RESEARCH

Pyrrolizidine alkaloids in honey: research, implications, and what you can do to reduce them

Wymond Symes and Jane Lancaster, Catalyst® Ltd

Pyrrolizidine alkaloids (PAs) in honey, and their effects, is an issue commanding increasing international scrutiny. Our research sheds some light on PAs in New Zealand, the implications for the industry, and what you can do to help reduce their presence in New Zealand honey.

The industry—including Apiculture New Zealand (ApiNZ) and previously the Bee Products Standards Council, in conjunction with the Ministry for Primary Industries (MPI)—has been researching the presence of PAs in NZ honey for some years.

It is important work. There are valid concerns over PAs; like tutin, they are natural toxins that can be present in honey and therefore show up in testing. It's vital that we as an industry understand the issue and arm ourselves with science-based knowledge, particularly against a backdrop where testing in some key export markets has revealed high levels of PAs in some New Zealand honeys.

In recent years our research has been led by the ApiNZ Standards, Compliance and Regulatory Focus Group, chaired by Tony Wright, in partnership with Wymond Symes and Jane Lancaster of Catalyst® Ltd. It's been made possible with funding assistance from the Sustainable Farming Fund.

The research provides our producers, exporters and hobbyists with more knowledge about PAs and some perspective on their potential risks and impact on our industry. It also enables us to pass on some practical advice to our producers to help reduce PA levels in their honey.

SOME BACKGROUND

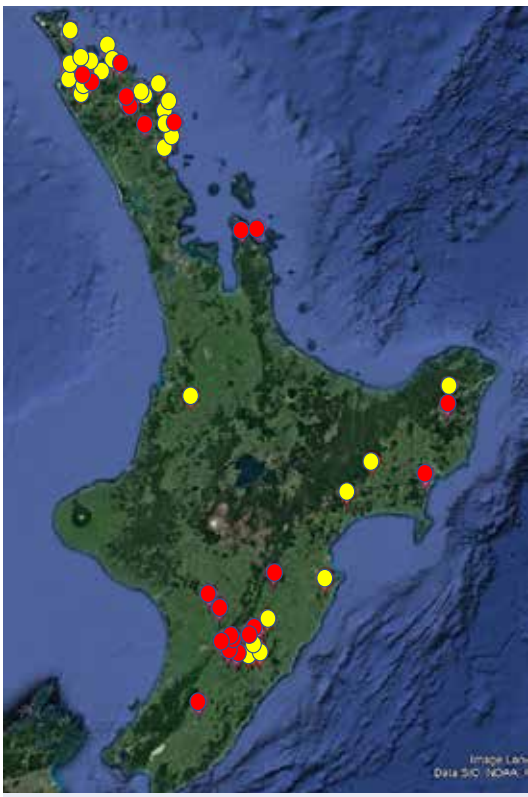
Pyrrolizidine alkaloids are a naturally occurring toxin produced by some plants, most likely as a defence against herbivores.

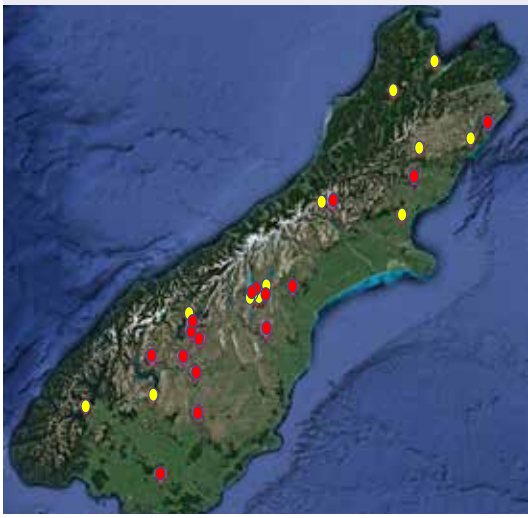
As honey is a food source gathered from nature, PAs make their way into honey through bees collecting nectar and pollen from plants that produce PAs. **Of course, this isn't unique to New Zealand—it's a global phenomenon, as plants containing PAs are found all over the world.**

The issue for New Zealand producers is that many of the plants containing PAs are widespread in New Zealand and there is a potential concern where PAs at very high levels are consumed over a long period of time. That said, it is important to note that our own Food Standards Australia New Zealand (FSANZ) and MPI stress there is no evidence to date of harm to humans from PAs in honey.

INTERNATIONAL RISK ASSESSMENT

Codex Alimentarius, the international body that sets the rules for the international food trade, is currently undertaking a PA risk-assessment programme across a range of foods—but at present, as Nick Fletcher, FSANZ Principal Toxicologist says, **"there are no set international levels for honey, as there is no evidence PAs in honey cause harm to humans. But if producers can reduce the level of PA compounds in our honey, so much the better".**





PAs are found in honey across New Zealand, but higher PA honeys seem more prevalent in these areas. Yellow spot = 100-249µg/kg; pink spot >250µg/kg PAs. Maps supplied.

