

REFUGIA - WP4

Hedgerows as refugees for biodiversity

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Presentation headlines

- **More plant species in hedgerows at organic farms compared to conventional**
 - **More food for pollinators in hedgerow at organic farms**
 - **Biodiversity takes time – continuity in organic practice important**
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Sampling design

Pairs of hedgerows in two areas:

Djursland Bjerringbro

A pair consists of 3 hedgerows:

2 at organic farms - differ in time since transition

1 at a conventional farm

Within each pair the hedgerows were as similar as possible with respect to:

Soil type: sand or loam

Orientation: N-S-running

Tree and bush composition

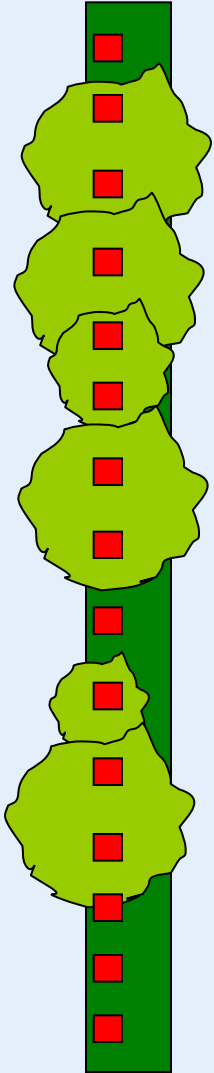
Age: all hedgerows > 50 years

6 pairs of hedgerows on sandy soil (Bjerringbro)

6 pairs of hedgerows on loamy soil (Djursland)



Sampling methodology - vegetation



100 m transect

15 sampling plots 0.5 x 0.5 m on W-facing side

Sampling period: April – September

Sampled parameters:

Species composition

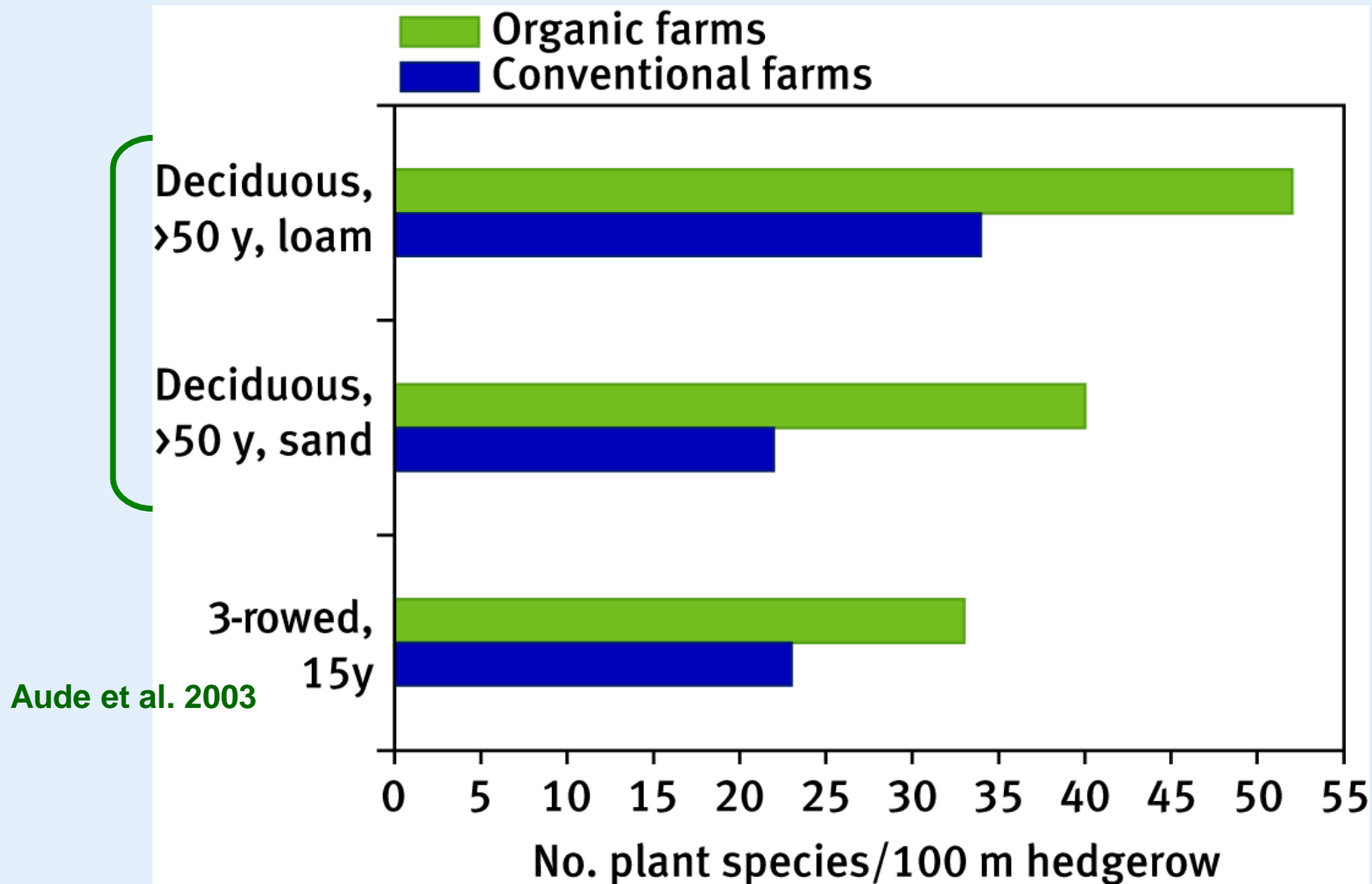
Flowering frequency, i.e. # plots with flowering

