Indian Journal of Extension Education
Vol. 56, No. 3 (July-September), 2020, (69-75)

ISSN 0537-1996 (Print)
ISSN 2454-552X (Online)

Extent of Knowledge of Beekeepers in Relation to Improved Apiculture Practices in Jammu Province

Yogesh Kumar[1]*, Bashir Ahmad Rather[2], Rajinder Peshin[3], M.S. Nain[4], Kaneez Fatima[5], Lokendra Singh[6] and M.S. Kanwar[7]

ABSTRACT

The study was conducted to ascertain the knowledge level of beekeepers of Jammu region with respect to the improved beekeeping practices. Four districts were purposively selected for the study which includes Jammu, Kathua, Rajouri and Ramban, due to the maximum number of the beekeepers in these four districts in the Jammu province. The proportionate sampling plan was adopted to select 210 beekeepers. Data was collected with a knowledge test comprising seven improved beekeeping practices. All the districts revealed a significant knowledge gap in all the improved beekeeping practices especially in bee biology, bee enemies, bee breeding and disease management. The marginal beekeepers possessed a low level knowledge regarding these practices. However, the pooled data revealed maximum mean knowledge score with respect to general information followed by management of boxes. The minimum mean knowledge score was recorded in case of knowledge about bee enemies and bee biology. It is concluded that beekeepers of Jammu region had a significant level of knowledge about general beekeeping practices but they were lacking knowledge in some important areas like bee breeding, queen management, bee enemies/disease management and production of other bee products which are important for flourishing the apiculture industry.

Keywords: Bee, Beekeeping, Honey production, Knowledge, Management

INTRODUCTION

Considerable changes have been brought about in traditional agriculture during recent years in the country through various enterprises involving use of modern inputs and knowledge about new and improved technologies. Knowledge is one of the important components of behaviour and plays an important role in covert and overt behaviour of an individual. Knowledge is generally understood as an intimate acquaintance of an individual with facts. It is defined as, behaviour and test situations which emphasize the remembering, either by recognition or recall of ideas, material or phenomenon (Bloom, 1979). Beekeeping has established itself as an economic activity and a commercial enterprise worldwide which not only promote agricultural and horticultural development but also has a great potential for upliftment of the rural economy of the country. It provides employment, new sources of income generation, food and nutritional

[1]Technical Assistant, Extension Education High Mountain Arid Agriculture Research Institute, Leh, Ladakh
[2]Senior Scientist, Entomology High Mountain Arid Agriculture Research Institute, Leh, Ladakh
[3]Professor, Division of Extension, SKUAST-Jammu, (J&K)
[4]Principal Scientist, Division of Extension Education, IARI, New Delhi
[5]Technical Officer, AMFU, High Mountain Arid Agriculture Research Institute, Leh, Ladakh
[6]Ph.D. Scholar, Division of Floriculture and Landscaping, IARI, New Delhi
[7]Senior Scientist, Vegetable Science, High Mountain Arid Agriculture Research Institute, Leh, Ladakh
*Corresponding author email id: ykmahadev@gmail.com

security and improves rural economy. Beekeeping has naturally emerged as one of the important agri-based rural industry having potential to generate large scale employment. In addition beekeeping is low investment and high profit giving enterprise. It is a multipronged employment generating enterprise providing gainful employment opportunity to both rural and urban people, as income in this profession comes from several bee products and services. The increase in knowledge and adoption of scientific beekeeping practices offers a means to increase the honey production and generate income and employment for the rural youth.

The State of Jammu and Kashmir is endowed with high diversity of bee flora and favourable ecological conditions and is one of the leading honey producing states in India. The Jammu region particularly the districts of Jammu, Ramban, Rajouri and Kathua contribute a major share in honey production in the state. The present study was conducted to know the extent of knowledge of the beekeepers of the region with respect to improved apiculture practices because knowledge is considered one of the most important components of human behaviour for successful adoption.

