

## Evaluation of scab-resistant apple cultivars

*Vurdering af skurvresistente æblesorter*

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### Summary

The scab-resistant cultivars 'Prima', 'Priam', 'Priscilla', 'Sir Prize' and 'Macfree' have been evaluated. 'Prima' and 'Priam' ripen at the end of September – beginning of October, can be stored for 1–2 months and were rated best for overall fruit quality. 'Prima' was damaged by winter frost. 'Priscilla', 'Sir Prize' and 'Macfree' ripen at the end of October. 'Priscilla' has a very limited storage life. 'Sir Prize' can be stored for several months, but fruit skin is very tender and becomes greasy in storage. 'Macfree' has rather small fruits. No signs of scab has been observed on any of the cultivars.

**Key words:** Growth, cropping, fruit size, colour, eating quality.

### Resumé

De skurv-resistente sorter 'Prima', 'Priam', 'Priscilla', 'Sir Prize' og 'Macfree' blev vurderet. 'Prima' og 'Priam', der modner i slutningen af september – begyndelsen af oktober, kan opbevares 1–2 måneder og fik de bedste bedømmelser for frugt kvalitet. 'Prima' blev frostskaadet i 2 hårde vintre. 'Priscilla', 'Sir Prize' og 'Macfree' modner i slutningen af oktober. 'Priscilla' kan kun opbevares i en kort periode. 'Sir Prize' kan opbevares i flere måneder, men frugthuden er meget trykfølsom og bliver fedtet under lagring. 'Macfree' minder i udseende og smag om 'McIntosh', men har ret små frugter. Ingen af sorterne viste tegn på skurvangreb.

**Nøgleord:** Vækst, udbytte, frugstørrelse, farve, spisekvalitet.

### Introduction

Control of apple scab may under Danish growing conditions require 10–15 sprays of fungicides per year. Cost of sprays and concern about use of plant protection chemicals make it desirable to grow scab-resistant cultivars. 5 such cultivars

have been screened for yield, quality and storage characteristics.

### Materials and methods

8 2-year old trees per cultivar, all on M 26 rootstock, were planted in the test orchard of the

Institute of Pomology, Årslev, 1981–82. 4 trees per cultivar were planted at 3 grower farms and at the Horticultural Institute of the Royal Veterinary and Agricultural College, Copenhagen. A few trees were planted in 3 private gardens. The following tables are based on results from the Institute of Pomology only, while experiences from all test sites are included in cultivar evaluations.

Trees were planted at a spacing of 4 × 2 m in the test orchard, which received normal pest control sprays. Grass strips were established in 1984 to control excessive shoot growth.

Fruits appearance was rated by a group of experienced staff members. Rating of taste (over all acceptability) was carried out at weekly intervals by another group of institute personnel. In both cases rating followed a 1–9 scale (1: very poor, 9: very good). Fruit appearance rating is given as an average of 3 years results.

Results of taste ratings are given as the best average rating obtained during the tests. In addition, 2 groups of advisors rated fruit quality in November 1984.

Fruit samples were analysed for soluble solids (refractometric) and acids (titration). Results are given as a range of typical sugar/acid-ratios (per cent soluble solids divided by per cent malic acid).

Fruits samples were kept in ordinary cool storage at 3–4°C for observations on storage life.

## Results and discussion

### Scab-resistance

Symptoms of apple scab were not observed on any of the 5 cultivars, neither were they observed on trees not treated with fungicides. Scab-infection was severe in 1983, but none of the trees were infected in a plot with only minimal control sprays (12). Single cases of canker were observed on stems of 'Priam' and 'Sir Prize' and of powdery mildew on 'Priscilla'.

