Chapter 39

Honeybee Fauna in Mahakali Zone and their Ayurvedic Relations

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Eight species of honeybee are described in Ayurveda, the science of traditional medicine. According to Ayurvedic experts these species, found in the Himalayas, have differing medical values although no scientific work has yet been carried on this aspect. Their Sanskrit names are Makchhika, Kschudra, Chhatra, Bhramara, Pouttika, Aoudalaka, Arghya and Dala. The present study was carried out to survey honeybee species and identify them in Ayurvedic terms.

Materials and Methods

Collection of bees and honey

Four species of honeybee were collected from 14 sites in the districts of Darchula, Dadeldhura, and Kanchanpur in the Mahakali zone of Nepal. They were *Apis cerana, A. dorsata, A. florea* and *Trigona* sp. The medical value of these bees was traced from Ayurvedic texts (Charak, n.d.; Sen and Sen, 1346; Sushruta, 1827), and local knowledge was collected with a simple questionnaire.

Samples of honey were collected. Temperature, altitude, humidity, rainfall and surrounding flora was also noted as they can affect the quality of honey. To collect honey of *A. cerana* (nine samples) and *A. dorsata* (six samples), hives was smoked to evacuate the bees and then cut open with a knife. The honey was squeezed into a sterile collecting jar. Honey of *A. florea* (two samples) was collected without using smoke. The hive was cut open and the honey squeezed into a plastic bucket before being transferred to a sterile collecting jar leaving behind particles of nest, leaves and larvae. The honey of *Trigona* sp. (two samples) was collected with bare hands from holes in a dry tree and transferred to a collecting jar.

Collection of bee flora

Sixty-five samples of flora were collected from within 500 m of the hives. The flora were identified by the Central Department of Botany.

Microbial test

As honey is described as of great value in skin infections, wounds and fever, samples were collected for microbial testing against two bacteria species, *Staphyllococcus aureus* and *Salmonella typhi*. The microbial test was done after Hugo and Russel (1984). Mueller Hinton agar medium was used for culture of the pathogens. Unprocessed honey was used. Honey solutions were prepared in four concentrations by volume: 50%, 20%, 10% and 5%. Distilled water was used

as the solvent. Culture plates were treated with honey after Efem *et al.* (1992), and then incubated at 37°C for 24 hr. The plates were observed for zones of inhibition.

Results

Honeybee fauna and their Ayurvedic names

Four species of honeybee were identified and matched with their Ayurvedic name (Table 1).

Honeybee species and surrounding flora

Bee species collected and surrounding ecology are noted in Table 2.

Honeybees collected and their medical relations

Medical importance of honey was gathered from Ayurvedic texts: Charak (a traditional book), Sen and Sen (1346), Shaligram (1897) and Sushruta (a traditional book). Local knowledge was also collected (Table 3).

Microbial test

After 24 hr, the incubated plates were observed for zones of inhibition (Tables 4 and 5).

All honey samples showed high antimicrobial activity at 50% concentration against *S. aureus;* the highest (16.75) by honey of *A. dorsata.* As the concentration was lowered, the activity gradually decreased. At 5% concentration all samples showed a negative response. For honey of *A. cerana,* samples collected from Darchula showed the greater zone of inhibition (15).

Honey of *A. florea* showed the highest zone of inhibition (12.75 at 50% concentration) against *S. typhi.* This honey showed a positive response even at 5% concentration. Honey of *A. dorsata* also showed a strong effect. Honey of *A. florea* was similar to that of *A. cerana* from Darchula.

Discussion

Honeybee fauna

Ayurvedic experts describe eight types of honeybee. However, identification is limited to traditional names. During this study, four species have been matched to Ayurvedic nomenclature (Table 1). Also *Bombus* spp. can be compared to Bhramara in Ayurveda. *Ceratina* spp. are called Bhramara by local people, but their characteristics do not match the Bhramara described in Ayurveda. Three types have not been identified yet although they have great medicinal value: Aoudalaka is good against infectious wounds; Arghya is good for eye and throat infections; and, Dala stimulates bile production and is good for vomiting. Attempts are being made to trace them. *Apis cerana* was found at all sites and showed slight variations. *Apis dorsata* also showed some variation. This could account for different Ayurvedic types.

Honeybee flora and quality of honey

There was some variation in bee flora at different sites and considerable variation with respect to season. In Ayurveda it is clearly explained that the quality of honey varies with respect to honeybee species. Sushruta (1827) mentions seasonal variation in the medical effect of honey of different species. This could be due to flora they visit.

