

Re-establishment of arable weed vegetation by sowing

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Introduction

The aim of this study was to investigate if a regionally typical arable weed vegetation can be re-established by sowing. Therefore, a seed mixture was sown in two densities under two soil cultivation regimes (ploughing vs milling) on arable fields (Herzogtum Lauenburg, Schleswig-Holstein, Germany).

Methods

In 2001 two long-term observation sites have been established including different variants. These are soil cultivation (ploughing vs milling), the density of the sown seed mixture and in the milling site three densities of clover. The sites were partitioned as follows:

milling (site 1):

1. control (19 sites)
2. seed mixture in 1g/m² and 2,5g/m² (6 sites respectively)
3. seed mixture in two densities plus clover in three densities 0,1; 0,2 and 0,5g/m² (3 sites respectively)

Ploughing (site 2):

1. control (6 sites)
2. seed mixture in 1g/m² und 2,5g/m² (6 sites respectively)

The seed mixture used in this study mainly based on the mixture designed by RAMSEIER (1994) for Switzerland. The seed mixture was adapted to climatic, edaphic and plant-geographical conditions of the investigation area.

Tab. 1: composition of the seed mixture

Achillea millefolium	Daucus carota	Papaver dubium
Agrostemma githago	Erodium cicutarium	Pastinaca sativa
Anagallis arvensis	Erophila verna	Petrorhagia prolifera
Arabidopsis thaliana	Fumaria officinalis	Pimpinella saxifraga
Artemisia campestris	Hypericum perforatum	Potentilla recta
Anchusa arvensis	Hypochoeris radicata	Raphanus raphanistrum
Anthemis arvensis	Jasione montana	Scabiosa columbaria
Centaurea cyanus	Knautia arvensis	Silene noctiflora
Centaurea jacea	Lathyrus tuberosus	Silene vulgaris
Campanula rapunculoides	Lotus corniculatus	Silene alba
Chrysanthemum leucanthemum	Lychnis viscaria	Spergula arvensis
Chrysanthemum vulgare	Linaria vulgaris	Tragopogon pratensis
Cichorium intybus	Malva alcea	Trifolium arvense
Consolida regalis	Papaver rhoeas	Vicia villosa

Results

The species richness from the seed mixture decreased in 2003 in all variants. The main cause is the strong increase of the cover of sown species like *Cichorium intybus*, *Chrysanthemum vulgare* and *Raphanus raphanistrum*, which is expressed also in the total cover of the seed mixture (fig. 1). This effect is caused by the high space requirement of these plants. Thus, sowing has a positive effect on weed suppression and the establishment of a greater floristic diversity.

Ploughing leads to a greater loss of sown species than milling. In 2003 the loss is up to 100 % compared with 2002. Only some individuals of *Centaurea cyanus* and *Vicia villosa* could be found (fig. 2).

To re-establish typical arable weed vegetation in ecological agriculture soil cultivation has to be treated with care. Milling affects the establishment of sown species less negatively than ploughing.



Fig. 3: milling in spring 2003

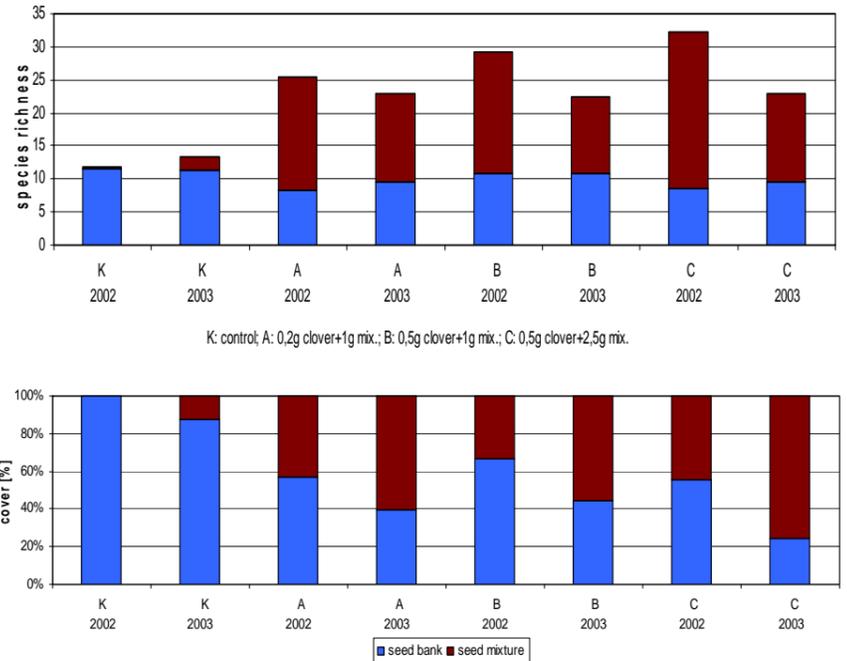


Fig. 1: species richness and cover of the milling-site

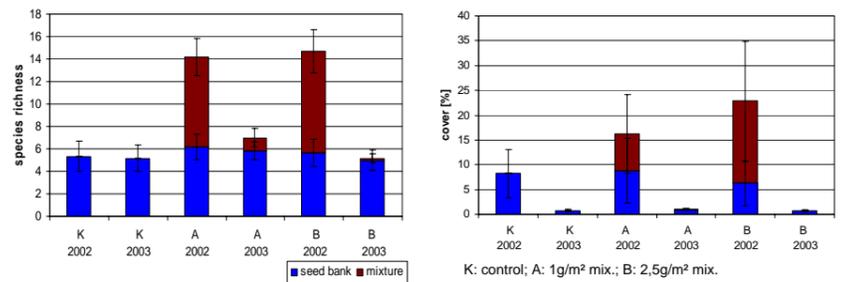


Fig. 2: species richness and cover of the ploughing-site

Studies in nature conservation on agricultural land should always include the yield.

Fig. 4 shows the yield of oat in dt/ha in different variants. It is obvious that the grain yield is around 50% lower in the milling area (in combination with the seed mixture)

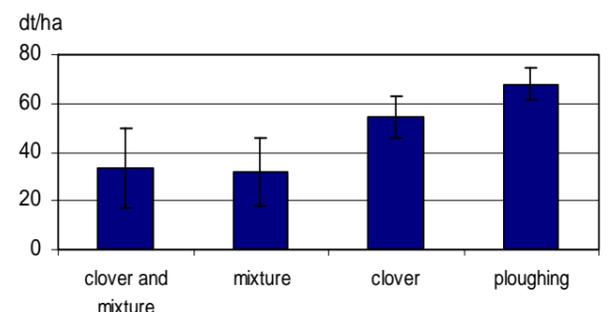


Fig. 4: oat-yield in dt/ha

as in the ploughing area. There is no difference between the two variants containing the sown seeds. The influence on the grain yield is clarified by the existence of the sown species.

Conclusion

Ploughing lead to a nearly complete absence of the sown species after one year of cultivation, while milling enabled most species to survive. Emergence and growth of common weeds (not sown) from the seed bank was suppressed strongly in the latter case, which we interpreted as a consequence of higher space competition.

Thus re-establishment of rare weeds and more or less typical weed community by sowing seems possible provided that soil cultivation is restricted to milling. However, it entailed also a grain yield loss, rendering a wide use in practice unlikely. Moreover, further investigations must show if the sown weeds can regenerate from the seed bank for long periods under ploughing management.