### Hardiness

2 very cold winters occurred during the test period: 1981–82 and 1984–85. Young trees of many cultivars were killed or badly damaged by frost. Of 4 trees of 'Prima', planted spring 1981, 2 died during the first winter, 2 were cut back and raised again, but died during 1984–85. 4 trees of the same cultivar were planted spring 1982, but 3 died during 1984–85. 120 trees of 'Prima' were budded on M 26 in August 1984, but only 50% survived the first winter. 'Prima' was also damaged at another test site. Of 8 'Sir Prize'-trees planted spring 1982 3 were severely damaged during the winter 1984–85. 8 trees of 'Macfree' were planted spring 1981. 2 trees were damaged and cut back in 1982, and 2 trees died after the last winter. 'Priam' and 'Priscilla' were undamaged.

Yield of the surviving trees is shown in Table 1. Due to frost damage, figures are in some cases

**Table 1.** Total yield, average fruit size and growth vigour.  
*Udbytte, gns. frugstørrelse og vækstkraft.*

Cultivar	Planting year	Harvest date	Yield, kg/tree 1983–85	Fruit weight g/fruit	Growth vigour
Sort	Planteår <sup>1)</sup>	Høstdato	Udbytte, kg/træ	Frugstørrelse g/frugt	Vækstkraft
'Prima'	1981 (4)	26/9	32 <sup>2)</sup>	126	strong, spreading
'Prima'	1982 (4)	26/9	50 <sup>2)</sup>	152	strong, spreading
'Priam'	1981 (4)	10/10	44	110	medium, spreading
'Macfree'	1981 (8)	27/10	41 <sup>2)</sup>	105	medium, spreading
'Priscilla'	1982 (8)	18/10	40	128	strong, spreading
'Sir Prize'	1982 (8)	26/10	50 <sup>2)</sup>	170	strong, spreading

<sup>1)</sup> Number of trees planted in brackets.

*Antal træer plantet i parentes.*

<sup>2)</sup> Figures based on only few trees due to frost damage.

*Tallene usikre pga. frostskaade.*

**Table 2.** Fruit colour and quality of 5 apple cultivars.  
*Frugtens farve og kvalitet i 5 æblesorter.*

Cultivar Sort	Ground colour Grundfarve	Overcolour <i>Dækfarve</i>		Russeting Skrub	Appearance, 1-9 Udseende, 1-9	Max. taste, 1-9 Maks. smag, 1-9
		Type	Amount, % % dækning			
'Prima'	yellow	red	40-60	weak	5.3	4.7
'Priam'	light yellow	red	30-50	weak	3.7	4.3
'Priscilla'	yellow	dark red	20-40	weak	2.3	3.8
'Sir Prize'	yellow-green	light red	very little	weak	4.7	4.6
'Macfree'	dark green	dark red	20-40	absent	3.0	4.2

based on only few trees and should be considered with caution. The following descriptions summarise the results of Table 1-4 and experiences from all test sites.

'Prima'. Breeders: Institutes in Illinois, Indiana and New Jersey, USA. 1970.

A strong growing tree with early and fairly high yields of medium to large apples. Fruit hang well on the tree and can be picked over a period of 1-2 weeks at the end of September. Well exposed fruits have a very attractive red overcolour on a yellow background. They can be eaten directly from the tree or kept in cold storage for about 1 month. Shaded fruits do not develop colour and have a poor quality. Fruit flesh is crisp and juicy. At optimum ripening the taste is subacid, fresh and pleasant. Taste panels have rated 'Prima' best of all 5 cultivars. For commercial growing the main problems are frost sensitivity, poor colour of shaded fruits and a short storage life.

Except for one case (9), scab has not been reported to occur on 'Prima'. It has considerable resistance to fire blight. Attacks of powdery mildew (16) and canker (19) have been reported.

**Table 3.** Sugar/acid-ratio in juice from 5 apple cultivars.  
*Sukker/syre-forhold i saft af 5 æblesorter.*

Cultivar Sort	Ratio Forhold
'Macfree'	25-30
'Priam'	15-17
'Prima'	12-16
'Priscilla'	20-30
'Sir Prize'	15-20

Litt: 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 16, 17, 18, 19, 21, 22.

