

Study On Seasonal Variation in Growth and Development of Stingless Bee (*Trigona iridipennis* Smith.)

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Abstract: The growth and development of *Trigona iridipennis* in terms of mean weight, increased gradually from first fortnight of August and reached maximum in second fortnight of September with mean of 4.53 per cent and found declined to an extent of 29.74 per cent in second fortnight of January, again colony weight was increased steadily and attained a mean growth of 35.54 per cent in second fortnight of July. The mean brood volume of tested colony declined from first fortnight of August to first fortnight of December to an extent of 57.09 per cent. Thereafter, brood volume increased to 139.25 per cent growth in second fortnight of June. Honey stores and number of honey pots declined in the colony from first to second fortnight of August, gradually attained to maximum in first fortnight of April which accounted 66.09 per cent growth. Further both components in the colony declined from second fortnight of April and reached to a minimum of 32.97 per cent in second fortnight of July. Pollen stores and pollen pots found greatly varied during the year with a major peak from first fortnight of March up to second fortnight of June which accounted an increased growth of 46.40 per cent. Both components declined from second fortnight of September to second fortnight of February registered a decline of 35.85 per cent in growth.

I. Introduction

Stingless bees are highly social insects living in dark nesting places like cavities in old walls, electrical switch/ meter boards, cracks and crevices, tree trunks and empty logs. They construct the brood including pollen and honey pots by using a mixture of wax, resin, propolis and mud, collectively called as “cerumen”. The colonies of *Trigona iridipennis* can survive themselves for years without artificial feeding and they will not desert their nest for many years (Wille, 1983). The information on seasonal variation with respect to weight, brood volume, honey and pollen stores in the colony of *Trigona iridipennis* is very much limited in India and other countries. Hence to bridge the research gap, study on seasonal variation in growth and development of stingless bee (*Trigona iridipennis* Smith.) was carried out at Regional Research Station, UAS, GKVK, Bengaluru.

II. Materials And Methods

The variation in growth and development of colony in different seasons was studied by recording weight of the colony, counting total number of food pots (pollen pots, honey pots) and brood cells at fortnightly interval in separately maintained two colonies. The data collected from two colonies were pooled and analyzed. The two colonies maintained in glass topped wooden boxes were weighed at fortnightly interval and weight was recorded. The length, breadth, height (volume) of food pots (honey pots and pollen pots) and brood cells of two colonies were measured at fortnightly interval. The total volume was computed and expressed in cubic centimeters (cm³). The total number of food pots and brood cells was calculated using following formula.

Total no. of brood cells= Total brood volume (cm³) X Number of brood cells in one cm³

Total no. of honey pots= Total volume of honey pots (cm³) X Number of honey pots in one cm³

Total no. of pollen pots= Total volume of pollen pots (cm³) X Number of pollen pots in one cm³

III. Results And Discussion

The growth and development of colony I and colony II in terms of weight, initially was 172.4 and 128.3 g respectively during first fortnight of August, gradually reached maximum of 179.62 and 131.4 g with an increased growth of 4.19 and 4.86 per cent respectively during second fortnight of September, thereafter development of colonies declined to a minimum of 124.40 and 94.11 g to the extent of 30.74 and 28.37 per cent by second fortnight of January in colony I and colony II respectively. Again a gradual increase in development of colonies observed from first fortnight of February and attained weight of 172.18 and 124.00 g with 38.41 and 31.76 per cent growth in colony I and II respectively by second fortnight of July (Table 1). The mean initial weight of both colonies also found increased from August first fortnight (148.85 g) to September second

fortnight (155.51 g) with an increased growth of 4.53 per cent. Thereafter, development declined to a minimum of 109.26 g accounting 29.74 per cent during second fortnight of January. Again a gradual increase in development was observed till the second fortnight of July (148.09 g) accounting 35.54 per cent increased growth. The gradual decrease and increase in weight of colony might be due to variation in presentation of floral rewards by flowering plants to foraging/field bees.

Table 1. Variation in weight of two colonies of *Trigona iridipennis* during different months at GKVK, Bengaluru.

