

Development of weeds in organic crop rotation experiments



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Organic Crop Rotation Experiments

The experiment was carried out at three locations in Denmark: Jydeved with a coarse sandy soil, Foulum with a loamy sand and Flakkebjerg with a sandy loam. It had two replicates for eight years (1997-2004) and included three factors: occurrence of nitrogen-fixing crops in a four-year crop rotation, manure application (with (+M) or without (-M) animal manure) and use of catch crops (with (+CC) or without (-CC) undersown catch crops or bi-cropped clover). All crops in the rotation were present every year. Weed control was decreased in the +CC treatment.

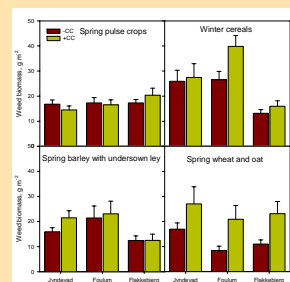
In the table is indicated in which crops catch crops are undersown (+CC) and in which crops manure is applied (+M). The amount of slurry is shown in the table.

	Rotation 1		Rotation 2		Rotation 4	
	R1		R2		R4	
First course 1997-2000	Spring barley/ley	+CC	Spring barley/ley	+M	Oats	+CC
	Grass-clover		Grass-clover		Winter wheat	+M
	Spring wheat	50	Winter wheat	50	Winter cereal	50
	Lupine		Pea/barley		Pea/barley	
Second course 2001-2004	Spring barley/ley	+CC	Spring barley/ley	+M	Winter wheat	+CC
	Grass-clover		Grass-clover		Oats	+M
	Oats	30	Winter cereal	50	Spring barley	50
	Pea/barley		Lupine/barley		Lupine/barley*	
Locations	Jydeved		Jydeved		Foulum	
			Foulum		Flakkebjerg	

● : Catch crops in +CC treatments 30-70: kg ammonium-N/ha in +M treatments
* : Pure lupine at Foulum



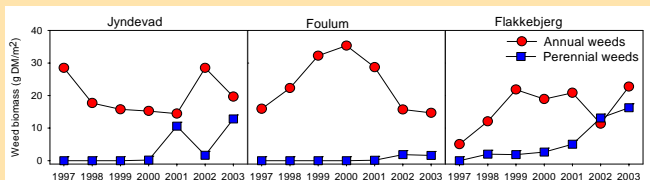
Effects of crop types and catch crops



Weed biomass in different crop types without (-CC) and with (+CC) catch crops. Mean of years, rotations and manure treatments 1997-2003. Vertical bars indicate standard errors.

- More weed biomass in winter than in spring crops
- More weed biomass without catch crops than with in winter cereals and spring cereals other than barley with undersown ley

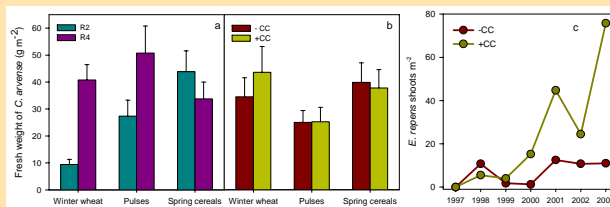
Weed dynamics



Development of annual and perennial weed biomass, mean of all treatments and crops at the three locations.

- Difference between locations
- Increasing weed pressure at Foulum was countered by increased mechanical weed control from 2001
- Early sowing of winter cereals at Foulum resulted in large weed infestations in these crops in 2000 and 2001
- Perennial weeds increased gradually at Jydeved and Flakkebjerg

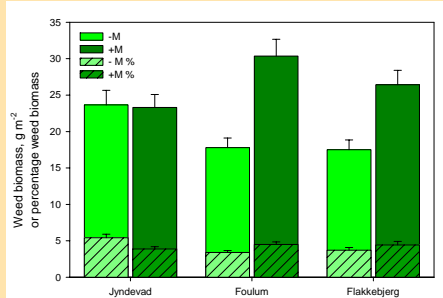
Effect of rotation and catch crops on perennial weeds



Fresh weight of *C. arvensis* at Flakkebjerg in different crop types in a) rotation 2 (R2) and rotation 4 (R4); b) without (-CC) or with (+CC) catch crops. Mean of other treatments, 1999-2003. Vertical bars indicate standard errors. c) Shoots of *E. repens* in spring barley without (-CC) or with (+CC) catch crops at Jydeved. Mean of rotations and manure treatments, 1997-2003.

- Grass-clover in rotation 2 reduced biomass of *C. arvensis* in succeeding crops
- Stubble cultivations without catch crops did not reduce biomass of *C. arvensis*
- Stubble cultivations without catch crops reduced shoots of *E. repens*.

Effect of manure



Weed biomass and percentage weed biomass (%) of total biomass (weed + crop) without (-M) and with (+M) manure. Mean of all crops, rotations and catch crop treatments 1997-2003. Vertical bars indicate standard errors.

- Crops benefited more than weeds from manure application at Jydeved

Conclusions

Different agricultural treatments such as rotation, manure and catch crops influence weed infestations either directly or indirectly, e.g. use of catch crops prohibits mechanical weed control and stubble cultivation. In organic farming, this becomes very obvious due to the renouncement of use of herbicides. Knowledge about the effects and their interactions is important in planning the crop rotation and weed management.