

Improving crop protection for food security

New innovative projects in crop protection to increase productivity whilst reducing the environmental impact of UK agriculture.

The need

With global population predicted to reach 9 billion by 2050, the agricultural sector will need to increase production by at least 50% to meet world demands for food in the coming century¹.

Advances in crop protection during the Green Revolution have greatly contributed to high yields and consistency in agricultural production. However, new EU regulations² on the approval and use of crop protection chemicals may threaten future yield, unless new strategies can be found.

Three innovative projects, led by KWS UK, RAGT Seeds Ltd and Barrier Biotech Ltd, will develop new crop varieties and plant protection products to increase yield, while reducing the environmental impact of UK agriculture.

The results

The Biosciences Knowledge Transfer Network assisted three business-led consortia that have been awarded funding through the “New Approaches to Crop Protection” competition from the Sustainable Agriculture and Food Innovation Platform (SAF-IP) of the Technology Strategy Board (TSB). These three projects, led by KWS UK Ltd, RAGT Seeds Ltd and Barrier Biotech Ltd, have the objective of developing a range of new crop varieties and plant protection products to increase the productivity of UK crops, whilst reducing the environmental impact of UK agriculture.

KWS UK Ltd is leading a consortium that includes DuPont Ltd, Masstock, Scottish Crop Research Institute (SCRI), Rothamsted Research and Mylnefield Research Services Ltd. The new project, called SIBLINGS (Symptomless Infection

of Barley: resistance breeding and integrated crop protection Strategies), will develop new barley varieties that are more durable to *Rhynchosporium secalis* infection. Rhynchosporium is the most problematic and economically damaging disease of barley, accounting for annual UK yield losses of 900,000 tonnes (worth approximately £7M)³. The potential added value of the new barley varieties is an increase in yield of 1% per annum (pa)⁴, corresponding to a value of £5.1M⁵. The project will also develop crop protection strategies for increased yield response and risk reduction, which could lead to an additional 25,000 tonnes of barley pa with a current value of £2M.

¹Reaping the benefits: Science and the sustainable intensification of global agriculture. The Royal Society (October 2009).

²Regulation (EC) No 1107/2009 of the European Parliament and of the Council – 21st October 2009.

³CropMonitor report, CSL/ADAS, 2002.

⁴RD-2004-3099 Rhynchosporium BBSRC-Link.

⁵DEFRA Farming and Food Brief, 2009.

RAGT Seeds Ltd, together with Limagrain UK Ltd, KWS UK Ltd and Rothamsted Research, will breed new UK winter wheat varieties that reduce take-all inoculum build-up in the soil, to improve protection of second wheat against this very damaging fungal disease. Current control measures against take-all are not 100% effective, causing up to half the UK crop to be affected with losses costing farmers up to £60M pa⁶. The potential added value of this project to the UK is an increased yield of up to 1.9M tonnes pa. The new wheat varieties will have an improved water and nitrogen uptake, reducing pollution of waterways through run-off, as well as improving grain quality, which will enable farmers to get a premium payment for their crop of up to £20/tonnes.

Barrier Biotech Ltd, together with Syngenta Ltd and the John Innes Centre (JIC), will develop novel nematicide products based on plant oil formulations. These formulations will target nematodes affecting arable root crops and will substitute existing commercial nematicides coming off the market due to changes in EU legislation². Nematodes are one of the world's major agricultural pests, causing root crop production losses of up to 30% annually in the UK. Losses in the UK potato industry alone are estimated at £43M pa. Use of the novel nematicides are predicted to off-set UK yield losses of between 20-30% in arable root crops, corresponding to a value of over £15M⁷. Other benefits include the efficacy of the formulations at low concentration,

which will reduce costs of production and associated environmental impacts affecting GHG emissions, surface and groundwater frameworks, and their low toxicity. The oils used in production of the novel nematicides are not sourced from major food crops and are produced sustainably outside the EU. Their use as a renewable raw material for nematicide production is therefore not anticipated to have adverse effects on food supply chains.

⁶HGCA Topic Sheet 49, Summer 2001- Take-all control in winter wheat: 1 planning.

⁷The Food and Environmental research agency (FERA) and the Pesticide Safety Directorate (PSD).

'Biosciences KTN has provided a helpful guide through the novel process of preparing an application to TSB. This was particularly valuable in clarifying at an early stage the differences between TSB funding and the more familiar R&D funding routes.'

Peter Werner, KWS UK Ltd



Adrian Newton, SCRI



Prof Kim Hammond-Kosack, Rothamsted Research

'I would say that the assistance we received from the [Biosciences] KTN was invaluable, especially because of the novelty of the TSB and as industrial partners, we are not used to writing grant applications.'

Sarah Holdgate, RAGT Seed Ltd

'We are delighted to have been successful in our application for research funding from the TSB for our novel nematicide project. It is the first time we have sought external support for our research effort and we found the independent analysis and constructive critique provided by the [Biosciences] KTN to be invaluable.'

Nigel Back, Barrier Biotech Ltd

Projects Funding

- 1) Rhynchosporium project
Total project investment: £690,110
Consortium partners: £271,250
TSB: £418,860
- 2) Take-all project
Total project investment: £237,943
Consortium partners: £118,972
TSB: £118,971
- 3) Novel nematicide project
Total project investment: £654,521
Consortium partners: £276,754
TSB: £377,767

These three industry-led projects attracted a total investment of £1.6M.

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