



## EVALUATION OF INDIGENOUS HONEY BEE *APIS CERANA*- SRINAGAR (J&K) VS. COIMBATORE (TAMIL NADU)

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### ABSTRACT

This study provides a comparison of the economically important traits of honey bee *Apis cerana* from Srinagar and Coimbatore. The parameters of bee strength, brood rearing, honey production and pollen collection are compared. The results reveal that maximum bee population was found in Coimbatore during May (14678 bees) and the least (5090 bees) during August; the brood area was maximum (1508.96 cm<sup>2</sup>) (May) and the least of 150.1 cm<sup>2</sup> during September. The collection was at a maximum of 418.70 cm<sup>2</sup> in August and minimum of 26.13 cm<sup>2</sup> in March. The honey production was maximum (3644 g) in June and minimum in March (263.2 g). In comparison, at Srinagar maximum population (14058 bees) in May and minimum (3010 bees) in April; maximum brood area (2440.2 cm<sup>2</sup>) was in May which reached a minimum (10.4 cm<sup>2</sup>) in March. Here, the maximum pollen collection (425.22 cm<sup>2</sup>) was observed in May, reaching the low of 3.4 cm<sup>2</sup> in September. Similarly honey yield was maximum (1500.2 g) in May and was minimum (130.4 g) in August.

**Key words:** *Apis cerana*, Srinagar, Coimbatore, seasonal variations, comparison, brood area, honey production, pollen collection

The production of honey by the honey bee *Apis cerana* depends on many factors. The seasonal variations are very important. Foraging activity affects the colony population directly and it depends on seasons (Kumar et al., 2016; Mathu et al., 1985). Colonies get selected on their performance on the basis of bee strength, brood area, honey stores and pollen area for the studies on the selective breeding (RAU, 2004). Foraging activity of the worker bees is stimulated by various factors inside and outside the colony (Abou-shaara HF, 2014). During foraging, honey bees are exposed to an extensive range of ambient weather parameters which influence their competence in forage and alter the time of forage (Kovac et al., 2011). Bees do not hibernate, the activity of bee colonies is significantly affected by temperature fluctuations (Allen and Jeffree, 1956; Rashad, 1957; Moller, 1958; Hassanein and El-Banby, 1960a,b; Abd El-Fatah, 1983; Graham, 1999; Heinrich, 1996). Other important factors include complementary feeding (Free and Booth, 1961), seasons (Free and Racey, 1968), strength of worker bees, queen age and protection from diseases (Abdel-Latif and Aboul-Naga, 1975). Hence, the present study compares the seasonal variations with regard to *Apis cerana indica* from Srinagar (Jammu and Kashmir) and Coimbatore (Tamil Nadu).

### MATERIALS AND METHODS

Data on the performance of bee colonies was obtained at monthly intervals during March-September, 2018 at Srinagar, and March- September, 2017 at Coimbatore. Total numbers of frames covered by bees were taken as the strength of a colony. Bee population were calculated from the strength as described earlier. In each of the experimental colonies, area of worker and drone bees were measured separately using a grid frame. The number of squares counted was multiplied with a factor of 6.25 to convert the observations into cm<sup>2</sup>. Pollen stores were measured using grid frame and then observation was converted into cm<sup>2</sup>. Similar procedure was used to measure empty comb space (Verma, 1998). Honey stores were estimated with the help of grid frame. The number of squares covering honey area were covered into g by multiplying with a factor of 7.8 (considering that average ISI frame full of honey, contained 1000 g of honey) (Verma, 1990).

### RESULTS AND DISCUSSION

***Apis cerana* at Srinagar:** Performance of *A. cerana* colonies at Srinagar compared to that at Coimbatore is depicted in Table 1. These include bee population,

Table 1. Performance of *A. cerana* at Srinagar (J&K) and Coimbatore (Tamil Nadu)

