Souvenir & Abstracts

NATIONAL SEMINAR
ON
"BEES AND BEEKEEPING : FUTURE PROSPECTS AND CONSTRAINTS IN INDIA"

September 9th, 2021

Organised by :

Department of Zoology, BGSB University, Rajouri (J&K)

Sponsored by :

National Mission on Himalayan Studies (NMHS)
Ministry of Environment, Forest & Climate Change, New Delhi, Govt. of India

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Message

Vice-Chancellor

It gives me immense pleasure to learn that the Department of Zoology, School of Biosciences and Biotechnology, Baba Ghulam Shah Badshah University, Rajouri, J & K is organizing a National Seminar on ***"Bees and Beekeeping: Future Prospects and Constraints in India"*** on September 9, 2021, sponsored by the National Mission on Himalayan Studies, Almora, (UP), Ministry of Environment, Forest and Climate Change, New Delhi. Apiculture is an important discipline in Biological Sciences. It plays a vital role in sustaining the biodiversity, as eighty percent of plants are being pollinated by insect pollinators. Nevertheless, the Apiculture, Sericulture and Lac-culture are regarded as the significant agro-based industries. Specifically, the global apiculture market is expected to grow at a CAGR of 2.7% during the period 2015 to 2022. Thus, protection of bees and maintenance of their health is a challenging task for the growth of apiculture market to which millions of people are associated in terms of employment and entrepreneurship.

I do hope that the seminar will motivate the budding entomologists, research scholars, progressive farmers and entrepreneurs to seize the opportunity in exploring the advanced research and trade avenues in apiculture. Indeed, such meets provide a vibrant platform to scientists, academicians and researchers of different regions for interactions, collaborations and exchange of ideas. It is my hope that in this seminar too there will be deliberations on current state of science and cutting-edge research in entomology. There will be free flow of ideas, meaningful presentations and scholarly discussions. No other state of the country requires to harness the fruits of Science & Technology in as great measure as J & K, on account of its varied topography, biodiversity, agriculture and ago-climatic conditions. Therefore, the issues specific to the State of J & K need to be addressed systematically and a policy frame-work with road map should be developed for consideration of the government funding agencies. I am quite optimistic that the scientific presentations and interactions during a day long seminar which will emanate innovative ideas and stimulate young researchers to exert for solving subject specific critical issues and problems.

I congratulate the organizers of the seminar, particularly Dr. SajadHussianParey, the Organizing Secretary and all members of Organizing Committee for undertaking this initiative for an offline programme at BGSBU.

I extend my warm wishes for a very successful seminar.

Prof. Akbar Masood
Vice Chancellor
BGSBU

Message

Dean Academic Affairs

It is a matter of great happiness and privilege that Department of Zoology, School of Biosciences and Biotechnology, Baba Ghulam Shah Badshah University, Rajouri is organizing one day National Seminar on ***"Bees and Beekeeping: Future Prospects and Constraints in India"*** on 9 September, 2021. I appreciate the effort oforganizing Secretary for getting financial assistance from National Mission on Himalayan studies (NMHS), Ministry of Environment, Forest and Climate Change, New Delhi and Science to hold this important scientific event. I have been informed that event is likely be attended by the delegates both from within and outside the UT of J&K.

Since the theme of the seminar is based on ***Bees and beekeeping: future prospects and constraints in India***, it is hoped that the deliberations in the seminar will go a long way to devise new ways of using bees as models of climate change. Further it will also provide entrepreneurship development as Apiculture which is a billion dollar insect industry all over the globe.

I wish the organizers all success in all their endeavors.

Prof. Iqbal Parwez
Dean Academic Affairs
BGSB Rajouri (J&K)

NATIONAL MISSION ON HIMALAYAN STUDIES(NMHS)
G.B. Pant National Institute of Himalayan Environment (NIHE)
Kosi-Katarmal, Almora - 263643, Uttarakhand, India

Message

Registrar

I am feeling happy to learn that the department of Zoology, Baba Ghulam Shah Badshah University, Rajouri is going to organise one day National Seminar on ""***Bees and Beekeeping: Future Prospects and Constraints in India***" on 9th September 2021. Apiculture is the act of rearing honeybees. Bees are commercially bred in apiaries in this way. An apiary is a space that can accommodate a significant number of beehives. The bees are cared for and controlled here in order to generate wax, honey and provide free ecosystem services in the form of pollination. Apiculture, or beekeeping, is not a new concept in India; it is mentioned in the ancient Vedas and Buddhist sacred scriptures, and it has exploded in popularity in recent years. India currently has over 35 lakh bee colonies, and the number of beekeepers and beekeeping organisations is rapidly expanding. The scope of apiculture is to initiate steps for quality honey production and other bee hive products for overseas and domestic markets besides enhancing productivity of various crops through bee pollination. Apiculture provide the employment opportunity in rural sector and thus enhancing the ancillary income of the beekeepers & farmers.

I am happy to learn that Department of Zoology has established an Apiary under NMHS sponsored project sanctioned in 2018.

(Er. Kireet Kumar)
Director, GBP-NIHE & Nodal Officer, NMHS

04/09/2021

Message

Head
Department of Zoology, BGSBU

It gives me immense pleasure our Department is going to organize National Seminar on ***"Bees and Beekeeping: Future prospects and constraints in India"*** on 9-September, 2021. This seminar is unique in a case that it will provide a platform for both academicians and researchers to facilitate collaborative researches. The participants will get to know about the new advancements and developments in the field of Apiculture.

The meeting will also provide opportunity for young scholars and faculty members early in their career to discuss about new areas of research and will open new avenues of collaboration between the faculties as well as institutions.

I appreciate the efforts of Organizing Secretary for making this event in the campus and extend my warm greeting and best wishes to the entire team.

Dr. A. A. Shah
Head
Department of Zoology
BGSB University
Rajouri (J&K)

Message

Convener

Apiculture is the scientific cultivation of honey bees for the commercial production of honey, wax, pollen, bee venom, and royal jelly. It's also known as beekeeping. Apiarists are people who raise bees, and an apiary is a site where bees are kept. Bees are one of several insects across the planet that can generate something that benefits us all. Honey is the most nutritionally beneficial food on the planet. Honey has been used to heal a variety of diseases since ancient times, and it is an antioxidant, thus beekeeping is an important activity. Provides bee wax, which is employed in a variety of industries such as cosmetics, polishing, pharmaceuticals, and so on. Pollination is a strong advantage for this plant. Honey bees are the most effective pollinators, improving the output of a variety of crops. According to current research, honey bee venom contains a variety of proteins that could be used as a prophylactic to kill HIV, the virus that causes AIDS in humans.