METHODOLOGY

The study was conducted in the Jammu region of Jammu & Kashmir during 2017. Four districts were purposively selected for the study as the maximum number of the beekeepers fall in these four districts in the Jammu province which include Jammu, Kathua, Rajouri and Ramban. They were selected on the basis of census of beekeepers carried out by department of Agriculture during 2011. A list of registered beekeepers of the selected districts was obtained and accordingly the number of beekeepers was selected randomly in each district, based on the proportionate random sampling method. A total sample of 210 beekeepers was selected in all the four districts which included 126 from Ramban, 22 from Rajouri, 43 from Kathua and 19 from Jammu. The selected beekeepers were interviewed regarding the extent of knowledge about seven beekeeping practices, on the basis of a well structured questionnaire involving eighty items about these practices. Knowledge was measured in terms of correct responses given by the beekeepers for all the practices under consideration. A score of '1' for correct answer and a score of 'zero' for incorrect answer was awarded. The frequency score of beekeepers for each practice was further converted into percentage in each district and the pooled mean scores was worked out for all the seven practices in the region (Kaur *et al.,* 2020).

The tool measuring knowledge level of different beekeeping practices involved seven major subjects and the number of test items included in each subject is given in Table 1.

Table 1: Major subjects of Knowledge test and number of items

Bee keeping practices	No. of objects involved
General aspects	21
Management of boxes	19
Bee biology	04
Production of honey	09
Bee flora	09
Bee enemies	08
Bee breeding	10
Total	80

RESULT AND DISCUSSION

The respondent beekeepers were enquired to express their extent of knowledge about different beekeeping practices involving different objects regarding these practices.

The results depicted in Table 2 reveals that the knowledge level of beekeepers of different districts in general aspects of beekeeping. The results revealed that majority of the respondent beekeepers in all the four districts possessed a significant knowledge about major portion of the general aspects of beekeeping which recorded an overall percentage of knowledgeable beekeepers' from 51.90 to 100 per cent in the region. However, only a meagre percentage of beekeepers i.e. 15.23 and 20.47 per cent possessed the knowledge about the types and morphology of honey bees respectively. The data further reveals that majority of the respondent beekeepers in all the districts were well versed about the

Table 2: District wise percentage of beekeepers' knowledge about different aspects of beekeeping (n=210)

Aspects	District-wise percentage of beekeepers				Overall
	Kathua (n = 43)	Rajouri (n= 22)	Jammu (n = 19)	Ramban (n= 126)	%tage of beekeepers (n = 210)
a) General Aspects					
Body parts of honey bees	23.25	22.72	42.10	15.87	20.47
Types of honey bees	11.62	9.09	36.84	14.28	15.23
Preference of domestic bees for comb making	83.72	77.27	42.10	58.73	64.28
Italian honey bees	100.00	100.00	100.00	99.20	99.52
Identification of queen bee	100.00	95.45	100.00	98.41	98.57
Number of queen bees in a colony	93.02	4.54	89.47	40.47	51.90
Collection of pollen by worker bees	97.67	100.00	100.00	100.00	99.52
Guarding of boxes by workers bees	100.00	100.00	89.47	100.00	98.57
Monsoon season for bees	76.74	63.63	63.15	85.71	79.52
Season for increasing of boxes	88.37	95.45	94.73	97.61	95.23
Collection of honey by the bees	39.53	45.45	47.36	44.44	43.80
Indian honey bees	93.02	100.00	94.73	97.61	87.14
Italian bees recommended for domestication	100.00	100.00	100.00	98.41	99.04
Drone bees are fatter than worker bees	100.00	100.00	100.00	99.20	99.52
Worker bee is sharp	100.00	100.00	100.00	100.00	100.00
Drone bee do not have sting	100.00	90.90	57.89	96.82	93.33
Importance of water for bees	100.00	100.00	84.21	99.20	98.09
Swarming of bees during April	95.34	95.45	94.73	93.65	94.28
Sugars present in honey	97.67	95.45	94.73	99.20	98.09
Age of worker bees	83.72	59.09	36.84	42.06	51.90
Identification of drones	65.11	36.36	42.10	50.79	51.42
b) Management Aspects					
Optimum time to start beekeeping	90.69	95.45	100.00	82.53	87.14
Box to box distance	37.20	50	42.10	24.60	31.42
Row to row distance	62.79	40.90	42.10	26.19	36.66
Sugar syrup feeding to boxes	100.00	100.00	100.00	96.82	98.09
Giving feed to boxes during off season	69.76	72.72	63.15	56.34	61.42
Time to giving feed to colonies	34.88	100.00	57.89	72.22	66.19
Optimum number of boxes to start beekeeping	62.79	63.63	36.84	44.44	49.52
Placement of boxes during winter	9.30	0.00	31.57	4.76	7.61
Checking of boxes during winter	93.02	95.45	84.21	88.88	90.00
Checking of boxes during summer	93.02	100.00	94.73	100.00	98.09
Method used to decrease the population of drones	65.11	90.90	31.57	49.20	55.23
Robbing during rainy season	55.81	9.09	26.31	10.31	20.95
Protection of boxes from robbing	97.67	100.00	89.47	91.26	93.80
Packing of boxes during winter	100.00	100.00	94.73	100.00	99.52

