

# Management of *Apis mellifera* in Semi-arid Subtropical Climates of India

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Success of beekeeping in a region depends upon three key factors: ambient climatic conditions; available bee forage; and, incidence of diseases, pests, predators and enemies (Eckert and Shaw, 1960; Eisikowitch and Masad, 1980; Lensky and Golan, 1966). Semi-arid tropics present a different set of environmental conditions and resources to temperate climates (Furgala, 1975), and therefore, require entirely different management practices (Sihag, 1990a, 1990b, 1991; Smith, 1953, 1960). This paper presents the life-cycle pattern and diseases, pests, predators and enemies of *A. mellifera* under prevailing climatic and floral conditions of subtropical India.

## Seasonal Climatic Conditions

Seasonal temperature and relative humidity prevailing at Hisar in northwest India are presented in Table 1. Throughout northern India, distinct summer and winter exist. The dearth period comes in summer and is accompanied by high temperature and low humidity (in some parts).

## Floral Conditions

Prevailing floral conditions are given in Table 2. However, there is variation in floral availability

from place to place. Bee forage availability starts with flowering of pigeon pea in September-October. Major honey plants are rape seed, mustard, sunflower, eucalyptus, pigeon pea and litchi (in restricted areas). Other plants support beekeeping during different months.

## General Ecobiology of *Apis mellifera*

*Apis mellifera* in subtropical northern India starts build-up activity with the commencement of flowering on toria (*Brassica campestris* var. Toria) in October. Weak colonies show build-up and strong colonies store honey. Drones are produced from December to March depending on earlier build-up. Accordingly, queens are reared. This coincides with winter in the region. Therefore, management practices related to winter are required, along with rearing of new queens and division of colonies. The post-winter months again witness weak colonies showing build-up and strong colonies storing honey. Honey storage continues with availability of bee forage. From mid-May onward the dearth period commences when temperatures are high with low relative humidity. Management practices related to these conditions are required during this period (Sihag, 1990a). In July, the rains start and humidity is high. During the post-rainy period both

**Table 1.** Seasonal pattern of temperature and humidity at Hisar

Season*	Duration of season	Temperature fluctuations (°C)		Relative day humidity (only during daytime min-max range)%
		Max.	Min.	
Early summer	Early March to early May	25-40	15-24	30-45
Mid-summer	Early May to early/mid-June	40-44	18-28	28-40
Late summer	Mid-June to I/II week of July	40-47	25-30	25-30
Early monsoon	Mid-July to mid-August	30-36	24-27	75-95
Late monsoon	Mid-August to mid-September	30-35	22-25	55-85
Early autumn	Mid-September to mid-October	30-35	15-25	50-70
Late autumn	Mid-October to mid-/late November	24-33	12-18	45-60
Winter	December to February	21-28	1-12	45-55

Note: \*Defined by Sihag (1983).

**Table 2.** Floral calendar of major bee plants in northern plains of India

Bee plant	Months of flowering
Pigeon pea ( <i>Cajanus cajan</i> )	September-October
Rape seed and mustard ( <i>Brassica</i> sp.)	October-February
Eucalyptus ( <i>Eucalyptus</i> sp.)	February-March
Berseem ( <i>Trifolium alexandrinum</i> )	March-mid-May
Shisham ( <i>Dalbergia sissoo</i> )	April
Sunflower ( <i>Helianthus annuus</i> )	April-May, October-November
Maize ( <i>Zea mays</i> )	May-July
Curcubits	May-October
Citrus ( <i>Citrus</i> sp.)	March
Litchi ( <i>Litchi chinensis</i> )	March

**Table 3.** Seasonal incidence of major pests, predators and enemies of *Apis mellifera* in northern India

Enemy species	Months of incidence
Ectoparasitic mite ( <i>Tropilaelaps clareae</i> )	September-May/June
Wax moth ( <i>Galleria mellonella</i> )	June-November
Predatory wasp ( <i>Vespa orientalis</i> )	June-July
Predatory bird ( <i>Merops orientalis</i> )	June-July
Robber ants	July-August
Robber bees ( <i>Apis dorsata</i> )	June-July

humidity and temperatures are high. Bee forage during these months is scarce. Therefore, colonies

either need artificial feeding or may be moved to other places. These conditions stretch to mid-September when pigeon pea begins to flower and colonies start build-up or honey storage.

### Diseases, Pests, Predators and Enemies

*Apis mellifera* has no viral and bacterial diseases in India. However, other enemies such as ectoparasitic mite, wax moth, predatory wasps and birds, robber ants and robber bees are prevalent. Their monthly incidence is reported in Table 3. Along with seasonal management practices, management of these enemies is also required as suggested by Sihag (1990b, 1991).

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Fall and Winter Management of Colonies

Carriage bees originated in the Alps and are well adapted to a climate of long harsh winters and hot summers. In autumn, as nectar and pollen are scarce, the brood-rearing activities are limited and the rate of brood-rearing are rapidly cut down. Generally, a small colony can well stand to winter.