Tony Wright agrees. "If we can keep the occurrence of PAs reasonable, we'll remove the need for New Zealand to be regulated and that's a good thing. But if we can't control the environment and if we're known to be a high source of PAs, that's when we'll see regulation."

Our research keeps New Zealand ahead of the game. It gives us an opportunity to play a leading role, providing science-based information, influencing

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Right: Abundant fireweed on a cleared forestry block on the East Cape. Photo: Wymond Symes.

any standards setting, and ensuring our honey can be freely exported. We'll also have the research knowledge to address competitor or market misinformation about the risks posed by PAs.

Karin Kos, CEO of ApiNZ, is pleased at the proactive approach taken by industry. "We've been looking at the PA issue for some time, and it's important that we compile good research and science to share with the industry, which in turn helps our producers make informed decisions. This is ongoing—and similar to tutin—as we learn more, we'll share it. It's a very positive industry/science/government initiative."

THE PA RESEARCH: WHAT YOU SHOULD KNOW

The research focuses primarily on two things:

1. Understanding the PA levels in our honey, and the types of PAs that are showing up.
2. Linking this to specific plant PA profiles to identify the potential botanical sources of PAs in New Zealand.

PA levels and higher-risk areas

PAs occur in honeys produced throughout New Zealand, and whilst PA profiles and levels vary, the pattern is consistent.

Research over a number of years shows that about 90% of NZ honey has PA levels under 100 µg/kg with almost 70% under 20 µg/kg honey.

Of the remaining 10%, there are 'hot spot' regions that appear to have a higher prevalence and concentration of PAs; these include:

- Northland and the Coromandel
- East Cape down to Wairoa
- Wairarapa
- inland parts of the South Island (from Marlborough down to central Otago).

You can find more detail about concentrations of PAs around the country at www.apinz.org.nz/pas/

Botanical sources

The research identified approximately 20 different plant species that are a botanical source of PAs in New Zealand. They come from these three families:

- *Asteraceae* (e.g., *Senecio* weeds like ragwort, Australian fireweed, groundsel, gravel groundsel, American fireweed)
- *Boraginaceae* (e.g., comfrey, honeywort, gromwell, hemp-agrimony, forget-me-not, common borage, *Echium* species like viper's bugloss, Paterson's curse)
- *Apocynaceae* (e.g., *Parsonsia* vines like New Zealand jasmine)

Plants and weeds from these families are common in foraging zones around New Zealand apiaries. There's a comprehensive glossary of plant species, detailed images, habitats, flowering times and common locations, at www.apinz.org.nz/pas/

Connection with forestry

There's strong evidence that high levels of PAs found in some honey samples relate to recent logging activity and forestry felling sites. Cleared ground, such as burnt scrub land or forestry, or milled forestry, poses a high risk. In certain areas, Australian fireweed in particular will densely colonise this land within six months and predominate for a number of years after felling.

Broadly speaking, habitats higher in risk include:

- forestry blocks felled in the past five years
- burnt, cleared or barren land that is hospitable to *Senecio* weeds
- pasture contaminated with *Senecio* weeds, particularly ragwort or gravel groundsel
- bush margins containing *Parsonsia* vines
- wild or cultivated herb fields or gardens containing borage and comfrey
- habitats with plentiful *Echium* species (viper's bugloss, Paterson's curse).

Detailed information on the various types of PA, and plant species containing them, is available at www.apinz.org.nz/pas/

HOUSTON, DO WE HAVE A PA PROBLEM?

The short answer is no, not with honey. Dr Andrew Pearson, Food Risk Assessment Manager at New Zealand Food Safety elaborates. **"When we consider lifetime patterns of honey consumption, PAs are not considered a risk for general NZ consumers."**

Tony Wright, Chair of the ApiNZ Standards Focus Group, encourages a common sense approach, so we can reduce any potential problem. "The research bears out that the occurrence of PAs in honey from a health perspective isn't a problem—but we know they're potentially harmful, so let's reduce them wherever possible".

Tony says ApiNZ's strategy is to be realistic about the risk, but empower producers to take action at source.

WHAT CAN YOU DO TO REDUCE PA RISK?

Familiarise yourself with the plants and weeds around your hives and foraging areas. If they are high potential PA sources, remove or avoid them if possible. If that's not possible, then avoid flowering periods.

Check the Risk Management flow diagram at www.apinz.org.nz/pas/ so you understand the source of your honey and avoid high-risk areas if possible.

It's unlikely that we can eliminate PAs entirely from our supply chain but bringing levels down as low as possible is the best outcome to provide certainty for consumers, and stability for our high-value export markets.