I expect to facilitate fruitful interaction among researchers exposed to wide variety of research areas with a common interest in improving overall knowledge about the field of Apiculture. I wish all the delegates and participants a very heathy, fruitful and safe stay at BGSB University Rajouri during the seminar. I am thankful to NMHS for providing the extramural grant to Department of Zoology, BGSBU for Establishing the Apiary within the campus.

I am extremely thankful to Hon'ble Vice Chancellor BGSB University Prof. Akbar Masood for providing every kind of facility and support for organizing this seminar.

Dr. Sajad H. Parey
Convener
BGSB University
Rajouri (J&K)

Sponsored by :

	**MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE (MoEF)**
	**NATIONAL MISSION ON HIMALAYAN STUDIES (NMHS)**

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4. Dr. Mohd Salim Reshi, Assistant Professor, Department of Zoology.
3. Dr. Sajad H Parey, Assistant Professor, Department of Zoology, Convenor.
6. Dr. Sajad A. Khan, Assistant Professor, Department of Zoology.
7. Ms. Shehnaz Anjam, Assistant Professor, Department of Zoology.

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- Dr. Tahira Akhter, Project Associate-1, Department of Zoology, BGSB University
- Mr. Aquib Majeed, Research Scholar, Department of Zoology, BGSB University
- Mr. Zahid Hussain Shah, Research Scholar, Department of Zoology, BGSB University

	Invited Lecture
1	***Honey: quality parameters, processing, authenticity and adulteration*** **Prof. Vikas Nanda**
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1	**Investigation on Effect of Stimulative Diets Fed to Honeybees (*Apismellifera)* during Dearth Period on Quantity and Quality of Honey** **InduKumari[a] and Rajesh Kumar[b]***
2	**Bee Keeping, Present and Future in J&K** **Akhter Hussain Najar***
3	**Geographical discrimination of honey from North Himalayan region of India using analytical spectroscopic techniques** Tariq Ahmad Ganaie[a], Sajad Ahmad Rather[b], F. A. Masoodi[b], Aamir Hussain Dar[a]
4	**Role of honey bees in Kashmir Himalaya plant pollinator network: native (*Apiscerana*) verses non-native (*A. mellifera*)** Zubair Ahmad Rather [a]
5	**On a collection of Apoidea (Insecta:Hymenoptera) from tehsil Ladpura, Kota (Raj.),India** Sandeep Hooda, Nita Jain and Jagdish Saini*
6	**Insect pollinator visitation received by Almond in the karewas of Kashmir valley** UzmaArific[a], Manzoor A Paray[b], ParveenaBano[b], ShabnumMohiuddin[c], HumiraMushtaq[c]
7	**Benefit - Cost analysis of Apiculture and brood improvement by Winter Packing in Rajouri, Jammu and Kashmir** AquibMajeed, Zahid Hussain, Tabaraq Ali, Tahira Akther and Sajad H Parey

8	**Scientific utilization of honey bee glue for its biological properties against the parasitic protozoan *Leishmaniadonovani.*** **Deepak K. Goyal***, Poonam Keshav, Sukhbir Kaur
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12	**Pollination Potential of Bumblebees (Hymenoptera: Apidae) in some economically Important crops in Kashmir** Aejaz H Parrey[a, c], Rifat H Raina[b], Sajad A Khan[c]
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INVITED TALK

HONEY: QUALITY PARAMETERS, PROCESSING, AUTHENTICITY AND ADULTERATION

Prof. Vikas Nanda

Department of Food Engineering and Technology,
Sant Longowal Institute of Engineering and Technology
(Deemed-to-be- University, Ministry of Education, Govt. of India),
Longowal-148106,
Punjab, India.

Honey is a very complex matrix due to the presence of several chemical classes of compounds Viz. sugars, enzymes (Diastase and Invertase), organic acids (Gluconic acid, Acetic acid, etc.), vitamins, volatile chemicals, phenolic acids, flavonoids and minerals in a very large range of concentrations. Quality parameters of honey are documented by FSSAI which were adopted from the Codex Alimentarius and European *directive. This adoption from different sources has created certain confusion among the producers, processors and exporters. The absence of unifloral honey in the Indian market has also complicated the various quality aspects related to honey. The processing of honey requires the minimum equipments but it is an important step to control the quality of honey. Somehow, the process of crystallization is also dependent on the processing of the honey. The extraction and processing of honey done by the beekeepers at farm level still needs a lot of improvement from the equipment and hygiene point of view.* Establishing the geographical and botanical origin of honey is of utmost importance to comply with the International legislations. The adulteration of honey is a contemporary phenomenon, a persistence anguish that has its trail imprinted on the world. The economics is working in favor of the adulterer so the supply chain that is helping to sustain the beekeepers has been thwarted. The countries are struggling to stay ahead by using analytical methods viz. Isotopic Ratio Analysis, Chromatographic, Nuclear Magnetic Resonance, and Sensors to ascertain honey authenticity and detecting adulteration.

ABSTRACTS FOR ORAL PRESENTATION

INVESTIGATION ON EFFECT OF STIMULATIVE DIETS FED TO HONEYBEES (*APISMELLIFERA*) DURING DEARTH PERIOD ON QUANTITY AND QUALITY OF HONEY

Indu Kumari[a] and Rajesh Kumar[b]*

[a]Department of Life Science, School of Life Sciences, Arni University, Kangra (H.P.), India.
[b]Department of Biosciences, Himachal Pradesh University, Shimla (H.P.), India.
*Corresponding author Email: drkumar83@gmail.com

Background: In India, very few studies have been made so far to check the effect of supplementary diets fed to honeybees on honey production and only meagre data is available on effect of feeding artificial diets on quality of honey. Therefore, an investigation was carried out to clear the misconception that pollen substitute and supplements may lead to deteriorate the quality of honey.

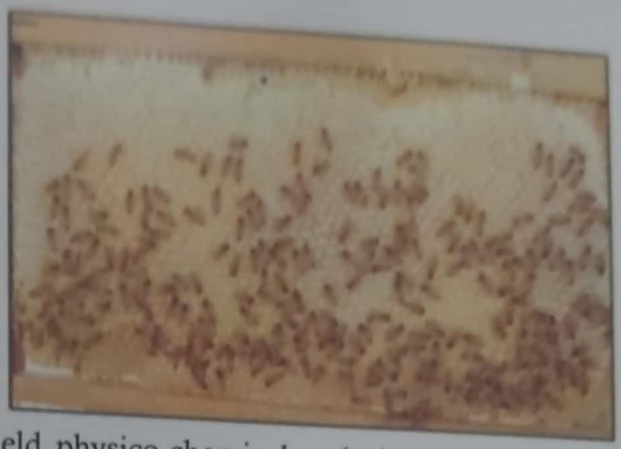
Objectives: Looking into the importance, the present study designed to analyze the effect of stimulative diet (s) fed to honey bees (*Apismellifera*) throughout the dry spell of year on quantity and quality of honey.

