Breeding for medical-grade honey

Understanding the heritability of bioactive ingredients for Australian Manuka honey will help focus breeding programs for honey bee farm establishment.

CRCHBP
FOR HONEY BEE PRODUCTS

Australian Manuka honey is produced from a variety of *Leptospermum* species. These medical-grade honeys have antimicrobial properties that fight against a diverse range of yeast and bacteria, including multidrug-resistant bacteria.

To be classed as medical-grade, honey must contain bioactive ingredients that do not degrade when irradiated for sterilization purposes, or when in contact with enzymes in the human body. Australian Manuka honey contains a specific chemical compound dihydroxyacetone (DHA). When naturally aged, DHA converts to methylglyoxal (MGO). MGO provides the antimicrobial properties Australian Manuka honey is famous for.

DHA is produced in the nectar of some *Leptospermum* species flowers. This special honey is formed when nectar is collected by honey bees and concentrated into the honeycomb for maturing. Reliable, quick and easy identification of *Leptospermum* plants that contain high levels of DHA is vital to build Australia's medical-grade honey industry.

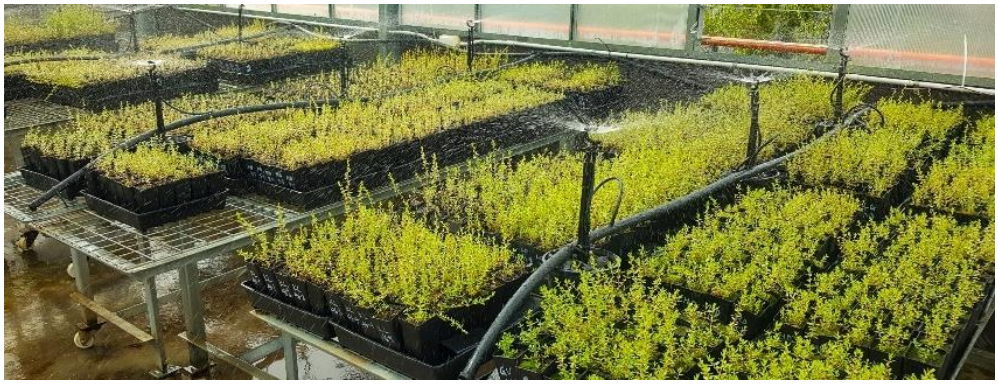
bioactive honey

breeding

chemical analysis

Leptospermum plants with high levels of DHA that naturally mature to the active ingredient MGO are highly sought after for Manuka honey farms.

As honey bees prefer sucrose-dominating nectars, knowing the identity of nectar sugars is also important to appreciate the attractiveness of the nectar to honey bees.



A genetic experiment garden containing *L. scoparium* plants from seed collected across Tasmania.

CRC for Honey Bee Products researchers studied and identified the heritable genetic traits in *Leptospermum scoparium*. The research aimed to better understand whether *L. scoparium* plants that produce high levels of DHA and nectar sugars can successfully be domesticated to improve the economic viability of commercial medical-grade honey farming in Australia.

Understanding whether *Leptospermum* growth rate, flowering and nectar production (including DHA and sugars) are under genetic control is critical to achieving economic benefit.

High DHA-producing plants are linked to early and profuse flowering, characteristics that are carried through when selected and bred as they are genetically controlled.

A new nectar analysis method to detect and quantify DHA and sugars in *Leptospermum* was developed. This analytical method was used to measure DHA and sugar concentrations in thousands of *L. scoparium* plants, as well as agronomic traits such as plant survival, flowering density and duration.

The research also revealed significant differences in the traits between *L. scoparium* populations in Tasmania. It determined that region, climate and environment played a role in driving genetic differences, with high levels of DHA generally found in the western half of Tasmania.

The research showed that DHA is a heritable trait, and one that can be positively selected for in breeding programs. This was not true for the sugars in the nectar, where environmental conditions have the greater influence.

Plant growth and flowering timing and intensity can also be selected for proving that the farming of Australian Manuka would benefit from a breeding program.

The *L. scoparium* experimental garden PhD student Chris Wellington established at Douglas River, Tasmania.

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