OP-253 [Beekeeping Technology and Quality]
Establishment and Evaluation of Cooling Shelter for Protecting Honeybee Colonies During Summer Season Under Abu Dhabi Emirate Conditions

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Maintaining honeybee colonies in arid area poses significant challenges due to harsh weather condition and limited floral resources. To address these challenges, Abu Dhabi Agriculture and Food safety Authority (ADAFSA) had developed and evaluated a cooling shelter constructed using date palm fronds, recycling irrigation system materials, and shade nets, integrated with a cooling system that operated for 30 minutes every two hours from 9:00 am to 5:00 pm. This study assessed the shelter's efficacy in mitigating UAE summer condition in two periods, June - September 2020 and 2021. The assessment was conducting by monitoring 69 colonies distributed in three groups (five-frame, three-frame, and control) in agricultural cropland. Each beehives group were approximately the same workers population, and each colony had a new mated queen. The control colonies were divided in two groups; three colonies with five-frames and three colonies with three-frames kept under trees shadow. All the colonies were fed weekly sugar syrup and pollen powder. Temperature differential, brood development, queen egg-laying efficiency, and honey production were recorded. The result demonstrated that the cooling shelter aided in 4-5oC in temperature reduction. Colony strength were improved dramatically in 2020, as five-frame colonies showed an increase in the number of brood as they expanded from two to six broods' frames, while three-frames colonies reached four frames. However, the colonies performance in 2021 experienced a decline due to the bee eater attacks which also increased the colony loss from 7.1% in 2020 to 17.2%. Lastly, Sider honey production yield varied by location, in 2020, 24 colonies across three sites in dry area (Al Ain area) yielded in average of 3.37 kg/site, whereas nine colonies in one site in wet area (Al Wathbah area) averaged 6.1 kg in 2021. In conclusion, the performance of the cooling shelter had enhanced the queen activity, colony survival and honey yield production achieving the primary goal of protecting bees from high temperatures conditions in arid area.

هيئة أبوظبي للزراعة والسلامة الغذائية
ABU DHABI AGRICULTURE AND FOOD SAFETY AUTHORITY

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Applied research and capacity building – ADAFSA

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Introduction

- Honeybee play a vital role in preserving biodiversity by pollinating more than 75% of flowering crops and plants.
- Maintaining honeybee colonies in arid area poses significant challenges due to harsh weather condition and limited floral resources.
- In the UAE, extreme summer climate causes high colony losses due to heat and lack of nectar/pollen.
- As a practices, some beekeepers usually use shade cloth to protect their colonies, and they avoid placing them directly on sand to reduce the reflected heat and moisture seepage.
- Abu Dhabi Agriculture and Food safety Authority (ADAFSA) had developed a cooling shelter constructed from agricultural recycling materials.

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The main challenges

Temperature

- Colony losses during the hot summer.

Flora Resources

- Scarcity of nectar and pollen sources.

Bee-eaters

- Protecting colonies from bee-eater bird attacks.

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Honey seasons in UAE

March April May June July August September October Novmber December

Ghaf

Prosopis cineraria

Samar

Acacia tortilis

Mangrove

Avicennia marina

Sidr

Ziziphus spina christi

Damas

Conocarpus lancifolius,C erectus

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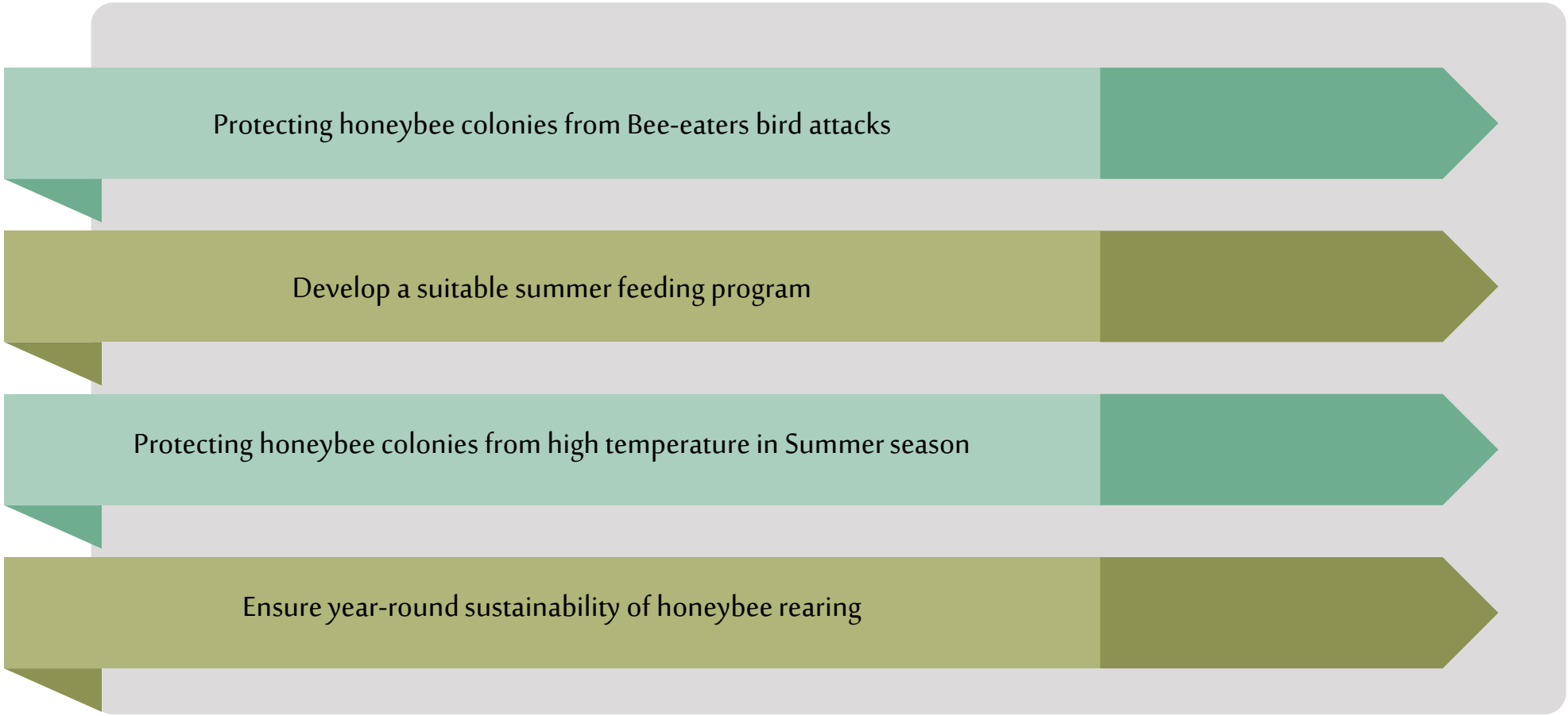
Objective