Method: In the present study, *Apismellifera*colonies were fed upon the different artificially formulated protein diets during the scarce period of the year. Effect of feeding diets on colony attributes as well as quantity and quality of honey was recorded. Samples of honey were collected from apiary at two stages i.e. before feeding and after feeding the stimulative diets. Collected honey samples were compared in terms of quality for significant variation (if any).

Results: In the current investigation, a significant difference was recorded among the total quantity of honey produced by experimental and control colonies.Gross nutritional and physico-chemical analysis revealed significant variation among the value of some parameters in pre-feeding and post-feeding samples of honey but none of tested sample exceeded the permissible limits set by national or international standards.

Conclusion: It may be concluded at the end of study that formulation of artificial diets may have positive impact on commercial beekeeping, which will further add to economy of beekeepers as well as country as a whole. The present work may help to clear the misconception that feeding the bees with artificial diet may lead to the deterioration of honey quality.

Images:



Keywords: *Apismellifera*, stimulative diet, honey yield, physico-chemical analysis.

BEE KEEPING, PRESENT AND FUTURE IN J&K

Akhter Hussain Najar*

J.S University, Shikoabad U.P- 283135

Abstract:

Beekeeping (or apiculture, from Latin: apis "bee") is the maintenance of honey bee colonies, commonly in hives, by humans. A beekeeper (or apiarist) keeps bees in order to collect their honey and other products that hive produces (including beeswax, propolis, pollen, and royal jelly), to pollinate crops, or to produce bees for sale to other beekeepers. Beekeeping is one of the oldest practices in J&K (India), and bearing a good no. of bee colonies in J&K, the no. is increasing day by day at a faster rate. Pollination becomes successful in peak season in spring and production of honey increased due to the passage of time and maximum youth engagement leads to good futuristic approach and reduces the unemployment and the factors which halt the bee keeping process in J&K mainly are: Weather pattern, migration, unavailability of medicines.

Keyword: Apiarist Bee-Colony Honey Pollination Migration

GEOGRAPHICAL DISCRIMINATION OF HONEY FROM NORTH HIMALAYAN REGION OF INDIA USING ANALYTICAL SPECTROSCOPIC TECHNIQUES

Tariq Ahmad Ganaie[a], Sajad Ahmad Rather[b], F. A. Masoodi[b], Aamir Hussain Dar[a]

[a]Department of Food Technology, Islamic University of Science and Technology, Awantipora, Pulwama
[b]Department of Food Science and Technology, University of Kashmir, Srinagar, Jammu and Kashmir, India

Abstract

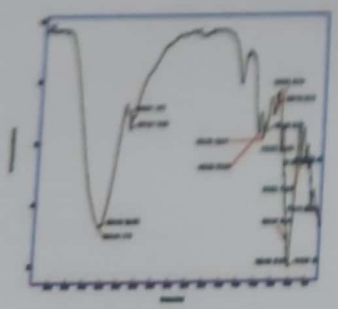
Background: Honey types from different geographical areas and floral origin presents varied composition and nutraceutical properties.

Objective: The present study aims to geographical discrimination and characterization of honey from North Himalayan region using conventional and analytical spectroscopic techniques.

Method: Three types of honeys viz. *Robiniapseudoacacia* (RSA), *Plectranthus rugosus* (PR) and multifloral honey (MF) from Kashmir Himalayas of India were characterized on the basis of antioxidant and ATR-FTIR spectroscopic features.

Result: The antioxidant assay revealed that total phenolic content (TPC), total flavonoids, ferric reducing antioxidant power and 1, 1-diphenyl-2-picrylhydrazy-IC50 (DPPH- IC50) free radical scavenging activity of MF honey was significantly higher in comparison to RSA and PR honeys ($P \leq 0.05$). ATR-FTIR analysis demonstrated that the absence of peaks at broad band around 1653.454–1637.656 cm^{-1} in MF honey, 1185.989–1153.072 cm^{-1} and 918.570–916.544 cm^{-1} wave numbers in PR honey thus clearly discriminating different types of honeys. **Conclusion:** The results revealed that antioxidant and FTIR spectroscopic characteristics of honey types vary with geographic origin and their floral sources and MF honey have a high therapeutic potential. Further discriminant analyses showed that it is possible to differentiate and evaluate traceability of honeys from Kashmir Himalayas according to their varying antioxidant and spectroscopic characteristics.

Images:



(a) ATR-FTIR Spectra

(b) Antioxidant properties

Keywords: Honey, antioxidant, ATR-FTIR spectroscopy, geographical discrimination, floral origin.

ROLE OF HONEY BEES IN KASHMIR HIMALAYA PLANT POLLINATOR NETWORK: NATIVE (*APISCERANA*) VERSES NON NATIVE (*A. MELLIFERA*)

Zubair Ahmad Rather *

**Centre for Biodiversity and Taxonomy, Department of Botany, University of Kashmir, Srinagar, 190006, India*

Abstract:

Background: To understand the consequences of increased introduction of non-native honey bees in Kashmir Himalaya plant pollinator network, it is necessary to reveal its role in structuring and functioning of the network.

Objective: Here a comparative study was made to unrevealed the roles of native and non-native honey bees in Kashmir Himalaya plant pollinator network.

Method: Field surveys were used to document interactions and data matrix of 80n x 230m was prepared and analyzed by*bipartite* package implemented in R version 4.1.0 (R Core team 2021) by visualizing networks, calculating indices and finally simulating extinctions.

Result: Non native honey bee has same nested contribution, degree, normalized degree, nested rank, species strength, paired difference index, partner diversity (PD), effective partners (EP), proportional generality (PG), proportional similarity (PS) and resource range (RR) as native honey bee; formed separate module and interacted with both native and non-native plants; when honey bees were removed from the network, 30 % of plants would collapse ($r = 0.83$).

Conclusion: Non native honey bee integrated well in Kashmir Himalaya network and display same network indices values as native honey bee and thus both functions as super-generalists and connectors in the network. Their extinction have serious consequences on the network thus must be conserved for nestedness of the network.

Keywords: Honey bees, native, non-native, Kashmir Himalaya, plant pollinator network.

