Occurrence of Medicinal Plant Pollen in *Apis cerana* Honeys of Khammam District, Andhra Pradesh, India

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ABSTRACT

A pollen analysis of 11 honey samples from Khammam district has been carried out. According to the pollen spectra found, most of them are unifloral (10); 1 sample multifloral. Thirty-two different pollen types were recorded, belonging to 20 families. Twenty-one plants recorded from the honey samples are used as medicinal plants in folklore and tribal medicine.

Key words: Honey, Khammam district, Unifloral, Multifloral.

INTRODUCTION

Melissopalynology, one of the branches of palynology, finds a very significant application in the field of apiculture for recognizing the nectar sources and botanical origin of honey (Ramanujam 1994). In the present work, 11 squeezed honey samples of *Apis cerana* collected from the Khammam district of Andhra Pradesh have been analyzed to determine their botanical origin and medicinal properties of the plants recovered. Many of the plants recorded as bee forage plants are used as medicinal plants in folklore literature. This flower nectar contains Alkaloid and Phenolic compounds. Baker, 1977, identified these chemicals in many of the tropical flowers nectar. While foraging on these flowering plants, bees gather the honey mixed with these chemical compounds. Hence, the honey would also have the medicinal property. In folklore medicine, this honey is used for controlling the various diseases.

MATERIAL AND METHODS

The major objectives of the study were to document the bee forage plants of *Apis cerana* and the medicinal uses of the recorded flora from the honey samples. Eleven squeezed honey samples were collected from the various mandals of the Khammam district. For preparation of the palynoslides 5 cc of the honey was diluted in 10cc of water and centrifuged. The resultant sediment was treated with 5 cc glacial acetic acid. Subsequently the acetic acid was removed and the material was subjected to traditional acetolysis technique (Erdtman, 1960). To analyze the pollen contents, three pollen slides were prepared for each sample and examined. Pollen types were identified as far as possible to the genus or species level with the help of reference slide collection of the local flora and relevant literature (Kiritikar, K.R. & Basu, B.D, 1995). Frequencies and frequency classes of the pollen types were determined in accordance with Louveaux *et al.* (1978). Medicinal uses of the plants were identified through the
literature and gathered from experienced and aged persons. The enumeration of plants includes botanical name, followed by name of the family, local name in Khammam district and the uses of different plant parts were recorded.

**OBSERVATIONS**

**Pollen analysis:**

Winter samples show the presence of pollen referable to *Melilotus alba* (Fabaceae), *Evolvulus alsinoides* (Convolvulaceae), *Mimosa hamata* (Mimosaceae), *Feronia elephantum* (Rutaceae), *Sesamum indicum* (Pedaliaceae), *Zizyphus mauritiana* (Rhamnaceae), *Borassus flabellifer* (Aricaceae), *Erythrina indica* (Fabaceae), *Ageratum conyzoides* (Asteraceae), *Crotalaria juncea* (Fabaceae), *Capsicum frutiscens* (Solanaceae), *Xanthium strumarium* (Asteraceae), *Alternanthera sessilis* (Amaranthaceae), *Amaranthus viridis* (Amaranthaceae), *Coccinia indica* (Cucurbitaceae), *Celosia argentea* (Amaranthaceae), *Aspidopteris indica*, *Psidium guajava* (Myrtaceae). Of these, the pollen of *Melilotua alba* (47%), *Ageratum conyzoides* (57.5%), *Aspidopteris indica* (82.5%) being represented by more than 45% and referred as predominant pollen type. Further these honeys are known as Melilotus, Aspidopteris, Ageratum honeys. The pollen of *Crotalaria juncea* (20%) represents the secondary pollen type. Other pollen types are placed under important minor and minor pollen categories.