Month/Fortnight	Weight (g)			Percent increase or decrease (+/-)		
	Colony I	Colony II	Mean	Colony I	Colony II	Mean
August I	172.40	128.30	148.85 ^{bc}	-	-	-
August II	174.70	127.00	150.85 ^b	+1.33	+1.36	+1.34
September I	177.80	129.50	153.65 ^a	+3.13	+3.35	+3.34
September II	179.62	131.40	155.51 ^a	+4.19	+4.86	+4.53
October I	161.56	123.67	142.62 ^{de}	-10.05	-5.88	-8.28
October II	160.68	119.58	140.13 ^e	-10.37	-8.99	-9.89
November I	158.00	115.49	136.75 ^{fg}	-12.04	-12.11	-12.06
November II	156.40	113.15	134.78 ^g	-12.92	-13.89	-13.33
December I	153.50	108.75	131.13 ^h	-14.59	-17.24	-15.68
December II	141.10	101.42	121.26 ^k	-21.44	-22.82	-20.10
January I	129.20	96.53	112.86 ⁿ	-28.07	-26.54	-27.43
January II	124.40	94.11	109.26 ^o	-30.74	-28.37	-29.74
February I	131.50	99.16	115.33 ^m	+5.71	+5.37	+05.55
February II	137.60	101.39	119.49 ^l	+10.61	+7.74	+09.36
March I	142.70	105.58	124.14 ^j	+14.71	+12.19	+13.62
March II	145.60	108.67	127.14 ^l	+17.04	+15.47	+16.36
April I	160.43	111.19	135.81 ^{fg}	+28.96	+18.15	+24.30
April II	163.52	113.21	138.37 ^{cd}	+31.44	+20.30	+26.64
May I	164.54	115.43	139.99 ^e	+32.26	+22.61	+28.13
May II	165.61	119.51	142.56 ^{de}	+33.13	+26.98	+30.48
June I	167.63	121.50	144.56 ^d	+34.75	+29.10	+32.31
June II	169.58	123.10	146.34 ^{cd}	+36.32	+30.80	+33.94
July I	171.13	123.50	147.32 ^c	+37.56	+31.23	+34.83
July II	172.18	124.00	148.09 ^c	+38.41	+31.76	+35.54

+ : Per cent increase over initial weight of the colony, - : Per cent decrease over maximum weight of the colony
Similar letters in superscript indicate non-significant difference

The development of colony in terms of brood volume and number of brood cells decreased from first fortnight of August (152.41 cm³ and 2757.09 cells) to first fortnight of December (65.40 cm³ and 1183.09 cells) registered a decline of 57.09 per cent. Again a moderate and continuous increase in brood volume was recorded from second fortnight of December (68.50 cm³ (1239.17 cells)) to second fortnight (156.47 cm³ (2830.54 cells)) of June accounting 139.25 per cent increased growth. The brood volume declined from first fortnight of July onwards (Table 2). These findings are in agreement with Veen et al., (1992) who observed that the colonies invested significantly more in brood production resulting in increased brood and adult population during summer.

Table 2: Growth of brood (mean of two colonies) in a *Trigona iridipennis* colony during different month at GKVK, Bengaluru

Month/ Fortnight	Brood volume (cm ³)	Number of brood cells *	Per cent increase or decrease (+/-)
August I	152.41 ^{ab}	2757.09	-
August II	149.34 ^b	2701.56	-2.01
September I	143.56 ^c	2597.00	-5.81
September II	131.42 ^d	2377.39	-13.77
October I	112.44 ^e	2034.04	-26.23
October II	108.44 ^e	1961.68	-39.10
November I	88.44 ^{gh}	1599.88	-43.30
November II	86.42 ^h	1563.15	-49.93
December I	65.40 ^j	1183.09	-57.09
December II	68.50 ^j	1239.17	+4.74
January I	70.12 ^j	1268.47	+7.21
January II	78.61 ⁱ	1422.05	+20.19
February I	80.50 ^m	1456.61	+23.09
February II	85.35 ^g	1543.98	+30.50
March I	92.15 ^f	1666.99	+40.90
March II	99.26 ^e	1795.61	+51.77
April I	108.60 ^e	1965.66	+66.06
April II	112.16 ^d	2028.97	+71.49

May I	135.18 ^{bc}	2445.41	+106.69
May II	145.53 ^a	2632.64	+112.52
June I	154.94 ^a	2802.86	+136.91
June II	156.47 ^a	2830.54	+139.25
July I	146.85 ^{bc}	2656.52	-6.45
July II	142.40 ^c	2720.74	-8.99

* :Number of brood cells in 1 cm³ =18.09, + : Per cent increase over initial number of brood cells

