



Annual Status Report 2001 and Application for Continuation in 2002

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The Directorate for Food, Fisheries and Agro Business
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1. Research program

Research in organic farming 2000-2005 (DARCOF II)

2. Project title and number

I.8 Management of perennial weed species in organic farming (MPW) FØJOII-8

3. Head of project

Senior scientist Bo Melander
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DIAS

4. Participating institutes

5. Contact persons

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6. Other project staff

Ph.d. student Rikke Klith Jensen
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7. Start of project: 2000

End of project: 2005

8. Annual report/Application for continuation in 2001

A. Objectives and expected achievements (from application)

The objective of the project is to augment the knowledge about crop-weed competition, population dynamics and mechanical control of the two main perennial weed species *Cirsium arvense* (L.) Scop. and *Elymus repens* (L.) Gould in organic farming. The knowledge can be integrated in weed management systems for these species, e.g.

- using catch crops to deplete and compete for nutrients, light and water
- strategic control of thistle patches
- hampering the growth and regenerative capacity by stem or root cutting
- tactics
- cultivation tactics to eradicate or weaken the regenerative capacity of
- roots and rhizomes.

B. Project summary (from application)

Cirsium arvense and *Elymus repens* are both perennial weed species that cause considerable problems in organic cropping. Currently, management of the two species is unsatisfactorily in many cases. Lack of information on more basic aspects on the ecology of *C. arvense* has often been a major obstacle to manage this species effectively. More is known about the ecology of *E. repens* but controlling this species, is often difficult because organic cropping systems only have few and short-termed post-harvest periods for soil cultivation. This also accounts for *C. arvense*. Usually, organic growers prefer to keep the soil covered by plants in most of the post-harvest period to retain nutrients in the upper soil horizons.

This project is focussing on important aspects of the ecology of *C. arvense*: competitive ability against different crops; spread and dispersal of thistle patches; and impact of stem and root cutting on the regenerative capacity of *C. arvense*. Research on these aspects will add valuable information to the economic importance of *C. arvense* infestations in organic crops, the suppressive ability of crops and catch crops, the development of thistle patches in different crop rotations, and the perspectives for stem or root cutting tactics against *C. arvense*. In addition, this will improve the fundamental knowledge of making more precise and effective management strategies against thistles. Regarding *E. repens*, an integrated control strategy, aiming at combining rhizome disintegration by soil cultivation in the post-harvest period, with later catch crop growing to suppress shoot growth, will be studied on sandy soils. Results from these experiments are expected to add new angles to the management of *E. repens*.

Table 1: Work package list (from application)

No.	Work package title	Participants*	Budget (1.000 DKr)	Start	End	Deliverable No:
1	The regenerative capacity and competitive ability of <i>C. arvense</i> following different periods of shoot growth inhibition in spring	<u>RKJ</u> BME	592	2000	2004	WP1D1- WP1D2- WP1D3
2	The regenerative capacity and competitive ability of <i>C. arvense</i> following different periods of shoot growth inhibition in fall	<u>RKJ</u> BME	475	2000	2004	WP2D1- WP2D2- WP2D3
3	Annual dispersal rate of <i>C. arvense</i> in a 4 year period under the influence of different levels of competition	<u>RKJ</u> BME	506	2000	2004	WP3D1- WP3D2- WP3D3
4	Integrated control of <i>E. repens</i>	<u>BME</u> RKJ	777	2001	2004	WP4D1- WP4D2- WP4D3

* Responsible participants are underlined

C. Progress

C.1 Annual description (resume) of main results and conclusions

Different periods of shoot growth inhibition with and without grass clover have been conducted with repeated above ground cuttings.

Two field experiments have been established this spring where treatments with hoeing and cutting will take place in 2002.

One field experiment in whole crop (spring barley, grasses and legumes) has been established and different harvest dates have been completed with following periods of soil tillages.

A dense infestation of *E. repens* has been established during 2001 on the experimental area, where the experimental treatments will take place in 2002.

C.2 Fulfilment of tasks and deadlines in individual work packages

(To be completed for each work package)

WP 1. The regenerative capacity and competitive ability of <i>C. arvense</i> following different periods of shoot growth inhibition in spring	Time schedule according to application	Deviations, if any
<i>Task</i>		
1. Planning, design and establishment of field experiments	April 2001	
2. Measurement of shoot emergence	Sept 2001	
3. Regression and time series analysis		
<i>Deliverables</i>		
1. Annual progress reports	Oct 2001	
2. Scientific contribution on the effect of cutting of <i>C. arvense</i> in national or international conferences/workshops		
3. Scientific contribution on the regenerative capacity of <i>C. arvense</i> following different periods of shoot growth inhibition in spring in a peer-reviewed journal		
<i>Milestones</i>		
1. Experimental design and protocol	Jan 2001	
2. Establishment of field experiments	April 2001	
3. Conducting and finalising the shoot growth inhibition and data capture	Aug 2001	
4. Choice of regression and time series models		

WP 2. Shoot emergence pattern and competitive ability of <i>C. arvense</i> following different periods of shoot growth inhibition in fall	Time schedule according to application	Deviations, if any
<i>Task</i>		
1. Planning, design and establishment of field experiment	April 2001	
2. Measurement of shoot emergence	Sept 2001	
3. Regression and time series analysis		
<i>Deliverables</i>		
1. Annual progress reports	Oct 2001	
2. Scientific contribution on the effect of post harvest tilling of <i>C. arvense</i> in national or international conferences/workshops		
3. Scientific contribution on the regenerative capacity of <i>C. arvense</i> following different periods of shoot growth inhibition in fall in a peer-reviewed journal		
<i>Milestones</i>		