Summer honeys consist of number of pollen types referable to *Phoenix sylvestris*, *Capsicum frutiscens*, *Borassus flabellifer*, *Coccinia indica*, *Tridax procumbens*, *Capparis grandis*, *Dillenia pentagyna*, *Syzygium cumini*, *Chrozophora indica*, *Schleichera oleosa*, *Terminalia arjuna*, *Acacia nilotica*, *Lagerstroemia parviflora*, *Zizyphus xyllocarpa*, *Sapindus emarginatus*, *Gardenia lucida*, *Guazuma ulmifolia*, *Madhuca indica*, *Bombax ceiba*, *Feronia elephantum*, *Strychnos potatorum*, *Croton bonplandianum*, *Azadirachta indica*. Of these, the pollen of *Phoenix sylvestris* (53.75-83.75%), *Dillenia pentagyna* (90%), *Schleichera oleosa* (53.75%), *Gardenia lucida* (47.5%) being represented by more than 45% of the palynoassemblage of the summer honey samples are represented to the predominant pollen types. These honeys are designated as the Phoenix, Dillenia, Schleichera, Gardenia honeys.

**Table 1:** pollen analysis of *Apis cerana* honeys of Khammam district.

<table>
<thead>
<tr>
<th><strong>WINTER SAMPLES:</strong></th>
<th><strong>P</strong></th>
<th><strong>S</strong></th>
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<tr>
<td><strong>1.C-K-10-9-05</strong></td>
<td>P-Melilotus alba-47%, S-NIL, I-Evolvulus -14%, Mimosa hamata-11.25%, <em>Feronia</em> 11.5%, <em>Sesamum</em>--4.25%, <em>M-Zizyphus</em> -2.75%, Borassus-1%, <em>Erythrina</em> -0.75%</td>
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<td><strong>2.B-B-K-20-12-06</strong></td>
<td>P-Ageratum conyzoides- 57.5%, S-Crotalaria juncea-20%, I-Capsicum--11.75%, <em>M-Xanthium</em> -2%, Alternanthera -1.75%, <em>Amaranthus</em> -1.5%, Coccinia-1.5%, <em>Celosia</em> -0.75%</td>
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<td><strong>3.B-N-K-16-10-07</strong></td>
<td>P-Aspidopteris indica- 82.5%, S-NIL, I-Mimosa hamata-9.5%, <em>Psidium</em> -8%</td>
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<td>M-NIL</td>
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SUMMER SAMPLES:

4.B-C-K-15-3-05 (Badrachalam-Mandal, Chodavaram-Village, Khammam-District)
   P- Phoenix sylvestris - 83.75%, S- Nil, I- Capsicum - 10.25%, M- Borassus - 2.75%, Coccinia - 1.33%, Tridax - 0.66%, Capparis - 0.75%.

5.C-B-K-2-4-07 (Chintoor-Mandal, Bodugudem-Village, Khammam-District)
   P- Dillenia pentagyna - 90%, S- NIL, I- Syzygium - 6.25%, Chrozophora - 3.75%, M- NIL

6.C-N-K-10-4-07 (Chintoor-Mandal, Nellipaka-Village, Khammam-District)
   P- Dillenia pentagyna - 58.75%, S- Schleichera oleosa - 24.50%, I- Terminalia - 3%
   M- Acacia - 2.5%, Lagerstroemia - 1.25%.

7.V-B-K-20-3-07 (Velurupad-Mandal, Banjara-Village, Khammam-District)
   P- Schleichera oleosa - 53.75%, S- NIL, I- Zizyphus - 15%, Sapindus - 10%,
   Capparis - 7.5%, Terminalia - 6.25%, Syzygium - 5%, M- Borassus - 2.5%.

8.K-B-K-1-4-07 (Kuknur-Mandal, Barlamadugu- Village, Khammam-District)
   P- Gardenia Lucida - 47.5%, S- Schleichera - 38%, I- Lagerstroemia - 7.5%, Zizyphus - 5%, M- Acacia - 2%.

