

TECHNICAL SUMMARY

GLYPHOSATE RESIDUES IN HONEY

Steve Howse, *Analytica Laboratories*

Glyphosate is the world's most widely used herbicide (weed-killer). Residues of glyphosate have been found in honey globally, and as a result some countries and/or consumers have an interest in this being measured. This article briefly covers the history of glyphosate use, and some recent international developments that have increased consumer and media awareness. The domestic Maximum Residue Limit (MRL) for glyphosate in New Zealand honey is 0.1 mg/kg (100 parts per billion), but consumers may require that there is no glyphosate detected in honey at all (for many labs the level of detection is 0.01 mg/kg or 10 parts per billion). We offer some suggestions on testing for those with an interest in knowing whether their honey contains glyphosate residues.

History

Glyphosate is a synthetic (man-made) chemical compound, which was discovered to have potential as a weed-killer in the early 1970s by the American company Monsanto. It was launched to the market as the active ingredient in Roundup®, and was exclusive to Monsanto until its patents expired in the year 2000. Herbicides containing glyphosate are now sold by a range of different companies in New Zealand and around the world, for domestic/home garden and commercial use.

Monsanto went a step further in 1996, releasing Roundup Ready® soybean seed to the market—soybean plants that were genetically modified to be resistant to glyphosate. This made it possible for weeds to be killed in crops by spraying them with glyphosate, leaving the soybean plants to continue growing. Since then Monsanto has developed Roundup Ready® maize, canola, sugar beet, cotton, and lucerne (and wheat is being worked on at present). In 2015 it was thought that over 90% of soybeans, maize, and cotton plants grown in the USA were genetically modified to be resistant to herbicides (USDA, 2018). Roundup Ready® plants are grown in a number of other countries as well, though not in New Zealand.

Toxicity

The issue of whether glyphosate is toxic or harmful to people or the wider world we live in is far too complex to go into here. Opinions are divided. There has been media coverage of legal and regulatory decisions in Europe and the USA in the last few years (see next section), and at the very least there is likely to



be a perception among some consumers that glyphosate represents a health risk.

The USA has set an acceptable level of glyphosate intake as 1.75 mg/kg of body weight per day, and the comparable European level is 0.5 mg/kg of body weight per day. The maximum residue limit (MRL) for honey in Europe is 0.05 mg/kg, and New Zealand has a default domestic MRL of 0.1 mg/kg. To put this into context, someone weighing 80 kilograms would need to consume 800 kilograms of honey a day, containing 0.05 mg/kg of glyphosate residue (the European MRL), to exceed the acceptable level of glyphosate intake in Europe.

Recent legal developments

A group of European countries have chosen to impose restrictions on the use of glyphosate. The Netherlands banned the

sale of glyphosate for home/domestic use in 2014, and France asked for retailers to adhere to a similar ban on a voluntary basis in 2015. There was a lot of debate when it came time to relicence glyphosate for use in the EU in 2016, which resulted in a decision in 2017 to relicence it for five years (a shorter time period than would be considered normal). There appears to be a range of views across European nations about the toxicity and health risks associated with glyphosate.

In the USA, a former Californian school groundskeeper was awarded almost \$US 300 million in damages in mid-2018, based on a claim that exposure to glyphosate had been involved in him developing cancer. This is being appealed by Bayer (the current owner of Monsanto), but in the meantime there appears to be a large number of other similar claims being lodged in the USA.



Vietnam has recently (April 2019) banned the use of glyphosate throughout their country, and a handful of other countries have banned or restricted the use of the chemical.

Testing for glyphosate residues in honey

Glyphosate residue testing is likely to be needed to address consumer concerns about food safety—regardless of whether those concerns are based on perception or fact. The requirement for testing will probably be market specific (European concerns about glyphosate have tended to be greater than those in the USA, for instance). Beekeepers should talk with the buyers of their bulk honey to understand what the requirement is for glyphosate testing in the markets they are selling honey to.

The testing method is broadly similar to the one used for tutin—it makes use of sophisticated testing instruments like LC-MS/MS [a combination of liquid chromatography (LC) with mass spectrometry (MS)] to reach the very low detection limits needed (0.01 mg/kg or 10 parts per billion).

For most New Zealand honey producers, there is probably only a low risk of finding significant glyphosate residues in honey, so a surveillance type approach to testing makes most sense:

- test batch samples, rather than individual drum samples.
- if you don't want to test all batches, work out which ones come from hive sites where bees would have access to areas where glyphosate may be used (farms, orchards, urban parks and reserves, roadsides, etc.) and focus on testing them. Native bush or scrub is unlikely to have been sprayed with glyphosate, so honey from these areas will have a lower risk of containing glyphosate residues.
- or you can just get honey tested when asked for results by a bulk honey buyer, or an end consumer.

Consumer expectations

Despite the fact that many governments regard glyphosate to not be very harmful, consumers are increasingly concerned about the presence of glyphosate (and any other agrichemical) residues in their food. There are endorsement programmes operating overseas to give consumers assurance that products are free from detectable levels of glyphosate (usually at a detection limit of 0.01 mg/kg). If these endorsement programmes become better known among consumers, there will be more pressure on producers to ensure they comply. For honey, this means ensuring that residues are below the detection limit of the test (0.01 mg/kg).

Precautions with pasture honey

Although glyphosate is effective at killing many plants, clover is naturally resistant to glyphosate at normal application rates. What this means is that clover plants may be sprayed with glyphosate, but they are likely to continue growing and producing nectar with glyphosate residues on the plant and in the soil around them.

Honey made from clover nectar in areas where glyphosate spray is used for weed control may, therefore, have a higher risk of containing glyphosate residues. In addition to normal use for weed control, some farmers spray surplus pasture with glyphosate in spring to wilt it more quickly before making silage, and clover which regrows in those pastures may be at risk of containing glyphosate residues as a result.

Further reading

MPI has a comprehensive page on its website talking about glyphosate residues: <https://www.mpi.govt.nz/food-safety/whats-in-our-food/chemicals-and-food/agricultural-compounds-and-residues/glyphosate/>

Many articles and websites are available via your Internet search engine.

Reference

United States Department of Agriculture. (2018). Recent trends in GE adoption. Retrieved June 13, 2019, from <https://www.ers.usda.gov/data-products/adoption-of-genetically-engineered-crops-in-the-us/recent-trends-in-ge-adoption.aspx>

Timely reminder for beekeepers

It's important for beekeepers to be aware of the risk of pesticides and ensure that if spraying or use of pesticides cannot be avoided near hives, that precautions are taken.

Here's a simple checklist sourced from the Environmental Protection Authority (EPA):

- no spraying near hives
- no spraying on crops likely to be visited by bees, or when bees are foraging
- no spraying when flowering crops or weeds are present in the treated area
- avoid spraying budding or flowering plants.

Although there is greater awareness about pesticide use and the impact on bees, it is also important that beekeepers and landowners work together and make pesticide use safer for bees. Some of these options include landowners informing beekeepers of intentions to spray, considerations as to whether spraying is necessary, and using bee-friendly products. The best approach is always having productive and proactive relationships with landowners based on good communication and cooperation.

For more information on managing the risk of pesticides, check out Apiculture New Zealand's website here <https://apinz.org.nz/resources/pesticides/>. It includes a range of useful resources for beekeepers, farmers and the public.

- Apiculture New Zealand