

AICRP - HONEY BEE & POLLINATORS

Objectives

1. Awareness, promotion and dissemination of advance technologies of beekeeping among farmers.
2. Conservation, promotion and augmentation of pollinators for various crops.
3. Develop advance management practices for beekeeping.
4. Evolving eco-friendly management practices for various enemies and diseases of honey bees.
5. Developing and standardizing rearing /management technologies of various pollinators thriving in hills and foothills.
6. Conservation and promotion of Indian Bee *Apis cerana* in hilly region of Uttarakhand.

1. Significant Achievements:

1. A new research center Model Bee Garden for Research & Training has been established with an outlay of 80 acres during 2013-14.
2. Honey processing plant has been installed in 2015 for processing of honey.
3. Approximately 9000 bee flora plantations have been done for pollinators and honey bees in bid to conserve, promote and augment the pollinators.
4. Foraging range of all the four honey bee species have been ascertained.
5. Advance beekeeping for *Apis mellifera* has already been standardized under the influence of prevailing climatic Condition of Uttarakhand.
6. The standardized advance technique of apiculture has been disseminated properly among the farmers and popularized and successfully adopted this profession.
7. Since the beekeeping with *Apis cerana indica* had been the cultural activities of Uttarakhand people since thousands of years ago, therefore, the scientific and advance technologies developed by the scientists have already been incorporated to improve the beekeeping practice with *Apis cerana indica*.
8. Practices and packages for organic honey production have been developed and disseminated among the farmers to fetch the better price of the apicultural production from the nearby market.
9. Since Uttarakhand state is rich in biodiversity especially in medicinal flora, hence the importance of medicinal honey production is being emphasized and popularized among the farmers in order to enhance the biodiversity and encompass the health prospects of human being. Simultaneously, to add the extra income for the farmers.
10. Safe use of chemicals against various disease like foul brood disease and Varroa mite have been narrated and popularized among the beekeepers.
11. General farmers have already been trained to stop the use of the pesticide at the time of blooming in any crops or orchards to save our precious pollinators.
12. Improved queen rearing techniques have been introduced among farmers to improve their stock culture and production.
13. Pant Wall hives have been developed and being popularized among the farmers to promote their traditional beekeeping along with scientific technologies.
14. Complete package to check or manage the infestation of Varroa mite has already been developed and popularized among the farmers resulting, Mite infestation have been completely managed in the apiary of Uttarakhand farmers.