9.B-R-K-5-4-07 (Burgampad-Mandal, Rudramkota- Village, Khammam-District)
   P- NIL, S- Schleichera oleosa - 18%, I- Zizyphus - 13.75%, Dillenia - 11%, Syzygium - 10%, Terminalia - 7.5%, Borassus - 6.75%,
   Melilotus - 5%, Madhuca - 4.25%, Bombax - 3.75%, Lagerstroemia - 3.75%,
   M- Feronia - 2%, Strychnos - 1.75%.

10.M-T-K-3-4-07 (Mulkalapalli-Mandal, Togudem- Village, Khammam-District)
    P- Schleichera - 80%, S- NIL, I- Sapindus - 6.25%, Croton - 7.50%, Borassus - 5%,
    M- Bombax ceiba - 1.25%.

11.M-M-K-7-4-7 (Mulkalapalli-Mandal, Madavaram- Village, Khammam-District)
    P- Schleichera oleosa - 72.5%, S- NIL, I- Lagerstroemia - 8.75%, Azadirachta - 8.75%, Terminalia - 5%, Strychnos - 5%, M- NIL.

P- Predominant pollen, S- Secondary pollen, I- Important minor pollen, M- Minor pollen

MEDICINAL USES

1. Ageratum conyzoides L.
   Family: Asteraceae
   Local name: Midaku
   Uses: plant antihelminthic, Antipyretic, haemostatic, styptic; and used for burns, colic, cuts, headache, and uterine problems.

2. Acacia nilotica L.
Family: Mimosaceae
Local name: Tumma
Uses: bark extract is applied externally to cure wounds. Gum and bark paste applied over a wound will heal.

3. *Alternanthera sessilis* L.
   Family: Amaranthaceae
   Local name: Mullabanthi
   Uses: whole plant is used as lactagogue. The leaf and root extract is given internally with honey for stomachache.

4. *Amaranthus viridis* L.
   Family: Amaranthaceae
   Local name: Thotakura
   Uses: the root is considered diuretic, laxative, and galactagogue. The decoction is given for retention of urine and gonorrhea; Root paste is applied for curing piles.

5. *Azadirachta indica* A.Juss.
   Family: Meliaceae
   Local name: Vepa
   Uses: the bark is bitter; anthelmintic, relives bad taste in the mouth, cough; cures ulcers and inflammations. The leaves are anthelmintic, insecticidal, and good in skin diseases.

6. *Bombax ceiba* L.
   Family: Bombacaceae
   Local name: Buruga
   Uses: the gum is bitter; astringent, styptic, aphrodisiac; used in stomatitis, diseases of blood, burning of the body.

7. *Cardiospermum halicacabum* L.
   Family: Sapindaceae
   Local name: Butta thiga
   Uses: The plant is diuretic, emetic, laxative, rubefacient; and used for chest pain and leaf juice is used for earache.

8. *Celosia argentea* L.
   Family: Amaranthaceae
   Local name: Gunugu
Uses: the seeds are useful in diarrhea, mouth sores. The leaves are antipyretic, aphrodisiac; reduce inflammations, strengthen the liver; useful in gonorrhea.

   Family: Euphorbiaceae
   Local name: Galivana
   Uses: the watery latex is used for skin diseases.

10. *Capsicum frutiscens* L.
    Family: Solanaceae
    Local name: Mirapa
    Uses: the fruits are used in spices and condiments.

    Family: Cucurbitaceae
    Local name: Kaki donda
    Uses: leaf juice mixed with castor oil is used for body pains; leaves are boiled in castor oil and applied externally in psoriasis, itch.

    Family: Dilleniaceae
    Local name: Ravidi
    Uses: fruits are laxative and used in abdominal pains.

    Family: Fabaceae
    Local name: Badisa
    Uses: the bark is used in dysentery; leaves are bitter, hot, stomachic, anthelmintic; improve appetite; flowers are used in ear troubles.

14. *Evolvulus alsinoides* L.
    Family: Convolvulaceae
    Local name: vishnukrantha
    Uses: the leaves and roots are used in medicine by the local tribe (Konda Reddy). Leaves are made into cigarettes and smoked in chronic bronchitis and asthma; root is used in intermittent fever in children.

