

Field resistens of pears (*Pyrus communis*) varieties in Denmark

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Summary¹

In 1994 to 1997 the yield and susceptibility to pest and diseases were assessed for 10 pear varieties. Significant differences between varieties were found in cases for yield and scab infections. The varieties 'Pierre Corneille', 'Grev Moltke' and 'Conference' had the highest yield, 'Clapps Favorite' was most infected by scab, while 'Conference' was most resistant to scab and had the highest number of fruits accepted for sale.

None of the varieties were perfect to grow in management systems where pesticides are avoid.

Introduction

Efforts to avoid or reduce the use of pesticides are stressed in organic production systems. Growing less susceptible varieties are one of the important factors. The aim of this study was to compare the susceptibility of 10 pear varieties to various diseases and pests under field conditions where no pesticides were used.

Materials and methods

In 1990 10 pear varieties were planted at the research field of the department of Fruit and Vegetables, Aarslev, Denmark. The trial included the French varieties: 'Bonne Louise', 'Coloreé de Juillet', 'Doyenne de Comice', 'Pierre Corneille'. The Danish varieties: 'Clara Frijs' and 'Grev Moltke', the American 'Clapps Favorite', the English 'Conference', the Belgian 'Herrepære' ('Seigneur') and 'Gråpære' which origin is unknown.

10 trees of each variety were planted at 5 x 2 m and randomized in 10 blocks. Grass alleyways and 1.5 m wide mechanical cleaned strips in the row were established.

The trees were not protected against fungal diseases and pests.

The yield from each tree and fruit size of a sample of 50 fruits per tree were determined in 1994-1997. The damages on the fruits were assessed at harvest on 250 fruits of each variety (25 fruits/tree). The number of fruits accepted for sale were calculated in 1995 to 1997 using the european standards for fruit size and damages on the fruits. Fruits with scab lesions smaller than 1 cm² were accepted for consumption.

Results:

Yield:

The varieties 'Pierre Corneille', 'Grev Moltke' and 'Conference' had the highest yield, while 'Clapps Favorite' and 'Gråpære' had the lowest as average in 1994 -97 (Table

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1). The fruit size was generally small. 'Comice', 'Pierre Corneille', 'Grev Moltke', 'Conference' and 'Herrepære' had the biggest fruits. 'Grápære' and 'Bonne Louise' had very small fruits, but for both varieties small fruits are distinctive for the variety (Table 1).

The percent of fruits accepted for sale diminished during the period. In 1995 in average 53 percent of the fruits were accepted for sale, while only 4 percent were eatable in 1997 (table 1).

Table 1: Yield, fruit weight and fruit accepted for sale for 10 unsprayed pear varieties 1994-1997.

| Variety | Average yield 1994-97 kg/tree | Average fruit weight 1994-97 g/fruit | Number of Fruits accepted for sale 1995 pct | Number of fruits accepted for sale 1996 pct. | Number of fruits accepted for sale 1997 pct |
|------------------|-------------------------------|--------------------------------------|---|--|---|
| Bonne Louise | 6.2 bcd | 70 e | 40 c | 1 d | 0 b |
| Clapps Favorite | 1.5 f | 93 d | 0 d | 0 d | |
| Clara Frijs | 5.2 cd | 97 cd | 48 c | 0 d | 0 b |
| Coloreé | 4.1 de | 71 e* | - | 32 b | 1 b |
| Comice | 6.5 bc | 134 a | 84 a | 37 b | 0 b |
| Conference | 9.8 a | 105 c | 86 a | 63 a | 28 a |
| Grev Moltke | 10.3 a | 122 b | 57 bc | 0 d | 0 b |
| Grápære | 2.4 ef | 61 e | 16 d | 8 cd | 0 b |
| Herrepære | 8.2 ab | 105 c | 82 a | 22 bc | 3 b |
| Pierre Corneille | 10.3 a | 125 ab | 66 ab | 2 d | 1 b |
| Average | 6.5 | 98 | 53 | 17 | 4 |

* only 1996

Numbers followed by the same letter in columns do not differ significantly for $P < 0.05$.

