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## Fruitgrowers towards a new approach to enhance biodiversity in organic orchards

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### Abstract

*In the frame of the project "Arbeitsnetz zur Weiterentwicklung der Anbauverfahren des ökologischen Obstbaus" (BOEL-project Nr. 03OE178) a group of fruitgrowers and advisers started to discuss new measures and new concepts to enhance biodiversity in organic orchards. Strips with flowering plants that can be integrated in the normal mulching system and thus, do not originate vole problems, are actually tested on the farms. Other measures as single bushes at the top and end of the rows are in discussion.*

*If such measures are to be integrated successfully in the practice of organic fruit growing, the impulse must spring from growers themselves and their requirements regarding the different risks must be considered. Otherwise, an acceptance in practice is not very probable. This activities are reported here since we want more people to join us.*

**Keywords:** biodiversity, flowering strips, hedges

### Introduction

Organic fruitgrowers often express the concern that the actual development of organic fruit growing towards an intensive production process will prove not sustainable. "Not sustainable" in this context means, that a process of development erodes its own basic principles and, thus, lacks long term perspectives.

One of the basic principles of organic farming is the idea of a cultivation practice that provides such a high biodiversity that pests do not or only to a certain extend occur and cause damage. Furthermore, the "ideal" organic orchard provides not only fruit without the application of synthetic pesticides or herbicides but it is also an important contribution to ecology. A really sustainable fruit production will also give a valid contribution to biodiversity. Consumers image of organic orchards is often affected by flowering meadows and hedges. The reality in the orchards is drifting towards more or less the same system as in conventional orchards – the higher biodiversity still observed in the organic orchards in comparison to orchards under integrated production is often more due to the non-application of synthetic herbicides and insecticides than to the application of any measures to enhance biodiversity.

During the years past, many initiatives to include flowering plants in orchards were made, first by growers (Brugger 1986, in Kienzle, 1988), then by scientists (Kienzle & Straub, 1991, Kienzle, 1995; Wyss, 1994). Since the enhancement of beneficials failed to improve control of key pests as the rosy apple aphid and on the other hand the flowering strips caused evidently problems with voles, these structures were not established in common practice (Kienzle et al., 1997). Actually, In Germany very few growers try to integrate hedges in their orchards, too. This is due at one hand to the problem of sooty blotch infection sources in the hedges, at the other hand, however, also to the common legislation for nature conservation. Once planted, it is difficult to remove hedges. In consequence, growers are limited in their decisions to arrange and rearrange their orchards after plantation of hedges and refrain from planting.

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Since this situation is not satisfying, in the frame of the project BLE 03OE178 a working group of interested fruit growers was founded who wanted to go new ways to enhance biodiversity in orchards.

### Material and Methods

In a discussion with the growers the requirements for measures to enhance biodiversity, beneficial insects and pollinators in organic orchards were defined:

- The grower must maintain the liberty to rearrange his orchard. It must be possible to remove and to change the structures established for the enhancement of biodiversity when new plantations are planned.
- The measures should enhance biodiversity and offer also alimentionation to beneficial insects and pollinators, especially *Osmia rufa* and *Osmia cornuta* .
- The measures may not enhance vole establishment in the orchards
- The measures may not present other risks well known from such structures as enhancement of infestation potential of sooty blotch and fireblight, higher populations of mirids and Cicadidae or damage by *Ceresa bubalus* Fab.
- The measures must not require much care or any problems in the cultivation of the orchards
- There should be different measures that can be combined respecting the specific conditions of each single orchard and region

Afterwards, first ideas for new possibilities were collected and discussed in several meetings in the orchards with different experts. In 2006 and 2007, first methods were tested in practice by several growers.

### First measures in test

The following measures were considered very interesting and test were started in several orchards:

#### ***Flowering strips in the tree rows with plants that support frequent mulching***

If the strips were not mulched, they became rather quickly excellent habitats for voles. Thus, the idea rose to use only plants that support short mulching und to mulch quite normally even the strip. Since the aim of the strips is not only to enhance certain beneficial insects but just to enhance biodiversity the plants were selected not only from families as *Compositae* or *Apiaceae* with flowers where the nectar is easily reachable for all insects but also from the family *Labiatae* which is interesting only for certain wild bees or bumblebees. For the growers, the enhancement of wild bees, especially *Osmia spec.* , was one of the main targets of the strips since alternative pollinators to honeybees turn to be more important.