ON A COLLECTION OF APOIDEA (INSECTA : HYMENOPTERA) FROM TEHSIL LADPURA, KOTA (RAJ.),INDIA

Sandeep Hooda, Nita Jain and Jagdish Saini*

University of Kota (Rajasthan),* Zoological Survey of India(Kolkata)

Abstract:

Background-The bees are very important pollinators of both cultivated and non-cultivated crops. Various attempts have been made to access their value but the contribution which they make to the pollination cannot be quantized. Superfamily Apoidea includes all kinds of bees subdivided under 07 families namely Apidae Linnaeus, Colletidae Lepeletier, Andrenidae Laterille, Halictidae Thomson, Melittidae Schenck Megachilidae Laterille, Stenotritidae Cockerell.

Objective-The present paper has distribution localities of Apoidean species of a specific region of Kota district of Rajasthan i.e.Tehsil Ladpura.

Material and Methods- The bee specimens collected from different locations of tehsil Ladpura at different times were identified using taxonomic keys and diagnostic characters were noted down. Photographs were taken using Nikon D 3200 camera available in the Zoology laboratory of VMOU, Kota.

Results- In total 123 specimens collected during different times were identified to belong to 19 species of 07 genera belonging to 04 subfamilies encompassing 03 families. The maximum collections were of family Apidae.

Conclusion-The study of Apoidean diversity is crucial for a region to access the potential pollinators and conservation of bee fauna, similar attempts in other regions of Kota as well as Rajasthan will meet the objective.

Images- 19 pictures in 3 plates of different bee species collected from Ladpura ,Kota(Raj.)

Keywords: Bees, Collection, Diagnostic, Taxonomic.

INSECT POLLINATOR VISITATION RECEIVED BY ALMOND IN THE KAREWAS OF KASHMIR VALLEY

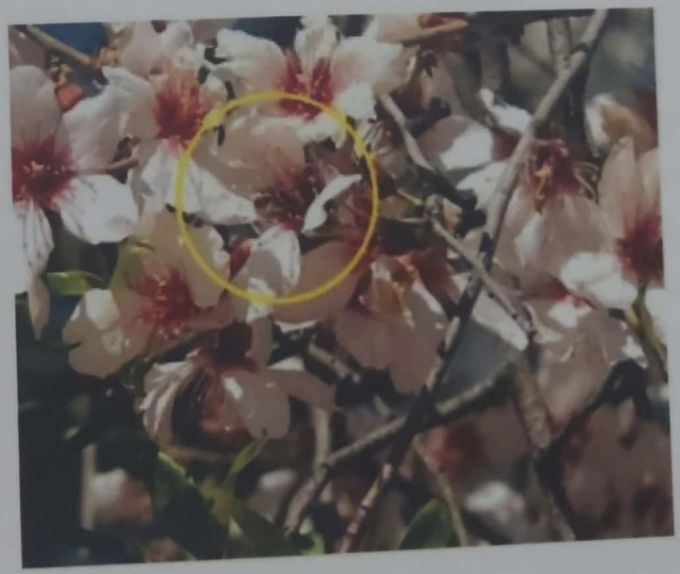
UzmaArifie[a], Manzoor A Paray[b], ParveenaBano[b], ShabnumMohiuddin[c], HumiraMushtaq[c]

[a]FoA, WaduraSopore, SKUAST Kashmir.
[b]RTCPPPM Shalimar, SKUAST Kashmir.
[c]FoH, Shalimar SKUAST Kashmir.

Abstract

Almond is highly nutritious, self-incompatible nut crop that undergoes mass bloom in early spring and entails proper insect pollinator visits to set fruit. The present study aimed to investigate the visitation received by the crop. The almond bloom was monitored visually in the lower branches and videographed in the upper branches to count the proper insect pollinator visits at different stages of bloom. For a total observation time of 600 minutes, 101 insect pollinator visits were received by the bloom. The highest number of visits were made by genus *Lasioglossum*. Applying mathematical linear model with the assumption that the almond bloom lasts for 10 days, insect pollinator visits received shall be to the tune of 1224 approximately, which does not compare favourably to the flowering rate of almond. Hence the almond bloom is not visited adequately and along with other factors, results in low fruit set in the crop.

Fig: Proper insect pollinator visit



Keywords: Almond, Bloom, Insect pollinator, Visitation

BENEFIT - COST ANALYSIS OF APICULTURE AND BROOD IMPROVEMENT BY WINTER PACKING IN RAJOURI, JAMMU AND KASHMIR

AquibMajeed, Zahid Hussain, Tabaraq Ali, Tahira Akther and Sajad H Parey

Department of Zoology, School of Biosciences and Biotechnology, Baba Ghulam Shah Badshah University Rajouri-185234

Corresponding Authors Email: majeedaquib@gmail.com

Abstract

Background: The present study was carried out in District Rajouri were most people are unaware about scientific beekeeping. This study was conducted to calculate the benefit-cost analysis of apiculture enterprise and brood improvement by winter packing of colonies in Rajouri district. Fifteen beekeepers were selected randomly for sample survey to collect the data. Benefit-Cost (BC) ratio of apiculture was calculated by including and excluding the revenue obtained from colony selling. For brood improvement winter packing was carried out to a group of eight weak colonies having constant number of frames but varies in store and brood taken as variables. The control colony was taken in comparison with weak colonies to check the improvement of brood by winter packing.

Materials and Methods: Questionnaire was used to withdraw information from the beekeepers. The cost and benefit sides were separately calculated and the cost side divided the benefit side to compute the BC ratio. The cost items were grouped into two categories, i.e., i) fixed costs and ii) variable costs. To find out the total cost (TC), total fixed cost (TFC) was added to total variable cost (TVC). Likewise, average cost (AC) was obtained by adding average fixed cost (AFC) and average variable cost (AVC) as TC = TVC + TFC, and AC = ATC + AVC. Where, AC = TC/No. colonies. For brood improvement winter packing was carried out to a group of eight weak colonies having constant number of frames but varies in store and brood taken as variables. The control colony was taken in comparison with weak colonies to check the improvement of brood by winter packing. The packing of colonies were done by foam. Hives were wrapped by foam Direct method was applied to take deviations from the actual data. Colonies were inspected after every 15 days from first inspection.

Results: The Average of B/C ratio was calculated at 2.37 summarizes the relation between costs and benefits therefore all the colonies are expected to deliver positive net present value in both short run as well in long run. Significant brood improvement in bee colonies was observed by winter packing.

Conclusion: Benefit-cost ratio of apiculture enterprises was found 2.37. It showed that about 94.06% bee colonies were running in profit. The average income per bee farm per quarter was Rs 115,319.00 and

the average income per colony per quarter was Rs. 3343.00, which is a good source of income for the tribal people of District Rajouri.Insulating colonies for winter can be worth the cost and effort in cold climates by increasing winter survival.

