Neonicotinoids – A Subject of Contention

On 8th January 2021, the UK government published a decision to issue – with strict conditions – emergency authorisation to use neonicotinoids to treat sugar beet seed. Neonicotinoids are a class of chemicals used as insecticides and are used to protect several crops. In particular, to protect sugar beet against a type of sugar beet virus spread by aphids which has decimated yields. It's often referred to as 'virus yellows' as a generic term for what could be multiple similar viruses, due to the yellowing of the leaves it causes.

It has been recognized for a number of years that the use of neonicotinoids is likely contributing to the decimation of insect populations, including bees.

Insects perform vital roles in our ecosystem. As well as being key pollinators, they are food for numerous animals further up the food chain, but insect populations have suffered drastically in the past few decades. Populations are declining and many are threatened with extinction. There are multiple reasons for this. Climate change and habitat loss disrupt bee behaviour, as well as widespread pesticide use, with neonicotinoids shown to be a particularly harmful class of chemical.

Ideally, as an alternative to harmful pesticides, more support is given to farmers to find alternative means of agricultural practises which support nature. In the longer term, undoubtedly plant scientists will develop new solutions, but these are a few years off.

Historical context

The first commercial neonicotinoid entered the market in 1991 and by 2008 neonicotinoids represented a quarter share of the global insecticide market. However, there has become increasing studies into the effects of these on bees. In 2013, several countries in the EU put restrictions on neonicotinoids, and in 2018 the EU banned the use of the three main neonicotinoids (clothianidin, imidacloprid and thiamethoxam).

Adapting without it has been difficult for some farmers of sugar beet, due to the prevalence of the sugar beet virus. Despite the EU-wide ban, there have been cases in the EU where exceptions have been made and bans have been lifted temporarily to aid sugar beet farmers. This was the case in France last summer for example, where the government granted a temporary lift of the ban on neonicotinoids to support the industry.

Challenges for the sugar beet industry

The sugar beet industry also faces competition from sugar cane. Beet and cane sugar have the market split roughly in half in the UK, the two main refineries operated by British Sugar (sugar beet) and Tate and Lyle (cane sugar). Sugarcane, which cannot be grown in the UK, has historically been met with heavy tariffs, however as of January this year, the UK government has implemented a tariff-free import quota, which will apply to 260,000 tonnes of raw cane sugar per year.

Competing with cane sugar without the safety net of EU agriculture subsidies is a challenge for UK sugar beet farmers, and made especially hard when battling the sugar beet virus. Some argue that if the use of neonicotinoids are fully prohibited without an alternative method of pest control, the UK will rely on imports of cane sugar or sugar from countries allowing the use neonicotinoids for beet cultivation. While the sustainability of imported sugar cane and home-grown sugar beet is up for debate, certainly 3,500 UK farmers will be troubled by the loss of a usually reliable crop, which

among other beneficial attributes, provides ecological benefits in crop rotations and minimises food miles.

Another challenge for the sugar beet industry in the last couple of years is the scrapping of production quotas which artificially inflated the price of sugar beet by limiting the supply. This kept the output of UK sugar beet at just over 1 million tonnes a year. The EU abolished those limits at the end of 2017 intending to boost the output of sugar beet and work towards being a net exporter. Although this points to increased opportunity for the sugar beet industry, farmers are paid less for their crop. Raising outputs to minimise their costs can help offset the lower selling price, but there is only so much demand in the world market so it's somewhat of a mixed blessing.

The expected sugar surplus in the EU after 2017 is one reason why sugar beet has a renewed interest from the bioeconomy sectors. Now that there is the opportunity to grow more, we can find innovative ways to utilise it.

Sugar beet – an opportunity for the bioeconomy

A sugar beet refinery could produce sugar for human consumption, as well as a variety of other products.

Bioethanol is used worldwide as a biofuel. It's produced via the fermentation of sugars which can be from a variety of feedstocks, including sugar beet. Between April 2017 and 2018, the UK consumed 744 million litres of bioethanol of which 17% was derived from sugar beet. Taking into account cultivation, processing, transport and distribution of different feedstocks used for bioethanol production, sugar beet has lower greenhouse gas emissions than corn, wheat and sugar cane, according to REDII.

Alternative fermentation products can be produced from the processing of sugar beet, for example raw materials for polymer production. Polylactic acid (PLA) is one example – which is currently produced from lactic acid derived from the fermentation of sugars and is a valuable biobased and industrially compostable plastic used commonly in packaging applications. Polyhydroxyalkanoates (PHAs) are another example of a biobased and compostable plastic which can be produced from sugars. Other platform chemicals could be produced from the processing of sugar beet, such as furfural and furans.

There are multiple residues and side streams before the primary product is obtained which have the potential to be utilised for biofuel, bioenergy and biobased chemical production. For example, sugar beet pulp containing some residual sugar but mostly cellulose, is one of the highest volumes of vegetable waste produced in Europe. Most of it is dried and used for animal feed, however, there are opportunities for higher-value utilisation.

Biomethane produced from anaerobic digestion is a key contributor to the UK's efforts to reduce carbon emissions. Sugar processing residues are already used widely as a feedstock to produce biogas in the UK, which can be used to meet heating requirements of the processing plant or be upgraded to biomethane, and used for the greening of the gas grid. In addition, the remaining digestate can be used as a fertiliser.

However, it's important to bear in mind, without pollinators like bees, there is no bioeconomy. Bees and other insects are essential for our food chain, and as such it's important to safeguard them against harmful agricultural practises and minimise the risks associated with pesticide use. Some steps can be taken to reduce the effects, for example, the effects of pesticides on insects vary with

the application method, or whether the plant flowers. Even from a purely economic perspective, without bees, it would cost UK farmers £1.8 billion a year to pollinate crops.

In the past, neonicotinoids have been used widely on more than 140 crop varieties to control a variety of pests. Emergency authorisation with strict conditions is a far cry from this, but the question remains, where should the line be drawn?

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