ABSTRACT

Name: Mr. Sanjaya Bista
Semester and admission year: First, 2013
Major subject: Entomology
Major advisor: Prof. Resham Bahadur Thapa, Ph.D.

Id No.: R-2013-ENT-01P
Degree: Ph. D.
Department: Entomology

Promotion of apiculture is possible through superior breed, quality flora, suitable colony management practices, cost-effective pest management techniques and their integration. Realizing these facts, studies were conducted to establish management practices for *Apis mellifera* beekeeping at rural and forest locations of mid-hill areas in Lalitpur and plain areas in Parasi district of central Nepal. Specific management activities included a) weather-based floral calendar prepared with field observations from 2016 to 2019; b) abundance of major pests documented in five colonies at fortnightly from 2016/17 to 2017/18 in fifty worker brood and hive debris for mite (*Tropilaelaps mercedesae*), and at three different hours of the day for three minutes for hornet (*Vespa* spp.) as well as its predation rate during July to November; and c) management of *T. mercedesae* mite by evaluating common acaricides [65% formic acid (FA) @ 3 ml/frame, glucose powder (GP) @ 4 g/frame, neem seed powder (NSP) @ 3 g/frame and cow urine solution (CUS) @ 5 ml/frame] and control treatments during 2017 and 2018. Among flowering plants, 161 and 154 major bee floras were recorded from Lalitpur and Parasi districts, respectively. March to May during spring and September to November in autumn seasons were found as honey flow period while December to January in both districts, as well as June to July in Lalitpur and June to August in Parasi districts were recognized as dearth periods. Hornet species, *Vespa basilis*, *V. tropica*, *V. velutina* and *V. mandarinia* were noticed around Lalitpur, while along with these *V. bicolor* occurred in Parasi. Occurrence of *V. velutina* was most dominant followed by *V. tropica*. Hornet incidences began to increase from late spring and reached its peak during early autumn. Highest abundance prevailed on early-October in both, Lalitpur (64.6 in forest & 55.8 in rural) and in Parasi (45.4 in forest & 38.8 in rural) districts per 3-min. count. In addition, another peak occurrence was during early-July (7.4 in rural & 10.2 in forest/3-min.) in Lalitpur and mid-July (14.2 in rural & 15.2 in forest/3-min.) in Parasi districts. Presence of hornet was lower in winter and early spring seasons, with no prevalence during December to March in Lalitpur and January to April in Parasi. The highest population was recorded at morning hours in both districts. Highest hornet predation appeared in early-November (70.27%) at rural and mid-November (58.62%) in forest areas of Lalitpur while in Parasi it existed in early-November (55.65%) at forest and mid-November at rural (46.88%). The highest hornet predation was observed at evening hours in rural and during noon hours at forest locations of both districts. Hornet intensity positively correlated with RH (r=0.235), maximum (r=0.504) and minimum temperature (r=0.524) whereas rainfall (r=-0.184) demonstrated negative relation. Also, incidence and predation rate correlated highly positive (r=0.408) in both districts considering high predation of bees was likely with more hornet visits. Occurrence of *T. mercedesae* mite was highly dominant compared to *Varroa destructor*. Two peak infestation periods of *T. mercedesae* mite were identified in Parasi, as mid-September to early-

November at forest (42.6 to 30.2%) and early-September to early-November at rural (42.2 to 26.4%) and another minor peak during mid-March to mid-May at both locations. At Lalitpur, it attained during early-September to mid-October (35.6 to 25.2% at rural & 33.8 to 20.2% at forest) pursued by other two minor peak, first during mid-July and early-August and next in mid-April to early-June. Winter season was recognized as lowest infestation period in both districts. Mite population on debris was more in Parasi ranging from 22.8 to 34.2 at rural and 23.8 to 33.8 at forest during autumn season, whereas at Lalitpur, it occurred between 22.4 to 25.4 at rural and 20.4 to 24.3 at forest locations. The correlation between colony strength, mite abundance at hive debris and brood infestation rate exhibited highly significant and positive (higher r=0.602 at Lalitpur forest, lower r=0.278 at Parasi rural). Among acaricides evaluated, FA performed better whereas CUS and NSP also provided significant results. CUS decreased mite population at 7.87±0.58 level with 62.79±5.19% survivability in 1.34 days, production of 1.20±0.06 kg/colony of honey at evaluation period with minimum cost per mite control of NRs. 0.69, likewise mite population decreased up to 11.0±1.76 level by NSP with 29.84±5.16% survival rate in 0.79 LT_0 value with 1.12±0.04 kg of honey. Performance of FA was witnessed superior, where mite decreased up to 3.62±0.65 with 9.48±1.51% survivability in the lowest LT_0 (0.715 days) with highest honey production of 2.12±0.11 kg and net benefit of NRs. 1536.2. The knowledge on temporal and spatial distribution of predatory hornets and parasitic mites is necessary for decision making to develop management plans against these pests. Mite management technique described herein also will contribute to quality honey production.