THE AGBIZ TODAY *E-Magazine,* Vol. -2 Issue-3, July 2025: 092 -097
ISSN: 3049-2491 (Online)
Kumar et al.
https://sabm.scholics.in/

The Western Honeybee Apis mellifera L.: Its Introduction and the Factors Affecting its Distribution in Himachal Pradesh

Anjali Kumari, Vikul Kumar and Ritika Chaudhary*

Department of Bioscience, Himachal Pradesh University, Summer Hill Shimla (H.P.) – 171005, India

***Correspondence Author Email :** vknaik91@gmail.com

ABSTRACT

Apis mellifera, the Western honeybee, plays a vital role in global agriculture through pollination and the production of economically and nutritionally valuable hive products. In India, the introduction and expansion of A. mellifera beekeeping have significantly advanced since its domestication in the 1960s in Kangra valley of Himachal Pradesh. The state's diverse agro-climatic zones and rich floral diversity make it an ideal region for apiculture. However, the distribution and productivity of A. mellifera colonies face various challenges, including climatic variability, pesticide exposure, floral dearth periods, diseases, pests, predators, and migratory stress. Interspecific competition from the indigenous Apis cerana further complicates sustainable apiculture in the region. Despite these challenges, beekeeping has become a crucial livelihood for thousands of rural youths, supported by state-led initiatives. This article highlights the ecological and environmental factors influencing the distribution and success of A. mellifera in Himachal Pradesh. It emphasizes the challenges presented by climate, pests, migration, and competition, alongside the species growing role in sustainable apiculture.

Keywords: *Beekeeping, Pollination, Ecological Challenges, Sustainable livelihood.*

1. Introduction:

The Western honeybee, or *Apis mellifera*, is an important provider of ecosystem services including pollination, which are important to environmental quality and biodiversity (Stout and Finn, 2015). The most commercially useful pollinator in the world, honey bees affect a large variety of wild plants and commercial crops, some of which are in danger of going extinct (Hristov *et al.,* 2020). Products from Hive are valuable for their favourable effects on human and animal health in addition to their financial advantages (De Goede *et al.*, 2013; Boppre and Vane-Wright, 2019 and Brodschneider and Gratzer, 2021). Honeybee is considered as an important insect species among pollinators and a biomarker for the sustainability of the environment because of its pollination services.

There are many agro-climatic zones with different bee flora in Himachal Pradesh, which makes the state unique in its beekeeping industry. It is divided into four Agroclimatic zones: subtropical and low hills (up to 914 m); sub-temperate, sub-humid mid-hills (915-1523 m); wet temperate high hills (1524-2472 m); and dry temperate high hills and cold deserts (above 2472 m). In Himachal Pradesh, each of the four honeybee species can be found in a distinct climate zone but only *A. mellifera* and *A. cerana* are the only two species that are currently complementary to each other in temperate and subtropical regions, respectively, in terms of beekeeping (Sharma *et al.,* 2022). From the Shivalik hills to the Greater Himalayas, Himachal Pradesh boasts 37.033 square kilometres of forest cover, making it a prime location for beekeeping expansion. Beekeeping is mostly responsible for pollination, honey production, and wax production (Lal *et al.,* 2012).

After being domesticated in Himachal Pradesh between 1964 and 1965, *A. mellifera* has since been kept under various state conditions. Different morphological traits are displayed by honeybee species in different environmental conditions (Pathania *et al*., 2022). *A. mellifera* L., commonly referred to as the European honeybee, is an important bee species that pollinates a wide variety of crops worldwide. According to Paudel *et al*., 2015, *A. mellifera* plays a significant role in pollinating a wide variety of fruits, nuts, vegetables, and field crops. The Bee Research Station in Nagrota Bhagwan, Himachal Pradesh, was the first place *A. mellifera* was introduced in 1962.

Fig.1. Modern beekeeping with *A. mellifera* using movable frame bee boxes (Gurung *et al*., 2012),

In 1934 and 1936 modern beekeeping practices implemented in the Kullu and Kangra valleys of Himachal Pradesh, respectively. Afore the introduction of *A. mellifera* to the State in 1961 at the Bee Research Station in Nagrota, Kangra the only honeybee raised in the State was *A. cerana indica*, an Indian honeybee. Due to the impotance of beekeeping in the fruit business, the program was moved from the Agriculture Department to the Horticulture department when the Agriculture department was split up in 1971. The entire state of Himachal Pradesh had only 1250 honeybee colonies kept in contemporary bee hives before to April 1971. The advancement of beekeeping has improved significantly since the program was moved to the Department of Horticulture in 1971. Given the significance of honey bees for fruit plant pollination and the production of valuable honeybee products the government had implemented this program on a priority basis. Actually, the performance of *A. mellifera* in H. P. has been so promising that, as of right now, approximately 1500 educated youths without jobs have made *A. mellifera* beekeeping their full-time career and are caring for close to 80,000 bee colonies, compared to 4200 in 1981–1982. These bee colonies can produce over 1600 metric tons of honey a year, compared to 3 M.T. in 1981–1982 (Department of Horticulture, Government of Himachal Pradesh,).