Scab:

The main reason for the step fall in fruits accepted for sale was the increasing pear scab (*Venturia pirina*) infections on the fruits. In 1994 82.7 percent of the fruits had scab lesions smaller than 1 cm² scab and the level was gradual reduced to 5.4 percent in 1997 as average for all varieties (Figure 1).

'Clapps Favorite' was the variety which became infected by pear scab at first. Already in 1994 93 percent of the fruits had too much scab to be accepted for sale. The next two years 100 percent of the fruits were infected and in 1997 the scab infection had become so serious that no fruits were produced on the trees. In 1994 and 1995 'Conference' and 'Comice' had a field resistance against pear scab that could resist the heavy scab infections. In 1996 'Comice' could not stand the heavy contamination and in 1997 'Conference' followed and had 60 percent fruits with more than 1 cm² scab (Figure 1).

The number of fruits that fell to the ground before harvest mainly because scab were enormous. As average 46 percent of the fruit were at the ground. Only 'Conference' had an acceptable number (2 pct) of fruits as preharvest fall.

There have been minor lesions on the fruits caused by European pear rust (*Gymnosporangium sabinae*) and in 1997 especially 'Coloreé' and 'Clara frijs' had secondary infection of monilia (*Monilia fructigena*).

Figure 1: Percent fruit with scab lesions > than 1 cm²
not accepted for consumption

pests:

Tortrix moths

Tortrix moths in spring caused damages to the fruits varying from an overall average of 3.9 in 1994 to 12.6 in 1996. Within a single year significant differences in damages between varieties could be found, typically a 3 or 4 fold difference. The highest level of damages were recorded in 1996 where 28 percent of 'Coloreé' was damaged- opposed to less than 6 percent of the variety 'Herrepære'. However seen over a range of years variety differences blurred. What was the most damaged variety in one year became one of the lesser damaged the next and visa versa. It has therefore not been possible to prove significant differences in susceptibility over a range of year.

Lesions caused by Tortrix moths during late fruit ripening varied from 0,7 to 1.9 percent as average for all varieties and single years. There were no significant differences between the varieties.

Capsids:

Capsids caused damages to the fruits varying from an over average of 3.1 in 1994 to 7,9 in 1996. In single years significant differences between varieties could be found. However over a range of years there were no clear differences.

Weevils:

Weevil damages probably caused by the apple fruit rhynchites (*Rhynchites aequatus*) were increasing during the period. In 1996 10 percent of the fruits had lesions caused by weevils and in 1997 the percent had raised to 22 % as an average for all varieties.

The varieties 'Grev Moltke' and 'Gråpære' had the largest percent of injured fruit in both years.

There have been minor attacks by Codling moth (*Cydia pomonella*), apple sawfly (*Holocampa testudinea*), and the damaged caused by pear midge (*Contarinia pyrivora*) has been raising during the period.

Discussion:

Pear scab infections in the spring are caused by infected leaves overwintering on the orchard floor and as mycelium in infected twigs. In this study heavy twig infections occurred and may also be one reason for the massive development of scab.

Planting systems where varieties are randomly mixed in blocks were expected to reduce the infections level in the planting. In apples a variety mixture was suggested to reduce the apple scab in orchards (Blaise & Gessler 1994), but maybe the opposite situation occurred here. The very susceptible varieties possibly contaminated the more resistant varieties and increased the number of scab lesions.

Conclusion:

This study showed that 'Conference' and 'Comice' had the lowest susceptibility to scab; however the scab infection increased during the period and reduced the number of fruits accepted for sale dramatically also in 'Conference'.

None of the selected varieties are perfect to grow in management systems where pesticides are avoid.

References:

- Blaise PH. & Gessler C. 1994. Cultivar mixture in apple orchards as a mean to control apple scab? Norwegian Journal of Agricultural Sciences. Supplement No. 17, Integrated Control of Pome Fruit Diseases, 105-112.