15. In litchi, fruit weight and fruit yield was significantly higher with 311.96kg. (30m foraging distance)
16. A parasitic mites in varroa jacobsoni *Apis mellifera* colonies during the year 2005.
17. Population dynamics studies revealed that Varroa mite had peak population (14.33/ mite/hive) during autumn season from 39 SW to 52 SW, whereas lowest mite population (9.33 mite/hive) was recorded in rainy season from 25 SW. However the mite population in a hive also depends on the colony strength and brood area.
18. The highest population of Varroa mite was recorded in the first week of Feb. which ranged from 10-12 dead/ fallen mite/ hive.
19. During the survey in Kumaon region Uttarakhand, approximately 35-40 percent reduction in the number of *A. mellifera* colonies is estimated due to Varroa mite infestation.
20. In the region, the stingless bee (H⁺ Trigona sp.) were receded in plains, foothills and hot valleys upto about 1200MSL.
21. Sample surveying of 62 apiaries during 2007 revealed that 85.3 percent of the surveying *Apis mellifera* apiaries had varroa mite infestation. The average decline in number of *A. mellifera* colonies was 11.7 per cent during 2006 which increased to 34.6 percent in 2007. losses to individual beekeepers were much higher and varied from 4.0 to 31.25 percent in 2006 and 22.7 to 100 percent in 2007. the *A. cerana* colonies experienced hardly any loss due to varroa mite in spite of the infestation in 14.3 percent apiaries in hill districts of the region.
22. Thymol at 1% concentration gave 85% mortality of wax moth larvae after 48 hrs of exposure followed by Thymol at 0.5% concentration with 70.60% mortality. Menthol showed 69.0% and 76.10% mortality at 0.5 and 1% concentrations.
23. Studies on the effect of botanical oils and formic acid revealed that maximum mortality (54.00 dead mite/ hive) was observed with Eucalyptus oil followed by Neem oil (49.30 dead mite/hive).
24. Exposure of combs to sun for 15-20 minutes at weekly interval and storing them in air tight hives or polythene bags was found effective in reducing the damage by greater wax moth larvae in storage conditions.
25. The efficacy and persistence of Flumethrin (T4) was nearly stable for first and second week with 94.22 and 92.37 percent mite mortality which was slightly reduced to 90.17 percent after third week of treatment giving overall 92.25 percent with mean 95.56 dead/ fallen mites/ hive/ week which was significantly higher ($P < 0.001$) than thymol oil + formic acid (T2), Thymol oil (T1), and Thymol oil stripe (T3) treatments.
26. Flumethrin (T4) applied at 3 drops per live at weekly interval showed the highest efficacy and persistence to control varroa mite with 92.25 percent mite mortality with mean 95.56 dead/ fallen mites/ hive/ week and having highest brood development (24.83 percent increase) with maximum honey production (5.5kg). Followed by, Thymol oil (t1) T1) Thymol oil+ formic acid (T2) and Thymol oil stripe (T3) recorded 81.11, 89.77, and 77.65 percent 70.33, dead / fallen 7.66, percent increase in brood mite mortality and honey production were significantly higher ($p < 0.0001$) in treatment T4 and T2 compared with T1, T3 and T5.
27. In second group of experiment applied as dust against varroa mite indicated highest mite mortality was observed in Turmeric + Sugar powder (T8) treated colonies with 90.06 percent mite mortality and 39.18 percent increase in brood with 4.72 kg honey/ hive.
28. Bee colonies as sprays highest efficacy and persistence to control varroa was showed by Turmeric + Lemon juice (T11) with mean 87.96 percent mite mortality (144.44 dead/ fallen mite/ week) followed by Oxalic acid (T9) treated colonies with 84.87 percent mite mortality (95.11 dead/ fallen mite/ week) with 33.84 and 15.13 percent increase in brood area with 4.52 and 4.17 kg honey per hive respectively.
29. The highest number of insects pollinators visiting

on the flowers of various fruit crops (mango & litchi) represented the odr Diptera and family Syrphidae which included *Episyrphus balteatus*