2. Factors affecting the distribution and success of *A. mellifera* in Himachal Pradesh:

In Himachal Pradesh, beekeeping through *A. mellifera* is crucial to the production of honey as well as the pollination of crops. In recent years, the beekeeping community here has encountered numerous factors that are posing challenges to honeybees.

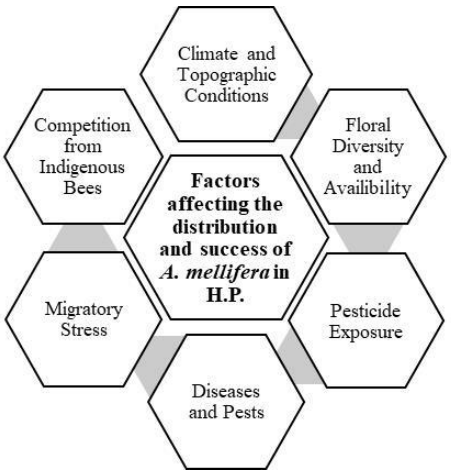

Fig.2. Factors affecting the distribution and success of *A. mellifera* in Himachal Pradesh (Author's own work)

- **Climate and topographic conditions:**

A study by Sonika *et al*., 2021 assessed how the environment affected honeybee species in the Western Himalayan region. The population, comb size, feeding

habits, and other activities of bees are all being significantly impacted by the changing climate, according to the statement. The aim of the study was to assess the effects of the environment on honeybee colonies across multiple districts in Himachal Pradesh.

A study was carried out in the state of Himachal Pradesh to investigate the perceptions of farmers on climate change and its potential impact on apple farming along the altitudinal gradient. According to the findings, the majority of farmers claimed that the air temperature had increased at all elevations; hence, 72% of farmers believed that the loss of fruit size and quality at low hills was due to the temperature increase (Basannagari and Kala, 2013).

- **Floral diversity and Availability:**

The success of *A. mellifera* colonies in Himachal Pradesh is closely linked to the region's floral diversity. The state supports diverse flowering plants due to its varied altitude and climate, providing abundant nectar and pollen sources throughout different seasons. Major bee-forage crops include apple (*Malus domestica)*, mustard (*Brassica campestris*), litchi (*Litchi chinensis*), wild flora like Eucalyptus, Berberis, and various forest plants.

However, the availability of floral resources is not uniform year-round. "Floral dearth periods" during the summer (May–June) and winter (November–January) lead to reduced foraging activity and weakened colonies. Beekeepers must either migrate colonies to better forage zones or provide artificial feeding (Bhatia *et al.,* 2022). Therefore, maintaining diverse and bee-friendly cropping systems is crucial for sustaining *A. mellifera* populations and enhancing pollination services.

- **Pesticide Exposure:**

Kangra is an agriculturally oriented district, according to Kumar and Kundal (2016). However, spraying insecticides, fungicides, weed killers, and other chemicals on flowering crops does significant harm to bees. Therefore, dead or dying bees were seen at the entrances to bee colonies at a number of apiaries in this area, which may indicate pesticide poisoning.

A study on the mustard crop (Brassica juncea) at the Dr. YS Parmar University of Horticulture and Forestry in Nauni, Solan, Himachal Pradesh, by Sharma *et al*., 2018 revealed that systemic residues in nectar and pollen following neonicotinoids sprayed during the flowering period pose danger to the health of honeybees.

- **Diseases and Pests:**

Sac brood virus was found in two places in Himachal Pradesh in 2003. It was found in colonies at Nauni (district Solan) in the spring and summer (March–May), affecting 0.39–5.20 percent of brood; at Jachh (district Kangra), it was also found in colonies from March–June, affecting 0.23–2.10 percent of the brood (Rana and Rana, 2015).

According to Brar *et al.*, 2018, bears were cited as a significant issue in the Kinnaur region (Telangi and Reckong Peo) between May and July. Colonies of *A. mellifera* that had migrated to Kinnaur were attacked by lizards in May and June. In May and June, lizards also devastated colonies in the Kinnaur regions of Telangi and Reckong Peo. Bees' primary enemies are wax moths, wasps, birds, ants, hive beetles, mites, mice, and bears. In addition to destroying combs, hives, and hive components, they also catch and kill bees, inhibit community development, eat nutrient supplies, and irritate honey bees which reduces colony productivity (Yadav and Kaushik, 2017). According to a study conducted by Sharma *et al.*, 2013, in 30 apiaries spread across different agro-climatic zones in Himachal Pradesh, two species of reptiles entered honeybee colonies in addition to invertebrates.