Flowering intensity, i.e. number of flowers per plant

Length of flowering season (April-September)

Continuity of flowering

Species richness (biodiversity) of hedgerow ground vegetation



Species richness and composition

	Herbs: annuals and biennials	Herbs: perennials	Grasses	Total
Conv., sand	7 ± 1.8	5.3 ± 1.7	9.3 ± 2.0	21.5 ± 1.9
Organic, sand	16.6 ± 2.5	14.4 ± 2.5	9.2 ± 0.6	40.2 ± 3.8
Conv., clay loam	13 ± 2.7	11.8 ± 2.3	8.7 ± 1.3	33.5 ± 4.9
Organic, clay loam	22.5 ± 3.2	18.6 ± 1.4	10.6 ± 0.8	51.7 ± 2.1

An aerial photograph of a rural agricultural landscape. The image shows a patchwork of green and brown fields, with a network of roads and hedgerows. A central road runs vertically, with several smaller roads branching off. The hedgerows are highlighted in yellow, showing their linear arrangement across the landscape. The text "Hedgerows" is written in yellow at the top, and "Linear semi-natural habitats within the agricultural landscape" is written in yellow below it. The overall scene is a typical agricultural landscape with a mix of crops and natural features.

Hedgerows

Linear semi-natural habitats within the agricultural landscape

Main reasons for differences in hedgerow ground vegetation

Farming practice
organic or conventional

Organic farming

Fertilization

total $N_{\text{sand}} = 0.9 \text{ mg/kg}$

total $N_{\text{clay}} = 1.6 \text{ mg/kg}$

No pesticides

Conventional farming

Fertilization

total $N_{\text{sand}} = 1.2 \text{ mg/kg}$

total $N_{\text{clay}} = 1.4 \text{ mg/kg}$

Pesticides

Hedgerows as habitats and bread baskets for the fauna

- Hedgerows form (more) stable habitats
 - overwintering for field-living animals
 - nesting areas (birds, pollinators)
- Hedgerows plants contribute food resources
 - berries
 - seeds
 - flowers (pollen and nectar)

Food resources for pollinators in hedgerows



**Number of
bumblebee
plants**

Total

Conv., sand

1 ± 0.8

21.5 ± 1.9

Organic, sand

7.4 ± 0.3

40.2 ± 3.8

Conv., loam

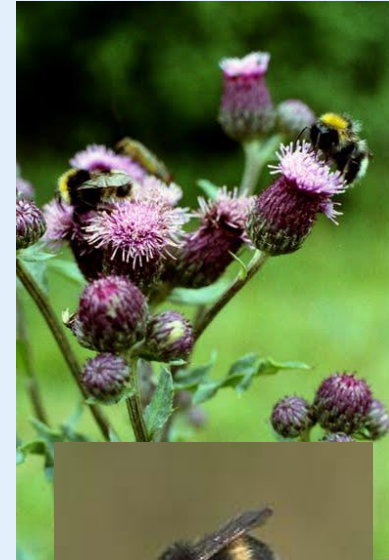
8 ± 1.3

33.5 ± 4.9

Organic, loam

12.3 ± 1.1

51.7 ± 2.1



Continuous flowering during the season

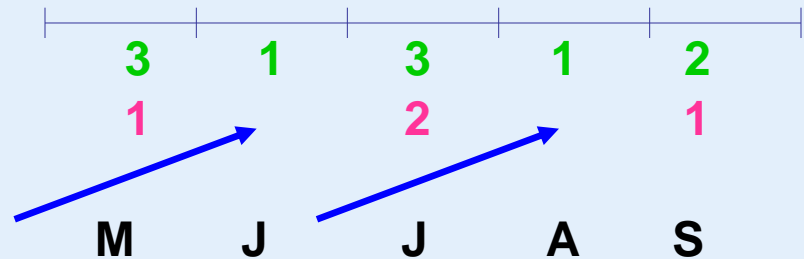
Number of bee-plants and number of flowering bee-plants in hedgerows



