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Influence of rooting hormones, topophysis, shoot age and season on rooting success in propagation by cuttings in European Blueberry (*Vaccinium myrtillus* L.)

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The Interreg IVB North Sea Region Programme

10 th International Symposium on "Vaccinium and other superfruits", Maastricht, Holland, 17-21 June 2012

Native wild populations in all regions of Denmark

Why is bilberry of interest?

- 'Superfruit'. Attractive taste, high price on berries
- Possible health effects: Cholesterol lowering, lowers blood pressure, improve cognitive performance, antibacterial, vision
- Higher concentration of antioxidants than in highbush blueberries
- No commercial orchard production, only 'natural collection'
- Manual harvesting – high costs, limit production and supply, non-sustainable
- Limited production world wide, market demand increasing
- No breeding or selection done, no cultivars reported
- Orchard production of selected cultivars of bilberry with mechanical harvesting may create new product options due to lower cost
- Native Danish species – climate adapted genetic ressources available
- Exploit Nordic Food trend
- 'Window of opportunity' for growers and industry

What is needed to domesticate European Blueberry?

Critical barriers to develop an efficient orchard based production

- and ongoing research at Aarhus University

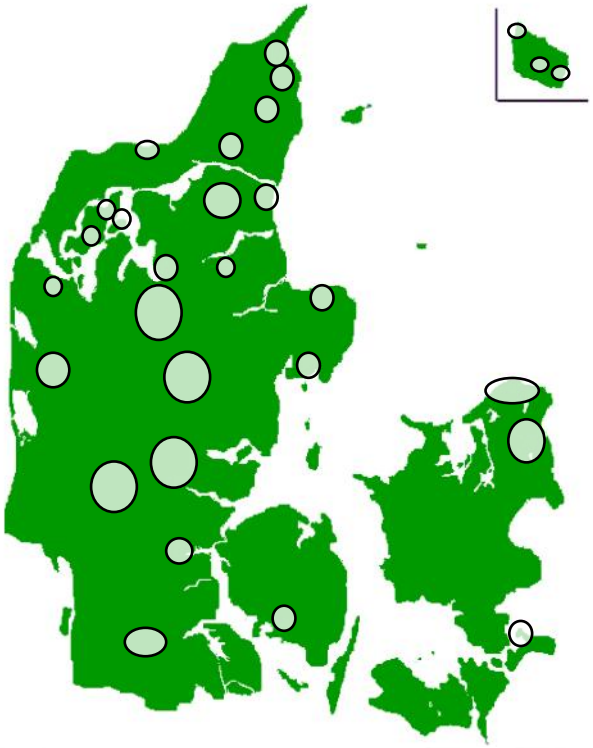
- Significant improved berry yield/plant is needed (selection and breeding).
- Significant more efficient and non-expensive methods of vegetative propagation is needed.
- Development of sustainable orchard concept/design adapted to mechanical harvesting
- Development of efficient mechanical harvesting is critical to reduce cost of harvest.

Ongoing

– Collecting and comparing the genetical variation and identification of superior plant material from wild Danish populations

– Develop propagation techniques: vegetatively in vitro or cuttings, and from seed

– Develop cultivation concept on acidic soils or on setup beds/rows



Collecting clones:

Initially collected berries, seeds and cuttings from more than 150 clones from 59 populations

Criteria: many large berries, plant health, vigourous growth, variation

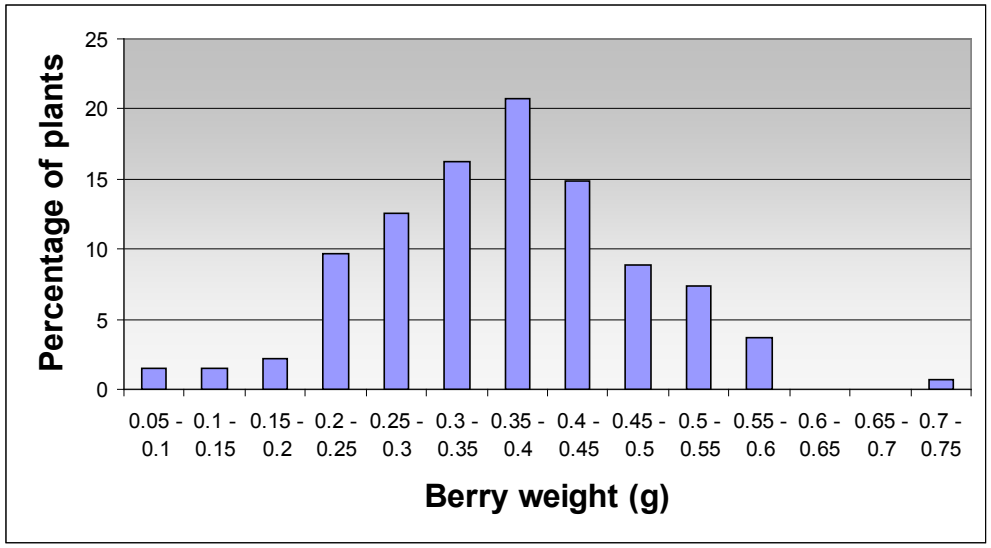
Established collection:

113 clones from 40 populations. Two sites, 9 replicates in three blocks each site.