Srinagar (March-September, 2018)		Colony number					Mean	SE(±)	CV
Months		SGR-1	SGR-2	SGR-3	SGR-4	SGR-5			
March	Bee population (no of bees)	5280	3016	7044	8880	8980	6640	816.18	25..52
	Total brood (cm <sup>2</sup> )	290.8	10.4	200.2	90.77	250.20	168.47	38..23	62..12
	Honey (g)	331.3	200.4	440.4	502	688	432.42	68..37	28..42
	Pollen (cm <sup>2</sup> )	30.18	6.20	40.19	150.22	75.80	60.51	15..38	65..27
April	Bee population (no of bees)	7081	3010	8880	7071	8090	6826.40	7324.34	26..48
	Total brood (cm <sup>2</sup> )	840	361.70	980.6	350.21	1570	820.50	182.71	59..20
	Honey (g)	520.71	230	480.2	371.2	840	488.42	108.37	51..30
	Pollen (cm <sup>2</sup> )	42.70	30.21	20.22	171	214.70	95.76	19.17	42..28
May	Bee population (no of bees)	7080	4072	8890	4464	14058	7712.8	1812.68	40.18
	Total brood (cm <sup>2</sup> )	1004.21	923.90	1492	180.4	2440.2	1208.14	305.62	76..34
	Honey (g)	620	190	650.2	680.2	712.4	570.56	119.16	42.66
	Pollen (cm <sup>2</sup> )	73.12	361.72	425.22	170.80	420	290.17	68.63	76.46
June	Bee population (no of bees)	8980	10667	7080	5042	8890	8131.8	1172..24	45.15
	Total brood (cm <sup>2</sup> )	765	500	198	90.73	470	404.74	112..30	24.60
	Honey (g)	1500..2	621	678	840.2	152	758.28	122..37	54.31
	Pollen (cm <sup>2</sup> )	45	16.71	70.00	9.31	40.0	36.20	218..32	89.88
Srinagar (March-September, 2018)		Colony number					Mean	SE(±)	CV
Months		SGR-1	SGR-2	SGR-3	SGR-4	SGR-5			
July	Bee population (no of bees)	8880	5280	6070	10670	7725.0	1813.6	46.13	
	Total brood (cm <sup>2</sup> )	740	1242	1242	865.0	1022.2	285.16	62.13	
	Honey (g)	610.3	341	1034.2	1034.7	755.05	173.11	52.48	
	Pollen (cm <sup>2</sup> )	106.21	62.65	84.90	16.10	67.46	24.26	46.34	
August	Bee population (no of bees)	8880	7081	6060	5054	8780	7171	1809.1	49.20
	Total brood (cm <sup>2</sup> )	1082.60	980.4	910.4	430.20	620.0	804.7	188.3	58.31
	Honey (g)	810.2	160.4	602.4	130.4	850.0	510.6	114.3	38.30
	Pollen (cm <sup>2</sup> )	221	130.22	90.70	18.71	52.22	102.57	21.30	43.65
September	Bee population (no of bees)			5042		5280	5161	668.2	18.36
	Total brood (cm <sup>2</sup> )	A*	A*	250.22	A*	170.18	210.2	61.30	79.24
	Honey (g)			923.6		371.4	647.5	123.19	59.39
	Pollen (cm <sup>2</sup> )			3.4		3.10	3.25	1.28	30.24
Coimbatore (March-September, 2017)		Colony number					Mean	SE(±)	CV
Months		COM-1	COM-2	COM-3	COM-4	COM-5			
March	Bee population (no of bees)	6180	4200	6270	2308	7530	5297.7	632.18	33.16
	Total brood (cm <sup>2</sup> )	450.2	278.6	176.6	200.7	340.9	289.4	46.38	69.33
	Honey (g)	263.2	389.3	289.3	102.8	458.4	300.6	62.14	34.12
	Pollen (cm <sup>2</sup> )	26.13	77.6.9	91.34	109.7	98.5	80.67	21.24	76.19
April	Bee population (no of bees)	8890	9678	10776	12774	10634	10550.4	1192.12	36.15
	Total brood (cm <sup>2</sup> )	930	760.3	969.9	1002.2	1092.6	951.0	191.19	64.61
	Honey (g)	754.5	678.9	923.7	1241.2	1058..4	931.34	146.18	72.26
	Pollen (cm <sup>2</sup> )	170.66	156.69	98.4	218.70	287.43	186.37	37.14	84.34
May	Bee population (no of bees)	9740	8976	12570	14678	13654	11923.6	1266.30	48.28
	Total brood (cm <sup>2</sup> )	1177.41	1026.64	1077.3	1176.1	15086.9	3908.8	338.65	78.54
	Honey (g)	878.4	792.4	1020.2	1344.9	1289.3	1065.0	224.80	44.12
	Pollen (cm <sup>2</sup> )	276.13	249.16	165.77	234.67	156.91	216.52	66.14	71.90
June	Bee population (no of bees)	8970	9678	8432	11641	10315	9807.2	1184.13	53.78
	Total brood (cm <sup>2</sup> )	860	765.9	832.3	1060.4	789.3	861.58	118.14	46.13
	Honey (g)	3644.7	387.8	420.6	520.4	770.1	1148.7	158.43	53.12
	Pollen (cm <sup>2</sup> )	270.21	244.24	212.8	392.71	367.41	297.47	46.20	78.19
Coimbatore (March-September, 2017)		Colony number					Mean	SE(±)	CV
Months		COM-1	COM-2	COM-3	COM-4	COM-5			
July	Bee population (no of bees)	9754		9274	7167	1073	6817	1134.1	48.13
	Total brood (cm <sup>2</sup> )	879		659	1356	1065.0	989.7	275.81	70.31
	Honey (g)	872.2		1397.2	1123.0	1023.9	1104.0	284.63	67.42
	Pollen (cm <sup>2</sup> )	76.20	A*	91.34	73.66	80..4	84.92	23.60	65.65
August	Bee population (no of bees)	5090		7065	11704		7953	918.12	30.16
	Total brood (cm <sup>2</sup> )	1020.78		967.32	1412.2	A*	1133.4	316.20	75.32
	Honey (g)	987.4		706.3	687.2		793.63	131.07	57.28
	Pollen (cm <sup>2</sup> )	170.66		98.4	418.70		229.25	61.37	72.60
September	Bee population (no of bees)	7099		8506	6420		7341.6	11129.2	46.24
	Total brood (cm <sup>2</sup> )	109.2		234.3	150.1	A*	164.53	42.72	86.14
	Honey (g)	787.4		1010.3	1240.4		1012.7	288.52	70.38
	Pollen (cm <sup>2</sup> )	71.3	A*	134.26	22.16		75.90	24.06	75.30