Table 2 contd...

Aspects	District-wise percentage of beekeepers				Overall
	Kathua (n = 43)	Rajouri (n= 22)	Jammu (n = 19)	Ramban (n= 126)	%tage of beekeepers (n = 210)
Robbing problem	93.02	90.90	100.00	100.00	97.61
Swarming of bees	74.41	90.90	94.73	81.74	82.38
Best season for bees	100.00	86.36	94.73	84.12	88.57
Hive tool	100.00	95.45	84.21	96.03	95.71
Benefits of winter packing	97.67	100.00	94.73	100.00	99.04
c) Bee biology Aspects					
Life cycle of honey bee	13.95	22.72	42.10	2.38	10.47
Rearing of queen from eggs	37.20	4.54	21.05	7.14	14.28
Rearing of drone from eggs	13.95	0.00	0.00	0.00	2.85
Rearing of worker bee from eggs	13.95	0.00	0.00	0.00	2.85
d) Honey production aspects					
Consumption of honey by bees for production of wax	30.23	18.18	52.63	9.52	14.28
Purity of honey	41.86	18.18	57.89	19.04	27.14
Extraction of honey	100.00	95.45	94.73	97.61	97.61
Freezing of honey	97.67	86.36	31.57	96.03	89.52
Maturity of honey	10.00	95.45	94.73	100.00	99.04
Wax production	51.16	50	84.21	43.65	49.52
Queen excluder	30.23	81.81	94.73	59.52	59.04
Benefits of queen excluder	32.55	13.63	63.15	44.44	40.47
Production of honey	93.02	68.18	89.47	54.76	67.14
e) Bee flora aspects					
Things collected by bee from flowers	97.67	100.00	100.00	97.61	98.09
Migration of boxes	100.00	100.00	100.00	100.00	100.00
Whether bees destroy the flowers	100.00	100.00	100.00	99.20	99.52
Availability of bee flora during March-April	100.00	100.00	100.00	98.41	99.04
During January, honey bees collect enough nector	13.80	90.90	89.47	74.60	76.19
Importance of pollen for bees	100.00	95.45	100.00	99.20	99.04
Maize as a good source of flora	100.00	100.00	94.73	99.20	99.04
Pollen collected by worker bees	97.67	90.90	94.73	99.20	97.61
Which crop produce more honey	93.02	81.81	84.21	76.98	81.42
f) Bee enemies aspect					
Damage of wax moth	100.00	100.00	9.73	97.61	98.09
Damage of green sparrow	95.34	100.00	9.73	97.61	97.14
Incidence of wax moth	60.46	4.54	36.84	17.46	26.66
Season of incidence of wax moth	69.76	81.81	63.15	67.46	69.04
Thai sac brood disease of bees	0.00	0.00	0.00	0.00	0.00
Protection of bees from ants	100.00	100.00	100.00	100.00	100.00

Table 2 contd...