1. Experimental design and protocol	Jan 2001	
2. Establishment of field experiment	April 2001	
3. Conducting and finalising the shoot growth inhibition and data capture	Oct 2001	
4. Choice of regression and time series model		

WP 3. Annual dispersal rate of <i>C. arvensis</i> in a 4 year period under the influence of different levels of competition	Time schedule according to application	Deviations, if any
<i>Task</i>		
1. Planning, design and establishment of field experiment	April 2001	
2. Annual temporal and spatial measurements	Sept 2001	
3. Regression and time series analysis		
<i>Deliverables</i>		
1. Annual progress reports	Oct 2001	
2. Scientific contribution on the spatial and temporal dispersal of <i>C. arvensis</i> in national or international conferences/workshops		
3. Scientific contribution on the annual dispersal rate of <i>C. arvensis</i> in a 4 year period under influences of different levels of competition in a peer-reviewed journal		
<i>Milestones</i>		
1. Experimental design and protocol	Sep 2000	
2. Achievement of <i>C. arvensis</i> in a regular grid	Sep 2000	
3. Conducting and finalising the crop sequence and data capture	Sep 2001	
4. Choice of regression and time series model		

WP 4. Integrated control of <i>Elymus repens</i>	Time schedule according to application	Deviations, if any
<i>Task</i>		
1. Planning, design and establishment of field experiments	Sep 2000	
2. Conduction of field experiments and data capture	April 2001	
3. Data analysis and publishing		
<i>Deliverables</i>		
1. Annual progress reports	Oct 2001	
2. Scientific contributions in national or international conferences/workshops		
3. Scientific contribution in a peer-reviewed international journal		
<i>Milestones</i>		
1. Experimental design and protocol	Sep 2000	
2. Achievements on rhizome disintegration and distribution in the soil profile	Oct 2001	
3. Achievements on catch crop suppression of <i>E. repens</i>		
4. Achievements on the final control of <i>E. repens</i> following the integrated strategy		
5. Final choice of statistical approach to describe data		

* *Deviations are to be further discussed at C3*

C.3 Discussion on the progress, incl. deviations and achievements in the project as a whole and in the individual work packages

Tasks and deadlines have been modified according to the proposed changes in the previously annual

report. The following workpackages are structured as followed:

Workpackage 1

Two field experiments has been established in spring barley, one with undersown red clover and one with undersown white clover. The shoot growth will be inhibited in different periods by hoeing in row-sown red clover and mowing in white clover. The regenerative capacity of thistle following the different periods of growth inhibition will be investigated and whether or not the competitive ability of thistle has been influenced by these periods of growth inhibition.

Workpackage 2

One field experiment in whole crop has been established and different harvest times have been accomplished by repeated soil tillage. Likewise WP 1, the major objective is to investigate the regenerative capacity of thistle following different periods of harvest time and subsequent soil tillage and whether or not the competitive ability of thistle has been influenced by these periods of growth inhibition.

Workpackage 3

Root fragments of *C. arvensis* has been established at two levels of crop competition, one in spring barley and one in grass clover. The spatial distribution of shoot emergence will be measured over time in a period of 4 years. The shoot emergence this year has been very low.

Workpackage 4

The experimental area has been laid out on a sandy soil at Jyndevad experimental Station. A dense infestation of *E. repens* has been established during the 2001 season by sowing *E. repens* seeds in an open spaced barley crop. The experimental treatment will be conducted in 2002. It has been decided only to conduct this workpackage at Jyndevad due to budget limitations

D. Description of plans and future work in the project as a whole and in the work package (Including plans for publication and communication)

A Nordic working group with participants from all the Nordic countries has been established as a NJF working group. The group is dealing with issues on the management of perennial weeds, particularly in organic farming. A joint experiment studying the dormancy of *C. arvensis* and *S. arvensis* is planned to take place in the coming spring. Further, the second meeting will be held at Research Centre Flakkebjerg on February the 4th 2002. The major purpose of this meeting is to present and co-ordinate the joint activities. But also current activities on perennial weed research accomplished in the Nordic countries will be discussed.

E. Project publications

1. **Articles in international, scientific journals with review procedures**
2. **Presentations at congresses, symposiums etc.**
3. **Articles in agricultural journals etc.**
4. **Other presentations at meetings, field days etc.**

25th Sept 2001 - Presentation on modelling shoot emergence of Canada thistle at the University of Minnesota, St Paul, Department of Agronomy and Plant Genetics, presented by Rikke Klith Jensen.

2nd Feb 2001, first meeting in the Nordic NJF-group mentioned above – Oral presentations of coming Danish activities and experiments with *C. arvensis* and *E. repens*, including current knowledge about the management of those two species in organic cropping in Denmark. Presented by Rikke Klith Jensen and Bo Melander

F. Scientific education (ph.d. and post doc.), including visiting scientists and visits abroad

1st July 2001 - Rikke Klith Jensen has started a ph.d. study on *C. arvensis* and has been in USA for a 3-month leave from July to October 2001, visiting Dr. Frank Forcella at the USDA-ARS North Central Conservation Research laboratory in Morris, MN.

A model to predict shoot emergence of *C. arvensis* based on soil temperature was developed as a result from this stay using shoot emergence data from the trials in Denmark

Further, contact is established with Dr. W.W. Donald, USDA-ARS Columbia, USA, who has an extensive knowledge and research experiments in *C. arvensis*.

G. National and international co-operation

See D and F

H. Possible elaboration of project and achieved results

See F