'Priam'. Breeders: Institutes in Illinois, Indiana and New Jersey, USA and in Angers, France. 1974.

The tree is of medium vigour with an open, spreading habit. The small to medium sized fruits ripen during the first half of October and drop easily when picking is delayed. They are oblong in shape with a homogenous or striped red blush. Storage life is about 4-6 weeks or longer depending on picking time. Fruit appearance and taste are rated lower than for 'Prima', mainly because of smaller fruit size and a more acidic flavour.

**Table 4.** Rating of fruit appearance and taste by 2 groups of advisors.

*Bedømmelse af frugtens udseende og smag foretaget af 2 grupper af konsulenter.*

Session A: 4 persons on 1 November 1984.

Session B: 21 persons on 17 November 1984.

Cultivar Sort	Appearance, 1-9 Udseende, 1-9	Taste, 1-9 Smag, 1-9
Session A.		
'Prima'	6.0	7.0
'Priam'	5.3	6.0
'Priscilla'	4.5	4.0
'Sir Prize'	4.0	3.5
LSD	n.s.	1.1
Session B.		
'Prima'	7.9	6.2
'Priam'	6.2	5.5
'Sir Prize'	5.0	5.0
LSD	0.9	0.8

Sensitivity to powdery mildew is low to medium (4, 15).

Litt: 1, 3, 5, 6, 10, 11, 12, 15, 17, 18, 19.

'Priscilla'. Breeders: Institutes in Illinois, Indiana and New Jersey, USA. 1972.

A strong growing, spreading tree with high yields of fruits strongly resembling one of its parents 'Red Delicious'. It ripens late, around mid-October. The fruits are uneven in size, and the dark red colour is often poorly developed and unattractive. Fruits eaten directly from the tree are crisp and juicy with a sweet, aromatic and pleasant taste. However, taste ratings have been low, since stored fruits quickly become too sweet and insipid. Scald develops on many fruits in December.

'Priscilla' has considerable resistance to powdery mildew. Sensitive to canker (14).

Litt: 1, 2, 3, 6, 7, 11, 12, 14, 16, 17, 18, 19, 23.

'Sir Prize'. Breeders: Institutes in Illinois, Indiana and New Jersey, USA. 1975.

A triploid, strong growing and high yielding tree with large, green or light yellow fruits. Some fruits have a slight red blush. They ripen very late, and the taste is strongly acid at picking time. The skin is very easily bruised by picking and grading and becomes very waxy (greasy) in cold storage. Fruits can be stored until March or longer and ripe fruits have crisp, tender flesh with a mild, pleasant flavour.

Attacks of powdery mildew (16), fire blight (24) and canker (19) have been reported.

Litt: 1, 2, 3, 6, 10, 11, 16, 17, 18, 19, 24.

'Macfree'. Breeders: Institutes in Illinois, Indiana and New Jersey, USA, and Ontario, Canada. 1974.

Growth vigour is medium to strong. Early fruiting on young wood retard growth and make a drooping tree habit. Some test trees became biennial. Fruits are of 'McIntosh' – appearance and quality but ripen very late. The size is small, even with fruit thinning. 'Macfree' can be stored till February–March. Core flush was noted after long

term storage. Eating quality is very similar to 'McIntosh'.

Litt: 12, 17, 20.

## Conclusion

Resistance to apple scab is a major progress in apple breeding. Home producers of apples have been the first to benefit, since some of these cultivars have been recommended for garden use (10, 11, 19, 24).

Commercial growers and consumers have also great interests in disease-resistant cultivars, because of reduced need for fungicide sprays. The main complaint from a commercial viewpoint has been, that fruit quality was insufficient to compete with standard cultivars. However, taste evaluations carried out by groups of advisory people show, that 2 cultivars were rated above medium both in appearance and taste (Table 4). So, even if fruits of scab-resistant cultivars are not of prime quality, they may be well accepted, at least by some groups of consumers.

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