Aspects	District-wise percentage of beekeepers				Overall
	Kathua (n = 43)	Rajouri (n= 22)	Jammu (n = 19)	Ramban (n= 126)	%tage of beekeepers (n = 210)
Damage of varroa mite	95.34	100.00	84.21	68.25	78.57
Control measures for varroa mite	53.48	50.00	78.94	22.22	36.66
g) Bee breeding aspects					
Maximum number of eggs laid by queen bees	58.13	4.54	0.00	16.66	22.38
Laying of eggs by queen bee	93.02	100.00	84.21	97.61	95.71
Method of queen rearing	41.86	4.54	10.52	32.53	29.52
Number of eggs queen lays per cell	100.00	100.00	84.21	98.41	97.61
Purchasing of bees and young mated queen	81.39	100.00	100.00	68.25	77.14
Swarming by young queen	100.00	100.00	94.73	96.82	97.61
Young queen lay more number of eggs than old queen	100.00	100.00	100.00	100.00	100.00
Mating of queen bee by drones	65.11	68.18	89.47	74.60	73.33
Age of queen bee	79.06	25.58	84.21	45.23	54.76
Laying worker bees	93.02	44.18	78.94	51.58	66.19

major management issues of boxes among beekeeping practices. However, they were less aware about the placement of boxes in an apiary, robbing during rainy season and also their placement during winter. This was observed as the data revealed a low percentage of respondent beekeepers i.e. 7.61, 20.95, 31.42 and 36.66 per cent respondent beekeepers recorded knowledgeable in respect of placement of boxes during winter, robbing during rainy season, box to box distance and row to row distance, respectively.

The respondent beekeepers in different districts were also observed to possess a very low knowledge about biology aspects of honey bee. The data reveals an overall a very low percentage of knowledgeable beekeepers about life cycle (10.47%) and rearing of queen (14.28%), drone (2.85%) and worker bees (2.85%). Regarding level of knowledge of the respondent beekeepers in different districts about the practices involved in production of honey the result are depicted in Table 2. The data revealed that beekeepers, in general, in all the districts were less aware about the practice of consumption of honey by bees for wax production and knowledge about the benefits of queen excluder. A low percentage of respondent beekeepers i.e. 14.28 and 40.47 per cent were recorded aware about consumption of honey by bees for wax production and the benefits of queen excluder, respectively. However, majority of the respondent beekeepers in all districts were observed to possess a significant level of knowledge about all other practices involved in production of honey. Similarly the data collected with respect to the awareness of respondent beekeepers about the distribution and diversity of bee flora and its role in honey production reveals that majority of the respondent beekeepers in all the districts possessed a highly significant degree of knowledge with respect to the different aspects of bee flora which include its availability in different seasons, role of pollen and nectar and their composition in different bee flora, etc.

The extent of knowledge of respondent beekeepers of all the districts about different bee enemies like incidence of wax moth, damage by green sparrow, Thai sac brood disease, and protection of bees from ants, *Varroa* mite and its management shows that majority of the respondent beekeepers of the districts possessed a significant level of knowledge about the damage caused due to incidence of wax moth, *Varroa* mite and its management and also the damage caused by green sparrow and wasps and bumble bees. But the respondent

Table 3: District wise extent of knowledge of beekeepers about different aspect of beekeeping in the Jammu region (n =210)

