Allelopathy
- a practical weed management tool?

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What is allelopathy?

The term allelopathy refers to the production, by a plant, of chemicals (allelochemicals) which can influence the growth and development of another plant. Such an effect can be varied and can be negative (e.g. reduced germination) or positive (e.g. increased growth). For weed management we are interested in the inhibition of one plant (the weed or weeds) by another (usually the crop) through the production of allelochemicals. These allelochemicals may be actively produced by a growing plant or arise from the residues after death. The effects of the allelochemicals may be reduced or enhanced by micro organisms

What are the effects of allelopathy?

Allelopathic effects can include poor germination, impaired root growth and stunted shoot growth. Obviously these symptoms in can also have other causes apart from allelopathy and in practice it can often be difficult to distinguish true allelopathic effects

Is it important?

Because is difficult to separate the effects of competition (e.g. for light, water and/or nutrients) from allelopathic effects in the field some researchers doubt the importance of allelopathy in practical terms. For day to day crop management it is of less importance whether a weed suppressing effect is due to allelopathy or not. This distinction will however, be important in developing a successful research programme

Couch grass suppressing barley—is it allelopathy or just competition?

Which crops show allelopathic properties?

Many crops have been reported as showing allelopathic properties at one time or another and farmers report that some crops such as oats seem to clean fields of weeds better than others. The list includes:

Wheat • Barley • Oats • Cereal rye • Brassicas
• Red clover • Yellow sweet clover • Trefoil • Vetch • Buckwheat • Lucerne • Rice • *Sorghum*

What other factors might need to be taken into account?

Before using allelopathy in weed management programmes there are a number of other factors that might be important in any given situation

Varieties

There can be a great deal of difference in the strength of allelopathic effects between different crop varieties

Specificity

There is a significant degree of specificity in allelopathic effects. Thus, a crop which is strongly allelopathic against one weed may show little or no effect against another

Autotoxicity

Allelopathic chemicals may not only suppress the growth of other plant species, they can also suppress the germination or growth of seeds and plants of the same species. Lucerne is particularly well known for this and has been well researched. The toxic effect of wheat straw on following wheat crops is also well known

Crop on crop effects

Residues from allelopathic crops can hinder germination and growth of following crops as well as weeds. A sufficient gap must be left before the following crop is sown. Larger seeded crops are effected less and transplants are not affected

Environmental factors

Several factors impact on the strength of the allelopathic effect. These include pests and disease and especially soil fertility. Low fertility increases the production of allelochemicals. After incorporation the alleopathic effect declines fastest in warm wet conditions and slowest in cold wet conditions

Allelopathic weeds?

Several weed species have been reported to show allelopathic properties. They include couch grass, creeping thistle and chickweed. Where they occur together they may have a synergistic negative effect on crops

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What practical use is allelopathy?

As outlined in the previous boxes there are many potential problems with attempting to use allelopathy as a practical tool for weed management in organic farming systems. In particular:

- Information about which crops are effective against which weeds is limited
- Information about which are the most allelopathic varieties of a particular crop is not available
- To provide maximum weed suppression, allelopathic crops need to be managed effectively, but there are no effective management recommendations, which in any case will vary from one crop to another

Where does this leave us?

Current evidence indicates that the role of allelopathy in weed suppression in both field and cover crops is at best uncertain. It is probably safe to say that at the present time we are not in a position to provide practical advice for the use of allelopathic effects in weed management programmes

A dense cover crop such as vetch (above), as opposed to an open crop like leeks ,can effectively suppress weeds through competition; allelopathic effects may or may not be present

Where do we go now - weed management?

Cover crops can provide effective weed control whether allelopathic or not. Choose vigorous species and varieties for maximum weed control, but remember timeliness of establishment is vital, especially for winter cover crops.

Cash crops vary in their weed suppressing abilities. Choose strongly suppressive crops such as potatoes and oats in the rotation to balance weakly suppressive ones such as leeks and carrots.

Crop varieties vary slightly in their weed suppressing ability, be aware of this and make use of it where appropriate.

When using a crop especially a green manure, which may be alleopathic, leave a gap after incorporation before planting the next, especially with small seeded crops

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.

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This leaflet was produced as part of the 2006 DEFRA funded project 'Participatory Investigation of the Management of Weeds in Organic Production Systems'. The information has been produced from a range of sources, including farmers, advisors and researchers, and we gratefully acknowledge their contributions. It is one of a number of leaflets written to give an overview of non-chemical weed control opportunities and developments in the crops covered. They include historical information and summaries of more recent research.

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.

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