2. Research Publications:

1. Durgapal K.K. and Mall Pramod 2018. Quality assessment of honey collected from Uttarakhand and Uttar Pradesh. *Indian Journal of Entomology*, 80 (3), 1109-1113.
2. Rakesh Kumar and Pramod Mall 2018. Important traits for the selection honey bee (*Apis mellifera* L.) Colonies. *Journal of Entomology and Zoology Studies*. 6 (3) 906-909.
3. Sapna Tiwari, Pramod Mall and Renu Pandey 2018. Impact of floral variations on physico-chemical properties of bee pollen. *International Journal of Chemical Studies*, 6 (4) 1833-1835.
4. Rakesh Kumar and Pramod Mall 2018. Evaluation of hygienic bees behaviour and quality queens production through Doolittle method in honey bee *Apis mellifera* L *International Journal of Chemical Studies*, 6 (3) 1503-1506.
5. Rakesh Kumar and Pramod Mall 2018. Important traits for the selection of honey bee (*Apis mellifera* L.) colonies. *Journal of Entomology and Zoology Studies*. 6 (3) 906-909
6. Gouri Shankar Giri, Pramod Mall, Sunil Verma and Sneha Joshi 2018. Effect on food storage level of *Apis mellifera* Exposed to thiamethoxam treated mustard crop. *J. Exp. Zool. India*, 21 (1) :215-216
7. Gouri Shankar Giri, Sapana Tiwari, Pramod Mall and Renu Pandey 2018. Thiamethoxam had negative impact on *Apis mellifera*, enhance yield of Brassica. *Journal of Pharmacognosy and Phytochemistry* . 7 (3) : 2812-2813.
8. Gouri Shankar Giri, Pramod Mall and Renu Pandey 2018. Effect of thiamethoxam on average frome weight and strength of *Apis mellifera* L. exposed to thiamethoxam treated mustard crop. *International Journal of Chemical Studies*, 6 (3) : 3655-3657.
9. Gouri Shankar Giri, Sapna Tiwari, Pramod Mall and Renu Pandey 2018. Effect of thiamethoxam on brood and capped cell area of *Apis mellifera* L. *Journal of Pharmacognosy and Phytochemistry*, 7 (4) : 320-321.
10. Gouri Shankar Giri, Babita Bhatt, Pramod Mall and Renu Pandey. 2018. Effect of thiamethoxam on foraging activity and mortality of *Apis mellifera* (L.) *Indian J. Agric. Res.* 52 (2) : 215-217.
11. Gouri Shankar Giri, Pramod Mall and Renu Pandey. 2017. Effect of thiamethoxam on colony development of *Apis mellifera* L. *Journal of Entomology and Zoology Studies*. 5 (6) : 177-179.
12. Mahendra Singh and Pramod Mall. 2017. Palynological Studies of pollen grains of Some Apiculture Importance Bee Flora in Tarai Region of Uttarakhand. *Journal of Pharmacognosy and Phytochemistry*. SP-1: 352-356.
13. Joni Kumar and Pramod Mall 2017. Hygienic behavioral response of *Apis mellifera* Ligustica against pin-killed and infectious brood. *Journal of Entomology and Zoology Studies* 5 (1) :913-915
14. Shweta Patel, Sunil Kumar Yadav, Pramod Mall 2016. Influence of Electromagnetic Radiations on *Apis mellifera* L. Colonies *Agricultural Research Journal* 53 (3) : 442-443
15. Jony Kumar and Pramod Mall, 2016. Assessment of colony performance through brood and honeyt measurement in *Apis mellifera* Ligustica, *J. Exp. Zool. India* 19 (1) pp 1355-1358
16. Jony Kumar and Pramod Mall, 2016. Effect of Life stages and colony on live weight of Newly emerged queen *Apis mellifera* Ligustica, *J. Exp. Zool. India* 19 (1) pp 1379-1383.
17. Shweta Patel, Pramod Mall 2015. Impact of electromagnetic radiations on biology and behaviour of *Apis mellifera* L. *Journal of Entomological Research* 39 (2) : 123-129
18. DM Tripathi, PK Mall 2015 Longevity, fecundity and hatching of *Agrotis ipsilon* (Hufn.) on different