Likewise, it has been noted that *A. cerana* and *A. mellifera* colonies in the Chamba valley of Himachal Pradesh are being attacked by pests and predators in a variety of agro-climatic zones. Reptiles were found to be responsible for 3% of honeybee predation (Chandra and Mattu, 2017). Brar *et al*., 2018 found that a wasp, *Vespa auraria* visits peaked in September, with August, October, November, and July following closely after. From October to November, very few *V. magnifica* were seen visiting the apiary at Nauni. Comparable outcomes were observed in the Chamba Valley, where the most common predators that pose a serious threat to the beekeeping industry are *V. auraria* and *V. orientalis* (Chandra and Mattu, 2017).

Table 1. The status of diseases in *A. mellifera* in Himachal Pradesh (Negi *et al.*, 2020)

Districts	Bee Diseases	Months Of Prevalence	Annual Colony Loses (%)
Solan	European Foulbrood	February	10-12
	Sac brood	March	2-3
	Ectoparasitic mites	November	10-20
Kangra	Ectoparasitic mites	Dec- March	10-12
	Sac brood	April- June	2-3
	European Foulbrood	May- July	10-15
	Nosema	July -August	4-5
Kinnaur	European Foulbrood	March- August	12-20
	Sac brood	May- July	1-2
	Ectoparasitic mites	April-May	8-15

A bee eater bird known as *Nyctyornis athertoni* was observed attacking *A. mellifera* colonies in February 2016 in the apiary housed in the Department of Entomology, College of Horticulture, Dr. YS Parmar University of Horticulture and Forestry Nauni, Solan. The bird typically visited in groups of two to three or by itself during the day (direct sunshine). The Himalayan foothills provide the earliest evidence of the bird's predation on *A. mellifera* (Sharma *et al*., 2016).

Table 2. The status of enemies in *A. mellifera* colonies in Himachal Pradesh (Brar *et al.*, 2019)

Bee Enemy	District	Months Of Prevalence	Annual Colony Loses (%)
Wasps	Solan	July- October	15-18
	Kangra	June- October	12-15
	Kinnaur	June- August	8-10
Bear	Solan	-	-
	Kangra	-	-
	Kinnaur	May-June	15
Birds	Solan	Throughout year	2-3
	Kangra	Throughout year	2-4
	Kinnaur	-	-
Lizard	Solan	Throughout year	2-4
	Kangra	Throughout year	2-3
	Kinnaur	May-June	8-10

- **Migratory stress:**

Migratory beekeeping exposes honey bee colonies to various stressors including transportation, handling, and environmental changes. These stressors can impair immune function, reduce foraging efficiency, and increase susceptibility to diseases and parasites. Frequent relocation also disrupts colony organization and brood rearing. Nutritional deficiencies during migration further contribute to colony

weakening. (Simone-Finstrom *et al.*, 2016) highlighted that migratory stress plays a substantial role in declining colony health and productivity.

Table 3. Migratory cycle of *A. mellifera* adopted by beekeepers in Himachal Pradesh (Sharma *et al.*, 2022)

Period	State	Major Honey Source
January- February	Haryana	Eucalyptus
November-December	Punjab, Rajasthan	Mustard,
September-November	Punjab, Rajasthan	Mustard
December- February	Haryana	Eucalyptus
March- April	Himachal Pradesh	Apple
March- April	Himachal Pradesh	Apple

- **Competition from indigenous honey bee**

Competition from the indigenous honey bee *A. cerana* poses a significant challenge to the introduced species *A. mellifera* in regions like Himachal Pradesh. Both species often forage on overlapping floral resources, leading to interspecific competition that can reduce the foraging efficiency and honey yield of *A. mellifera*. *A. cerana* is better adapted to local environmental conditions and shows greater resistance to native pests and diseases, giving it a competitive edge in certain habitats. Additionally, aggressive interactions at foraging sites and robbing behaviour can further stress *A. mellifera* colonies. Understanding this competition is crucial for sustainable beekeeping practices and maintaining ecological balance (Verma, 1990).

3. Conclusion:

A. mellifera has emerged as a vital contributor to agricultural productivity and ecosystem health in Himachal Pradesh, particularly through pollination services and hive products. The diverse Agroclimatic zones of Himachal Pradesh offer immense potential for apiculture, yet several challenges persist. Climate variability, floral scarcity, pesticide exposure, disease outbreaks, predation, and migratory stress collectively affect colony health and productivity. Moreover, competition from the indigenous *A. cerana* further complicates colony dynamics. Despite these constraints, sustained efforts by government bodies, particularly the Department of Horticulture and Forestry, have led to notable advancements in modern beekeeping. Continued scientific management and ecological monitoring are essential for sustaining *A. mellifera* populations and enhancing apicultural benefits.