Antimicrobial effects of honey

Considerable work has also been carried out in relation to the use of honey for wounds.

Table 1. Bee species recorded

Bee species	Local name	Ayurvedic name	No. of bees / hive
Apis cerana	Ghar mahuri	Makchhika	500–2000
Apis dorsata	Bheri, ghar mahuri Chhatra	–	5000–8000
Apis florea	Kathori	Kschudra	500–1000
Trigona sp.	Puttunga	Pouttika	2000–5000

Table 2. Bee species collected and site information

Bee species	Collection site	Hive type	Temp. (°C)	Altitude (m)	Surrounding flora
Darchula					
A. cerana	Sipti	Log hive	20	2200	*Brassica* spp., *Bassia* spp., *Citrus* spp., *Psidium guajava*, *Syzygium cumini*
A. cerana	Gokuleswor	Wall hive	30	1000	*Mangifera indica*, *Psidium guajava*, *Brassica* spp.,
A. cerana	Guljar	Wall hive	28	1800	*Musa* spp., *Brassica* spp., *Ficus religiosa*, *Raphanus sativus*
A. dorsata	Gokuleswor	Branch of mango tree	30	1000	*Mangifera indica*, *Musa sapientum*, *Zizyphus jujuba*
A. florea	Gokuleswor	Branch of *Woodfordia fruticosa* and *Pinus roxburghii*	30	1000	*Pinus* spp.,*Shorea robusta*, *Acacia catechu*,*Dalburgia sissoo*, *Mangifera indica*, *Zanthoxylum armantum*, *Trifolium repens*
Trigona sp.	Gokuleswor	Crack of tree	30	1000	*Musa* spp., *Psidium guajava*, *Carica papaya*, *Musa* spp., *Mangifera indica*, *Cedrela* spp.
Trigona sp.	Lalinath	Crack of tree	28	1200	*Ficus religiosa*, *Ficus benghalensis*, *Brassica* spp., *Musa* spp., *Mangifera indica*, *Citrus aurantifolia*
Dadeldhura					
A. cerana	Jogbudha	Log hive	30	896	*Shorea robusta*, *Acacia* spp., *Mangifera indica*, *Psidium guajava*, *Musa* spp.
A. cerana	Rupal	Wall hive	25	1997	*Brassica* spp., *Malus domesticus*, *Citrus* spp., *Citrus aurantifolia*, *Zanthoxylum armentum*, *Rhododendron* spp., *Myrica esculanta*
A. cerana	Pokhara	Wall hive	28	1884	*Citrus* spp., *Brassica* spp., *Berberis* spp., *Woodfordia fruticosa*
A. dorsata	Jogbudha	Branch of *Dalbergia sissoo* and *Shorea robusta*	30	896	*Shorea robusta*, *Mangifera indica*, *Acacia* spp., *Berberis* spp., *Musa* spp., *Woodfordia fruticosa*
Kanchanpur					
A. cerena	Gobariya	Branch of fallen lemon tree	30	116	*Musa* spp., *Mangifera indica*, *Rosa sinensis*, *Psidium guajava* , *Dalbergia sissoo*, *Acacia catechu*, *Bassia* spp., *Shorea robusta* , *Hibiscus* spp.
A. cerena	Gobariya	Wall hive	30	116	*Musa* spp., *Shorea robusta*, *Dalbergia sissoo*, *Psidium guajava*, *Mangifera indica*, *Brassica* spp.
A. cerena	Belauri	Wall hive	30	186	*Shorea robusta*, *Dalbergia sissoo*, *Woodfordia fruticosa*, *Musa* spp.
A. dorsata	Mahendrangar	Hanging on the ceiling	30	116	*Ficus religiosa*, *Psidium guajava*, *Brassica* spp.
A. dorsata	Gaddachowki	Branch of *Dalbergia sissoo*	30	110	*Mangifera indica*, *Dalbergia sissoo*, *Shorea robusta*, *Bombax ceiba*
A. dorsata	Dodhara	Branch of *Dalbergia sissoo*	30	120	*Dalbergia sissoo and Shorea robusta*
A. florea	Suklaphanta	Branch of *Shorea robusta*	30	198	*Shorea robusta*, *Dalbergia sissoo*, *Acacia* spp., *Azadirachta indica*, *Ficus religiosa*, *F. bengalensis*, *Lotus*.
Trigona sp.	Jhalori	Inside hollow of dried tree	30	213	*Bassia* spp., *Musa* spp., *Helianthus annuus*, *Psidium guajava*, *Brassica* spp., *Raphanus sativus*