Triple purpose:

- Gene conservation
- Clonal comparison trial: yield, quality, health
- Source of cuttings/seeds of superior genetics

Variation in plant material



Frequency distribution of mean berry weight between clones collected in nature

Anthocyanin profiling of berries ongoing at James Hutton Institute, Scotland (Climafruit)

Large variation in plant growth parameters: Right: clonal leaf area difference

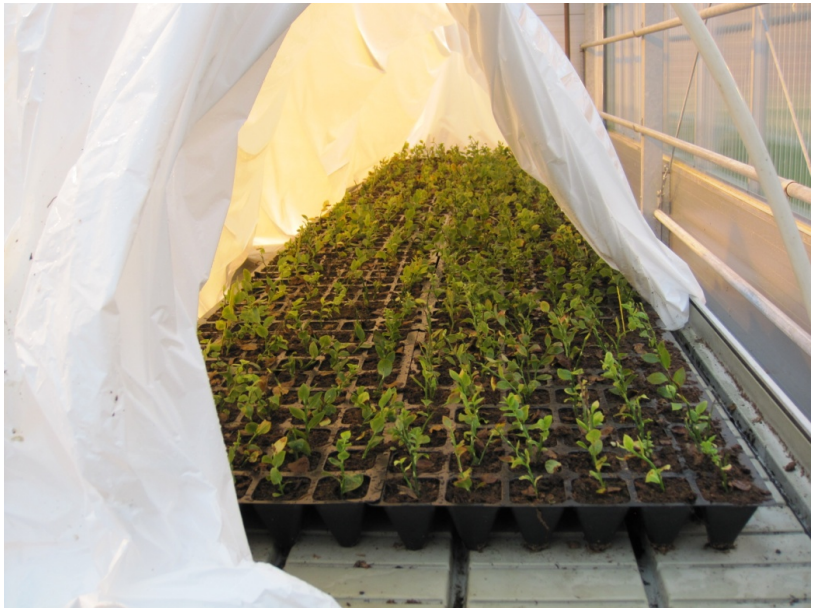
Vegetative propagation

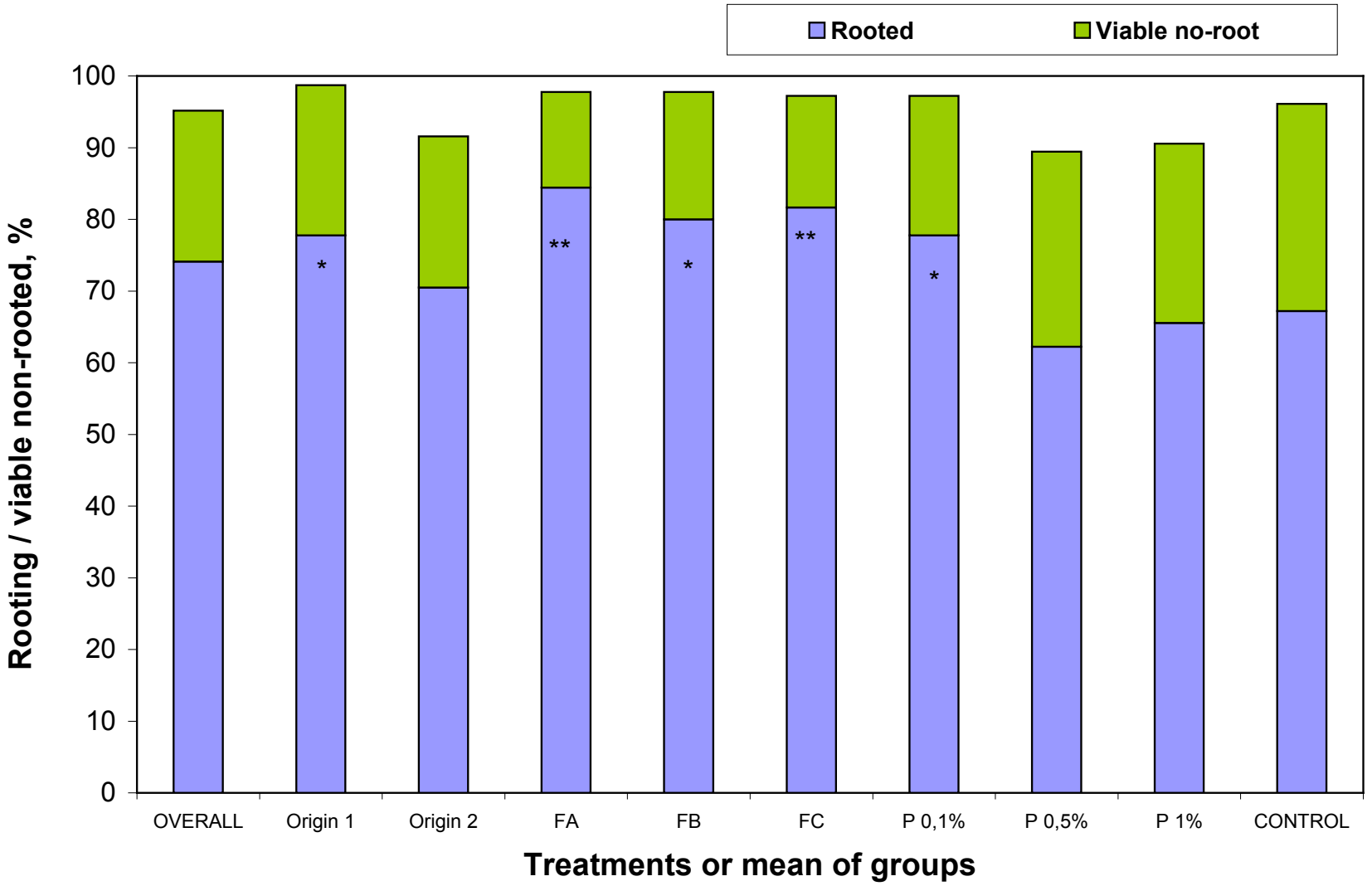
Successful in vitro propagation from surface sterilized buds using the Jaakola method (Jaakola, 2009)

