

Functional agrobiodiversity – a novel approach to optimize pest control in fruit production

Stine K. Jacobsen & Lene Sigsgaard

Section for Organismal Biology, Department of Plant- and Environmental Sciences, University of Copenhagen, Thorvaldsensvej 40, 1871 Frederiksberg C, Denmark (stikra@plen.ku.dk)

BACKGROUND

Apple growers suffer great economic losses each year due to pest damage. Pesticide residues are frequently found on apples for fresh consumption which have resulted in an increasing consumer demand for un-sprayed apples. For these reasons there is an increasing interest from growers to develop sustainable and more resilient production systems.

Some of the most serious pests in Danish apple production is the Rosy apple aphid (*Dysaphis plantaginea*) and the Codling moth (*Cydia pomonella*), for which current control options are scarce.

Functional agrobiodiversity (FAB) is a technique developed with the purpose of reducing pest damage and pesticide use, by promoting the abundance and diversity of natural enemies in ecological infrastructures. Wild flower strips (FS) as an ecological infrastructure have previously shown to reduce infestation levels of the Codling moth.

OBJECTIVES

To investigate the performance of **two types of flower strips** in apple orchards in relation to:

1. Pest infestation and resulting damage of the Rosy apple aphid and the Codling moth
2. Predator abundance and diversity
3. Predation level



Spiders, ladybird bugs and *Chrysoperla* larva are among the many naturally occurring predators in apple orchards

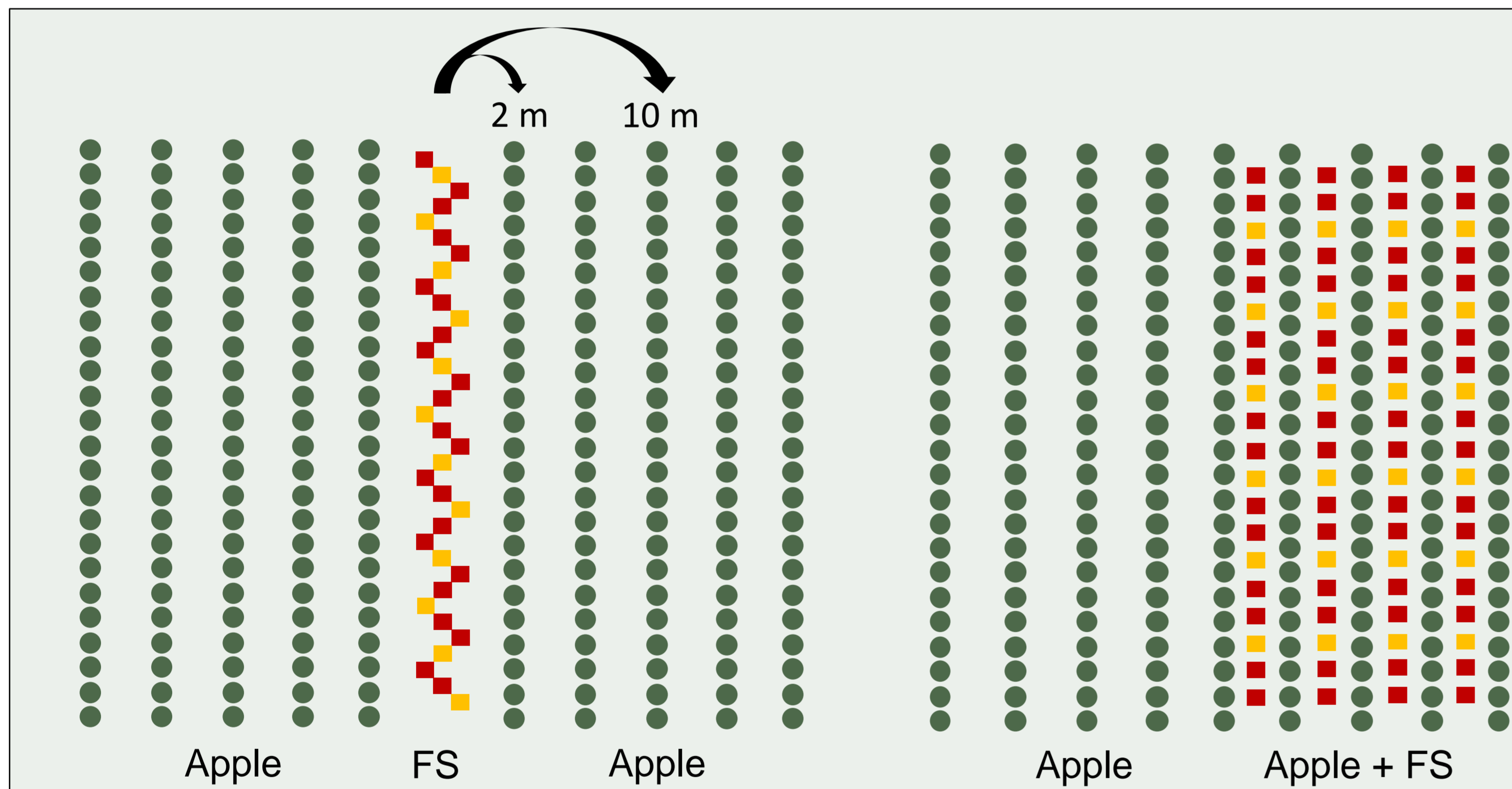


Fig. 1: Flower strip (FS) replacing a row of apples. Pest and predator assessments are done in the first row (2 m) and third row (10 m) from the flower strip.

Fig. 2: Flower strips in the interrows of apple trees. Pest and predator assessments are compared between plots with and without flower strips.



METHOD

Two techniques are experimentally tested in organic apple orchards in May-August, 2016 and 2017:

1. Flower strip replacing a row of apples (fig.1)
 Established 2015
 Seed mixture: 40 species
 Effect of distance to flower strip (2-10 m)
2. Flower strips in the interrows of apple trees (fig. 2)
 Established 2015
 Seed mixture: complex mix 35 species, simple mix 18 species
 Effect of plot with and without flower strips

Seed mixtures are perennial species native to Denmark. Selection is based on flowering time, plant size and tolerance to traffic (flower strips in the interrows are between tractor wheels).

Botanical assessments are done May-August to compare the performance of the different seed mixtures.

Pest and predator occurrence is investigated by:

- Visual assessments (the Rosy apple aphid and predators)
- Sentinel prey (predation cards with eggs of *Ephestia* sp.)
- Beating samples
- Corrugated card board traps (Codling moth larvae)
- Damage assessments (Rosy apple aphid + Codling moth)

GROWER COLLABORATION

The concept of FAB are supported by workshops to share ideas and visions of FAB between growers, advisors and scientists. Simple methods to monitor biodiversity in orchards are currently tested by growers to encourage and support the implementation of functional agrobiodiversity. The methods include:

- Visual assessments, beating samples, predation cards, corrugated card board traps, yellow sticky traps



Links to Research Projects:

EcoOrchard: <http://coreorganicplus.org/research-projects/ecoorchard>
 ProtecFruit: <http://icofs.dk/forskning/dansk-forskning/organic-rdd-2/protecfruit/>
 Applied Insect-Plant Ecology research group:
http://plen.ku.dk/english/research/organismal_biology/applied_entomology/ecoorchard/



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