Improved weed management in organic crop production

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Implications

Weed problems can constrain organic crop production resulting in significant losses in yield and quality. Especially perennial weed species such as *Elytrigia repens*, *Cirsium arvense* and *Tussilago farfara* are posing problems as arable cropping systems do not hamper their vegetative proliferation sufficiently. Annual weeds may also reach unacceptable infestation levels leaving the growers with poor yielding crops and severe future weed problems owing to the shedding and spread of weed seeds. Effective weed management is a key component for successful organic crop production and a prerequisite to increase the yielding potential of many organic crop production systems. Weed problems are most severe on stockless arable farms because the supply of nutrients can be limited and may not suffice to produce competitive crop stands. Crop rotations in arable cropping systems often have fewer grass-clovers leys or other perennial crops known to disrupt weed proliferation more effectively than cash crops such as cereals and pulses. The higher nutritional status of soils on dairy farms and the more frequent use of perennial crops for mowing are major causes for less severe weed problems on those farms.

Research has produced many new results on improved tactics and methods to control weed problems in organic crops in recent years. Still the transfer of knowledge to extension services and finally producers has been insufficient and not fully utilized to benefit organic crop production. Consequently, we have synthesized current knowledge of relevance for practical implementation and structured it into three main principles to help extension services and growers plan weed control programs more stringently and still concisely to ensure the commitment of the users. Our principles for weed control in organic farming are: a. competitive crops, b. effective weed control actions, and c. disruption of significant weed problems. The three principles are seen as cornerstones for achieving effective weed management in organic crop production where weed problems should never reach uncontrollable infestation levels. The principles are accompanied by a range of weed control strategies and control interventions that need to be followed to comply with the principles.

Background and objectives

Crop productivity has stagnated in Danish organic farming as yields have apparently not benefited from the recent achievements in research. Low to moderate crop yields limit farmer revenues and hinder the expansion of the organic area. The requirements for organic grain and fodder may not be fulfilled and thus reduce the potential for production of other products in the food chain or necessitates import. The Danish multidisciplinary research project, *HighCrop*, addresses these issues by focusing on new research, development and demonstration. Weed management is one important component in the project with the objective of transforming research results and analyses of existing data into concepts of weed control and finally cropping system planning tools to be used by farmers and advisers to achieve better tactical and strategic weed management.

Key results and discussion

The work on weed management has yielded a set of principles, strategies and tactics to support advisors and growers in their efforts to better manage weeds and improve crop productivity. In addition, the principles, strategies and tactics have been re-formulated into a web-based weed management planning tool for advisers and growers. This tool will

be further modified and extended concurrently with the achievements made from analyzing data from long-termed crop rotation experiments.

How work was carried out?

Existing data from previous long-termed crop rotation experiments was extracted, analyzed and synthesized to describe and quantify weed dynamics under the influence of different crop rotations and nutrient management factors (Olesen et al. 2000; Rasmussen et al. 2006). The synthesis is discussed in relation to the literature (e.g. Barberi 2002; Rasmussen 2002; Melander et al. 2005; Rasmussen et al. 2006) and includes information produced in other projects and networks on new control tactics and strategies against perennial and annual weeds (e.g. http://www.icrofs.org/Pages/Research/darcofIII_weeds.html; http://www.ewrs.org/pwc/proceedings.asp). The information amalgamated is used to formulate concepts of weed control tactics and strategies for perennial and annual weed management. These concepts are then modified to suit the three principles: a. competitive crops, b. effective weed control actions, and c. disruption of significant weed problems. For example, the principle of weed disruption requires a cropping strategy based on diversified crop sequences to prevent the buildup of specific weed species. The tactic needed for effective disruption could be crop sequences composed by spring and autumn sown crops including 20% or more of N-fixating green manure crops. The principle of competitive crops can be achieved through a strategy based on fertilizer placement whenever possible as one strategy among other strategies. One tactic for fertilizer placement could be to place slurry between the rows of spring cereals before sowing.

References

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