Keywords: Benefit- Cost Analysis, scientific beekeeping, winter packing, brood, Rajouri

SCIENTIFIC UTILIZATION OF HONEY BEE GLUE FOR ITS BIOLOGICAL PROPERTIES AGAINST THE PARASITIC PROTOZOAN *LEISHMANIADONOVANI*

Deepak K. Goyal*, Poonam Keshav, Sukhbir Kaur

Department of Zoology (UGC-CAS & DST-FIST), Panjab University Chandigarh.
*deepakgo23284@gmail.com

Abstract

Honey bee glue (HBG) is a resinous material that is produced by bees. It is produced by the collection of different resins, plant saps, and other waxy substances of plant origin mixed with its salivary secretion. HBG from different countries has been extensively studied for its biological activities. HBG from Indian origin has been explored as an antibacterial, anti-inflammatory, and anticancer. No scientific report elucidated the antileishmanial potential of the HBG from Indian origin. At present, few chemical agents are used to mitigate the infection but the limited efficacy, high cost, and lengthy regimen are restricting their use. Moreover, the emerging and increasing drug resistance are reported against different antileishmanial agents. Therefore in the current study, we aimed to utilize this honey bee product for its biological effects against the parasitic protozoan *Leishmaniadonovani* that causes leishmaniasis. We assessed the efficacy of this product against the strains of *L. donovani* sensitive and resistant to the standard antileishmanial agent. It was evaluated against both the stages (amastigotes and promastigotes) of the parasites of sensitive and resistant strains. Different stress markers were also performed for the evaluation of its efficacy against the parasite. We found an IC_{50} of 20.22 ± 1.5 □g/mL and 20.93 ± 1.35 □g/mL against the resistant and sensitive amastigotes whereas an IC_{50} o 29.43 ± 1.54 □g/mL and 27.95 ± 1.53 □g/mL against the resistant and sensitive promastigote respectively. The HBG disturbed the cell cycle of the parasite by arresting the DNA in the sub-G0/G stage. We also performed the GC-MS screening of the HBG that revealed the presence of the variou constituents which are biologically active. Our findings are encouraging as the efficacy of this honey be product is good enough against the sensitive as well as the resistant strain of the *L. donovani*. Therefore, can be a potential drug target against this dreaded parasite.

Keywords: Honey bee glue (HBG); *Leishmania*; Parasite, Antileishmanial; Drug resistance.

ROLE OF HONEY BEES IN POLLINATION OF CORIANDER (CORIANDUMSATIVUM L.)

Jameela Rasool, Munazah Yaqoob

Division of Entomology, Faculty of Agriculture, Wadura, Sher-e-Kashmir University of Agricultural Sciences and Technology-Kashmir, Srinagar.

Abstract:

Background: Coriander is one of the most important aromatic annual herbs cultivated for its leaves and seeds. It possesses compound umbel and is highly cross pollinated crop. Provision of bee colonies during the flowering period of the crop is very essential for increasing productivity in coriander. No work, however in this context was taken up in Kashmir, it therefore, became pertinent to know the contribution of honey bees in pollination of coriander.

Objective: The present study aims to study pollination efficiency of honey bees on quantitative improvement in coriander.

Method: In order to determine the pollination efficiency of honey bees on quantitative improvement of coriander, the experiment was laid out in the field at Division of Entomology, Faculty of Agriculture, SKUAST-K Wadura in Randomized block design with four treatments each replicated five times. The coriander was grown in plots (3x3 m^2) with following treatment detail: T1 - Open pollination, T2 - Pollination with Apismellifera, T3 - Pollination with A. cerana, T4 - Control (No pollination). In case of open pollination, all the species of pollinators were allowed to visit the coriander umbels whereas the plots with A. mellifera and A. cerana were covered with nylon mesh (1mm size) and respective colonies were placed inside the net during 10 per cent flowering. In control (No pollination), the plots were covered with nylon mesh and pollinators were not allowed to visit the umbels. The cages along with bee colonies were removed when bloom period was over. The data on different parameters was recorded from each treatment. Characteristics of coriander seed produced under different modes of pollination- The seeds produced under different modes of pollination were obtained and brought to the laboratory of Division of Entomology, FoAWadura for observing following characteristics: 1. Number of seeds per umbel, 2. Number of seeds per plant, 3. Seed weight per umbel (g), 4. Seed weight per plant (g), 5. Seed size (mm). Effect of seeds produced under different modes of pollination on quantitative parameters of coriander- The seeds produced under different modes of pollination were harvested and brought to the laboratory of Division of Entomology, FoAWadura to determine the effect of different modes of pollination on quantitative parameters of coriander. The following quantitative parameters were recorded: 1. Germination percentage, 2. Shoot length, 3. Root length, 4. Seedling vigour.

Result : Effect of different modes of pollination on coriander was determined using two species of honey bees viz., A. cerana and A. mellifera which were compared with open pollination and control (No pollination). Seed characteristics such as number of seeds per umbel, number of seeds per plant, seed size, seed weight per umbel, seed weight per plant and 1000 seed weight were significantly higher in Apis cerana pollinated plot (43.64 ± 4.80, 763.00 ± 22.19, 4.94 ± 0.16 mm, 0.43 ± 0.02 g, 8.51 ± 0.47 g 11.73 ± 0.23 g, respectively) followed by open plot (33.90 ± 3.06, 682.71 ± 12.08, 4.33 ± 0.25 mm, 0.36 ± 0.01 g, 7.55 ± 0.28 g, 10.82 ± 0.43 g, respectively), A. mellifera plot (30.69 ± 0.76, 620.53 ± 37.60, 4.17 ± 0.19 mm, 0.30 ± 0.01 g, 7.00 ± 0.17 g, 10.50 ± 0.29 g, respectively) and control (23.61 ± 0.36, 493.76 ± 10.06, 3.75 ± 0.17 mm, 0.20 ± 0.01 g, 4.19 ± 0.13 g, 8.77 ± 0.14 g, respectively). The quantitative parameters such as germination percentage, shoot length, root length and seedling vigour were significantly higher in A. cerana pollinated plot (83.23 ± 0.54%, 11.92 ± 0.30 cm, 8.79 ± 0.28 cm and 1723.69 ± 34.10, respectively) followed by open plot (76.06 ± 1.62%, 10.74 ± 0.35 cm, 7.71 ± 0.34 cm and 1393.41 ± 20.94, respectively), A. mellifera plot (75.75 ± 1.88%, 10.57 ± 0.14 cm, 7.58 ± 0.50 cm and 1392.31 ± 22.28, respectively) and control (52.70 ± 3.23%, 9.02 ± 0.56 cm, 6.84 ± 0.14 cm and 835.90 ± 13.80, respectively).

