

## Testing apple and pear cultivars for organic production in Denmark

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### Abstract

*In 2010, scions from 29 apple cultivars from several breeding stations all over the world were grafted and planted in Denmark. The cultivars were originally selected among cultivars thought to be suited for Danish conditions and climate. The aim of the work was to find robust apple cultivars for either long term storage or cultivars suited to fill the sales gap between the two large organic cultivars in Denmark: Discovery and Aroma.*

*11 pear cultivars were tested for suitability to organic production. Cultivars of apples and pears suited for organic production in Denmark are recommended.*

**Keywords:** Apple, pear, testing, robust, cultivars.

### Introduction

In 2010, apple cultivars from breeding stations all over the world were grafted and planted in Denmark. The cultivars were selected among cultivars thought to be suited for Danish conditions and climate. Especially looking for cultivars for long term storage or to fill the sales gap between Discovery og Aroma. In 2017 to 2018 11 pear cultivars were investigated for suitability to organic production.

### Material and Methods

The apple cultivars were established at a planting distance of 3.5 x 1 m, on Rootstock M9. The cultivars were established in a randomized trial with 4 replicates of 5 trees and grown organically. Using mechanically weed cleaning. Sulphur and Armicarb for disease control and Isomate, Bt-products and NeemAzal for pest control.

After the first five screening years 19 cultivars and selections became deselected due to: Susceptibility to pest and diseases, to late ripening for Denmark, poor fruit quality or to short shelf life.

After the first five screenings years 10 cultivars were selected for more complete investigations. The selected cultivars were: Alkmene, Fragance, Galant, Galiwa, HL 782, Maribelle, Red Topaz, Sansa, Santana and Tells 47/05.

Susceptibility to pests and diseases were evaluated on tree and leaves in June and August and on fruits at harvest. Flowering and harvest time, yield per tree, fruit size, fruit colouring and taste were recorded 2016-2018. Fruit quality was determined at optimal maturity and for most cultivars a shelf-life study was conducted. Firmness, sugar, acid content and shelf life are determined for most cultivars.

In 2015, a conventional planting of pear cultivars was converted to organic production. Using mechanically weed cleaning. Sulphur and Armicarb for disease control and Isomate, Bt-products and NeemAzal for pest control. In 2017 and 2018, 11 pear cultivars were examined for suitability to organic production.

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## Results

The following 19 apple cultivars became deselected after the first screening due to high susceptibility to pest and diseases, to late ripening for Denmark, poor fruit quality or to short shelf life: Ginger Gold, Gaia, Smeralda, Your Choice, Apollo, Katja, Poul Sloth, Frosta, Golida, HL 1080, Flordika, Artika, Vysocina, Autento, A40R4T11, Tells 58/60, A987-74 Tells A587, Pomfital.

The 10 selected cultivars were tested for susceptibility to pest and diseases, yield, and fruit quality (Table 1).

Table 1: Percentage of discarded fruit due to apple scab at harvest in 2016, percentage of fruits damaged by apple sawfly at harvest in 2016. Gross yields and fruit size average of 2016-2018. Firmness at harvest in 2018 and scores for eating quality and fruit appearance average of 2017 and 2018 (1-9, where 9=best).

Cultivar	Apple scab 2016		Apple sawfly damage % infested fruits at harvest 2016	Average 2016-2018		Firmness At harvest 2018	Averages of 2017 and 2018	
	% discarded fruit at harvest	% infested fruit at harvest		Gross Yield Ton/ha	Fruit size G/fruit		Eating quality 1-9 where 9 = best	Appearance 1-9 where 9 = best
Alkmene	0	2	28	14*	117	7,5	6,1	6,7
Fragrance	0	14	34	21	224	8,4	5,6	5,5
Galant	4	30	26	32	115	9,3	5,3	6,2
Galiwa	0	8	52	14	165	8,9	6,1	6,9
HL 782	10	48	26	11	148	9,0	5,4	5,6
Maribelle	2	18	18	33	189	8,1	6,6	6,2
Red Topaz	0	2	32	20	169	8,0	7,3	6,9
Sansa	-	-	-	25	135	6,3	5,1	6,1
Santana	0	10	36	22	188	7,0	6,9	5,9
Tells 47/05	0	2	22	30	110	7,0	5,9	6,1

### Recommendations of apples for organic production

The standard cultivars Red Topaz and Santana are high yielding, with high fruit quality. It is difficult to find cultivars better than these. The older German cultivar Alkmene, showed a high yield and good taste. Alkmene is now recommended for organic growing in Denmark. The following cultivars need further testing but are promising cultivars for organic production: Fragrance (Czech Republic) is an autumn cultivar, robust with a good taste and high yield. Sansa (New Zealand). Is a summer cultivar, robust, sweet taste, a nice eating quality and middle to high yield. Tells 47/05 (Netherlands) is an autumn cultivar, robust, nice taste, and big stable yield.

The following cultivars are not recommended for organic production: Galant (Netherlands). Autumn cultivar, very susceptible to scab, small fruit, and high yield. Maribelle: Becomes too big, susceptible for apple scab and sooty blotch. The selections HL 782 is susceptible to apple scab and Topaz spot and the yield is low. Galiwa are not recommended due to a low yield and susceptibility to apple sawfly.

Table 2: Pear cultivars, origin, growth, harvest time, gross yield (kg/tree) for 2017 and 2018 and comments.

Cultivar	Origin	Growth	Harvest time	Gross yield/kg/tree		Recommendation for organic production
				2017	2018	
Alexander Lukas	Moldavia	Weak	Late September	15,7	12,0	Susceptible for pear scab
Anna	Norway	Weak	Mid-September	8,0	23,0	Thick peel and susceptible to pear scab
Carola	Sweden	Middle	Primo September	1,0	16,0	Robust, big pear with average eating quality
Celina	Norway	Middle	Primo September	2,0	8,4	susceptible to pear scab
Clara Frijs	Denmark	Weak	Primo August	-	17,0	Very susceptible to pear scab
Concorde	England	Middle	Mid-September	-	2,7	Robust fine eating quality
Conference	England	Middle	Mid-September	7,2	12,5	Robust fine eating quality
Fondante de Charneu	Belgium	Weak	Mid-September	-	15,8	Very susceptible to pear scab
Fritjof	Norway	Weak	Mid-September	13,7	24,9	Some scab average eating quality
Grev Moltke	Denmark	Weak	Mid-September	.	8,1	Very susceptible to pear scab
Ingeborg	Norway	Middle	Mid-September	1,8	8,3	Robust, average eating quality
Kristina	Norway	Middle	Late August	1,3	5,4	Very susceptible to pear scab
Delbard Premiere	France	Middle	Mid-July	6,3	1,3	Very susceptible to Brown rot

### Recommendations of pears for organic production (Table 2)

In spring 2017 we had frost during flowering followed by low yield in some cultivars. The cultivars Carola, Concorde, Conference and Ingeborg are robust and have an acceptable eating quality and is recommended for organic production.

Anna and Fritjof are not good for organic production. Anna has a rather big, not nice-looking fruit with thick peel and medium susceptibility to pear scab. Fritjof has a poor eating quality and medium susceptibility to pear scab.

Under Danish conditions Alexander Lukas, Celina, Clara Frijs, Fondante de Charneu, Grev Moltke and Kristina are very susceptible to pear scab and Delbard

Premiere is very susceptible to brown rot. These cultivars are not suitable for organic production.

### **Acknowledgements**

Fonden for økologisk landbrug and Promilleafgiftsfonden for Frugtavlen og gartneribruget.

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