

Weed Management in Organic Cereals

About the crops:

- Organic cereal production generally fits into a planned rotation usually on a mixed organic farm, often where all or most of the grain and straw are used on the farm
- All the main cereal crops, wheat, barley, oats, triticale, rye and spelt can be grown organically in the UK
- Winter cereals can yield more and are harvested earlier than spring varieties, but are exposed more to weed competition due to the longer growing season
- Spring cereals are better suited to undersowing and generally placed at the end of the rotation
- Oats, winter rye and triticale are better weed competitors than barley, with wheat being least able to tolerate weeds
- Organic cereals have several main markets:
 - On the producing farm, for use as livestock feed
 - By supply agreement to other organic farms or marketing groups
 - On the open market – for feed, bread/biscuit/flour, malting quality grain
- Cereals for human consumption must be produced to the requisite high quality standards of the intended market



Poppies in wheat

About the weeds:

- A dense stand of cereal may appear relatively competitive against weeds but at early crop growth stages or under unfavourable conditions, particularly where crop stand is reduced, weeds can take over and cause substantial yield losses
- In addition to causing a loss of yield, the weeds may delay ripening, hinder harvesting and reduce grain quality
- Weeds such as vetches can reduce crop yields by causing lodging
- Weed seeds such as mayweeds may contaminate the grain and require additional seed cleaning or make the crop unmarketable for certain purposes
- Perennial weeds including docks (*Rumex* spp.) and creeping thistle (*Cirsium arvense*) are more important in the organic crops than annual weeds
- There are differences between spring and winter cereals in the weeds that are likely to cause the most problem
- The main emergence period for 'winter annuals' such as blackgrass (*Alopecurus myosuroides*) and ivy-leaved speedwell (*Veronica hederifolia*) is the autumn and early winter when winter cereals are being drilled
- The peak of emergence for certain other weed species such as fat-hen is the spring, and the sowing date in spring-sown cereals will affect the composition of the weed flora
- However, a number of weed species will emerge at any time that conditions are favourable e.g. annual meadow-grass (*Poa annua*), chickweed (*Stellaria media*) and shepherd's purse (*Capsella bursa pastoris*)
- Chickweed can be a particular problem in a mild autumn when it swamps the slower-growing cereal



Wild oats topping wheat and dock emerged between cereal rows



How can weed problems be reduced?

- Crop rotation design is important for weed control; crop, variety and length of rotation must be selected according to the farm weed problems
- Modern short-strawed cultivars, bred for conventional farming, are less able to smother weeds than the older taller ones, although, straw height is not the only factor
- In cereal variety trials, earliness of ground covering and canopy density are considered important characters that indicate the weed suppressing ability of cultivars
- Cultivars with an early prostrate, ground-covering habit can significantly reduce weed biomass
- Early ground covering is needed during crop establishment when weed emergence is at its peak. Canopy density becomes more important in wet seasons when weed growth continues into the summer unless shaded out by the crop
- The primary and secondary cultivations used to prepare a seedbed have a considerable influence on the weed population. However, the nature and timing of these cultivations will vary with the previous crop, with soil type, with soil condition at the time of any operation, and with the equipment available
- “Minimal cultivation” machinery is now available which will produce a seedbed from a stubble in a single pass. Such systems have advantages but weed populations will be higher and they are only appropriate in situations of low weed seed banks and growing competitive crops
- In spring cereals, allowing time for a stale seedbed helps to reduce weed numbers in the growing crop
- Increasing the seed rate of cereals has been shown to reduce the biomass of weeds but often the number of weeds is not affected
- Larger crop seed size has been positively correlated with greater seedling establishment
- It is important that only clean cereal seed is drilled, in the past weed seed contamination was responsible for increasing existing weed problems and introducing new ones

Barley

- Spring barley is well placed at the end of the rotation as it is a good nurse crop for an undersown ley
- Spring barley is more competitive than spring wheat or field beans against the perennial grasses common couch and black bent
- Winter barley is susceptible to weeds: early drilling date promotes weed seed germination and it is not a competitive crop. However the early harvest date provides a good opportunity for post harvest cultivation for perennial weed control
- Among barley cultivars, the best competitors against weeds are the tallest ones, those with the greatest stem weight or those with high early relative growth rates
- Cultivars that developed good early ground cover suffered lower subsequent weed infestations. Information on this character from variety trials based on conventional cropping could be used by organic growers

Wheat

- Winter and spring wheat require the high fertility and lower weed pressures at the beginning of the cropping phase of the rotation
- It is sometimes thought that spring varieties are more competitive against weeds but a late-sown well-established winter crop can give good suppression of spring emerging weeds
- Good, rapid establishment through correct seedbed preparation and timeliness of drilling is critical
- In field trials the characteristics that improved competitive ability against weeds were high tiller numbers, plant dry weight and seedling growth rate, but the most important was plant height
- Row spacing and seed rate may not affect early weed density but can contribute to reducing the growth of weeds
- In the UK it is generally advised that drilling after mid-October is optimum for reducing weed competitiveness

