



Position on modern biotechnologies to modify plant genomes

Context

The James Hutton Institute conducts research in agriculture and environmental sciences over a range of scales from genes, cells and plants to field, catchment and landscape. The research supports sustainable land management including crop production systems and integrated management practices. The aim of our research in crop production is to develop high yielding, stress tolerant crops that help deliver food security in an environmentally sustainable manner.

These studies utilise many different methods, predominantly conventional breeding methods at all scales, and including new breeding technologies such as gene editing at the laboratory scale. All our research using plant breeding technologies is undertaken within a clear governance framework that also considers the social and economic aspects of deploying these new techniques. New breeding technologies such as gene editing techniques, enable high precision modification, and in many cases no genes are introduced but existing genes are switched on or off to enhance beneficial traits. We conduct research funded by governments, research councils and industry that contributes to the production of new cultivars with traits that are beneficial to agriculture and the environment. The techniques are used in our research in two different ways:

- As a research tool to discover new insights in plant biology. The findings can be used to accelerate and improve the development of crop breeding, for example, by identifying gene sequences that pinpoint where a beneficial trait can be found and then use these to identify new varieties of crop carrying that trait in a conventional breeding population. This research therefore opens up the opportunity to speed up conventional breeding of new cultivars with economic, environmental and social benefits.
- To create new genetically modified plants to be used in contained experiments. This work moves the research phase to demonstrate proof of concept that the work will produce benefits currently not available from conventionally bred cultivars. Such benefits may include, for example, enhanced nutritional value or better disease resistance which not only benefit farmers but also consumers and the environment e.g. by reducing chemical inputs that pose risks to waters, soil, biodiversity and contribute to greenhouse gas emissions. At present, the cultivation of genetically-modified crops is not approved in 19 European member States, including Scotland, so here research takes place only at the experimental level in contained glasshouses and controlled environment rooms.

Apart from the research which directly involves genetic modification, we also conduct research on the environmental and ecological risks of GM. For example, research on the safety of GM crops

funded by EU and Food Standards Agency investigated the biochemical composition of plants and we have also worked on European long-term field trials to look at effects on biodiversity, located out-with Scotland.

Our Position

- Genetically modified (GM) crops have the potential to increase crop production and feed a growing population using fewer chemicals and energy as well as to increase their resilience to the effects of climate change. Therefore, we use this technology as a research tool to better understand gene function in plants to benefit economic growth, the environment and to enhance social wellbeing both within Scotland and globally. We will contribute to research that is focussed on economic benefit with an emphasis on “public good” traits and environmental improvement, such as disease and pest resistance that can result in decreased applications of agrochemicals currently used in growing crops.
- We would only seek commercialisation of genetically modified plants in Scotland (or elsewhere) in compliance with the prevailing laws. However, we aim to develop and maintain skills, knowledge and research capability to advise Scotland and other countries on the benefits and risks and ensure that Scotland’s industries and environment are ready to take advantage of the benefits should laws and social acceptance change. This involves continuing to research by review of the published data and reports, modelling and experimentation the wider agriecological impacts associated with the use of GM and as well as the social and economic aspects of GM.
- We believe it is our role to advance and inform balanced public debate on all new plant breeding technologies. We will listen to other points of view and disseminate the findings of our research in an open and transparent manner so as to evaluate the effectiveness of these technologies by sharing of scientific knowledge within Scotland and more broadly.
- Our research will continue to be conducted in accordance with legal requirements and regulatory guidelines.
- We respect the right of staff, students and associates to hold different views on genetic modification and that this may differ from the Institute’s position. We also respect the right of staff, students and associates to engage as individuals in scientific and social debate on genetic modification provided their views are identified as being their own and not necessarily that of the Institute.

For more information on new plant breeding technologies see:

<https://bbsrc.ukri.org/research/briefings/gm-synthetic-biology-genome-editing/>

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