

Melissopalynology and Survey of the Bee Plants in North-Eastern Hill Region

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ABSTRACT

Microscopical studies of 21 honey samples extracted during summer and early winter seasons from 10 localities of the North-eastern hill region of India revealed that dominant sporomorphs were of *Adhatoda* sp., *Ageratum* sp., *Brassica* sp., *Clematis* sp., *Helianthus* sp., *Mussaenda* sp., *Solanum* sp., *Wendlandia* sp., and Papilionaceous, Rubiaceae, Rutaceae and Zingiberaceae members. The minor pollen sources in these honey samples were: *Acer* sp., *Bauhinia* sp., *Caesalpinia* sp., *Litsea* sp., *Ocimum* sp., *Parkia* sp., *Polygonum* sp., *Senecio* sp., and species of families Asteraceae, Bignonaceae, Euphorbiaceae, Lamiaceae, Lauraceae, Malvaceae, Myrtaceae, Papilionaceae, Polygonaceae, Ranunculaceae, Rosaceae, Rubiaceae, Rutaceae, Scrophulariaceae and Zingiberaceae. Survey of the bee plants was also made. A list of 12 major sources of nectar and pollen along with 32 minor and 60 subsistant sources is presented.

There are large number of bee plants in India which provide nectar and pollen to honey bees. Melissopalynological study is helpful in both quantitative and qualitative pollen analysis of honey (Louveaux et al., 1978). Quantitative analysis is useful for the confirmation of botanical sources of unifloral and multifloral honey, whereas, qualitative analysis is helpful in the identification of geographical origin of honey samples (Maurizio, 1975; Nair, 1985). Honey pollen analysis also helps in knowing the season of honey extraction during the annual cycle. However, the scope of microscopic analysis of honey is immense in establishing the seasonal pollen spectra of honey from various climatic and geographical areas, in comparative evaluation of honey originated from physiographic regions and in detecting misrepresentation and adulteration of honeys (Chaturvedi, 1983). The present investigations were, therefore, undertaken to study pollen spectrum of some honeys and to find out the major, minor and subsistent sources of pollen and nectar in the North-eastern hill region.

MATERIALS AND METHODS

Twenty one honey samples extracted during summer and early winter seasons of 1989 were collected from 10 localities of the North-eastern hill region of India. Summer honey samples were collected, one each from Aizawl, Kurseong and Gangtok. Of the early winter honey samples collected from Manipur, three each were from Serou, Moirang, Churachandpur, Komlathabi and Ukhrul; two from Mao and one from Imphal.

Slides of the pollen sediments from the honey samples were prepared by the method described by Louveaux et al. (1978), modified by Iwama and Melhem (1979). The pollen grains recovered from honey samples were identified with the help of standard works of Erdtman (1960) and Nair (1964, 1985) and confirmed by comparing them with reference pollen slides deposited in the pollen herbarium of the Palynology laboratory, National Botanical Research Institute, Lucknow.

The number of pollen grains was counted by using haemocytometer (Louveaux et al., 1978; Seethalakshmi, 1980; Suryanarayana et al., 1981). The absolute pollen count and percentages of pollen types in each sample were then calculated on the basis of total number of pollen grains in all the suspensions and pollen spectra were constructed on the basis of these percentages. The honey samples were considered rich, poor and extremely poor in pollen if the number of pollen grains per 10 gm of honey was above, 1,00,000; 20,000 to 1,00,000 and below 20,000, respectively (maurizio, 1975). Honey samples having 45 per cent or more grains of a single pollen type were termed as "unifloral honeys" and those having several pollen types in considerable percentages, were termed as "multifloral honeys" (Iwama and Melhem, 1979; Chaturvedi, 1983).

Survey work of honey yielding plants was carried out in different parts of North-eastern hill region during 1989 and 1990. Flowering plants visited by honey bees to collect pollen and nectar were collected and identified with the help of local flora and plant taxonomists from Manipur University, Imphal and Gauhati University, Guwahati. Standard reference pollen slides have been prepared from the anthers of each of these specimens. The plants have been categorised as major, minor and subsistent sources depending upon the pollen grains found in honey.

RESULTS AND DISCUSSION

Honey pollen analysis

The pollen spectra of honey samples and frequency distribution of pollen types are summarised as below.