Rooting experiments – softwood cuttings

- EXP 1. Effect of hormones on rooting
- Softwood cuttings directly from nature into greenhouse
- Tip cuttings taken medio July 2010
- Two origins (Stenholt and Kollemorten Krat)
- 5 replicates of 18 cuttings for each treatment
- 7 treatments
- Floramon powder dip: A (1 g/kg) , B (2 g/kg), C (4 g/kg) (a-naphthaleneacetic acid)
- Pomoxon spray, (a-naphthaleneacetic acid) 0,1 %, 0,5 % , 1 %
- Control
- plugtrays, raw finegraded peatmos, pH 4, no fertiliser, rainwater irrigation,
- Greenhouse, min 20 C, ventilation 25 C, white plast tent cover 100% RH
- Daylength 20 hours.

- Recording rooting on surface of plug-media 28th October 2010





Effect of hormones and origin of cuttings on rooting succes. (3 months).

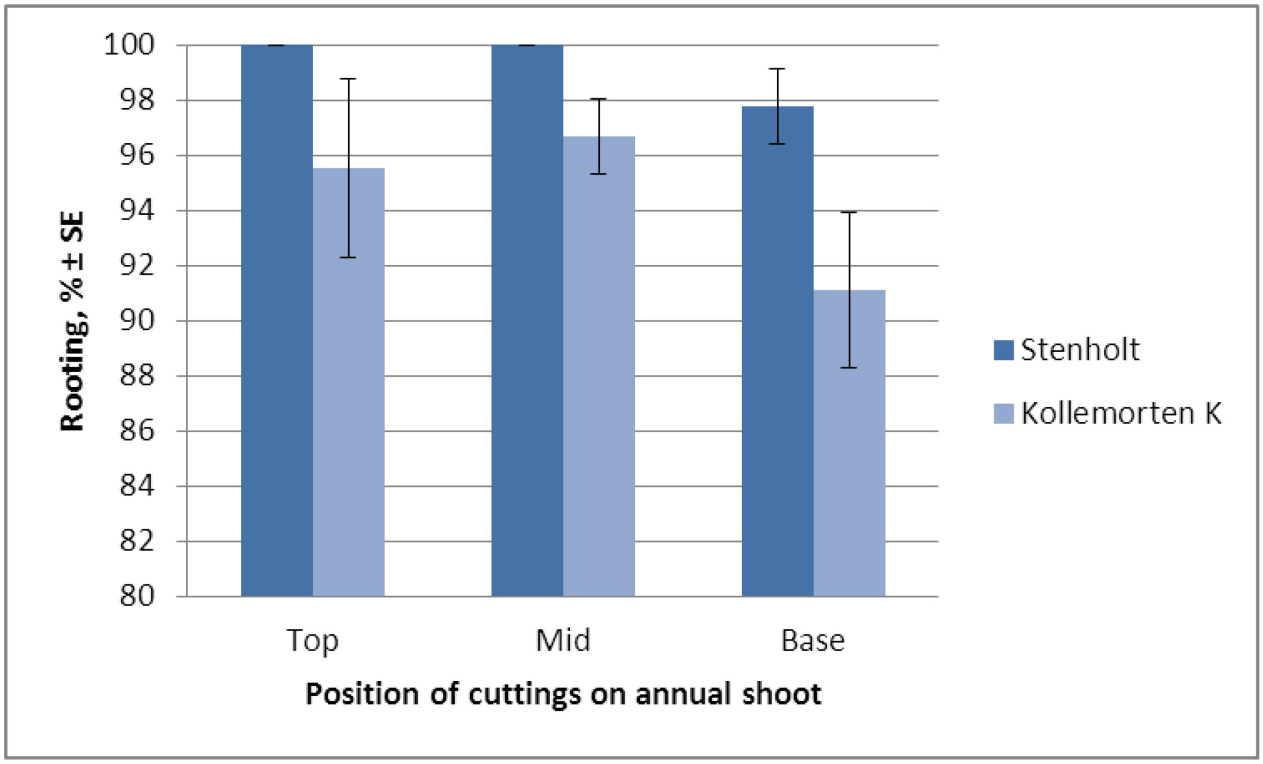
- Large scale confirmation of cutting process, two origins, 500 cuttings each, stored 2 weeks in cold storage in plastic bag, dip in Floramon B, cuttings stuck late July 2010, recorded rooting 24 January 2011