test foods *Journal of Entomological Research* 39, (1) : 57-60

19. P Mall, Y Kumar 2014. Effect of electromagnetic radiations on brooding, honey production and foraging behavior of European honeybees (*Apis mellifera* L.) *African Journal of Agricultural Research* 9 (13), 1078-1085
20. Ruchira Tiwari and Pramod Mall, 2011. Efficacy of different acaricides against honey bee mite *Varroa destructor* (Anderson and Trueman) in *Apis mellifera* Linn. Colonies in Uttarakhand, *Journal of Insect Science*, 24 (1): 75-79
21. PL Gangasaran, P Mall, OP Garhwal 2010. Economic impact of extensive pollination through honey bee in peach orchard. *Indian Journal of Horticulture* 67 (4) 475-477
22. Pramod Mall and Suresh Ram, 2010. Evaluation of preference and safteness of some biorational insecticides on foraging of Italian bee *Apis mellifera* L. *Ann. Entomol*, 28 (1):69-73.
23. Indu Varshneya; Pandey, A. K.; Mall, P.; Rathore, R. R. S, 2009. Seasonal incidence of predatory wasps in *A. mellifera* colony having different number of frames. *Journal of Entomological Research*. Vol. 33 (1): 45-49.
24. Vikas Kumar and Pramod Mall, 2009. Exploration of Pollen substitute for *A. mellifera* L. *Pantnagar Journal of Research*, 7 (1) :120-123
25. S.C.S.Sajwan and Pramod Mall, 2008. The effect of harvesting interval on production of royal jelly by selected *Apis mellifera* L. colony. *Pest Management and Economic Zoology*, 16 (1):107-109.
26. Indu Varshneya; Ajay Kumar Pandey; P. Mall and (late) R.R.S.Rathore, 2008. Seasonal incidence of wax moth (*Galleria mellonella* L.) in European honey bee (*Apis mellifera* Linn.) Colony. *J. ent. Res.*, 32 (1) : 1-6.
27. S.C.S.Sajwan and Pramod Mall, 2008. Impact of Thermoregulatory material on brood rearing by *Apis mellifera* LINNAEUS During winter. *J. Insect Sci.* 21 (3) : 317-319.
28. Vikash Kumar and Pramod Mall 2008. Morphometrical studies of pollen of vegetable crops. *Pantnagar Journal of Research* 6 (2), 215-219.
29. Ruchira Tiwari and Pramod Mall. (2007). Efficacy of cow urine for management of European foulbrood disease of honeybee, *Apis mellifera* L at Pantnagar. *Journal of Eco-friendly Agriculture*. 2 (2), 201-203.
30. P. Mall and R.R.S. Rathore, 2004. Food carrying capacity of *Apis cerana indica* and *Apis mellifera*. *Indian J. Appl. Ent.* 18 (1) : 53-55
31. Mall, P. and Rathore, R.R.S. 2002. Foraging pattern of *Apis florea* under the influence of seasonal variations, *Indian Journal of Applied Entomology* 16 (1) 6-9.
32. Mall, P. and Rathore, R.R.S. 2001. Foraging pattern of *Apis mellifera* during winter and spring at Pantnagar. *SHASHPA* 8 (2) : 153-156.
33. Mall, P. and Rathore, R.R.S. 2001 Investigations on the foraging pattern of Rockbee. *Apis dorsata* as influenced by seasonal variations, *Indian Journal of Applied Entomology* 15 (1):1-6.
34. Mall, P. and Rathore, R.R.S. 2001. Foraging pattern of *Melipona* sp. During monsoon. *Indian Journal of Applied Entomology*, 15(1):70-71
35. P. Mall and R.R.S. Rathore 1998. Investigations on the foraging pattern of Indian Honey bee, *Apis cerana* F. *Pest Management and Economic Zoology* 6 (2) : 151-154.

National Training/Conference/Workshop organised:

- Organised workshop on honey bees and Pollinators for 2 days on 17 and 18th June 2013 in which **70 scientists** from various state of the country participated and effective strategies for comprehensive development of Beekeeping have been formulated on the basis of research finding of the scientists working on honey bee and pollinators across the country.

- Organised one beekeeping farmer's fair and exhibition on 19th and 20th June 2013 in which **251 farmers/beekeepers** participated. Experts from various states have been invited to enrich the knowledge of beekeepers for two days. The recommendations were made on the basis of feed back from beekeepers for proper growth and development of beekeeping.
- Delivered one TV talk for DD Kisan Bharti Durdarshan in 2016.
- Delivered 4 TV talks for Dehradun Durshan in 2007-2009
- Delivered 287 TV talks for ETV Uttar Pradesh and Uttarakhand

Radio Talks:

- Delivered 7 Radio talks for Rampur Radio
- Delivered 485 Radio talks for Pantnagar Janbani since 2001.

Connectivity through mobile

Attended more than 5500 calls through mobile from the farmers/beekeepers. The problems related to insect pest management and beekeeping were discussed and resolved and proper recommendation were conveyed to the farmers.

Farmers connectivity through Kisan Call Centres (Help line number)

More than 276 farmers were advised through help line number regarding their problems related to insect pest management and beekeeping.

