WP4. Apple cultivars and rootstocks with higher frost resistance

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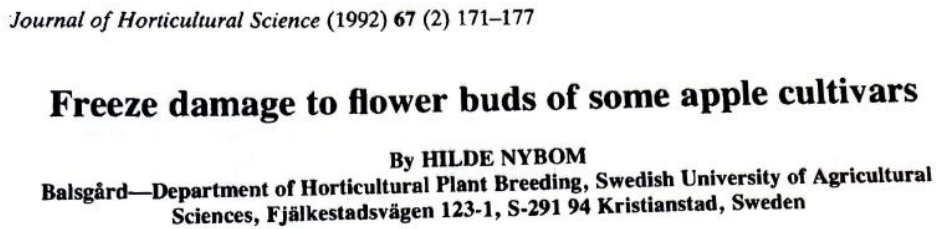
Background

- Frost resistance can vary considerably between apple cultivars and may also be modulated by the rootstock

- Few studies examined the flower bud resistance to Spring frost in different cultivars or identified rootstocks that improve scions' ability to withstand frost damage

Apple cultivars and rootstocks with higher frost resistance



Journal of Horticultural Science (1992) **67** (2) 171–177

Freeze damage to flower buds of some apple cultivars

By HILDE NYBOM
Balsgård—Department of Horticultural Plant Breeding, Swedish University of Agricultural Sciences, Fjälkestadsvägen 123-1, S-291 94 Kristianstad, Sweden

- Frost event (-9°C) in Sweden (Kristianstad) on the 17th-18th of April, 1991.
- **129 cultivars** evaluated (% dead buds)
- There was considerable variation in frost resistance among cultivars (range 4% to 100%, mean 51%)
- **Some correlation with onset of flowering** (late flowering cultivars less damage, but small difference between early and medium flowering cultivars)
- **Correlation between country of origin and frost resistance**

Apple cultivars and rootstocks with higher frost resistance

Journal of Experimental Botany, Vol. 36, No. 168, pp. 1159–1171, July 1985

Variations in Cold Resistance among Apple Cultivars during Deacclimation

WARREN K. COLEMAN

Agriculture Canada, Research Station, P.O. Box 20280, Fredericton, New Brunswick, Canada E3B 4Z7

- Frost resistance (hardiness index based on 3 criteria) in 9 grafting combinations
- Differences in harvesting index depending on the rootstock [e.g., Imperial Red Mac/Antonovka (2 HI and 1HI) whereas Imperial Red Mac/M111 (9 HI and 7 HI)]

Apple cultivars and rootstocks with higher frost resistance

Aim: To select appropriate apple cultivars and rootstocks for frost-prone areas in Denmark

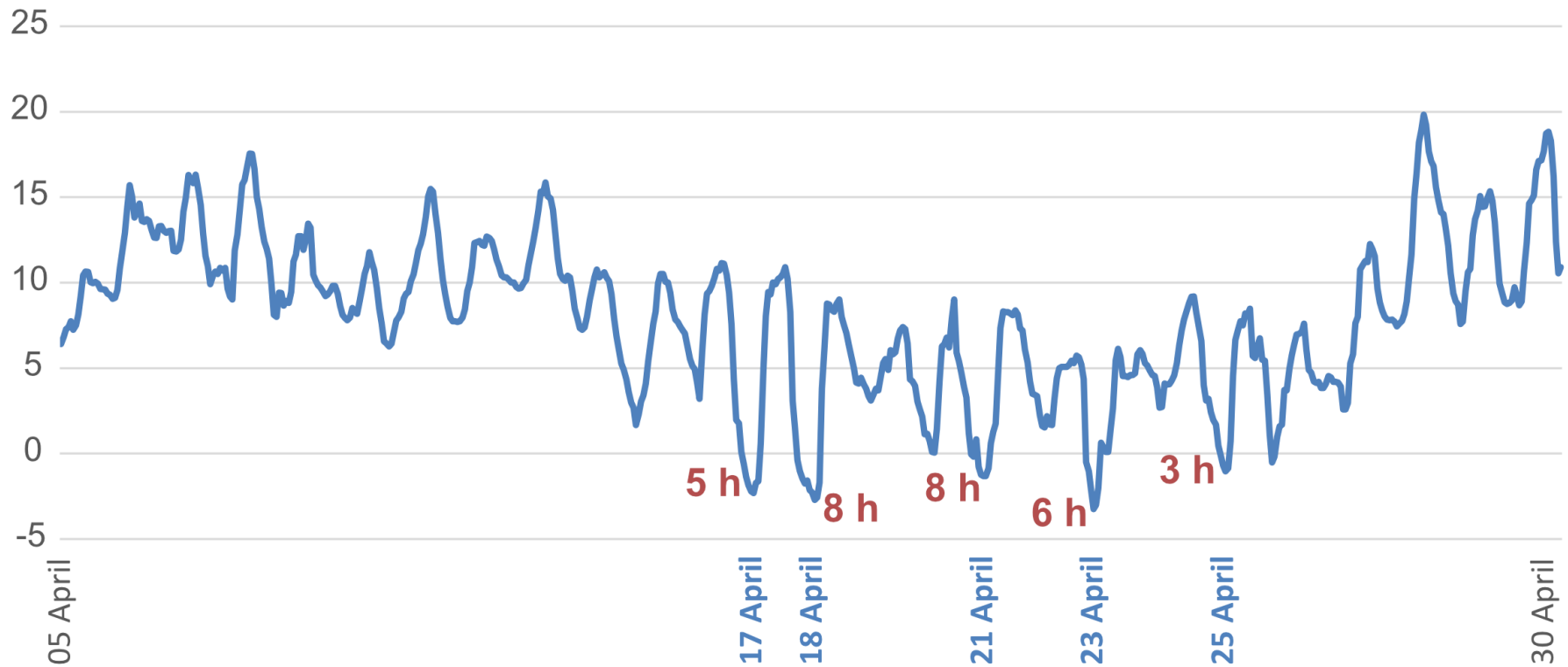
Plant material, experimental design, and measurements

