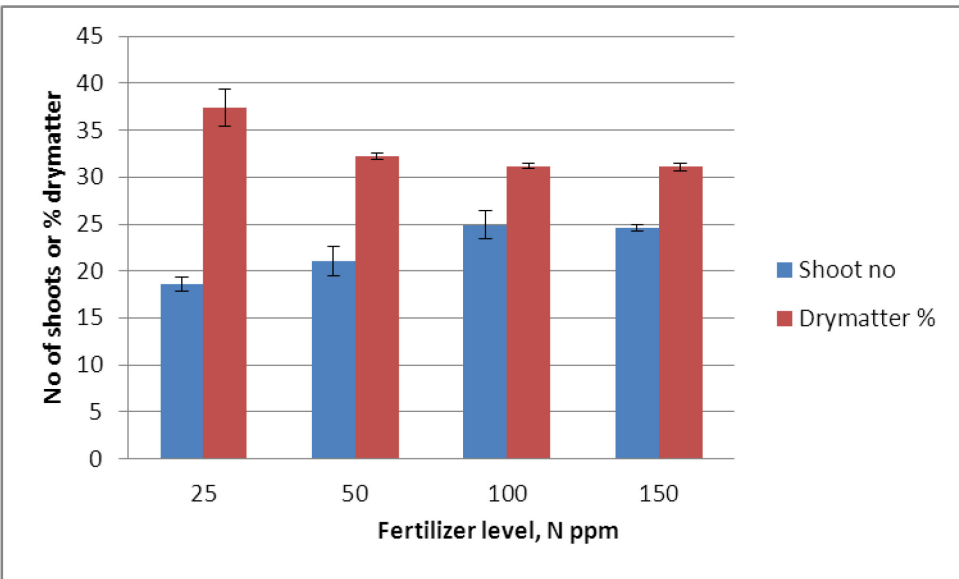
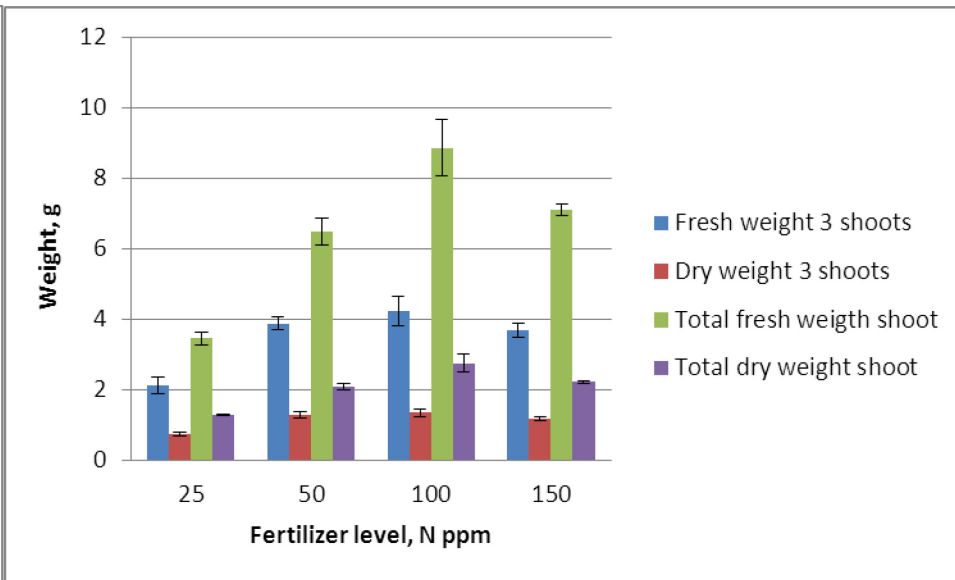
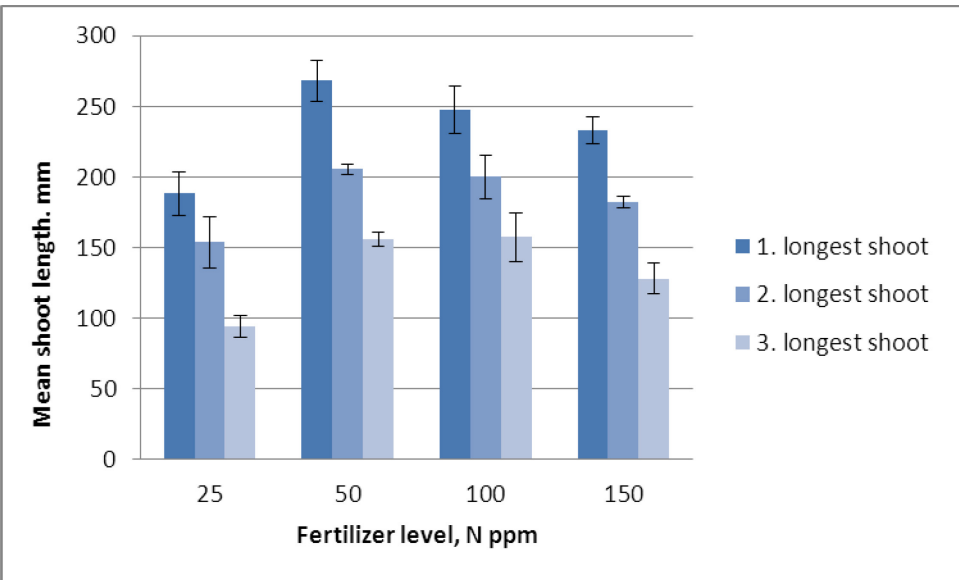
Focus on early growth