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Methodology

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Shelter Construction steps

1	Palm fronds used for structure, covered with green mesh.
2	Topped with used irrigation pipes and drippers (recycle irrigation equipment) .
3	Openings for bee flight (entrance, side vents, top gaps).
4	Water tank with ½ horsepower pump.
5	Automated watering: every 2 hours for 30 minutes, from 9 a.m. to 5 p.m

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Experiment period and details

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Location	Year	# of bee Colony in Cooling shelter		# of bee Colony in Control (under trees shadow)		Total
		5-frame hive	3-frame hive	5-frame hive	3-frame hive	
Farms area in Al Ain	2020	15	13	3	3	34
Al-Salamat Research Station	2021	15	14	3	3	35

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Feeding Protocol

Sugar Feeding	• 500 ml sugar syrup per hive weekly • Weekly consumption measured before each feeding
Protein Feeding	• **5-frame colonies:** ~90 g pollen (ground pollen grains) weekly. • **3-frame colonies:** ~45 g pollen (ground pollen grains) weekly. • Consumption measured 3 days after feeding.

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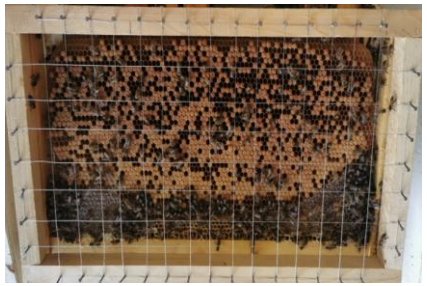
Measurements & Evaluation

Queen Egg-Laying Efficiency	100-cell grid counts
Brood Area	Measured every 21 days using a square-inch frame
Stored Pollen & Honey	Measured in square inches
Temperature	Digital thermometers inside and outside the shelter; recorded three times daily, three days per week



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Result

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Result

Temperature	• Cooling Shelter has successfully reduced the internal temperature by about 4–5 ◦C during June–September (2020 & 2021). • Internal temp. was around 37 ◦C to 38 ◦C while external temp. was between 42 ◦C to 45 ◦C.
Colony loss	• 2020 colony loss: 1 control and 2 experimental colonies (3-frame) demonstrated a loss with ~7.1%. • 2021 colony loss: showed a higher percentage in loss within the experimental colonies (3-frame) due to bee-eater attacks (~17.2% loss)

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Result

Five-Frame Honeybee Colonies (Experimental vs. Control)				
Year	**# of colonies**	**Initial frame type**	**End result**	**% of change**
2020	15	2 brood frame	5-6	150-200 %
		1 honey frame	2	100 %
		1 pollen frame	1-2	0-100 %
2021	15	2 brood frame	3	80 %
		1 honey & pollen frame	1	50 %
		0 pollen frame	1	50 %

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Result

Three-Frame Honeybee Colonies (Experimental vs. Control)				
Year	**# of colonies**	**Initial frame type**	**End result**	**% of change**
2020	13	2 brood frame	3-4	50-100 %
		1 honey & pollen frame	1	50-100 %
		0 pollen frame	1	100 %
2021	14	2 brood frame	0.5 - 1	30-50 %
		1 honey & pollen frame	1	0 %
		0 pollen frame	0	0 %

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Result

Honey Production				
Year	**Total # of colonies**	**Distributed area**	**# of Colonies**	**Average honey/hive**
2020	24	Al Maqam	7	2 Kg
		Al Shuwaib	7	2.45 kg
		Al kuwaitat	10	4.6 Kg
2021	9	Al Wathba	9	6.1 Kg

Emirati honeybee colonies produced good quantities of Sidr honey under the cooling-shelter system

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Conclusion

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Conclusion

- ADAFSA had succeeded inestablishing a low cost cooling shelter .
- Cooling shelter had enhanced the queen activity, colony survival and honey yield production after summer season.
- The feeding protocol played a role in colony survival.
- Honeybee colonies under the colling shelter produce a sufficient honey quantity in the next season, Sider honey.
- Select sites where bee-eater birds are fewer.

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THANKS BEE-ING HERE

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