    Family: Rutaceae
    Local name: Velaga
    Uses: the fruit is sour, sweet; refrigerant, cardio tonic, tonic to the liver and the lungs,
astringent diuretic; the juice is good for stomatitis and sore throat; topically it relieves the pain due to stings of bees and wasps.

   - Family: Rubiaceae
   - Local name: Karinguva
   - Uses: the yellow resin is used to suppress warts.

   - Family: Lythraceae
   - Local name: konekomma
   - Uses: leaves are used for throat irritation

   - Family: Anacardiaceae
   - Local name: Buushi
   - Uses: the bark and the leaves are used in ulcers.

   - Family: Sapotaceae
   - Local name: Ippa
   - Uses: the milky juice from the bark is astringent; the flower is aphrodisiac, good in heart diseases, cures burning sensation; the leaves are boiled in water, and given as cure for several skin diseases. The honey from the flowers is used in the treatment of eye diseases.

    - Family: Fabaceae
    - Local name: china mentha
    - Uses: leaf paste is externally applied for pains and aches.

    - Family: Mimosaceae
    - Local name: Korindum
    - Uses: leaves are applied to burns.

22. *Psidium guajava* L.
    - Family: Myrtaceae
    - Local name: Jama
    - Uses: leaves are used for wounds and ulcers; leaves are chewed for toothache. Leaf
   Family: Sapindaceae
   Local name: Poosuga
   Uses: Bark paste supported by bamboo sticks is applied to cure fractured bones. For early relief, this treatment should also be accompanied by oral use of bark juice twice a day. Bark also used for skin diseases, ulcers.

24. *Sapindus emarginatus* L.
   Family: Sapindaceae
   Local name: Kunkudu
   Uses: the seeds pounded with water are given in epilepsy.

25. *Strychnos potatorum* L.
   Family: Loganiaceae
   Local name: Chilla
   Uses: the seeds are used to clear turbid water; astringent to the bowels, diuretic; the root cures all kinds of leucoderma.

   Family: Combretaceae
   Local name: Tellamaddi
   Uses: the bark is antidysenteric; useful in fractures, ulcers, urinary discharges; ashes of plant parts applied for wounds and cuts.

27. *Tridax procumbens* L.
   Family: Asteraceae
   Local name: Railu rodda
   Uses: the juice of leaves is applied externally to cure wounds and cuts.

28. *Xanthium strumarium* L.
   Family: Asteraceae
   Local name: Marulamatangi
   Uses: the plant is diaphoretic, sedative and used for chronic cases of malaria; the root is bitter and toxic.

29. *Zizyphus mauritiana* L.
   Family: Rhamnaceae
   Local name: Regu
DISCUSSION
The results of the pollen analysis of the 11 honey samples from Khammam district indicate that *Melilotus alba*, *Ageratum conyzoides*, and *Aspidopteris indica* constitute the chief nectar source during winter; extensive distribution of *Schleichera oleosa* furnished the chief sources of nectar, followed by *Phoenix sylvestris*, *Gardenia lucida*, and *Dillenia pentagyna* during summer for *Apis cerana*. It has also been noted that most of the pollen types encountered in winter samples are from herbaceous taxa whereas in summer from tree taxa. The present study highlighted the following melliferous taxa, which are characteristic elements of the forest, as fairly reliable nectar sources for bees: *Dillenia pentagyna*, *Schleichera oleosa*, *Gardenia lucida*, *Lagerstroemia parviflora*, *Terminalis arjuna*, *Feronia elephantum*, *Strychnos potatorum*, *Zizyphus xylocarpa*, *Syzygium cumini*.

Our studies on medicinal properties of the plants recorded from the honey samples indicate that many of the plants are being used as medicinal plants by the local practitioners and tribal people (Koya and Konda Reddy). However, the authors are of the opinion that the medicinal properties of the honey are attributable to the fact that the pollen comes from medicinal plants. An in-depth study, mainly experimental with clinical efficacy of these plants and honeys is essential in many cases.

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