Serou honey

Honey samples are of light yellow colour and extremely poor in pollen with 19,593 pollen grains per 10 gm of honey. Unifloral honey represented by 9 pollen types and hominated by *Brassica* (69.77%). Other types are *Adhatoda* (22.09%), *Helianthus* (2.36%), Malvaceous (1.84%), Rosaceous (1.81%) and Papilionaceous (0.55%) members, *Solanum* (0.54%), Asteraceous (0.51%) and Ranunculaceous (0.37%) members.

Moirang honey

Honey samples are of yellow colour and poor in pollen with 73,920 pollen grains per 10 gm of honey. Unifloral honey, containing 11 pollen types, being dominated by the pollen of *Wendlandia* (84.39%) and followed by those of *Mussaenda* (6.82%), *Helianthus* (2.73%), *Agenratum* (1.31%), *Solanum* (1.21%), *Brassica* (1.07%), *Litsea* (0.62%), *Malvaceous* (0.57%), *Lauraceous* (0.33%), Scrophulariaceous (0.27%) and unidentified Dicot (0.21%) members.

Imphal honey

Honey is yellow in colour and poor in pollen with 23,340 pollen grains per 10 gm of honey. Unifloral honey, containing 12 pollen types, being dominated by the pollen of *Solanum* (63.14%) and followed by *Brassica* (16.14%), *Helianthus* (4.12%), *Ageratum* (3.73%), Malvaceous member (3.05%), *Ocimum* (3.03%), Myrtaceous member (3.02%), *Mussaenda* (1.69%), Bignonaceous (1.30%) and Papilionaceous (0.05%) members, *Litsea* (0.16%) and *Caesalpinia* (0.12%).

Churachandpur honey

Honey samples are of brown colour and poor in pollen with 29,120 pollen grains per 10 gm of honey. Multifloral honey, containing 12 pollen types namely, *Helianthus* (39.83%), *Wendlandia* (33.29%), *Ageratum* (9.68%), *Solanum* (6.09%), *Mussaenda* (4.20%), *Brassica* (2.06%), *Adhatoda* (1.51%), *Parkia* (0.99%), *Caesalpinia* (0.99%), *Bauhinia* (0.69%), Zingiberaceous (0.33%) and unidentified Dicot (0.32%) members.

Komlathabi honey

Honey samples are of yellow colour and extremely poor in pollen with 9,700 pollen grains per 10 gm of honey. Unifloral honey, represented by 9 pollen types, being dominated by the pollens of *Ageratum* (52.09%) and followed by *Wendlandia* (17.46%), *Solanum* (12.53%), *Helianthus* (11.68), *Caesalpinia* (2.36%), Malvaceous (1.59%) and Rosaceous (1.55%) members, *Mussaenda* (0.48%) and unidentified Dicot member (0.27%).

Unkrul honey

Multifloral honey of yellow colour and rich in pollen with 6,70,033 pollen grains per 10 gm of honey and represented by 11 pollen types : *Helianthus* (19.83%), Zingiberaceous member (16.98%), *Mussaenda* (15.66%), *Brassica* (15.51%) Papilionaceous member (13.60%), *Solanum* (10.73%) *Caesalpinia* (3.20%), Lamiaceous (2.09%) and Myrtaceous (1.84%) members, *Ageratum* (0.69%) and *Bauhinia* (0.04%).

Mao honey

Multifloral honey of brown colour and rich in pollen with 22,40,890 pollen grains per 10 gm of honey and represented by 15 pollen types: Rubiaceaceous member (22.61%), *Helianthus* (18.77%) Rutaceous (15.02%) and Zingiberaceous (13.99%) members, *Mussaenda* (11.87%), *Ageratum* (5.64%), *Solanum* (3.86%), Lamiaceous (3.14%) and Euphorbiaceous (1.76%) members, *Brassica* (1.40%), unidentified Dicot member (0.88%), *Bauhinia* (0.77%), *Caesalpinia* (0.17%), Papilionaceous (0.06%) and Malvaceous (0.06%) members.

Aizwal honey

Honey is of brown colour and rich in pollen with 1,33,320 pollen grains per 10 gm of honey. Unifloral honey, containing 8 pollen types, being dominated by the pollens of *Brassica* (84.02%) and followed by *Bauhinia* (4.32%), Polygonaceous (3.36%), Rubiaceaceous (3.24%), Ranunculaceous (3.12%) and *Caesalpinia* (0.09%).

