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TOXICITY OF NECTAR OF TEA (*CAMELLIA THEA* L.) TO HONEYBEES

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Summary

Honeybee (*Apis mellifera*) colonies at Darang, India, have suffered brood mortality in October, when tea bushes are in flower, in each year since 1977. Three colonies (4–5 combs each) were established on empty combs in October 1983, and given one comb of healthy brood and combs containing fresh nectar taken from Darang colonies. It was established by pollen analysis of nectar taken from foragers that the nectar was tea nectar. Symptoms of poisoning appeared in all colonies within 2–3 days; larvae turned yellow and died, emitting a rancid odour. Larvae which were fed on tea nectar in the laboratory showed similar symptoms, whereas larvae fed with diluted nectar taken from healthy colonies developed normally. There were no apparent harmful effects on adults. It is concluded that the presence of poorly-managed small tea estates in the foot-hills of the Dhauladhar range of the Himalayas renders the area unsuitable for *A. mellifera* colonies in autumn.

Introduction

There are many reports of nectar that is toxic to honeybees (Palmer-Jones & White, 1949; MacGregor, 1960; Palmer-Jones & Line, 1962, 1969; Atkins, 1975; White, 1975; Maurizio, 1975; Majak et al., 1980). Plants recognized as toxic to honeybees (Robinson & Oertel, 1975) include mountain laurel (*Kalmia latifolia* L.), California buckeye (*Aesculus californica* Nutt.), death camas (*Zigadenus venenosus* Wats), locoweed (*Astragalus* spp.), yellow jasmine (*Gelsemium sempervirens* Ait) and summer titi (*Cyrilla racemiflora* L.). In India, studies on sources of poisonous nectar are wanting.

Since its establishment in Himachal Pradesh in 1964, the European honeybee has spread to adjoining areas, including the foothills of the Dhauladhar range where considerable tea is planted. Beginning in 1977, honeybee colonies at our out-apiary at Darang (910 m elevation, and surrounded by hills) had been observed to suffer brood mortality each year in the month of October. As the mortality coincided with the flowering of tea bushes, an investigation was carried out to determine if the tea nectar was the cause of it.

Materials and Methods

Floral survey

In October, 1983 a thorough survey was made of nectar and/or pollen sources in the area within 3 km of the Darang apiary.

Studies on the contagiousness of the ailment

To test the possibility that brood mortality might be caused by a bacterial or viral infection, contagiousness of the symptoms was studied. Three colonies with healthy brood were selected at the Bee Research Station at Nagrota. Three severely affected brood combs in which larvae were collapsing were removed from the colonies at Darang and brought to the Nagrota Station, and one of the combs was placed in each of the three healthy colonies. Observations were recorded daily for two weeks to determine whether symptoms of the ailment would appear in the healthy brood.

Studies on the toxicity of nectar to brood

It was first ascertained that the nectar carried by the bees came from tea flowers. Bees collecting nectar from tea were caught and their anterior region pressed against a slide to obtain a drop of nectar. The pollen in the nectar was compared with pollen taken directly from tea flowers and found to have the same structure. Gut contents of foragers caught at the hive entrance and nectar freshly stored in the comb were also examined and found to contain tea pollen.

To test the toxicity of the nectar three colonies of average strength (4–5 combs) were selected at the end of October, 1983 and established on empty combs. Each colony was given one comb of healthy brood in various stages of development and combs containing fresh nectar from tea flowers obtained from Darang colonies. Brood was checked daily for the appearance of poisoning symptoms.

Forced feeding of larvae with tea nectar

Three colonies were selected in the end of October, 1983, at the Nagrota Bee Research Station. One frame with the maximum area of brood in the larval stages was removed from each colony and 100 brood cells containing larvae about 48 h old were marked with nail polish. These larvae were fed with diluted tea nectar. Larvae in another group of cells were fed with diluted nectar taken from the comb of their colony. Feeding was done in the laboratory using glass droppers, at 11 h and 17 h daily. After feeding, the brood combs were replaced in their respective colonies. Feeding was continued for three days to observe poisoning symptoms.

Results and Discussion

Although nectar production in October is sparse at Nagrota (the site of the main apiary) colonies at Darang were observed to store some fresh nectar. The floral survey of the area revealed that no sources other than tea bushes were in flower. The tea bushes flowered profusely and honeybees (*A. mellifera*) were collecting nectar from them in large numbers. Some bees were also gathering pollen. A few stray *A. cerana* workers were also seen visiting these flowers.

Studies on the contagiousness of the brood symptoms showed that when affected brood was introduced into the normal colonies, it was removed by the house bees and the cells were prepared for egg laying. The queen laid eggs in these contaminated combs. The eggs hatched and brood developed normally without any symptoms of toxicity. The larvae in other brood combs also remained healthy and no disease symptoms appeared in any of the three colonies. Thus, it was confirmed that the ailment was not contagious. In the third week of October, affected colonies were shifted from the Darang apiary to a place where wild cherry, *Prunus puddum* Roxb. was in flower, and where no tea plantations existed. Combs containing tea nectar were removed from colonies. Bees started collecting fresh nectar from wild cherry and toxic symptoms disappeared.

When healthy brood in various stages of development was provided with combs containing tea nectar, symptoms of poisoning appeared in all three colonies within two to three days. Larvae turned yellow and then started to collapse, emitting a sour, rancid odour. Symptoms persisted 10–15 days and then disappeared; by that time the supply of nectar from tea had been consumed and the colonies were bringing fresh nectar from fields of toria (*Brassica campestris* var. *toria* Duth). Unlike nectar of *Astragalus miser* var. *serotinus*, which was poisonous to honeybee workers, tea nectar caused no apparent injury to adult honeybees.

Results of the larval feeding experiment are recorded in Table 1. Larvae began to collapse by the third day. By 11 h on the fourth day all marked dead brood had been removed by the bees and the cells were neatly cleaned. As brood fed with diluted nectar taken from healthy colonies developed normally, the nectar from tea flowers was clearly toxic.

TABLE 1 Numbers of dead larvae removed from hives by house bees at daily intervals after feeding on tea nectar at Nagrota, Himachal Pradesh, India. In each colony 100 larvae received nectar.

Colony No.	No. larvae removed on Day 1		Day 2		Day 3		Day 4	
	11h	17h	11h	17h	11h	17h	11h	17h
1	—	—	—	—	45	50	5	—
2	—	—	—	—	43	52	5	—
3	—	—	—	—	40	57	3	—

In localities where no other source than tea is available bees forage on its flowers and colonies dwindle and perish. But in areas where wild cherry is also available during October and November, bees prefer to forage on it and hence escape the poisonous effect of tea nectar. The presence of poorly managed tea plantations in the foot-hills of the Dhauladhar range of the Himalayas makes this area unsuitable for keeping *Apis mellifera* colonies in the autumn season.

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