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Articles in this issue

[Higher antioxidant content in organic milk than in conventional milk due to feeding strategy](#)

[Low nitrate leaching from long-term grass-clover](#)

[Lupin grows well where pea is destroyed by soil borne diseases and vice versa](#)

[Nitrate leaching in organic arable crop rotations](#)

[Band-steaming reduces laborious hand-weeding in vegetables](#)

[Soil organic carbon as an indicator of soil quality](#)

[Contamination of oilseed rape varieties by pollen and seeds](#)

[Broilers reduce the apple sawfly population in organic apple growing](#)

[Threshold levels for seed borne diseases in organic](#)

Broilers reduce the apple sawfly population in organic apple growing

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In organic production in Denmark, no pesticides are allowed. The need for alternative pest control is therefore large. Apple sawfly (*Hoplocampa testudinea*) cause big crop losses in apples. Sawflies infest fruitlets and cause these to drop prematurely after which the pests pupate in the topsoil.

Combined production of hens and fruit trees is a subject often discussed in organic fruit production in Denmark. The feeding poultry may reduce the population of pests, which stay in the soil as a part of their life circle. Yet, very little research has been carried out on this type of production system.

In a small-scale trial, we tested the hypothesis of reduction in apple sawfly population and infestation as a result of pupate and fruitlets feed of broilers. Also, the effect of broilers on weeding, fertilisation, yield and fruit quality was investigated.

Research design

The apple variety 'Discovery' is susceptible to apple sawflies, but is recommended for organic production because it is less susceptible to diseases. 'Discovery' grafted on rootstock MM106 and planted at distances of 3.25 x 1.25 m was established in autumn 1997 at Fejø Research Orchard, Denmark.

Chicken runs with a width of 5 rows and lengths of 10 trees

[cereals](#)

[New fungicides for apple scab control in organic growing](#)

[Major congress on Organic Farming, Food Quality and Human Health](#)

[News briefs](#)

[Front](#)

were established spring 2002. A total of nine plots were used with and without release of broilers. The trees were kept unsprayed. Mechanical weeding in the tree row was done just before and after the release of broilers.

The broilers were moved to the experimental orchard at five weeks of age and given access to an orchard at 8 m² per broiler and unlimited access to feed and water.

Poultry reduced the fly of apple sawfly

The yield of 'Discovery' in 2002 and 2003 was very small, showing the severity of the crop loss due to apple sawfly in unsprayed organic fruit production ([Table 1](#)).

The flight of the sawflies started the first week of May both years. The most intensive flying period was mid May and no sawflies were caught after the end of May ([Figure 1](#) and [Figure 2](#)).

A reduced catch of sawflies was found on sticky traps in chicken runs ([Figure 1](#)). The number of caught sawflies was reduced by 50-75 percent in treatments with broilers in 2002 and by 10-25 percent in 2003.



Photo 1. Catch of apple sawflies.

Similar yield

The yield and fruit size (not shown) in Discovery was similar for the two treatments in 2002 and 2003 ([Table 1](#)). The total numbers of flower clusters and thereby the potential yield in 2003 was the same for the two treatments even though there was a tendency towards a higher number of flower clusters on the trees grown in combination with broilers. The harvested fruit per cluster was very low and the number of drop of fruitlets due to infestation of sawflies was very high ([Table 1](#)). There was a tendency towards a bigger drop of fruitlets from trees grown without broilers.

Skin damages caused by infestation of pests and diseases (not shown) on the skin of harvested fruits did not differ for the two treatments ([Table 1](#)).

On-farm research

Experiences from on-farm research projects concerning poultry in apple orchards showed that weeding and reduction of insects is evident within a 100 m from the house. The

effect decreases with the distance from the henhouse. Apple sawfly were found in 20 percent of the apples situated within 100 m from the henhouse, but in 75 percent of the apples situated further away.

Small research plots or real life

Experimental designs for studies of production systems are a challenge, especially when effects on moving/flying factors like insect populations are investigated. Such designs must take into consideration the soil and microclimate variations, the economical liberty of action and the biological and practical factors.

In the present trial we decided to use 5 chicken runs for Discovery to eliminate the block variation. The rather small plots sizes reduced the chance to determine any variations in the sawfly population, but in spite of that, we found a difference in the catch of sawflies on sticky traps, which was very satisfying.

When egg layers are combined with apple orchards the on-farm research showed a reduction in sawfly infestation decreasing with the distance from the henhouse. Together the results show that combined production of apples and broilers or egg layers can decrease the population of apple sawflies.

Insufficient control of sawflies

The population size of apple sawflies at the research orchard in Denmark - and most of Europe - was very high in 2002 and 2003. In susceptible varieties a total catch of 20-30 sawflies per sticky trap is the damage threshold. This threshold was highly exceeded in both treatments and years in the research plots. Thus, the overall sawfly population after reduction by poultry feeding was still large enough to destroy most of the Discovery harvest. The reduced catch of apple sawflies, therefore, had no significant effect on the yield or the fruit quality ([Table 1](#)).

Conclusions

- Apple sawflies cause big losses in unsprayed organic fruit production.
- The catch of apple sawflies was reduced in the combined apple and broiler production.
- The reduction in the catch of apple sawflies in the research plots had no significant effect on the yield or the fruit quality.
- Experiences from on-farm research show that combining fruit and egg-production is one way to reduce the problem with apple sawfly. Yet, poultry alone is not a sufficient way of controlling sawflies.