- Stenholt, 85 % rooting
- Kollemorten Krat , 71 % rooting

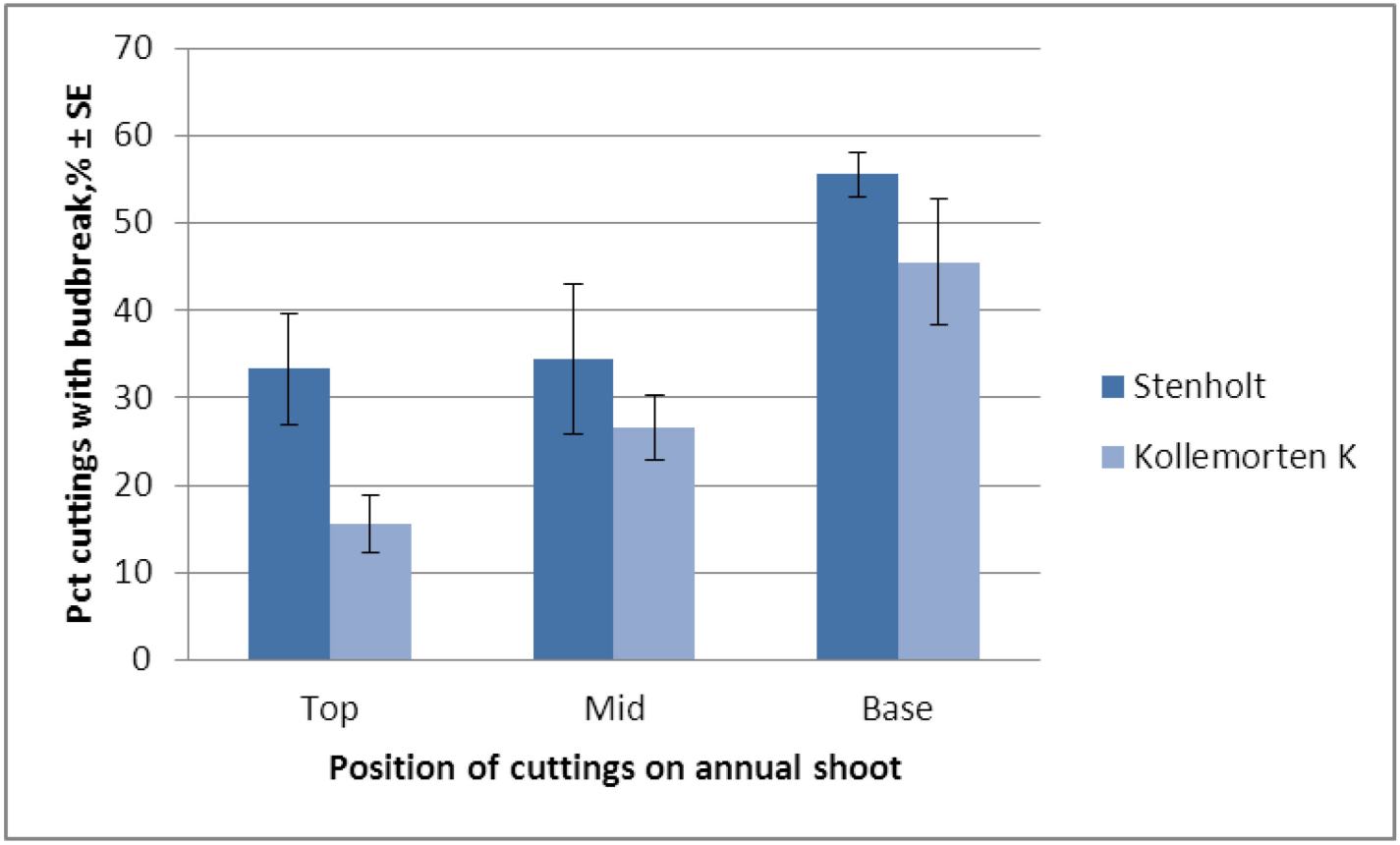
One year old plants from cuttings in greenhouse

