Department of Primary Industries and Regional Development

GOVERNMENT OF WESTERN AUSTRALIA

ChemCentre EXPERT SOLUTIONS

FOOD RESOURCE DIFFERENCES ON THE BODY COMPOSITION OF EMERGING BEES

Madlen Kratz[1], Dominique Blache[1], Rob Manning[2], Kenneth Dods[3], Boris Baer[4]

University of Western Australia[1], Independent Consultant[2], ChemCentre[3], CIBER - University of California[4]

Introduction

Colony performance is maximized when honey bees are provided with adequate nutrition. This includes a good source of protein, which is crucial for continuous brood rearing (Herbert et al. 1977). So far however, it is not well understood whether natural food sources that honey bees are raised on influence bee health later in life, such as lifespan and possibly also foraging ability.

In WA, where it is common practice that bees get shifted from one nectar flow or site to the next, it is especially important to understand the dietary implications of different flora on bee health and performance. If not detected early, brood rearing will diminish, honey bees will starve and whole colonies may be lost. When food sources are scarce, honey bees also become more susceptible to disease (Alaux et al. 2010). Here we test the effects of a variety of commercially important honey and pollen sources (Jarrah, Redgum, Coastal and Canola) on the body composition of emerging bees.

Materials and Methods

The experiment consisted of four groups of bees (with 10 replicate colonies each), which were fed Jarrah, Redgum, Coastal and Canola honey and pollen in the field (Figure3.)

1 kg packages of bees were placed (shaken in) into four frame nucleus hives at the beginning of September 2017 with sister queen bees. In each nucleus hives there were two frames of honey and pollen from the four food groups (previously collected from apiary sites), one drawn comb and one frame of foundation (Figure1.A). These nucleus hives were monitored for 6 weeks near Perth and measured weekly for foraging activity, brood expansion, pollen collection using pollen traps (Figure1.B), hive weight and food consumption (Figure1.C). Nosema and emerging bee (Figure2.) samples were also taken for later laboratory analysis. After 6 weeks, the beehives were taken 2.5 hours south of Perth to an Avocado orchard and placed alongside a row of mature fruiting avocado trees. All of the previous measurements were continued over a further 6 week period. Following the field work, frames of hatching bees from each of the four food groups were taken to the University of Western Australia, hatched out and used in longevity experiments for a further period of several weeks.

Figure 1: Nucleus hive setup (A) Nucleus hive with pollen trap (B) Bees consuming the pollen patty provided (C).

Figure 2: Emerging bee collection.

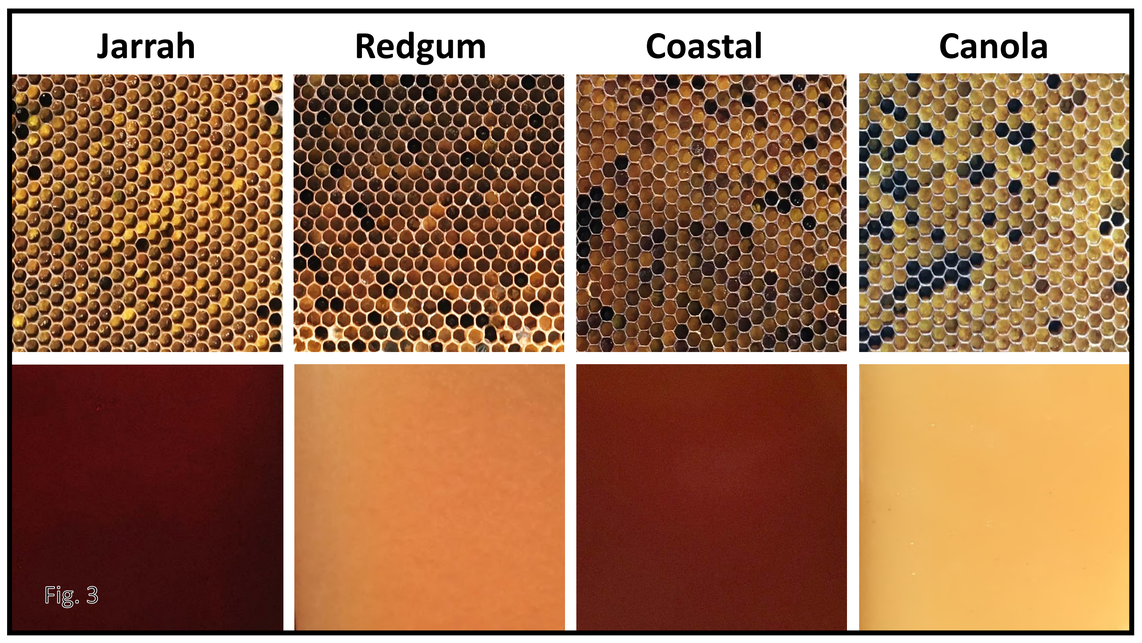

Figure 3: Pollen (bee bread) and honey sources that bees had access to from each of the treatment groups.

Summary

- Honey bees thrive if their nutritional requirements are met. However, if nutritional deficiencies persist the health of the colony will endure from reduced brood rearing capacity, longevity and foraging ability.
- Being aware of the effects of specific food sources already at the larval stage, will allow beekeepers to make more informed decisions about site selection and supplementary feeding of colonies (if required).
- Better management practices will allow for maximum honey bee health, consequently making it possible for beekeepers to meet economic demands.

Acknowledgements

Funding for this project was provided by The Department of Primary Industries and Regional Development as part of their **Grower Groups Research and Development Grants Program - Round 2 — GGRD2 2016-1700179 — INDUSTRY STANDARDS OPTIMISING STORAGE AND SUPPLY VOLUME OF WA MONO-FLORAL HONEY**.

We acknowledge the following people for their financial support and assistance: Stephen Davies, Mark Rhodes, Colin Fleay, Dave Leyland Michael Bellman, Neil Delroy, Giorgos Lykogiannis and Nadja Kratz and Dominic Lake for their assistance with sample processing and field work preparation.

References

Herbert EW, Shimanuki H, Caron DM.1977. Optimum protein levels required by honeybees (Hymenoptera, Apidae) to initiate and maintain brood rearing. Apidologie, 8:141–146.

Alaux C, Ducloz F, Crauser D, Le Conte Y. 2010. Diet effects on honeybee immunocompetence. Biology Letters, 6(4):562-565.

CIBER CENTRE FOR INTEGRATIVE BEE RESEARCH

THE UNIVERSITY OF WESTERN AUSTRALIA

BICWA BEE INDUSTRY COUNCIL OF WESTERN AUSTRALIA

WAFARMERS