-:Per cent decrease over maximum number of brood cells

Similar letters in superscript indicate non-significant difference

Honey stores and number of honey pots declined slightly from first fortnight of August (28.64 cm³ and 68.74 honey pots) to second fortnight of August (27.53 cm³ and 66.07 honey pots) to an extent of 3.88 per cent, thereafter both components gradually increased from first fortnight of September (30.11 cm³ and 72.26 honey pots) and reached a maximum during first fortnight of April (44.07 cm³ and 105.77 honey pots) registering an increased growth of 66.09 per cent. Further, both components found declined from second fortnight of April (40.53 cm³ and 97.27 honey pots) to second fortnight of July (29.54 cm³ and 70.90 honey pots) with a decline of 32.97 percent. Similarly, pollen stores and number of pollen pots increased from first fortnight of August (45.2 cm³ and 126.56 pollen pots) to second fortnight of August (47.00 cm³ and 131.60 pollen pots) to an extent of 5.04 per cent increased growth. Thereafter, both components found drastically reduced from first fortnight of September (44.75 cm³ and 125.30 pollen pots) to second fortnight of February (30.15 cm³ and 84.42 pollen pots) accounting a decline of 35.85 per cent. The moderate and continuous increase in storage of both components were recorded from first fortnight of March (33.00cm³ and 92.40 pollen pots) up to second fortnight of June (44.14 cm³ and 123.59 pollen pots) to an increased growth of 46.40 per cent. Declined trend was observed in both components from July onwards (Table 3). In general, during study period as honey stores and number of honey pots found increased, the pollen stores and number of pollen pots were found declined and vice versa. Which may be corroborated with the specific component requirement of the colony to rear the brood or it may be more of nectar or pollen yielding plants in the vicinity of study area.

Table 3: Quantity of honey and pollen stores in Trigona iridipennis colony during different months at GKVK, Bengaluru

Month/ Fortnight	Honey stores (cm ³)	Number of honey pots #	Per cent increase/ decrease (+/-)	Pollen stores (cm ³)	Number of pollen pots ##	Per cent increase/ decrease (+/-)
August I	28.64 ^f	68.74	-	45.20 ^{ab}	126.56	-
August II	27.53 ^f	66.07	-3.88	47.00 ^a	131.60	+5.04
September I	30.11 ^{ef}	72.26	+9.36	44.75 ^{ab}	125.30	-4.78
September II	31.25 ^e	75.00	+13.52	43.26 ^b	121.13	-7.96
October I	34.12 ^d	81.89	+23.94	41.38 ^c	115.86	-11.96
October II	36.54 ^{cd}	87.70	+32.74	41.00 ^c	114.40	-13.07
November I	36.81 ^{cd}	88.34	+33.71	40.50 ^{cd}	113.40	-13.83
November II	37.12 ^{cd}	89.09	+34.84	38.40 ^d	107.52	-18.30
December I	37.65 ^{cd}	90.36	+36.76	37.30 ^{de}	104.44	-20.64
December II	38.42 ^c	92.21	+39.56	37.10 ^{de}	103.88	-21.06
January I	35.92 ^c	93.41	+41.38	36.40 ^{de}	101.92	-22.55
January II	39.41 ^{bcd}	94.58	+43.15	35.10 ^e	98.28	-25.32
February I	40.54 ^{bc}	97.30	+47.27	32.21 ^f	90.19	-31.47
February II	41.52 ^b	99.65	+50.82	30.15 ^f	84.42	-35.85
March I	42.62 ^{ab}	102.29	+54.82	33.00 ^{ef}	92.40	+9.45
March II	43.63 ^{ab}	104.71	+58.48	35.10 ^e	98.28	+13.86
April I	44.07 ^a	105.77	+66.09	36.20 ^d	101.36	+20.07
April II	40.53 ^b	97.27	-8.36	37.50 ^d	105.00	+24.38
May I	38.40 ^c	94.40	-10.95	39.90 ^{cd}	111.72	+32.33
May II	37.54 ^{cd}	90.10	-14.81	41.50 ^c	116.20	+37.65
June I	37.00 ^{cd}	88.80	-16.04	43.20 ^{bc}	120.96	+43.28
June II	35.50 ^d	85.20	-19.45	44.14 ^{bc}	123.59	+46.40
July I	31.50 ^e	75.60	-28.52	42.13 ^{bc}	117.96	-4.56
July II	29.54 ^f	70.90	-32.97	42.56 ^{bc}	119.08	-1.50

:Number of honey pots in 1 cm³=2.4 cells,

:Number of pollen pots in 1 cm³=2.8 cells

+ :Per cent increase over initial pollen or honey stores -:Per cent decrease over maximum pollen or honey stores Similar letters in superscript indicate non-significant difference

References

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