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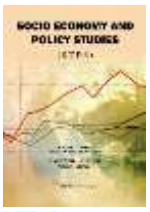

REVIEW ARTICLE

BEEKEEPING IN NEPAL AND ITS STATUS, CHALLENGES AND POSSIBILITIES: A REVIEW

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ABSTRACT

Beekeeping has been practiced in Nepal for a long time,beginning with the traditional log hive for personal consumption and progressing to the contemporary hive for commercial purpose.It has received a lot of attention in recent years in Nepal because of its minimal input and high output outcomes.Despite its growing popularity,beekeepers in Nepal confront a number of obstacles,including poor bee management,colony migration and absconding,pest and foes attack,insufficient bee research program and erroneous data on bee floral recognition.This review paper highlights the current state of beekeeping in Nepal,as well as honeybee species and honey production potential for long-term livelihoods.This paper emphasizes the enormous potential for commercial beekeeping as well as the challenges that it faces and suggestions for improving it.

KEYWORDS

Beekeeping, Honey production, Honey hunting, Floral diversity, Threats, Potentality

1. INTRODUCTION

Honey bees are a key pollinator of fruits,flowers and vegetables and are a very valuable insect.Beekeeping has been practiced to utilize bee products like honey and wax. Not only that,it also provides a variety of benefits such as revenue generating,job possibilities,nutritious food as well as development of sustainable agriculture through pollination services in Nepal.Traditional log hives and contemporary hives are the two types of beehives typically utilized in Nepalese beekeeping. When it comes to traditional log hives, they need minimal management,are inexpensive and use locally accessible materials, but they produce low yields and have higher risk of ant invasion which leads some bee colonies to flee (Allen, 1995). Overcoming these flaws,the modern hive generates a higher production and has a very low absconding rate. Even though the modern hive offers various advantages.it is out of reach for poor farmers.Each modern hive cost around Rs.10000.

Nepal has a wide range of climatic conditions and a vast floral diversity, which allows for the presence of a variety of bee species such as *Apis cerena, Apis mellifera, Apis florea, Apis dorsata and Apis laboriosa.* Among these, the only domesticated honeybee species are *A.cerena and A.mellifera*.(Publications, n.d.)(Pfeffer & Wolf, 2020). The most commonly utilized for beekeeping is *A.cerena*, which is endemic to the terai region and mountain valleys below 2300 m.*A.mellifera* was recently introduced to Nepal and can now be found in the Kathmandu valley.*A.cerena* is more popular and preferable to *A.mellifera* as it is less susceptible to nosema disease and predatory wasp invasion (Theisen-Jones & Bienefeld, 2016). Other species, despite not being domesticated, can be found in the wild establishing their own colonies.Dwarf honeybees,*A.florea* are native to the Terai region and warmer mountain valleys below 1000 m(Thapa, 1996). *A.dorsata*,the gaint honeybee is seen building honeycomb below 1350 m.*A.laboriosa* inhabits in Himalayan ranges of Nepal between 1500 and 4000 m.

Despite its economic importance,beekeeping is in steep decline and is on verge of extinction in its natural habitat.Native bee populations in the region are being harmed by habitat change from extremely diverse ecosystems to significantly less diverse ecosystems,particularly owing to deforestation.This habitat damage may result in the extinction of certain types of bee flora.*A.cerena* colonies have been severely afflicted by ailments such as nosema,viral clusters,sacbrood diseases and European foul brood disease.Natural enemies of bees include mites,wasps,lizards,ants and rodents,all of which have contributed to the decline of bee populations.Given the obstacles,if adequate manangement,frequent inspection and care are provided,there is high potentiality of beekeeping in Nepal due to floral diversity ranging from presence of *Rhododendron sps* in the mountain region to *Brassica campestris* in the Terai region.

2. METHODOLOGY

The primary and secondary methods are used in this review paper.In terms of the primary method,several beekeeping farms were visited and a few beekeepers in the Rupandehi district were questioned.The photos were taken during a visit to a bee farm in the Rupandehi district.It is also reviewed using secondary method,which involved reviewing a variety of available research papers published in journals,in national and international seminars and annual reports.