Hedgerow at organic farm



Hedgerow at conventional farm



Flowering intensity

Number of flowers per plant



Hedgerows at organic farms

Dandelion (*Taraxacum* sp.): 5 ± 2

Thistle (*Cirsium arvense*): 12 ± 4

Bluebell (*Campanula rotundifolia*): 5 ± 1



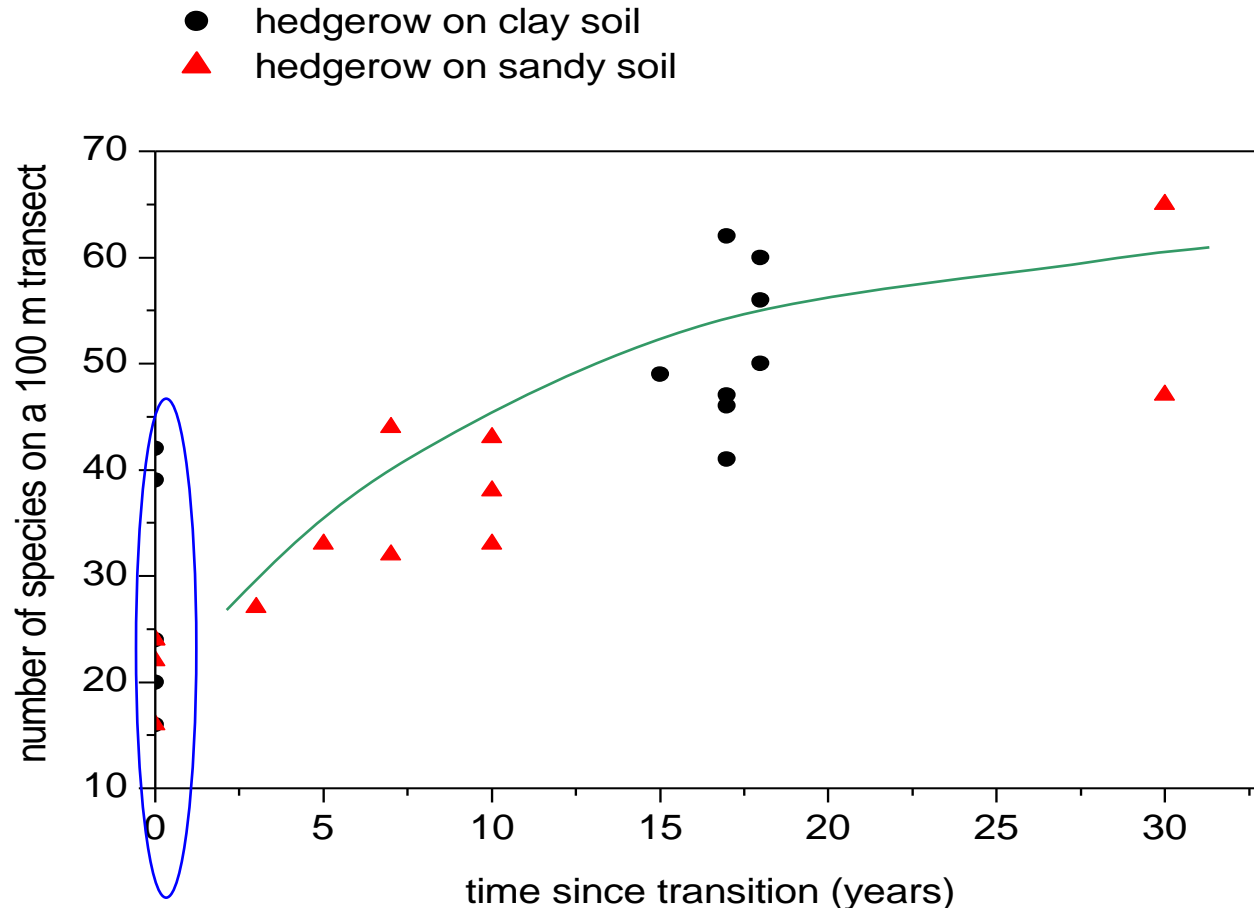
Hedgerows at conventional farms

Dandelion (*Taraxacum* sp.): 3 ± 1

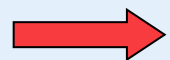
Thistle (*Cirsium arvense*): 7 ± 3

Bluebell (*Campanula rotundifolia*): 2 ± 1

Biodiversity improvement takes time



Establishment of (new) species takes time !