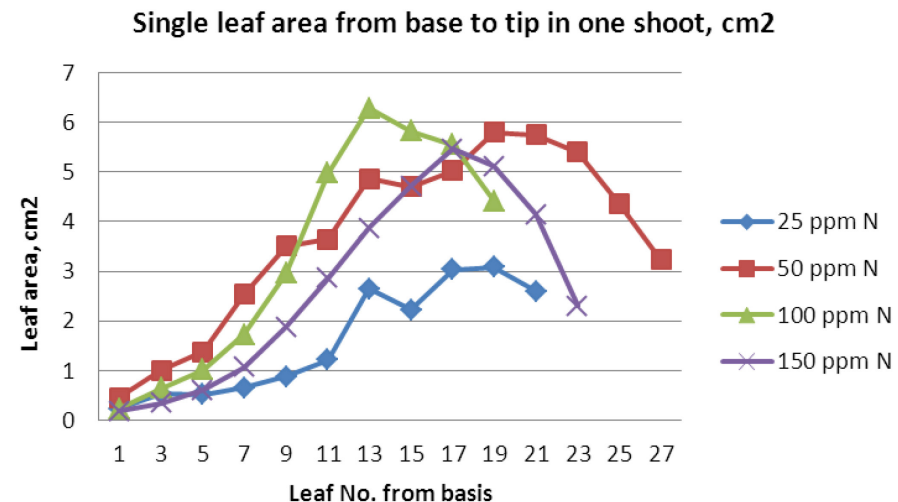
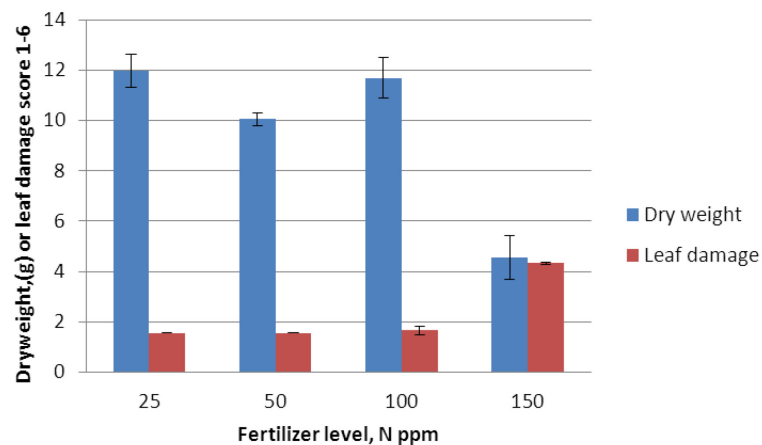
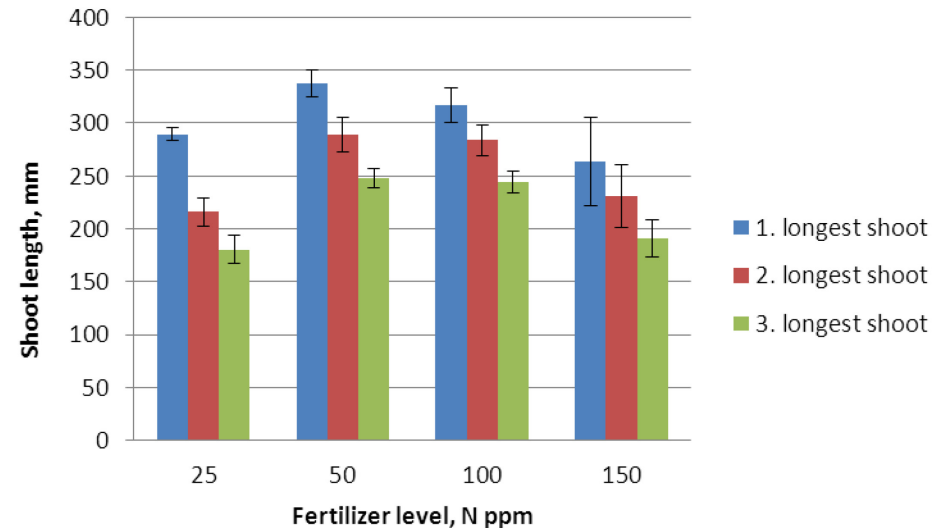
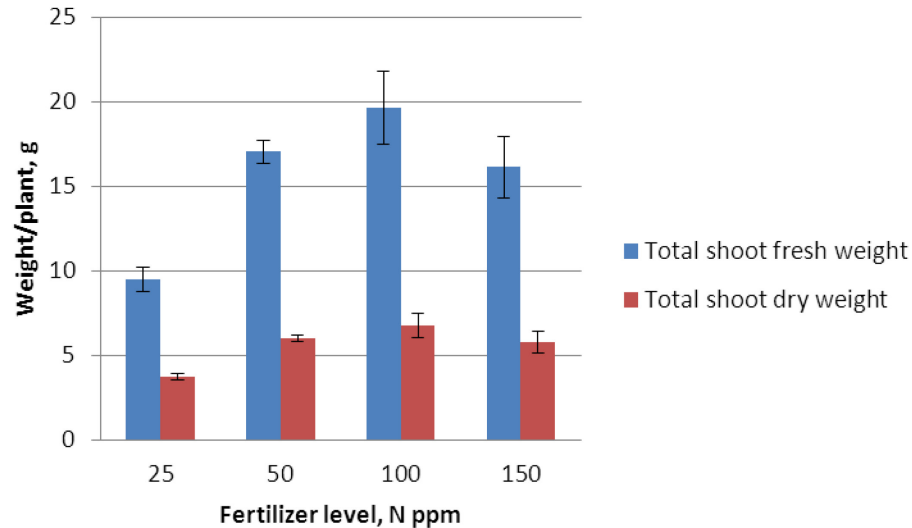
Growth of 4 young seedlings/pot