Exp 2. Effect of the position of the cutting on the annul shoot (top, mid, base) on rooting.

Softwood cuttings from nature, long shoots, two origins, 5 replications of 18 cuttings, stuck medio July 2010. Rooting recorded 19 January 2011.



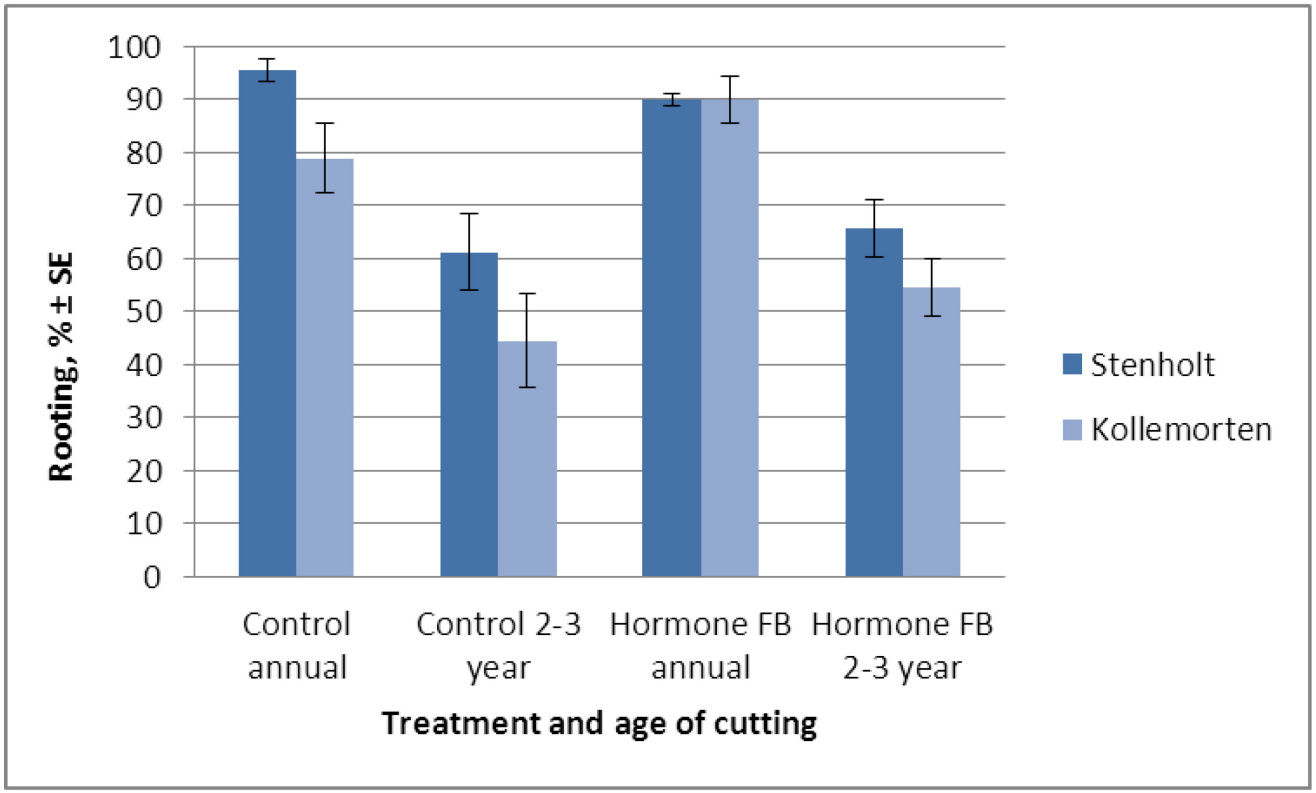
Exp. 2. Position effect on bud break of cuttings