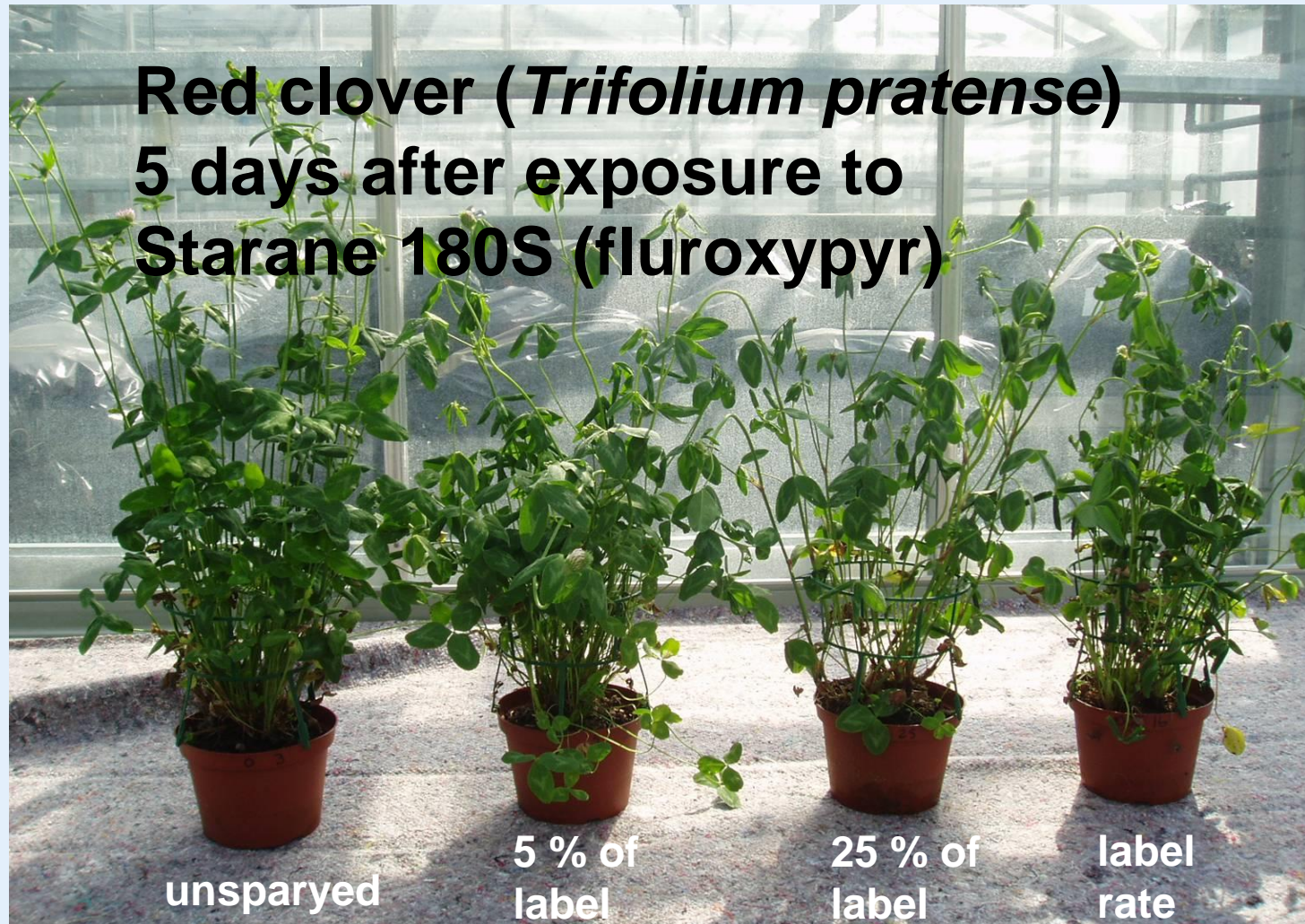


Continuity in organic practice is highly important

Thank you for your attention



Dose-response exp. Effects of herbicides on flowering



Effects of herbicides on flowering

Number of flowers (accumulated) as function of number of days since spraying

