
MANAGEMENT STUDIES TO OVERCOME ADVERSITIES IN BEE CULTURE

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ABSTRACT

Supplement feeding on a mixture of sugar, pollen and soyabean flour increased brood development of honeybee *Apis mellifera* L. upto 81% and sugar supplement alone upto 40% in the dearth period (August, September) as compared to non-feeding colonies. An increase of 53% of brood development was found in the colonies placed on sarsoon flora as against colonies placed on common flora during January, February. Mean maximum controlled temperature and mean humidity ranging from 30 to 34°C and to 67% during June to August increased brood development upto 18% as compared to ambient temperature and humidity (37°C - 41°C and 74 to 98%). double queen colonies produced 10% more brood than single queen colonies during June to August.

INTRODUCTION

Beekeeping industry is mainly based on bee flora. More than 700 plant species have been recorded as bee flora in Pakistan but most of these are minor sources of nectar and pollen and do not meet the requirements of beekeepers. A few major sources are distributed in different zones of the country which bloom in different parts of the year and support honey production. Commercial beekeepers shift their colonies to these zones during blooming period of the flora and produce honey 3 to 4 times in a year.

However small beekeepers, hobbyists and government organizations who practise stationary beekeeping produce honey once in a year and face

a lot of problems, scarcity of bee flora being the major one, though high temperature and humidity in the plains also affect brood development and colony strength. If proper management during the dearth periods and other adverse conditions is not done the stationary beekeepers suffer severe loss in colonies.

This paper reports the results of a study on brood development of honeybee colonies of *Apis mellifera* L. under different conditions to overcome adversities in stationary bee culture.

METHOD AND MATERIAL

To find out the effect of supplementary feeding on brood development during dearth period at Peshawar, a set of two *Apis mellifera* colonies was fed pollen in soyabean flour, sugar solution alone and mixture of pollen, sugar and soyabean flour as against a set of two colonies without supplementary feed. The feeds were prepared with one part of pollen, 4 parts of soyabean flour and 3 parts of water for pollen supplement and one part of pollen, 4 parts of soyabean flour, 7 parts of sugar and 3 parts of water for pollen-sugar supplement. The mixture in each case was kneaded into a soft dough. Cakes of 200 grams of the dough were prepared and placed, one cake in each colony, on 5 x 9 cm cardboard laid on the top bars of the frames inside the hive. Fresh feed was supplied on every 5th day. Sugar supplement was prepared by dissolving sugar in equal quantity of water (boiled and cooled). Sugar syrup was put in the feeders (honey jars) with a thick cloth tied on their mouths, inverted and placed one feeder in each colony on the top bars of

the frames.

To determine the influence of major floral sources on brood development, two colonies were placed each at the Pakistan Forest Institute, Peshawar on common flora and at Swabi on sarsoon, *Brassica* spp. during months January/February.

To examine the effect of temperature and humidity on brood development, rearing was carried out in the temperature and humidity controlled laboratory and at ambient temperature by placing two colonies each in the laboratory and in the field during June to August. In the laboratory the hives were placed close to the windows and the entrance hole of each hive was connected to the exterior by means of a piece of plastic pipe of 3 cm dia. Each hive was enclosed in a muslin cloth cage with space enough for one man to take observations.

The effect of double queen system on brood development was investigated during summer when two queens were placed first in double brood chambered hive with a queen excluder in between the two chambers. Later on when pupulation reduced to the capacity of a single chamber a vertical partition of a single brood chamber of the hive was done by erecting queen excluder in the centre.

Observation were taken fortnightly. Brood frames were checked one by one and brood area was measured by means of measuring scale on both sides of each frame. The sum of brood area of all frames was taken as total brood area of colony in each observation. Average brood area of two colonies per month and mean brood area for the whole period was worked out for each treatment.

RESULTS AND DISCUSSION

Results are tabulated as under:

Table 1 Comparative effect of supplement feeding and no feeding on brood development of *Apis mellifera* L.