Percentage of stuck cuttings with budbreak after 6 months

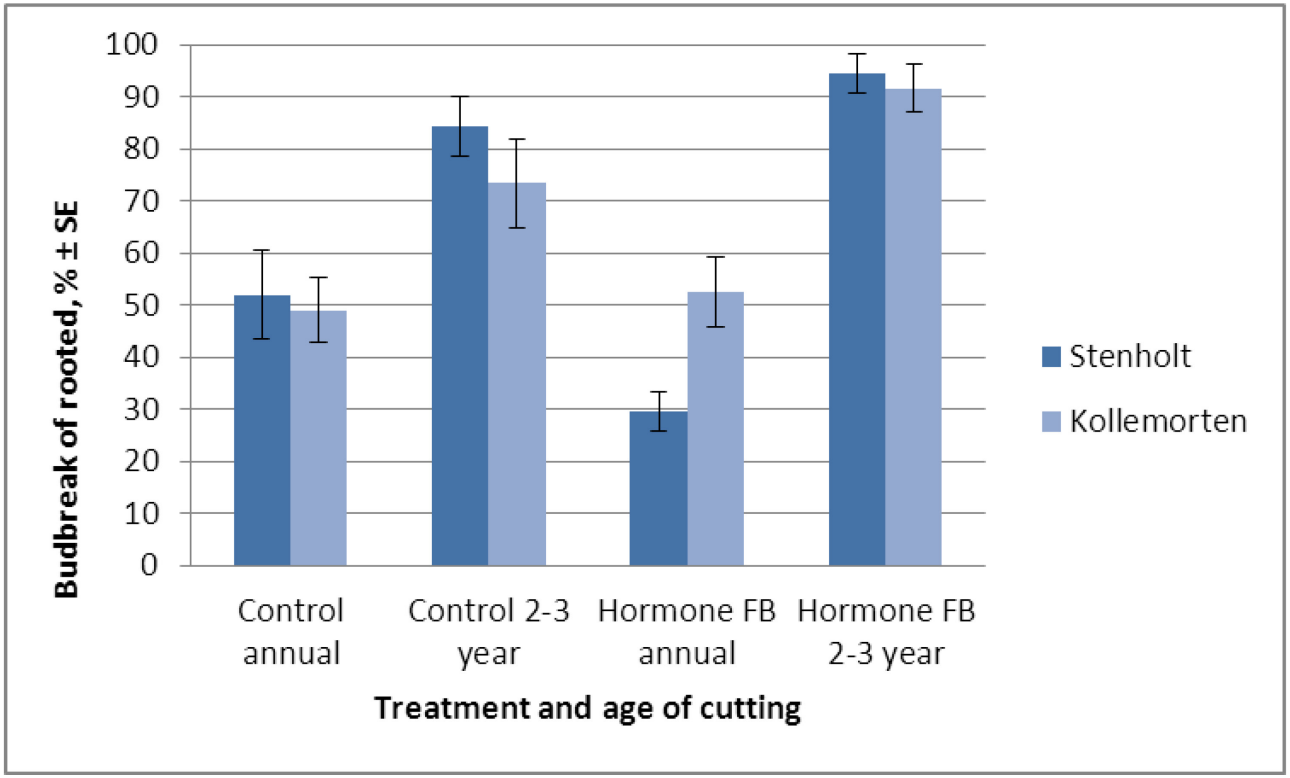
Exp 3. Effect of shoot age on rooting of cuttings: annual shoots versus 2-3 years branches

5 replicates of 18 cuttings, stuck mid July 2010, rooting recorded 19th January 2011.