References:

1. Basannagari, B. & Kala, C. P. (2013). Climate change and apple farming in Indian Himalayas: A study of local perceptions and responses. PLoS ONE, 8(10), e77976.
2. Bhatia, S., Thakur, M. & Devi, N. (2022). Correlation between foraging activity and bee strength in *Apis mellifera ligustica* colonies in mid-hills of Himachal Pradesh. Biological Forum – An International Journal, 14(4), 1315–1319.
3. Boppré, M. & Vane-Wright, R. I. (2019). Welfare dilemmas created by keeping insects in captivity. In Animal welfare, 23–67.
4. Brar, A. S., Sharma, H. K. & Rana, K. (2018). Survey studies: Integral approach towards the diseases and enemies of *Apis mellifera* L. in upper and lower hills of Himachal Pradesh: Beekeepers prospective. Journal of Entomology and Zoology Studies, 6(3), 939–942.
5. Brar, A. S., Sharma, H. K. & Rana, K. (2018a). Seasonal incidence of wasps in Apis mellifera L. colonies at Nauni, Solan (Himachal Pradesh). Journal of Entomology and Zoology Studies, 6(2), 3177–3178.

6. Brodschneider, R. & Gratzer, K. (2021). The FAO Guideline on Good Beekeeping Practices for Sustainable Apiculture. Bee World, 98(4), 144.
7. Chandra, A. & Mattu, V. (2017). Studies on major pests and predators of Apis cerana F. and Apis mellifera L. in the Chamba valley of Himachal Pradesh. Journal of Entomology and Zoology Studies, 5(6), 728–731.
8. De Goede, D. M., Erens, J., Kapsomenou, E. & Peters, M. (2013). Large scale insect rearing and animal welfare. In Wageningen Academic Publishers eBooks, 236–242.
9. Gurung, M., Partap, U., Shrestha, N., Sharma, H., Islam, N. & Tamang, N. (2012) Beekeeping training for farmers in the Himalayas–Resource manual for trainers. Kathmandu: ICIMOD.
10. Hajam, Y. A., Sharma, A., Kumari, I. & Kumar, R. (2021). Honey and honeybees as potential pollinators and indicators of environmental pollution. In *CRC Press eBooks*, 207–222.
11. Hristov, P., Neov, B., Shumkova, R. & Palova, N. (2020). Significance of Apoidea as main pollinators, ecological and economic impact and implications for human nutrition. Diversity, 12(7), 280.
12. Kumar, R. & Kundal, N. (2016). Beekeeping status in Kangra district of Himachal Pradesh. Journal of Entomology and Zoology Studies, 4(4), 620–622.
13. Lal, R., Sharma, S., Sharma, J., Sharma, V. & Singh, D. (2012). Impact of beekeeping training on socio-economic status of farmers and rural youths in Kullu and Mandi districts of Himachal Pradesh. Journal of Human Ecology, 39(3), 205–208.
14. Negi, N., Thakur M., Sharma, K. H. & Rana, K. (2020). Survey studies on beekeeping with Apis mellifera in Himachal Pradesh: Beekeeper's prospective. Journal of Entomology and Zoology Studies. 8. 315–318.
15. Pathania, A., Kumar, A. & Dhiman, S. (2022). Morphometrics of Apis mellifera in North-Western Himalayan region of Himachal Pradesh, India. Journal of Entomology and Zoology Studies, 10(3), 105–109.
16. Rana, B. S. & Rana, R. (2008). Detection of sacbrood virus and the incidence of sacbrood disease in *Apis mellifera* colonies in the North-Western Himalayas. Journal of Apicultural Research, 47(1), 58–62.
17. Sharma, A., Daroch, R. K., Kapoor, R. & Kasi, I. K. (2022). Status of bee keeping in Himachal Pradesh, India: A review. The Pharma Innovation, 11(3S), 257–265.
18. Simone-Finstrom, M., Walz, M. & Tarpy, D. R. (2016). Genetic diversity confers colony-level benefits due to individual immunity. Biology Letters, 12(3), 20151007.
19. Sonika, N., Hajam, Y. A. & Kumar, R. (2021). A study on evaluation of environmental effect on honey bee species in Western Himalayan region. Journal of Entomological Research, 45(4), 802–806.
20. Stout, J. C. & Finn, J. A. (2015). Editorial. Ecological Entomology, 40(S1), 1–2.
21. Verma, L. R. (1990). Beekeeping; in Integrated Mountain Development: Economic and Scientific Perspectives. International Centre for Integrated Mountain Development (ICIMOD): Kathmandu, Nepal.
22. Yadav, S. & Kaushik, H. D. (2017). Diseases and enemies of honeybees. In Springer eBooks, 67–108).