In a first step, all possible plants were summarized in a list. This list was discussed with experts from botanical and entomological point of view. Furthermore, the cost of the seeds and the availability of seeds from regional production in Germany were considered. In collaboration with the company Rieger-Hofmann, D-Blaufelden-Raboldshausen, a seeding mixture was produced. This mixture should be seeded in several orchards in different regions. It should be observed which plants give best results under the different conditions. Based on this, the number of plants in the mixture should be reduced to those successful in the different regions.

Table 1: Flowering plants in the first test seed mixture

Plant	Colour of flower	Flowering time in month	Main importance of the plant for (following the judgement of different experts and literature research)
<i>Achillea millefolium</i>	white	6-9	
<i>Ajuga reptans</i>	blue	4-6	Bumblebees and wild bees
<i>Bellis perennis</i>	white	4-11	Different species of wild bees, Syrphid flies and flies
<i>Campanula rotundifolia</i>	blue	6-9	Wild bees
<i>Crepis capillaris</i>	yellow	6-8	Syrphids, wild bees, parasitoids
<i>Dianthus deltoides</i>	red	6-8	Wild bees
<i>Galium album</i>	white	5-9	Syrphids, wild bees
<i>Geranium pyrenaicum</i>	violet	6-8	Syrphids, wild bees
<i>Glechoma hederacea</i>	blue	4-6	Bumblebees, wild bees, Syrphids
<i>Hypochoeris radicata</i>	yellow	6-10	Wild bees, Syrphids
<i>Leontodon autumnalis</i>	yellow	7-9	Syrphids, wild bees
<i>Leontodon hispidus</i>	yellow	6-10	Syrphids, wild bees
<i>Linaria vulgaris</i>	yellow	6-10	Wild bees
<i>Lotus corniculatus</i>	yellow	6-8	different butterfly species, <i>Osmia spec.</i>
<i>Malva neglecta</i>	rosy	6-9	Wildbees, butterflies
<i>Medicago lupulina</i>	yellow		Wildbees, butterflies, bumblebees
<i>Myosotis arvensis</i>	blue	4-10	Wild bees
<i>Primula veris</i>	yellow	4-5	Wild bees
<i>Prunella vulgaris</i>	brownish	6-10	Bumblebees
<i>Sanguisorba minor</i>	red	5-8	Different butterfly species
<i>Saponaria officinalis</i>	rosy		Syrphids, wild bees
<i>Silene vulgaris</i>	white	5-9	Wild bees, butterflies
<i>Thymus pulegioides</i>	violet	7-10	Wild bees, butterflies, flies
<i>Trifolium pratense</i>	red-violet	6-9	Wild bees, butterflies, bumblebees
<i>Trifolium dubium</i>	yellow	5-9	Wild bees, butterflies, bumblebees
<i>Trifolium campestre</i>	yellow	6-9	Wild bees, butterflies, bumblebees
<i>Veronica chamaedrys</i>	blue	5-7	Syrphids, wild bees

In 2006, it was planned to carry out several mechanical cultivations of the strip between the wheel tracks and seeded in spring. Due to unfavourable weather conditions, some growers decided to postpone the seeding in autumn. The strips which were seeded had problems with germination due to water shortage. In summer, only the flax seeded with the mixture to protect the strips from weed during germination of the flowering plants could be observed in the strips. In spring 2007, however, in these strips many of the plants seeded were found. Thus, 2007 first observations could be done. Since there is no funding, the observations are made by the growers and not really precise.

### **Solitary bushes at the top and the end of the row**

Many growers are not so interested in hedges due to the problems with mice and sooty blotch – a part the required space at the expense of possible tree rows. But even solitary bushes can provide alimentionation and a habitat for numerous arthropod species. At top and end of the tree rows, where the wire is fixed in the ground, in several orchards it is use to plant roses. Instead of roses, several other bushes can be planted, too, forming a kind of “hedge” transverse to the rows. The stem of these bushes must be formed in a way that the mechanical cultivation is possible in the same way as for the trees. Thus, no additional risk for vole problems is originated. Since the bushes can be included in the fungicide treatment, even the risk for sooty blotch is considerably reduced.

This systems seems very interesting, the potential effects has still to be tested. It could be also of interest as a publicity factor “first tree for nature” but many of the growers disapprove of such kind of image building.

### **Results and discussion**

First reliable results will be available at the end of 2008. Plants that were found abundantly in the first year of the test in most orchards such as *Galium album*, *Silene vulgaris*, *Lotus corniculatus*, *Malva neglecta* must still prove if they are able to survive longer time under orchard conditions.

In the meantime, new concepts for “ecological” orchards are discussed integrating vole control measures and the establishment of flowering plants and bushes.

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