IECHo 2025 Conference

The 2nd International Electronic Conference on Horticulturae

27–29 May 2025 | Online

MDPI

Formulation and characterisation of horticultural crops based pollen and nectar food substitutes for bees and to conserve their wellbeing during dearth periods

Jadala Shankaraswamy

College of horticulture, Mojerla, Sri Konda Laxman Telangana Horticultural University, Telangana, India

shankara.swamy@gmail.com

INTRODUCTION & AIM

Changing temperature regimes diminish floral resources availability and disrupt the honeybees foraging leading to mismatch between the time for pollen and nectar availability causing nutritional stress and colony collapse disorders has significant negative impacts on beekeeping industry. The present study proposes creating natural mimicking pollen and nectar substitutes from readily available horticultural crops like seabuckthorn fruits, banana fruit pulp and peel extract, sweet potato and yam starch to supplement honeybee diet during dearth period to improve nutrition, reduce stress on colonies, mitigate the risk of colony collapse disorders and promote sustainable bee keeping practices relying on horticultural crops ingredients rich in essential nutrients for honeybees.

METHOD

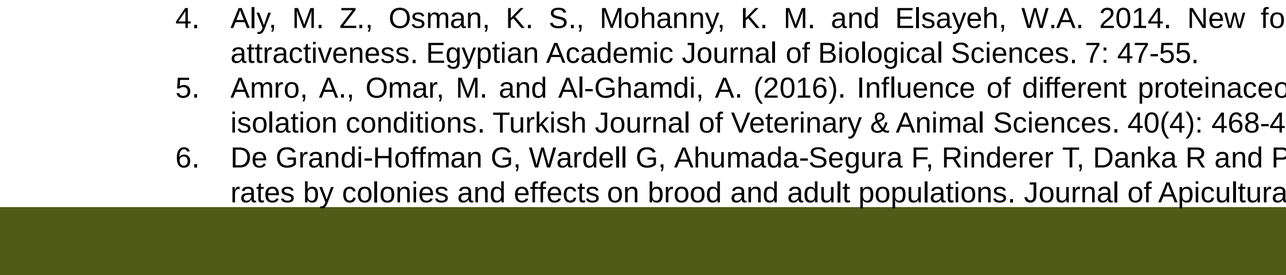
Eutectic solvent based extraction of seabuckthorn fruits

Formulated pollen

Starch extraction from yam and sweet potato

Liquefaction of banana pulp and peel and seabuckthorn based extraction

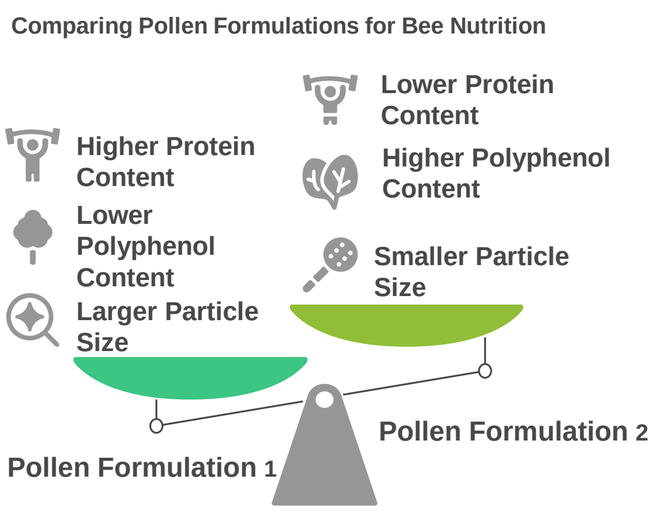
Nectar

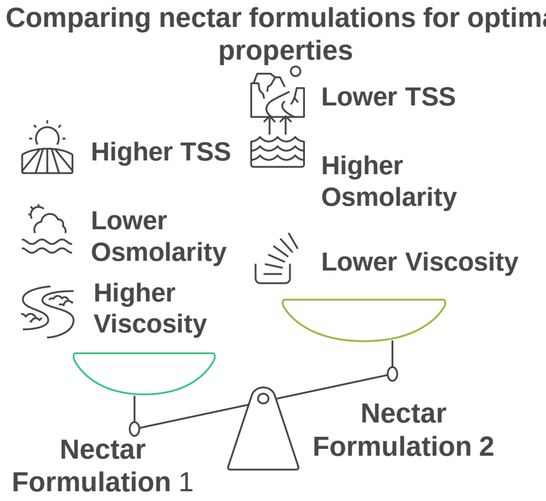


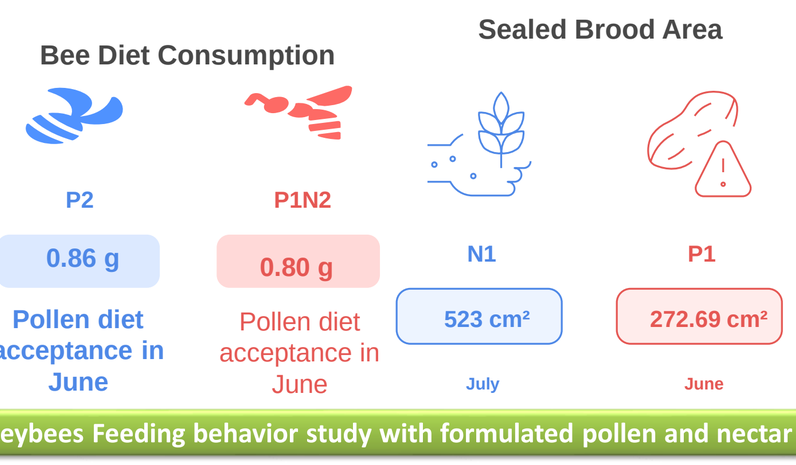
Feeding beghaviour study of honey bees with naturally mimicking pollen and nectar formulation

Before experimenting, all the colonies were equalized based on the following parameters viz., total brood area (open and capped), unripe (unsealed), ripe (sealed) honey stores, and bee strength (number of frames covered with bees). *Apis mellifera* colonies were equalized to have 8 bee-frame strength and any pollen containing combs were removed from these colonies. The data interpreted with Pair-wise comparison

RESULTS & DISCUSSION







All pollen formulations have specific glow happened at wavelength between 455 nm and 525 nm indicates they are in blue and green range that they are similar to real pollen which is very important for health of honeybees during dearth period

Honeybees Feeding behavior study with formulated pollen and nectar substitutes

CONCLUSION

The analysis of nectar formulations N1 and N2 reveals distinct differences in their physical properties and amino acid profiles. Both nectar formulations, pollen formulations P1 and P2, contain a total of 17 amino acids, with aspartic acid being the most prevalent in both formulations. This commonality suggests a potential nutritional benefit associated with the consumption of these nectars. N1 exhibits higher viscosity and lysine content, while N2 has a lower viscosity but higher osmolarity and total sugars, with aspartic acid being the most abundant amino acid. In conclusion, the study highlights the nutritional profiles and consumption patterns of various pollen and nectar formulations, demonstrating that both P2 and N1 significantly mimic natural substitutes, thereby enhancing dietary options for *A. mellifera* bees. The findings underscore the potential of these formulations to support bee health and productivity, particularly through targeted dietary strategies during unavailability of floral resources

FUTURE WORK / REFERENCES

These findings may guide future research and development in the formulation of nutritionally beneficial nectar and also should focus on understanding the long-term effects of formulated diet on honey bee colonies resilience during season high and low temperature and with limited flowering resources of different geographical regions of country

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