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**Sowing time, false seedbed, row distance and
mechanical weed control in organic winter wheat**

by

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Introduction

In organic farming, mechanical weed control in winter wheat is often difficult to carry out in the fall, and may damage the crop, and weed harrowing in the spring is not effective against erect, tap-rooted weeds such as *Tripleurospermum inodorum*, *Papaver rhoeas*, *Brassica napus* and others which have been established in the autumn. Experiments in conventional agriculture indicate, that while the yield decreases with delayed sowing time when using herbicides, this is not so in untreated plots, and the weed biomass decreases with delayed sowing time. The false seedbed technique has not been widely used in winter wheat in Denmark, but some experiences indicate that this might further decrease the weed infestation. Experiments with mechanical weed control in spring cereals show that some of the erect species, that cannot be controlled by harrowing, might be controlled by row hoeing at larger than normal row distance.

Materials and methods

Some experiments concerning sowing strategy and intensity of mechanical weed control, which included row distance, were conducted. The description of the experiments and the treatments can be seen in brief in table 1. Weed occurrence was counted in the spring before weed control at Flakkebjerg, and counted and weighed 4-6 weeks after weed control in all experiments. Yield was measured.

Table 1. Experiments carried out at two locations over two years.

Experiment	1	2	3
Year	1998	1999	1999
Location	Flakkebjerg		Foulum
Soil type	Sandy loam		Loamy sand
Weed flora	<i>P. rhoeas</i> , <i>T. inodorum</i> , <i>Veronica spp.</i> , <i>Poa annua</i>		<i>Stellaria media</i> , <i>Viola arvensis</i> , <i>Veronica spp.</i> ,
Weed density	> 500 m ⁻²	> 200 m ⁻²	< 50 m ⁻²
Treatments			
Row distances	12/24 cm	12/24 cm	12.5/25 cm
Sowing strategies	-	Early/Late/False Seedbed	
Control treatments	Untreated/Herbicide	Untreated/Herbicide	Untreated/Herbicide
Mechanical weed control treatments	High/low intensity	Harrowing at 12 cm/ Harrowing and hoeing at 24/25 cm	

Results

In experiment 1, high intensity weed control at larger row distance decreased the amount of weeds compared to the other treatments at larger row distance. The yield was highest at normal row distance.

In experiment 2, there was a tendency before weed control for less weeds m^{-2} at the late sowing time and most at the early. After the weed control, there was most biomass of weeds in the untreated and least in the herbicide treated. There was a tendency for less weed biomass at larger row distance, except with herbicide treatment. For *P. rhoeas*, which was the most important weed in the experiment (fig. 1-3), there seemed to be an interaction between sowing strategy and weed control, so that in untreated, there was most biomass of *P. rhoeas* with false seedbed, while with mechanical weed control, there was most with early sowing. The yield was highest with herbicide treatment, and tended to be highest at the early sowing time. With mechanical weed control, it tended to be highest at larger row distance.

In experiment 3, there was more weed biomass after weed control at the early sowing time than at the others. For *S. media* there was more biomass at larger row distance without weed control, but less with. There were no differences in the yield, although a tendency for higher yield at early sowing might be detected.

Discussion

The results underline the importance of choosing weed control strategy, including preventive measures, according to the weed flora in the field. In the experiment with low weed pressure and without erect weeds, there was very little effect of sowing strategy and row distance. In such a case, the winter wheat might as well be sown early, in order to avoid possible yield loss by later sowing, and at normal row distance to enhance the competitiveness of the crop. In the experiments with high weed pressure and erect weeds, the weed control was better with late sowing and large row distance (high intensity control), even though this was not always reflected in the yield. However, the trade-off for lower input to the soil seed bank in organic systems should be enough to balance off the risk of smaller yield.



Fig. 1. Winter wheat sown early, normal row distance, mechanical weed control.



Fig. 2. Winter wheat sown late, normal row distance, no weed control.



Fig. 3. Winter wheat sown early, large row distance, mechanical weed control.