Oats

- Winter and spring oats are suitable for lower fertility soils towards the end of the rotation
- Oats are able to compete against weeds but should not be grown more than once in succession because of nematode risk
- Selecting cultivars for a high rate of germination at low temperatures will improve the competitive ability of oats against weeds, particularly wild oats, during the early growth stages
- In a study of competitive ability against weeds, there was little difference in weed biomass between cultivars of contrasting straw length. Higher seed rates significantly reduced weed biomass. Row spacing had less effect but weed growth was greater at wide row spacings. Crop yield was increased by high seed rates and narrow row spacing
- Oats appear to have a significant allelopathic effect, reducing germination and growth of weeds
- Oats are unsuitable where wild oats are a problem due to the difficulty of hand roguing

Rye and triticale

- Winter and spring triticale and particularly rye are suited to the end of the rotation due to low fertility requirements and excellent weed suppression
- Rapid spring growth and long straw length are the main weed suppressing characteristics

Maize

- Maize is very susceptible to weed competition and is only suitable for relatively weed free sites where effective weed control can be achieved with timely use of specialist inter-row weeding equipment
- The growing of forage maize is mainly of relevance to those whose main enterprise is organic milk production
- It is better suited to drier, free draining fertile soils
- In central or southern England late-April or early-May is considered an appropriate time to sow maize, sowing later, in mid-May, allows the crop to get away more rapidly
- Maize is very sensitive to weed competition at early stages and weeding should commence as early as possible but avoiding crop damage
- Relatively short periods (2-4 weeks) of weed competition during early growth of the crop may be sufficient to reduce final yield
- Mechanical weed control is essential for maize
 - Pre-emergent “blind harrowing” with a spring-tine weeder can be used in this relatively slow germinating crop. Beware of damaging the seedling
 - Post-emergence use of the spring-tine weeder at the 8-10 cm stage may be needed
 - Inter-row hoeing once or twice is usually required - a degree of “ridging-up” is possible in the established crop and can help smother weeds in the crop row
- Maize can be flame weeded when it reaches a height of 10 cm and can be flamed until canopy closure. If flamed earlier than 10 cm tall maize should not be treated again until it reaches a height 15-23 cm. The crop row is flamed across with burners mounted in pairs, but staggered to avoid overlap, and set at an angle of 30 to 60 degrees from the horizontal
- Undersowing with a legume once the maize is established protects the soil from erosion when the crop is harvested
- There is little experience but some potential for intercropping maize with kale for silage which production can have advantages in terms of yield and weed suppression over the crops grown alone

Direct weed control options:

- Mechanical weeding in cereals can be broadly split between selective (e.g. inter-row hoeing) and non-selective methods (e.g. spring-tine weeding)
- Tine weeders tend to be used the most in the UK and mainly during the spring season, however weed control in winter cereals is much more effective if carried out in the autumn, crop and soil conditions allowing
- Early weeding can be carried out with tines once the crop reaches the 3 leaf stage, weeds and some crop will be buried with soil, which is less critical with a spring weeding
- At later stages weeds can be uprooted, torn apart and buried with a spring-tine
- Inter-row hoeing is usually carried out on wider row spacings, around 20 cm rather than 12 cm
- In a comparison of spring-tine weeders and inter-row hoeing in winter wheat, efficacy of the spring-tine weeder was more dependant on timing and the species present
- Tap-rooted weeds were best treated in autumn and fibrous-rooted ones in spring
- Inter-row hoeing is less sensitive to weed stage and weeding operations can be postponed to spring when the crop is less vulnerable
- Intra-row weeds are only partially controlled depending on the amount of soil coverage
- Hoeing in early April and again in late April gave better weed control than a single weeding, the early pass is important as hoeing late may control the weeds but does not prevent weed competition, increased driving speed did not improve weed control greatly
- The weather after any weeding treatment will greatly influence its efficacy
- In many mechanical weeding studies, weed control does not always result in improved yield
- Farmers with low to medium weed pressure are relying increasingly on cultural control techniques and concentrating on getting the crop off to a good start rather than using mechanical weeding



Photo: PAV Lelystad,
The Netherlands

A spring tine harrow weeding cereal in Holland

Vision guidance systems:

- Vision guidance systems have now been developed that can differentiate between the crop row and the weeds, the implement being automatically steered between the rows
- The hoe widths must be matched to the drill widths, with ever wider machines being developed
- This means weeding can be carried out much quicker and with greater accuracy than a fixed hoe, mechanical or hand steered
- The systems are now cost effective for larger farms and for contractor use



Vision guided inter-row hoes

For further information on weed management go to www.gardenorganic.org.uk/weed-management. There you will find the following:

- ◆ Advice on over 130 individual weeds, from Black Grass to Yarrow www.gardenorganic.org.uk/weeds-list
- ◆ Advice on cultivation controls, such as crop rotation, tillage and hygiene www.gardenorganic.org.uk/cultural-weed-controls
- ◆ Direct control methods, such as mulching and mechanical control www.gardenorganic.org.uk/direct-weed-controls
- ◆ Crop weeding strategies, in field vegetables, fruits and grasslands www.gardenorganic.org.uk/crop-weed-management-strategies
- ◆ Further reading in research papers.



Formerly HDRA.

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Disclaimer

The information contained in this leaflet has been compiled from a range of sources. It is accurate to the best of our knowledge. Authors are not responsible for outcomes of any actions taken based on this information.