Conclusion: A. cerana has highest contribution in the pollination of coriander than other pollinators resulting in significant improvement in quantitative characteristics of coriander

Images:

Keywords: Pollinators, quantitative parameters, seed characteristics

Ref.:

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DESIGNING OF LOW COST, ECO-FRIENDLY MUD HIVE FOR REVIVING INDIGENOUS BEE *APISCERANA* POPULATION

Bharti Sharma[a], Younis Ahmad Hajam[a] and Rajesh Kumar[b]*

[a]Zoology Division, Career Point University, Hamirpur (HP)
[b]Department of Biosciences, Himachal Pradesh University, Shimla (HP)

Abstract:

Background: *Apiscerana* used toinhabit thetraditional wall hives, commonly known as *Khadra, Jaala* or *Jalota*. But, since last two decades, the population of *Apiscerana* is drastically declining due to increasing modern cement houses. This is the main reason of demolition of *Apiscerana*'s habitat. Decreasing population of *Apiscerana* tends toward the loss of our social and cultural heritage.

Objective: This study aims to design low cost, eco-friendly movable mud houses for this species, as habitat destruction is the main reason of its population decline. The beekeepers all over the state shall be benefited and population of this indigenous bee may get revived.

Methods: Soil was procured from district Kangra and was tested in the laboratory for its geotechnical properties. Following the geotechnical analysis, soil was used for the construction of mud house in which light weight wood was used to provide rigidity.

Result: Based upon the test results, Cu (Uniformity Coefficient) = 6.07 and Cc (Coefficient of curvature) = 1.64 was depicted for taken soil sample. The Maximum dry density obtained in 100% pure soil sample is 1.47 kN/m^3 at 20% of water content and the maximum dry density of 99.5% of soil mixed with 0.5% of 10mm fiber is 1.47 kN/m^3 at 16% of water content. The Unconfined Compression strength (q) is 285kN/m^2 where shear strength is q/2, i.e., 142.5 kN/m^2 (cohesion) and plasticity index of the soil is obtained as 9.929 %.

Conclusion : Considering the finding of current study, it can be concluded that the well graded sand containing clay having high cohesion value that significantly increases the shear strength of the soil. Addition of fiber provided the insulation and prevents the cracking of mud during rainy season. Therefore, revival of nests/habitat may prove helpful in conserving indigenous bee species.

Keywords: Indigenous Bee, Mud Houses, *Apiscerana*, Habitat.

FORAGING BEHAVIOUR AND POLLINATION EFFICIENCY OF HONEY BEES IN COMPARISON WITH OTHER INSECT VISITORS OF BUCK WHEAT (*FAGOPYRUMESCULENTUM* L.)

Mathumitaa P, Munazah Yaqoob, Liyaqat Ayoub, Janardhan. H. N, Sheikh Salma, Jameela Rasool and Rakshandha Hanif

Division of Entomology, Faculty of Agriculture, Wadura, Sher-e-Kashmir University of Agricultural Sciences and Technology- Kashmir, Srinagar.

Abstract:

Background: Buckwheat is an annual herbaceous plant that requires insects for successful pollination. Honeybees are regarded the major pollinators of buckwheat in most places and agronomists often urge the introduction of hives to ensure enough cross-pollination.

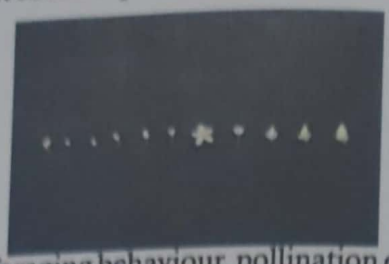
Objectives: 1. To study the foraging behaviour of honey bees and other insect visitors of buckwheat, 2. To determine the pollination efficiency of honey bees in comparison with other insect visitors of buckwheat and 3. To study the floral biology of buckwheat.

Method: Experimental trail (20 x20 m^2) was laid in the field of RCFC, North zone – II, Faculty of Agriculture, SKUAST-K, Wadura. Foraging behaviour was determined on the basis of foraging speed, foraging rate and foraging period. Pollination efficiency of honey bees and different major insect visitors were calculated based on their relative abundance and number of loose pollen grains sticking to their bodies by using the formula given below- Pollination Efficiency = Number of loose pollen grain sticking on the body of insect × Abundance of insect pollinators on buckwheat flowers. These observations were recorded from randomly selected five spots using quadrats of 1m^2 area, from 8:00 am to 6:00 pm at an interval of 2:00 hours for 7 days during the peak flowering of the crop. Under floral biology the following parameters were recoded - Date of bud initiation and days taken for full bud development, Time of anthesis, General structure of the flower, number of pollen grains per anther and per flower, Time of anther dehiscence, pollen viability, Stigma receptivity, location of nectar glands, Nectar quality –per cent sugar, Nectar quantity, Longevity of flowers.

Result: During the peak flowering period the foraging activity of bees started at 7:52 am and the maximum foraging activity was recorded at 9:00am to 10:00 am (119 bees/5min/m^2) and it starts declining at 2:00 pm and 4:00 pm with a population of 35 and 17 bees/5min/m^2. Maximum number of pollen grains was found in honey bees and honey bees were the most abundant species found in buck wheat (7.90/minute/m^2) followed by syrphids (3.45/minute/m^2). The average nectar production was around 0.08-0.10 mg per flower during the peak flowering period.

Conclusion: Honey bees are the most efficient pollinators of buckwheat.

Images:



Keywords: Honey bees, pollinators, foraging behaviour, pollination efficiency.

Ref.:

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POLLINATION POTENTIAL OF BUMBLEBEES (HYMENOPTERA: APIDAE) IN SOME ECONOMICALLY IMPORTANT CROPS IN KASHMIR

Aejaz H Parrey[a, c], Rifat H Raina[b], Sajad A Khan[c]

[a,b]Desert Regional Centre, Zoological Survey of India, New Pali Road Jodhpur, Rajasthan 342005, India
[c]Department of Zoology, School of Biosciences and Biotechnology, Baba Ghulam Shah Badshah University, Rajouri (J&K)- 185234, India

Abstract:

Background: Pollination is one of the most important mechanisms in the maintenance and promotion of biological diversity and in general, life on earth. Bumblebees are of great economic importance for their essential role in pollination of a great variety of crops, which are usually unable to be pollinated by other species of insects. Therefore, bumblebee's contribution to the ecosystem service of pollination is well accepted.