3. RESULTS AND DISCUSSION

There are two forms of beekeeing:Traditional hive and Modern beehive in Nepal.Traditional *A.cerena* beekeeping is the most popular beekeeping conducted by farmers in Nepal's rural areas.It only necessitates a small amount of financial commitment and management compared to modern beehive.Log and wall hives are the most commonly utilized traditional behives.Log hives are built of wood(mainly Sal tree),have one or two entrance holes and sealed at the ends with a stopper and mud.They are placed horizontally,generally from ropes,on the external walls or under the eaves of farmer's house to prevent colony losses due to predator

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attacks.Wall hives are cube-shaped chambers integrated into the structure of a house.A little aperture on the outside allows bees to enter,while a wooden door within the house permits honey gathering(Allen, 1995).

Modern beehives have recently become popular in Nepal(Bhusal et al., 2011).It comes with replaceable frames that apiarists can use to check for illnesses and parasites.Frames are thin rectangular constructions made of wood or plastic that are hung parallel inside the boxes.Each hive has ten frames with the appropriate amount of bee space between them.A modern beehive comprises of a hive stand,bottom board(bee entry),broad box(where queen lays her eggs),honey super(where honey is stored),inner cover(a feeding shelf), and an outer cover that protects the hive from the extreme weather.It is ideal for honey production on a large scale.Modern hives make bee colony management and transportation simple.Honey is extracted using a centrifugal honey extractor, which allows honey to be removed without causing damage to the comb.However,it is prohibitively expensive for poor farmers and the construction of the hive necessitates a high level of craftsmanship.

A

B

C

Figure 1: A.Modern beehive in Jyotinagar, Rupandehi, B.A.cerena bee, C.Traditional log hive seen in Nayamil

4. Honey Hunting

Honey hunting or Tamumai in Tibetan, is a practice of collecting honey from wild bee species especially *Apis dorsata*, practiced by the gurungs,a Nepalese highland tribe.A huge *A.dorsata* single comb nest hangs midway up the rock to gain enough sunshine and defend themselves from predators.Honey hunting is a risky adventure that involves harvesting honey from these large nest.The method entails using smoke to subdue and repel aggressive bees as well as a ladder built from mountain bamboo cortical thread.The ladder is suspended from the cliff's top and is firmly attached to the trees on both sides.The honey hunter climbed down the ladder,chopped the honey combs and gathered them in the basket.Gurungs generally love chewing honeycomb lumps.They spit out the wax and the juices they consume make them pleasantly drunk.Honey is most commonly used as a sweetener in rice and wheat flour.Honey is occasionally heated and blended with popped rice or barley or allowed to cool into toffee for kids(Strickland, 1982)(Gathering et al., 2019).

4.1 Floral Diversity

Beekeeping success is determined not just by honeybee strains,management and hive structures,but also by the abundance and availability of bee floral plants around bee farming area(Pokhrel, n.d.).Artificial feeding during the cold and rainy months as well as other management methods, must be considered.The colony development periods were reported to be early spring(mid-February to mid-March) and autumn(mid-August to mid-September). Plant species like *Caryopteris odorata,Leucosceptrum canum,Buddleia spp.,Prunus domestica, Prunus domestica,Prunus persica* and *Eupatorium spp* during early spring season and *Rhus spp.,Porana grandiflora,Glycine max,Osbeckia stellate* and *Rubus spp* during autumn season helps to flourish colony of bee.Rainy season and winter season are death periods for beekeeping with low temperature,very few flowering species like *Reinwardtia indica,Pogestemon glaber,Caesalpinia spp.,Eupatorium spp* and more uncertain death of honeybees(Bista & Shivakoti, 1970)(Cholis et al., 2020).

4.2 Honey Production and Demand

Honey is fundamentally a product and a source of long-term income for poor beekeepers and traditional honey hunters.Honey comes in a variety of brands in Nepal's market.According to available data,Nepal generates 1105 metric tons of honey,with 330 metric tons coming from *A.cerena*,400 metric tons from wild bees nad roughly 375 metric tons coming from *A.mellifera*.The domestic demand for honey is expected to be over 300 metric tons.Nepal exports a little amount of honey to other nations but imports a large amount of honey from other countries.Many nations outside of Nepal like Norway have banned Nepali honey due to pesticide residue concerns(Sivaram, 2012).