Percentages of rooted cuttings depending on shoot age, origin and use of hormone

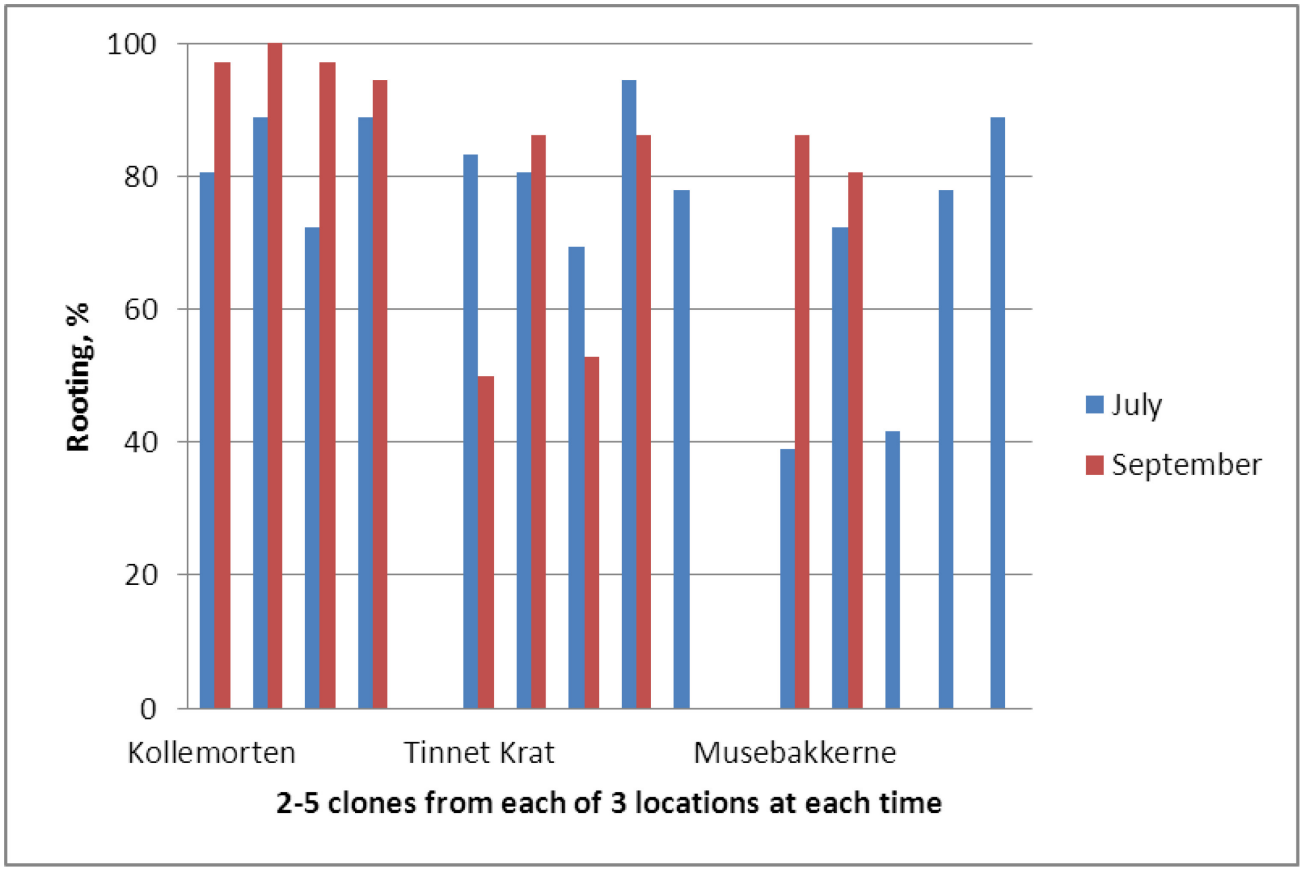
Exp 3. Effect of shoot age on rooting of cuttings: annual shoots versus 2-3 years branches



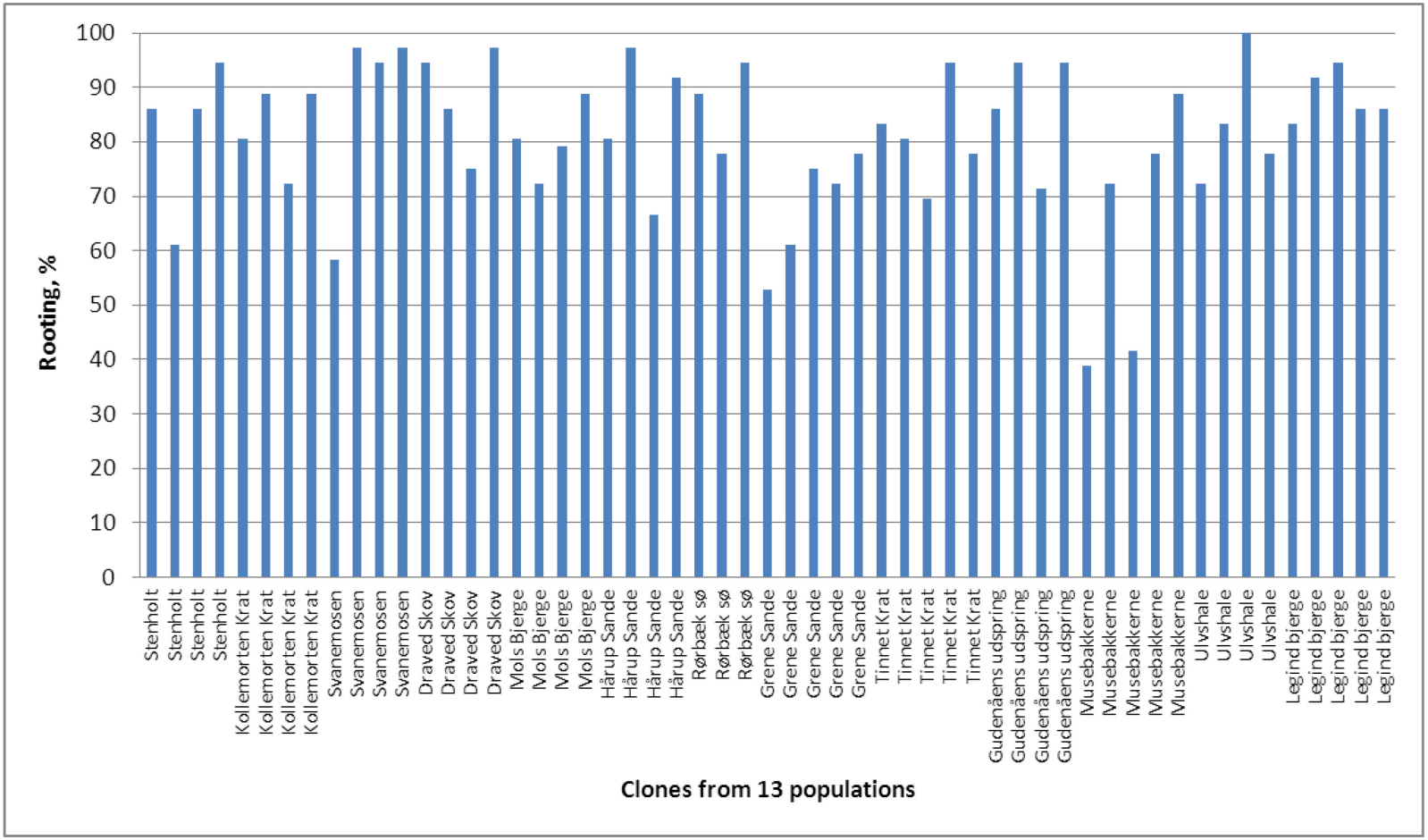
Percentage of rooted cuttings with budbreak