Start shoot height 30-40 mm



Mean of 12 seedlings

Multi seedling plugs: Seedling plugs: 8-10 seedlings/plug

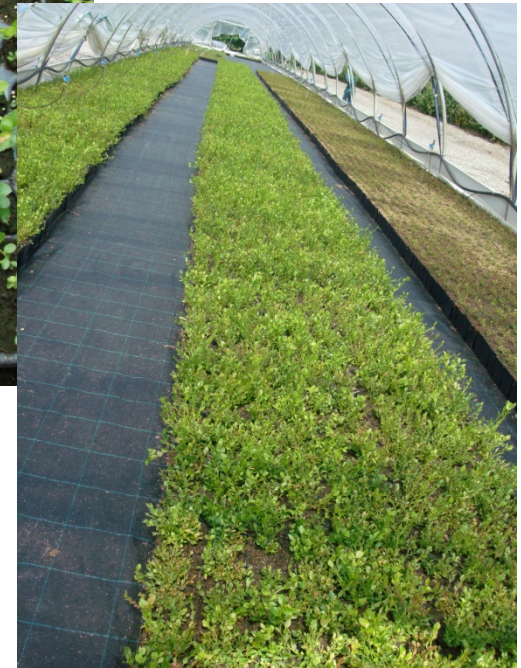


Older commercial plugs

Conclusions

- Liquid fertilizers with N values of 200 and 400 ppm N (EC=1,24 and 2,48) damage and kill plants after 1-3 months
- Addition of 10-25 % vermiculite to raw peat medium may improve growth slightly in a high nutrient stress situation
- 100 ppm N is optimal but only slightly better than 50 ppm in young seedlings, whereas 50 ppm was found better in cuttings.
- 150 ppm N fertilizer level gives leaf damage, accumulating over time
- 25 ppm N fertilizer level suggest P deficiency (red leaf colour)
- Ensure phosphorous level at low N level
- Early flowering in seedlings is promoted by higher fertilizer values
- Optimal fertilizer = 50 -100 ppm, EC = 0,3- 0,6

Applied experience in growing bilberries in pots and plugs at Gl. Sunds Nursery, near Herning/ Ole Søndergaard.



Orchard models

Established in autumn 2011 at
Halskenbjerg, Sdr. Omme.
Adapted to mechanical
harvesting.

3 rows, distance 25 cm
3, 4 or 5 plants per m row
10 cm pots, tray miniplugs, Jiffy
wood plugs
Seedlings from 3 origins
Mypex plast against weed
3 levels of fertilizer
Beds without mypex and beds
sown directly instead of
planting.



Thank you for your attention



Funded by The Danish Food Agency