Aspect	District-wise mean knowledge score				Overall mean knowledge score (n =210)	Maximum obtainable score	Difference	Difference (%)	t-value
	Kathua (n = 43)	Jammu (n = 19)	Rajouri (n = 22)	Ramban (n = 126)					
Bee breeding	8.14	7.26	7.14	6.83	7.17	10.00	2.83	28.3	27.10
Bee biology	0.79	0.63	0.27	0.09	0.30	4.00	3.7	92.5	81.38
Bee enemies	5.53	5.52	5.36	4.69	5.01	8.00	2.99	37.37	40.98
General information	17.51	16.10	15.90	16.17	16.41	21.00	4.59	21.85	36.18
Management of boxes	14.37	13.68	14.82	12.67	13.33	19.00	5.67	29.84	37.34
Production of honey	6.51	6.53	5.27	5.28	5.64	9.00	3.36	37.33	33.30
Bee flora	8.56	8.63	8.59	8.43	8.49	9.00	0.51	5.66	11.22
Total	61.41	58.35	57.35	54.16	56.35	80	-	-	-

beekeepers in all the districts were observed to lack knowledge about different diseases like Thia sac brood disease which caused a heavy damage to the beehives after incidence. Further, an overall less percentage of respondent beekeepers (26.66%) in all the districts were observed aware about incidence of wax moth.

The pooled data with regard to the extent of knowledge of different bee keeping practices in the entire Jammu region is presented in Table 3. The data revealed that there was a significant difference in extent of desired knowledge score of the respondents for these beekeeping practices. The knowledge gap related to bee breeding, bee biology, bee enemies, general information, management of boxes, production of honey and bee flora was significant. The knowledge gap was quantified by subtracting the actual knowledge score from the desired knowledge score. The maximum mean knowledge score of 16.41 per cent was recorded in case of general information about beekeeping followed by management of boxes (13.33%) and bee flora (8.49%). The minimum mean knowledge score of 0.30 per cent was recorded in case of bee biology followed by bee enemies (5.01%), production of honey (5.64%) and bee breeding (7.17%). The maximum score related to general aspects of beekeeping practices was 17.51, 16.17, 16.10, 15.90 per cent and minimum mean knowledge score related to bee biology was 0.79, 0.63, 0.27 and 0.09, in case of Kathua, Ramban, Jammu and Rajouri districts, respectively. The general aspects of beekeeping recorded an overall maximum mean knowledge score of 16.41 per cent and bee biology observed an overall minimum mean knowledge score of 0.03 in the entire Jammu province.

CONCLUSION

Based on the results it may be concluded that the respondent beekeepers possessed a significant level of knowledge about the major important beekeeping practices. Beekeepers were observed to have good knowledge about general aspects, management of boxes and bee flora but had a low level of knowledge about bee biology, bee enemies, production of honey and bee breeding. The study recorded a total knowledge score in case of respondent beekeepers at 56.88 per cent with maximum knowledge score at 78.14 per cent and

minimum mean knowledge score at 7.5 per cent. The mean knowledge of beekeepers was 61.41, 58.35, 57.35 and 54.16 out of 80 in Kathua, Jammu, Rajouri and Ramban districts respectively. The difference of 18.60, 21.65, 22.65 and 25.84 was significant in all the four districts. Finally, it is concluded that although beekeepers of Jammu have a significant level of knowledge about different beekeeping practices but they are lacking knowledge in some important areas like bee breeding, queen management, bee enemies and disease management and production of other bee products which are important for booming the apiculture industry. Therefore, the concerned agencies like Jammu and Kashmir agriculture department, KVKs of the districts and other NGOs should guide the beekeepers and conduct more and more skill development training programs for beekeepers so as to overcome these lacunae.

Paper received on : July 05, 2020
Accepted on : July 22, 2020

REFERENCES

Anonymous (2011). Agriculture status of J&K state. Directorate of Agriculture department, Government of Jammu and Kashmir.

Bloom, B.S. (1979). Taxonomy of Educational Objectives Handbook-1, New York: Longmans Green & Company.

Kaur, S., Kaur, P. and Pankaj (2020). Farmers knowledge of soil health card and constraints in its use. *Indian Journal of Extension Education*, **56**(1), 28-32.

Singh, K. (2005). Evaluation of the agricultural vocational training courses conducted by KVKs in Punjab. Ph.D thesis, P.A.U, Ludhiana, Punjab.