Exp 4. Rooting of cuttings from individual clones from 3 origins and two seasons of propagation.

Softwood tip cuttings directly from nature into greenhouse medio July 2010 or medio September and rooting recorded 19th January 2011 (3 replicates of 12 cuttings each clone)



Exp 4. Variation in rooting of 55 clones from 13 different origins. Softwood tip cuttings directly from nature into greenhouse medio July 2010 and rooting recorded 19th January 2011 (3 replicates of 12 cuttings each clone)



Conclusion

- Propagation by softwood cuttings taken in July and rooted in greenhouse under high RH and long days is generally a succesfull method for vegetative propagation of European Blueberry.

- Rooting hormones speed up rooting slightly and may increase rooting percentage significantly.

- Position of the cutting on the annual shoot only have little influence on rooting success but influence budbreak significantly with less budbreak in tip cuttings.

- Cuttings from 2-3 year branches show less rooting but higher bud break than annual tip shoots.

Conclusion

- Budbreak after rooting may require a vernalisation/chilling period.
- Level of rooting success is suggested to be similar in July and September adding flexibility in propagation.
- Some variation is found in rooting success between clones (cuttings from nature) but little or no general difference between origins.
- Cuttings from well managed greenhouse motherplants improve rooting succes (observed close to 100%)

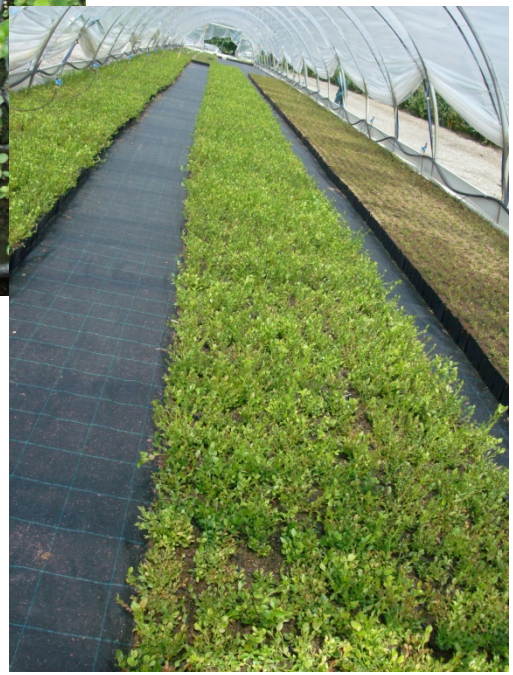
Perspective

- A new low tech and non-expensive method of vegetative propagation of bilberry may allow a future clonal production of superior cultivars for commercial orchard production

Ongoing research

Fertilizer experiments to obtain rapid growth of propagated plants

Improving on applied experience in nursery production of bilberries in containers at GI. Sunds Nursery/ Ole Søndergaard.



Orchard concepts

Established first bilberry orchard experiments in autumn 2011 adapted for mechanical harvesting.

Kaj Jepsen, Halskenbjerg

Acknowledgement

- Projects funded by Danish Food Agency and AU.
- Projects part of EU CLIMAFRUIT project
- Travel support from Niels Esbjerg Foundation.

- Kell Kristiansen, senior scientist
- Ruth Nielsen and Kaj Ole Dideriksen, horticultural technicians

- Project company partners: 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)

Thank you for your attention