Pantnagar center is working in collaboration with

- University of Reading, United Kingdom,
- World Bee Project, United Kingdom
- HAU, Hisar, Haryana;
- Panjab Agriculture University Ludhiana, Panjab : and
- Dr Y.S.Parmar University of Horticulture & Forestry Nauni, Solan Himanchal Pradesh.
- GBPIHEX, Almora
- VIPKAS, Almora
- KVIC, Haldwani
- SBREC, Jelolikote
- Jammu University, Jammu
- HP University, Shimla

State level beekeepers seminar organised:

A state level beekeepers seminar was organised on Awareness for the development of beekeeping and pollinators for skill development, employment and income generation among the farmers/beekeepers on 19th and 20 August 2017 on the auspicious day of Honey Bee Day 20th August 2017. In the above seminar approximately 241 beekeepers/farmers participated to enrich their knowledge with modern technology of beekeeping.

State level training for scientists on beekeeping:

A state level advance training was organised on 1-3 December 2009 in which **21 scientists** of all the 13 districts of the Uttarakhand state working in various KVKs and research centres have been participated to equip them with modern technologies of beekeeping in bid to promote and popularise the beekeeping among the farmers.

Organised farmers trainings:

97 beekeeping training were organised at Rudrapur, Sitarganj, Khatima, Almora, Dehradun, Haridwar, Chakrata, Kalsi, Saiya, Dhakrani, Badayu in which approximately 2640 farmers/beekeepers were trained to start beekeeping in order to generate additional income.

Lectures delivered:

Approximately 372 training lectures were delivered to trained the farmers and beekeepers about Insect Pest Management in various crops, horticultural crops and fruit trees. The training encompassed about **8000 farmers** from various state of the country.

TV Talks:

- Delivered one TV talk for Lucknow Durdarshan on Beekeeping

- GBPIHEX, HP unit, Kullu

Research & extension linkages with extension and development agencies.

- Horticulture Technology mission, ICAR
- Wageningen University Netherlands
- Central Institute of subtropical horticulture Lucknow
- Directorate of water management , ICAR.

3. Future Thrusts:

- Pollination requirement of important crops should be quantified considering the existing fauna biodiversity.
- On the basis of quantified pollinators requirement, the deficit in the prevailing agro-climatic conditions should be bridged by introducing the managed Pollinators in required strength.
- Independent Pollinators Promoters Council/Board should be established at central level along with

their branches in various states as research unit to study the biology and behavior of various important pollinators and quantify their role in the various crops and orchards being grown in the state.

- Through independent pollinators councils, the package and practices should be released encompassing the safety and conservation of pollinators which are on the verge of extinction due indiscriminate use of pesticides in various crops.
- Separate bee farms should be established in each University/Institute in order to manage enhance the biodiversity and prevent the destruction of natural habitat of our precious pollinators.
- Impaired agricultural practices should be discouraged to avoid the destruction of habitat in their niche.
- Separate bee farm should furnish the pesticide and chemical free area to attract pollinators and get multiplied.
- Well equipped apiculture laboratory atleast one in



Photographs pertaining to experimental trials

each state should be established.

- Pollinators carrying heavy vehicles should be arranged for needful migration of the pollinators as per the requirement of the crops or locality.
- Prompt action for capacity building of stakeholders should be ensured regarding potential use and conservation of insect pollinators.
- Since the *Apis cerana indica* is efficient and potential pollinators hence it should be conserved and promoted especially at high altitude hills to fillip the bridge of pollinators to enhance the productivity.
- Indeed, the conservation and promotion of Indian bees will enhance the agricultural production in temperate condition.
- Owing to the artificial plantation in most of the forest either in plains or hill, the bee flora are being depleted resulting migration/destruction of Indian bees from planted forest of hills/plains.
- An agreement/collaboration should be established with various government departments either for forest or roadside plantation only of nectar and pollen producing plants so that the availability of the food for pollinators can be ensured to encourage and multiply the pollinators.
- Ameliorated biodiversity will definitely increase the production of agricultural crops and fruit trees.