- **10 apple varieties** (Elstar, Ingrid Marie, Junami, Zari, Summer Crisp, Freya, Early Crunch, Braeburn Mariri Red, Crimson Crisp, Santana)
- For each cultivar, we have selected **6 trees (replicates)**, and for each tree, we have marked **4 shoots** (both sides)
- We recorded **number of flower buds per shoot** and **flower bud developmental stage every week (19 March - 21 May)**

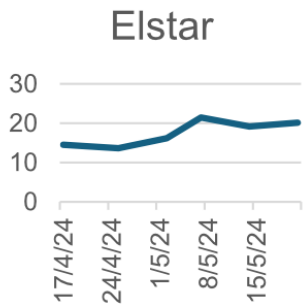
Plant material, experimental design, and measurements

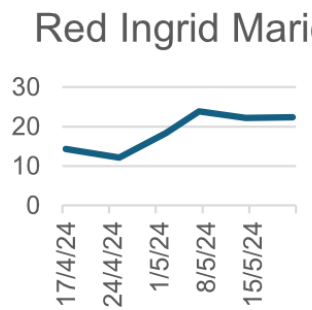
Source: https://blogs.cornell.edu/jentsch/tree-phenology-dates-and-degree-day-events/

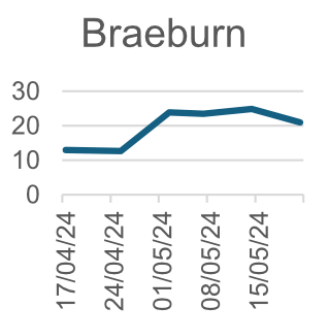
Minimum daily temperature (C°) in April, 2024

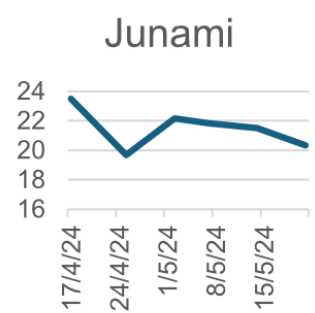


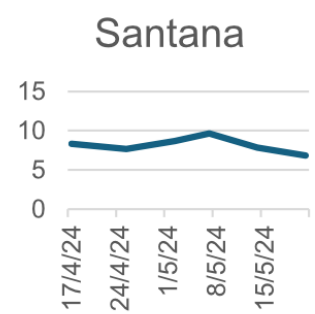
Number of flower buds transitioning to full bloom

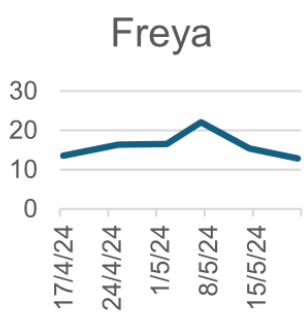


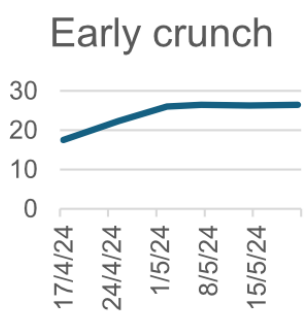


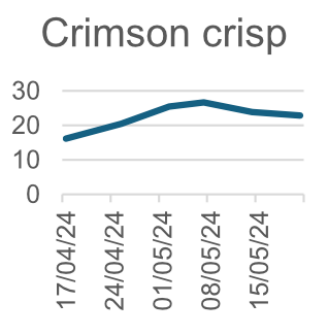


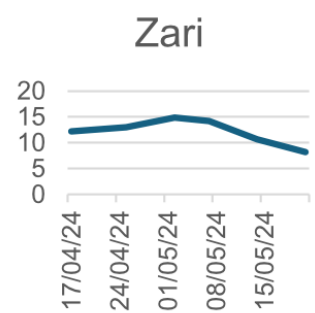


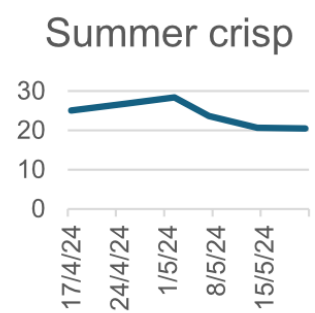












Onset of flowering (full bloom) and duration

Cultivars	Onset of full bloom	Last date of full bloom
Elstar	07-May	14-May
Red Ingrid Marie	07-May	**21-May**
Braeburn Mariri Reed	07-May	**21-May**
Junami	07-May	14-May
Santana	07-May	14-May
Freya	07-May	**21-May**
Early Crunch	07-May	14-May
Crimson Crisp	07-May	14-May
Zari	07-May	14-May
Summer Crisp	**02-May**	14-May

Harvesting date

Cultivars	Harvest date
Summer Crisp	08-Aug
Early Crunch	15-Aug
Zari	05-Sep
Red Ingrid Marie	10-Sep
Elstar	16-Sep
Freya	16-Sep
Santana	16-Sep
Crimson Crisp	01-Oct
Junami	03-Oct
Braeburn Mariri Red	23-Oct

Planned work in the coming season

- Continue cultivar evaluation (same analysis + counting of healthy and dead buds following a frost event)

- **15 rootstocks** (M9, G11, G41, G16, G213, G214, B9, M26, Pi80, M7, MM106, G210, B118, G814, M9-RN29) with ‘Elstar’ as a scion (onset of flowering and flower bud damage)

Acknowledgements

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AARHUS
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