Objective: The present study was carried out in some districts of Kashmir valley, during Blooming season of April- May 2021 to investigate the pollination potential of bumblebees. The pollination potential of bumblebees was calculated in pollinating a particular crop on the basis of their abundance and the pollen load carried on their body.

Method : The sampling sites were chosen in some districts of Kashmir valley, for the observation and collection purpose. A fruit orchard of 25×30m dimensions in Shopian district and a vegetable garden of the same dimensions in Pulwama district were selected. These sites were selected on the basis of the

rich floral diversity. The abundance of the bumblebees, which constitutes one of the determining factors of their pollination potential, was sampled during the blooming period of the crops.

Fig. 1 *Bombustunicatus* on Watermelon

Fig. 2 *Bombusalbopleuralis* on App

Results: The results showed that bumblebees visit the important crops during blooming period, has the maximum pollination value, and therefore constitutes the main pollinator of crops. In addition to this, they had specialized pollen-collecting structure (corbicula) present on their hind legs, which further added to their efficiency as pollen carriers. Thus makes them efficient and main pollinators of the crops.

Conclusion: The majority of the selected crops are mainly pollinated by bumblebees. Due to their foraging habit, diverse food preferences and special morphological characters like hairy body and pollen basket, they are considered to be the most efficient and major group of crop pollinators.

Keywords: Bumblebee, Pollinator, Crops, abundance, Forage, Pollen carriers,

BEES AND BEEKEEPING: PRESENT SCENARIO AND FUTURE CHALLENGE

Preeti Choudhary

Abstract:

Bees plays an important role as a fruit and vegetable pollinator, producer of honey and hive products. Beekeeping in India is a year round activity and is essential for securing food, poverty reduction, health, environmental protection and plant pollination. They are challenged by many biotic and abiotic factors. The climatic factors like extreme temperature, relative humidity, shortage of water, deforestation of floral plants, human factors like poor apicultural practices, synthetic pesticides, diseases, and arthropod pests led to the decline of honeybee colonies and their products. But the world market demand for honey and other hive products has increased tremendously in recent decades since it is important for a wide variety of uses and applications. This paper aimed to explore these major constraints in beekeeping. It also outlines the most important cultural methods with emphasis on sanitation, maintaining bee colony vigor and some other management practices. India has a potential to keep about 120 million bee colonies that can provide self-employment to over 6 million rural and tribal families. In terms of production, these bee colonies can produce over 1.2 million tonnes of honey and about 15,000 tonnes of beeswax. Organized collection of forest honey and beeswax using improved methods can result in an additional production of at least 120,000 tonnes and 10,000 tonnes of honey and beeswax, respectively. The present global status as well as future strategies for conservation of beekeeping is discussed.

Keywords: Bees, Beekeeping, Pollination, Conservation, Biotic and Abiotic factors.

ROLE OF MINING BEES (HYMENOPTERA: ANDRENIDAE) IN THE POLLINATION

Purnima Pathak and Rifat H. Raina

Desert Regional Centre, Zoological Survey of India,
New Pali Road, Jhalamand, Jodhpur- 342005, Rajasthan.

Mining bees (family Andrenidae) are also called digger bees because they excavate tunnels in the soil. Family Andrenidae is represented by a single genus *Andrena* in which 54 species were recorded from the Indian region. Mining bees are efficient pollinators in many crops, fruits, pulses, fodder, and flowering plants. These bees appear at the starting of the spring season. Genus *Andrena* is generally recognized by short tongue and build a nest in the soil. **"Facial foveae"** present between the compound eyes and basal part of the antenna, is the main morphological character of mining bees and most of the body is covered by brown and black hairs and the male of the bee is slender and smaller than a female bee and also found long spready hairs on the trochanter of the hind leg.

Mining bees mostly favour such as sweet cherry, oilseed rape, apple, various species of orchards, blueberry, huckleberry, Nanking cherry, Manchurian apricots, sunflowers, and other fruit trees for the nectar foraging. The main food plant families prefer by mining bees are Asteraceae, Brassicaceae, Cornaceae, Cucurbitaceae. Different species of the mining bees prefer different pollen-collecting mechanisms such as scraping, buzzing, rubbing, tapping, and rasping.

Genus *Andrena* performsa scraping mechanism for collecting pollens from *Collinsia* (Plantaginaceae) and *Lupinus* (Fabaceae) and *Andrenachlorogaster*Viereck, 1904 performs biting and scraping methods, *Protandrena mexicanorum* (cockerel) (Andrenidae) perform the buzzing method for pollen collection. In *Oxaea* sp. of the family Andrenidae shakes their whole body to generate hidden pollen from anthers. *Protoxaeagloriosa* Fox, 1893 (Andrenidae) rotate their body and holding anthers to release pollen from *Kallastroemia* sp. (Zygophyllaceae).

Andrena bicolor (Andrenidae) depends on the temperature for the foraging and pollination on *Narcissus longispathus* and foraged only in the daytime. *Andrena emeishanica* (Andrenidae) prefer *Epimedium pubescens* for foraging and female bee is efficient pollinator than male bee because female bees have corbicula for pollen collection with the long hairy region. The male bee collects a large number of pollen but delivers it to less than female bees. This abstract highlighted the role of different species of the mining bees in pollination and perform different pollen-collecting mechanisms for collecting pollens.

Keywords: Mining bees, pollination, ecosystem.

ROLE OF *CIRCIUM* SP. (ASTERACEAE) AS SOURCE OF FOOD FOR THE BUMBLEBEES IN HIMACHAL PRADESH

Babu Saddam and Rifat H. Raina

Desert Regional Center, Zoological Survey of India,
New Pali Road, Jhalamand, Jodhpur-342005, Rajasthan.

Abstract:

Bumblebees are the immensely valuable insects required to maintain the diversity and conservation of medicinal, vegetables and wild plants in high land ecosystem or Himalayan region. Because of some supplementary adaptation in bumblebees and great role in pollination at highland ecosystem makes them superior from other insects which can't survive in harsh condition where bumblebees make residence. But the shortage of flowering plants during early autumn (September and October) is a huge problem for bumblebee's survival and to maintain the diet required by bumblebees to establish a nest before hibernation. *Circium* sp. plays a vital role as the main resource of pollens for bumblebee during early autumn in highland ecosystem.

The current study is clarifying the role of *Circuim* sp. for the conservation and to maintain the diversity of bumblebees during early autumn when the other sources of food disappear because of off flowering season.

The survey was conducted during the early autumn from 25th September, 2020 to 30th October, 2020 at the different places or localities of Himachal Pradesh and the bumblebees and their host plants were collected simultaneously. The main flowering plants which act as main pollen source during early autumn for bumblebees are recorded during the present study.