Leszczynska and Microslaw (1993) studied antibacterial properties of various types of honey against *S. aureus*, *S. dublin*, *S. agona*, *Escherichia colii* and *Pseudomonas aeruginosa*. They found different types of honey differed in antibacterial activity. Efem *et al.* (1992) studied the antimicrobial spectrum of honey and found moderate inhibition of *S. aureus* but only at 100% and 50% concentration. Gupta *et al.* (1992) found honey to be more effective than a mixture of ampicilin and honey in infected wounds of buffalo. In the present study, honey of *A. dorsata*

Table 3. Medical properties of honey from bee species collected

Bee species	Ayurvedic view	Local knowledge
Apis cerana	It cures jaundice, piles, cough, asthma, tuberculosis. It is also good for optic health. It also cures one of urinary disease. Honey produced by this bee is best quality.	Uncooked honey is effective for cough, fever, stomach pain and urinary disorder. It is also fed to women after delivery.
Apis dorsata	Good for helminth, dearrangement of blood produced by acidity (rakta-pitta), leucoderma, gonorrhoea, giddiness, etc. It also cures one of urinary disease (diabetes). A little difficult to digest.	Honey is used in diarrhoea and vomiting.
Apis florea	Cures urinary disease. It is also said to cure eye disease. Possesses same properties as *A. cerana* honey.	Honey is used in snake-bite, stomach pain and general headache.
Trigona sp.	Cures urinary disease, but gives burning feeling in case of overdose. It has some bad effects on nerves.	Honey is used in infections. Wax is particularly useful for sealing pots.

Table 4. Impact of honey on *Staphyllococcus aureus*

Honey samples	Mean zone of inhibitions at various concentrations			
	50%	20%	10%	5%
A. cerana [1]	7.75	+ve	+ve	-ve
A. cerana [2]	15	12.25	+ve	-ve
A. dorsata	16.75	13.25	+ve	-ve
A. florea	9.75	+ve	-ve	-ve
Trigona sp.	11.25	+ve	+ve	-ve

Note: 1 from Kanchanpur; 2 from Darchula.

Table 5. Impact of honey on *Salmonella typhi*

Honey samples	Mean zone of inhibitions at various concentrations			
	50%	20%	10%	5%
A. cerana [1]	9.75	+ve	+ve	-ve
A. cerana [2]	12	10.5	+ve	-ve
A. dorsata	9	+ve	9.25	-ve
A. florea	12.75	11.5	+ve	+ve
Trigona sp.	+ve	+ve	+ve	-ve

Note: 1 from Kanchanpur; 2 from Darchula.

showed the highest zone of inhibition and was positive even at 20% and 10% concentration. *Staphyllococcus aureus* infection is serious but treatment is a problem as this pathogen produces b-lactamase which destroys antibiotics (Hope *et al.*, 1996). Thus further study on treatment with honey of *A. dorsata* could be of great medical value. Honey of *A. florea* showed the highest zone of inhibition against *S. typhi*.

Floral variations also seem to have some effect upon antibacterial activity of honey. Honey of *A. cerana* from Kanchanpur and Darchula showed variation in the zone of inhibition for both *S. aureus* and *S. typhi*. This could be due to floral variation at the two sites. Further study on the effects of *A. cerana* honey could identify flora that increases antibacterial activity.

References

Charak. (Traditional book).

Efem, S.E.E. Udoh, K.T. and Iwra, C.I. 1992. The antimicrobial spectrum of honey and its clinical significance. *Infection*, **20** (4): 227–229.

Gupta, S.K., Singh, H., Varshney, A.C. and Prakash, P. 1992. Therapeutic efficacy of honey in infected wounds. *Indian J.Anm. Sci.* **62**(6): 521–523.

Hope, R.A., Longmore, J.M., Hodgells, T.J. and Ramrakha. 1996. *Oxford Handbook of Clinical Medicine*. Oxford Univ. Press.

Hugo and Russel (eds). 1984. *Pharmaceutical Microbiology*. 3rd ed.

Leszczynska, F.A. and Microslaw, A. 1993. Antibacterial properties of various types of honey. *Med. Weter*, **49**(9): 415–419.

Sen, D. N. and Sen, U.N. 1346. *Ayurveda Sangraha*. 9th ed. Shree Vinaya Krishna Chakrabarti (ed.). pp. 266–268.

Shaligram, L.D. 1897. *Shaligram Nighantu*. Khem Raj and Shree Krishna Charan (eds).

Sushruta. 1827. *Sushruta Sanhita*. Shreela Chandra Kant Bhattacharya (ed.).