5. Challenges

Several biotic and abiotic causative agents such as parasite mite infestations,bacterial and viral infections,pesticide contamination,frequent queen losses,poor management,genetic weakening,habitat fragmentation,transgenic plant cultivation,migratory stress and climatic variability are some of the challenges responsible for widespread decline in honey bee populations(Thapa, 1996).A significant percentage of bee illness and mortality has been documented,posing serious issues for food security and biodiversity preservation in Nepal.Beekeepers and researchers have been paying close attention to the dramatic decline in honey bee numbers as a result of agricultural intensification,widespread use of agriculturally administered insecticides and environmental degradation.Loss of floral diversity due to urbanization and industrialization is one of the major challenges that needed to be address in time(Potts et al., 2010).

Hornets have been identified as the most dangerous bee predators.*V.velutina* and *V.mandarina* are the most abundant and serious enemies of honey bees in beekeeping(Ranabhat & Tamrakar, 2009)Neupane, 2009).Among six species of birds,*Dicrurus macrocercus* and *Dicrurus aeneus* are serious perdators which mainly feed on flying honeybees during rainy seasons(Bista et al., 2020).Species of ants such as *Componatus sp.,Monomorium sp., and Myrmica sp* are seen attacking beehives.*Palatar indicus,Ariope areuta* are species of spider found attacking beehives.One species od beetle, One chalcid and lizards were identified as natural enemies of bees. Viral diseases such as Thai sac brood virus, bacterial diseases such as American Foulbrood and European Foulbrood, protozoan diseases such as nosema diseases,amoebic disease, septicaemia and fungal diseases such as chalkbrood are all frequently seen diseases in honeybees (Amiri et al., 2017).

With the advancement of agricultural modernity,the use of pesticides and insecticides has been increased dramatically,affecting honey bee populations directly. During pollination, honeybees ingest these harmful pesticides and perish instantaneously. Another challenge in Nepalese apiculture is the conservation of the wild honeybee due to increasing deforestation. Apiculture also faces obstacles such as a lack of data on bee floral identification and mapping of bee pastures with carrying capacity. Poor beekeeper face a lack of government help(Aryal et al., 2015). The lack of competent honeybee research has resulted in a reduction in beekeeping in Nepal. Research on management of hives as well as training sessions are still insufficient in our country. In Nepal,the lack of experienced labor and the infrastructure required for beekeeping is posing additional obstacles (Cobb, 2019)(Abou-Shaara, 2019).

6. Possibilities and Strategies

Aside from honey production,farmers are drawn to beekeeping because of the additional money generated by by-products such as wax,pollen,royal jelly and queen bees.Also beekeeping has a lot of prossibilities in Nepal because of Nepal's diverse flora and the fact that it is a low-investment,high return enterprise(Bhandari & Kattel, 2020). If government and international organisations conduct enough research and provide adequate support,beekeeping in Nepal can develop to next level.Nepalese beekeeping can thrive well through appropriate instruction in beehive management and awareness of honeybee seasonal managment.Trees for bees in planting programs to boost pollination and raise crop yields,supporting honey hunters through beekeeping and exporting honey wines or beeswax cosmetics all facilitate beekeepers in Nepal better their livelihoods.(Abd Jalil et al., 2017)

7. Conclusion

To summarize,the review paper focuses on beekeeping in Nepal including its cahllenges and opportunities.Nepal offers a lot of potential for beekeeping because of its numerous ecological conditions.Increasing honey production can help alleviate some of the pressure in food security in a developing country like Nepal.Better administration,regular inspection,quality floral availability,more research, and more experienced workforce involvement can help to bring beekeeping to next level.Hence,There is further scope for beekeepers to grow through the development and popularization of modern beehives,streamlining community based beekeeping and tackling numerous challenges for the promotion of beekeeping in Nepal.

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