A total number of six bumblebee species namely viz., *Bombussimilimus* Smith, 1852, *B. tunicatus* Smith, 1853, *B. keriensis* Morawitz, 1886, *B. miniatus* Bingham, 1897, B. *albopleuralis*Friese, 1916 and *B. pressus* Frison, 1935 were recorded from the two districts (Chamba and Kangra) of Himachal Pradesh during early autumn.*Circiumarvense* (L.) and *C. falconeri* (Hook.f.) were observed as the main pollen provider during dearth phase or early autumn before bumblebees go into hibernation.

Circium sp. is rich in pollens and their morphological features makes easy for bumblebee to find it for pollens. During the late September and early October period most of the flowers disappeared or fallen because of harsh climatic condition but *Circium* sp. are the only flowering plants which have flowers until last days of November in Himalayas. Bumblebees are mainly depended on *circium*sp. during these days and collected pollens as their food for survival.

Keywords: Bumblebee, *Circium* sp. Pollination and autumn

PREVALENCE STUDY ON THE MITE (*TROPILAELAPS SPP.*) INFECTING HONEY BEES OF DISTRICT RAJOURI, J&K.

Samreen Sultana

Department of Zoology, BGSB University, Rajouri, J&K- 185234, India.

Abstract:

Background: Honey bee is an economically important insect that are known to pollinate crops across the globe. Beside their role in pollination, these insects provide a wide variety of products that are of great significance to the human population. Some of the bee derived products include honey, bees wax, royal jelly, propolis, pollen and bee venom etc. In view of their benefits to the ecosystem and mankind, the apiculture sector has grown rapidly in past several decades, however, there are certain constraints as well. Parasitic infections are one of the major threats to the bees both under the natural condition as well as to the beekeeping industry.

Objective: In the present study, the prevalence of the *Tropilaelaps spp.* commonly known as the Asian bee mite was recorded in the adults and larvae collected from the natural hives of the honey bee, *Apis spp.* located in the Rajouri district of J&K.

Method: Out of a total of 10 beehives, 450 adult bees and 200 larvae were examined. Three hives were found to be infected with the mites. Both the adult and larvae were infected with mites ranging from 1 to 5 in number. A total of 38 larvae were found to be infected with 97 mites while only 14 adult bees were infested with 26 mites, clearly showing the differential distribution of the mites.

Conclusion: Given the negative impact and high prevalence of these ecto-parasites on the bees, it is suggested that appropriate measures should be adopted to control these parasitic infections in order to ensure the well-being of these vital insects.

Keywords: *Apis spp.*, *Tropilaelaps spp.* and Asian bee mite

WIDE APPLICATIONS OF NANO BIOTECHNOLOGY ON APICULTURE

Tahira Akther, Aquib Majeed, Zahid Hussain, Tabaraq Ali, and Sajad H Parey*

Department of Zoology, School of Biosciences and Biotechnology, Baba Ghulam Shah Badshah University Rajouri-185234

Email: princesstahira209@gmail.com@gmail.com

Nanotechnology has brought a big revolution in science and technology. Nanomaterial synthesis using noble metals such as silver, copper, gold, magnesium, iron, and titanium has got immense importance and has attracted many nano researchers due to their various applications in science and technology. Nanoparticles are versatile agents with numerous applications in biomedical, bioengineering, agriculture and semiconductors, etc. Nanoparticles are the most potent nano weapon against plant pests and animal diseases. Only a few researchers have used nanotechnology in beekeeping so far. More research has been done on bee products synthesized as nanoparticles for medical purposes than on any other topic. Nanotechnology clearly has the potential to advance beekeeping and can be used in a variety of ways. Beehives can be painted with specialised materials to protect them from the sun, rain, or other unfavourable weather. Under high-temperature conditions, beehives with insulation performed better than control hives. It is envisaged that hives covered with particular nanoparticle insulators will outperform those coated with standard insulators in terms of performance and productivity. All beekeeping instruments can be made stronger and more adaptable to varied environmental conditions by being coated or constructed from specialised materials applying nanotechnology. It was manifested that the nano-silver coated hives protect bees against various diseases than the uncoated hives. Food manufactured as nanoparticles is expected to have different qualities than food in its natural state. Honey bees' health and digestive abilities may be improved as a result of this. Researchers are suggested to conduct further research on nanotechnology's applications in beekeeping and to choose the best formulations to complete the duties. The effects of nanoparticles on honey bees, both as target and non-target creatures, need to be further investigated.

Keywords: Honey bees, Pests, Diseases, Nanocolloids and Nanoemulsions.

CONSTRAINTS IN BEEKEEPING IN DISTRICT RAJOURI, JAMMU & KASHMIR

***Zahid Hussain, Tabarak Ali, Aquib Majeed and Sajad H. Parey**

**Department of Zoology, Baba Ghulam Shah Badshah University Rajouri, Jammu and Kashmir-185234*
Email: zahidshah2@gmail.com

Background: Bees are essential for the health of people and the planet. The role of bees as pollinators make them vital for food supplies. Most of the honey bee species are wild and few can be managed by human beings. From last few years, the rapid decline of honey bee population become great concern for researchers all over the world. Rajouri has rich flora and diverse climatic conditions to enhance the honey production on local level as well as for commercial scale.

Objective: This study was aimed to identify the constraints and opportunities for bee keepers. Results: We approached the local people to know about the techniques used for bee keeping. It has been observed through workshops and meetings at different places, viz. Darhal, GhabirMughlan, Koteranka, Budhal, Nagrota, and Palma from 2018-2020 that the local people have strong conviction and dedication for beekeeping. After the study, we came to conclusion that these people are facing some important problems with respect to management, marketing, and export of honey. High quality of pollen and Nectar from *Plectranthus rogosus* enhance the quality of honey in District Rajouri but from last few years, untimely rains aborted the blossoming of flowers, even small amount of flowers that blossomed were damaged by unseasonal rains or sometimes continuously rainfall reduce honeybee access to nectar and pollen, severe cold in winter, deforestation, excessive use of pesticides in agriculture weakening the colonies which don't have enough food. These crises heavily hit this small scale industry in this area.

Conclusion: People can plant more and more trees in their localities and they should get trained from state run/ central institutes. We also need to raise awareness on limiting the use of pesticides in agriculture. In winters, the packing of bee hives with foam reduce the size of hive entrance to maintain optimal temperature in hive. Strong colonies with young bees and good food store with proper packaging need no care during winter.

BABA GHULAM SHAH BADSHAH UNIVERSITY RAJOURI J&K

اِقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ

Department of Zoology
Baba Ghulam Shah Badshah University
Rajouri (J&K)