A\* -colony absconded; CV- Coefficient of Variance; SE (±)- Standard Error; +New swarm hived and hence difference in period of observation

total brood, and honey and pollen stores. These results reveal that in March, 2018, the population was 3016 which rose to a maximum of 8980 bees with increase in brood rearing activity. The brood area ranged between 10.4 (SGR-2) to 290.8 cm<sup>2</sup> (SGR-1). The variation in honey stores was from 200.4 to 688 g in (SGR-2) and (SGR-5), respectively. Pollen area was in the range of 30.18 to 150.22 cm<sup>2</sup>. Honey stores ranged from 230 to 520.71 g. Maximum and minimum amount of pollen area was 214.70 and 20.22 cm<sup>2</sup>. Such variations were observed with the monthly observations. Maximum population (14058 bees) in May and minimum (3010 bees) in April; maximum brood area (2440.2 cm<sup>2</sup>) was in May which reached a minimum (10.4 cm<sup>2</sup>) in March. Here, the maximum pollen collection (425.22 cm<sup>2</sup>) was observed in May, reaching the low of 3.4 cm<sup>2</sup> in September. Similarly honey yield was maximum (1500.2 g) in May and was minimum (130.4 g) in August. There was a reduction in bee population, brood area, honey stores and pollen stores during September.

***Apis cerana* at Coimbatore:** The observations depicted in Table 1 for the period March- September 2017 reveal that in March, 2017, bee population was in the range of 4200 to 7530. Brood area recorded was in the range of 176.6 (COM-3) to 450.2 cm<sup>2</sup> (COM-1). Honey stores were ranging between 102.8 (COM-4) to 458.4 g (COM-5). The pollen area recorded was from a minimum amount of 26.13 to a maximum of 109.7 cm<sup>2</sup>. The maximum value of coefficient of variation was observed for pollen store (CV=76.19) and minimum for bee population (CV=33.16). Such variations were observed in all the months. The results reveal that maximum bee population was found in Coimbatore during May (14678 bees) and the least (5090 bees) during August; the brood area was maximum (1508.96 cm<sup>2</sup>) (May) and the least of 150.1 cm<sup>2</sup> during September. The collection was at a maximum of 418.70 cm<sup>2</sup> in August and minimum of 26.13 cm<sup>2</sup> in March. The honey production was maximum (3644 g) in June and minimum in March (263.2 g).

Bee management for honey production depends upon understanding of bee biology and behavior (Ambrose, 1993). Ambrose (1993) observed that in *A. mellifera*, honey production increased over 150% when ratio of brood to bees goes down from 60 to 12%. In contrast in the present study it has been observed that there was no (significant) correlation between brood ratio and bee population at Srinagar (J&K) and Coimbatore (TN). These observations indicate that *A. cerana* did not follow the pattern found in *A. mellifera*.

The trend of brood rearing did not correspond to the increases or decreases in the bee population. Putten (1997) while describing the colony growth curves of *A. mellifera* found that in the third brood cycle, the queen produces maximum number of eggs and there is steady brood rearing with over 30000 cells with brood. The *A. cerana* colonies did not follow the pattern of growth curve described by Putten (1997). At Srinagar (J&K), the population peaked during April when there was no honey flow and declined by June-July when honey flow was available.

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