Treatments	Average brood area* (cm) ²		Mean brood area (cm) ²	% increase over control
	August	September		
1. Sugar + Pollen + Soyabean Supplement	1234	2388	1811	81
2. Sugar supplement	1201	1604	1402	40
3. Pollen + Soyabean supplement	980	1030	1005	0.4
4. Control	1100	902	1001	

* Average brood area of 2 colonies in each treatment

When the nectar and pollen are not available in plenty the queen bee stops laying eggs till such time when enough pollen and nectar is foraged by worker bees. The worker bees normally live for 6 weeks in summer and if the dearth period extends to two months most worker bee population expires resulting in collapse of the colony.

To keep the bee colony intact artificial or supplement feeding is very essential during dearth period. Results in Table 1 show that supplement feed of sugar, pollen and soyabean flour in a mixture stimulates brood development upto 81%. Sugar supplement alone provides brood development upto 40%, feeding of pollen and soyabean in a mixture plays no useful role in brood development.

Table 2 Comparative effect of sarsoon flora and common flora on brood development of *Apis mellifera* L.

Treatments	Average brood area* (cm) ²		Mean brood area (cm) ²	% increase over common flora
	January	February		
Sarsoon flora	1882	7016	4449	53.3
Common flora	1583	4211	2897	-

* Average brood area of 2 colonies in each treatment

Soon after dearth period in Peshawar loquat (*Eriobotrya japonica*) followed by sarsoon are two major sources of bee flora. As shown in Table 2 stationary beekeepers can increase strength of the over-wintering colonies upto 53.3% by placing their colonies on near-by sarsoon flora. This increase in strength helps in colony division in spring and honey yield in May - June.

Table 3 Comparative effect of controlled temperature and R.H. and ambient temperature and R.H. on brood development of *Apis mellifera* L.

Treatments	Average brood area* (cm) ²			Mean brood area (cm) ²	% increase over ambient temp. & RH
	June	July	August		
Controlled temp. & humidity Mean T. 30-34°C Mean RH 50-67%	5106	6131	5270	5502	18
Ambient temp. & humidity Mean T. 36-41°C Mean RH 74-98%	5442	4536	3999	4659	

* Average brood area of 2 colonies in each treatment

High temperature and humidity are considered to be limiting factors for brood rearing in the plains of Pakistan. Studies carried out on brood development in temperature and humidity controlled laboratory and in the field during summer indicated 18% increase of brood in the controlled conditions as against the ambient temperature and humidity in the field (table 3).

Dunham (1930) has shown that the queen responds to egg laying most actively at temperature 17°C to 18.5°C. Alexander (1907), Chambers (1907), Farrar (1936, 1958) and Dunham (1943) developed two-queen system to build up colony strength at a faster rate than could be done by the usual means of colony management.

In Table 4 comparison of brood development of two-queen colonies and single-

queen colonies during summer in Peshawar is given. Double-queen colonies produced 10% more brood than the single-queen colonies, indicating other causes for reduction in egg-laying such a scarcity of floral sources and high temperature and humidity.

These studies clearly indicate that the stationary beekpers can keep their colonies populous and strong by collecting pollen during spring and feeding to honeybees in mixture with sugar and soyabean flour during dearth period thus avoiding colony collapse. Colony strength can also be maintained by feeding sugar solution alone if pollen is not available.

Over-wintering colonies can be strengthened by placing the colonies on sarsoon flora from November to February in different localities. This enables the beekeepers to increase

their stock by colony division in March-April and honey production in May-June.

Table 4 Comparative effect of double queen colonies and single queen colonies on brood development of *Apis mellifera* L. during summer.

Treatments	Average brood area* (cm) ²			Mean brood area (cm) ²	% increase over single queen colonies
	June	July	August		
Double queen colonies	5260	3512	3372	4048	10
Single queen colonies	4813	3159	3050	3674	

* Average brood area of 2 colonies in each treatment.

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