

Potential of microbial biocontrol for the sustainable management of plant diseases in Scotland: Opportunities and barriers

Policy Summary



Credit: Soo Ann Woo

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Policy Summary

Background

The UK pesticide regulatory system aims to reduce the use of chemicals in agriculture, horticulture and forestry due to environmental concerns and the impact on worker and consumer safety. As a result of regulation there are fewer pesticides available and fewer being developed. In Scotland, a high proportion of chemical insecticides are estimated to be at high or medium risk of withdrawal, with six recently withdrawn for use in the UK. Integrated pest management (IPM) frameworks encourage reduced and targeted synthetic pesticide use.

The withdrawal of chemicals has driven an increased interest in using biological controls within IPM programmes to fill the gap. For clarity, biological control or biocontrol is the process of controlling a pest, disease or weed using another living organism for human benefit. Organisms with biocontrol potential are termed biocontrol agents (BCA). Where microbes, usually bacterial and fungi, have biocontrol potential they are termed microbial biocontrol agents (MBCA).

This review established which MBCA were being deployed in Scotland and the context in which they are being used. It also examined the potential for the use of new MBCA in Scotland in agriculture, horticulture, forestry and the natural environment. The current regulatory system relies on the pre-existing chemical registration process, we examine whether this is the most efficient system to encourage innovation and meet future pest and disease challenges in Scotland.

Key Research Questions

The objective of this project was to understand the current situation of microbial biocontrol in Scotland. Using a literature review and conducting a workshop with plant health stakeholders the project aimed to:

- 1 Understand the current use of MBCA in Scotland.
- 2 Determine the potential for using MBCA in Scotland.
- 3 Identify potential risks associated with using MBCA.
- 4 Determine whether the current regulations for MBCA are fit for purpose.

Main Findings

- Biocontrol is a valuable alternative to chemical plant protection products (PPP) and can be used in integrated management programmes. By reducing the need to use chemical pesticides, biocontrol can reduce the long-term toxicity impacts on human, animals, non-target organisms and the environment. Using MBCA can also reduce the harvest interval periods, allowing crops to be harvested shortly after MBCA application, and potentially have fewer health and safety concerns compared to conventional PPP.
- Stakeholders at the workshop held for this project reported that the public perception of biological control is positive, being viewed as an environmentally friendly option. In addition, MBCA are seen as alternative methods for disease control, especially in cases where disease resistance and conventional chemical control are not options.
- The most commonly used MBCA are *Bacillus* and *Trichoderma* species, both with products registered and used in Scotland. These are used for protected crops, e.g., strawberry, lettuce and tomato, for controlling diseases such as mildew and botrytis. A total of 31 % of the overall cropped area in soft fruits is treated with biopesticides. This

study provides a full list of products registered for use in the UK (and therefore Scotland), including details of the target pathogen and hosts.

- Mycoviruses (viruses that infect fungi, thereby rendering them less pathogenic) could potentially play an important role in disease management, particularly in forestry where large areas of land need to be covered and a spray or soil drench would be impractical in the UK.
- In arable crop surveys carried out by SASA, only 0.2 % of the overall cropped area is treated with biopesticides. *Bacillus amyloliquefaciens* (strain MBI600) is used as a seed treatment in oilseed rape crops. No biopesticides are used to control pathogens in grasslands and fodder crops.
- Respondents to a FERA survey indicated that the crops most favourable to biological products were fruit (54.1 %), salad crops (50.8 %) and vegetables (45.9 %). Arable crops (14.7 %) and potatoes (8.2 %) were considered least favourable. This is generally reflected in the Pesticides Usage in Scotland reports where almost no microbial based plant protection is used in arable and potato production but is more widely used by soft fruit growers.
- Reviews suggest that climate change will not have adverse effects on the potential for MBCA in the next 20 – 40 years in Scotland. It is possible, that with warming temperatures, conditions for MBCA could become more suitable. However, this could also mean more pathogens survive overwinter or expand their host ranges.
- Microbial biocontrol agents are living organisms that are antagonistic to plant pathogens (mostly fungi and bacteria). The impact on the natural environment of MBCA should be examined very carefully, particularly the implications of MBCA application on native microbial communities to assess any non-target effects.

Recommendations and next steps

- A major barrier to uptake of MBCA reported by stakeholders was lack of knowledge and understanding on using MBCA. Knowledge exchange, provision of advice, and comprehensive guidance on the use of MBCA are key recommendations for improving the uptake of MBCA in Scotland.
- The process of registration for new BCAs in the UK is currently stifling innovation. Stakeholders widely believed that the current system is not fit for purpose. This is largely because the pre-existing chemical registration process is being used for BCAs which is means that most of the tests are inappropriate. It currently takes about ten years to register a new product in the UK compared to two years in the US.
- Due to BCAs being treated as chemicals, their registration is managed by the HSE. Stakeholders reported that Defra (England) and Scottish Government (Scotland) would be better placed to manage biopesticide registration because they already have expertise in this area due to their other workstreams (e.g., invasive species, plant health and biosecurity).
- Therefore, a new regulatory framework needs to be developed to streamline the registration of MBCA whilst providing the highest possible protections for the environment. The new National Action Plan for sustainable use of pesticides, due for publication soon, may address some of these issues.

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