Kurseong honey

Honey is yellow in colour and extremely poor in pollen with 10,720 pollen grains per 10

gm of honey. Unifloral honey represented by 7 pollen types, being dominated by the pollens of a Rubiaceae member (84.65%) and followed by Polygonaceous (3.80%), Asteraceous (3.60%) and Ranunculaceous (3.15%) members, *Acer* (2.00%), Rosaceous (1.84%) and Euphorbiaceous (0.96%) members.

Gangtok honey

Unifloral honey of brown colour and poor in pollen with 58,500 pollen grains per 10 gm of honey and represented by 8 pollen types: *Clematis* (81.95%), *Polygonum* (6.22%), Proteaceous (4.18%), Asteraceous (3.46%), Rosaceous (1.33%) and Rubiaceae (1.28%) members, *Senecio* (0.90%) and Euphorbiaceous member (0.68%).

SURVEY OF HONEY YIELDING PLANTS

Twelve major sources of nectar and pollen along with 32 minor and 60 subsistent sources were evaluated by visual observations and confirmed through the microscopic analysis of honey samples.

The present investigations revealed that dominant sporomorphs in honey samples were of *Adhatoda* sp., *Ageratum* sp., *Brassica* sp., *Clematis* sp., *Helianthus* sp., *Mussaenda* sp., *Solanum* sp., *Wendlandia* sp., and Papilionaceous, Rubiaceae, Rutaceous and Zingiberaceous members. The minor pollen sources in honey samples were *Acer* sp., *Bauhinia* sp., *Caesalpinia* sp., *Litsea* sp., *Ocimum* sp., *Parkia* sp., *Polygonum* sp., *Senecio* sp., and species of families Asteraceae, Bignoniaceae, Euphorbiaceae, Lamiaceae, Lauraceae, Malvaceae, Myrtaceae, Papilionaceae, Polygonaceae, Proteaceae, Ranunculaceae, Rosaceae, Rubiaceae, Rutaceae, Scrophulariaceae and Zingiberaceae.

Present melissopalynological studies revealed that honey samples from Serou (*Brassica* sp.), Moirang (*Wendlandia* sp.), Imphal (*Solanum* sp.), Komlathabi (*Ageratum* sp.), Aizawl (*Brassica* sp.), Kurseong (Rubiaceous member) and Gangtok (*Clematis* sp.) were unifloral and all other samples were multifloral. Seethalakshmi (1980), Chaturvedi (1983) and Sharma (1989) also observed uniflorality and multiflorality in various honey samples.

Pollen analytical studies also indicated that honeys of the North-eastern hill region fall under the category of Group I to III formed by the International Commission for Bee Botany i.e, honey having absolute pollen count from 10,000 to 25,000 per 10 gm of honey.

Survey of bee plants in the North-eastern hill region of India could identify 12 major sources of nectar and pollen along with 32 minor and 60 subsistent sources. Present studies suggest that different parts of North-eastern hill region offer very rich potentiality for the development of apiculture due to multiplicity of the bee flora available.

REFERENCES

- Chaturvedi, M.(1983). Pollen analysis of autumn honeys of Kumaon region. Proc. Indian Nat. Sci. Acad. 49: 125-133.

- Erdtman, G. (1960). Handbook of palynology. Copenhagen, Munksgaard.
- Iwama, S. and Melhem, T.S. (1979). The pollen spectrum of the honey of *Tetragonisca angustula angustula* L. *Apidologie* 10: 275-295.
- Louveaux, J., Maurizio, A. and Vorwohl, G. (1978). Methods of melissopalynology. *Bee Wld.* 59: 139-157.
- Maurizio, A. (1975). Microscopy of honey. In: *Honey- A comprehensive survey*. Ed. Eva Crane, Heinemann, London, Pp. 240-247.
- Nair, P.K.K. (1964). A pollen analytical study of Indian honeys. *J. Indian Bot. Soc.* 43: 179-191.
- Nair, P.K.K. (1985). Melittopalynology. In: *Essentials of palynology. Today and Tomorrow's publishers, New Delhi*, pp. 59-64.
- Seethalakshmi, T.S. (1980). Melittopalynological investigations of some Indian honeys. *Proc. 2nd Int. Conf. Apic. Trop. Clim. New Delhi*, pp 609-621.
- Sharma, N. (1989). *Melissopalynology and survey of honey plants in Himachal Pradesh*, Ph.D. thesis, H.P. Univ., Shimla.
- Suryanarayana, M.C., Seethalakshmi, T.S. and Phadke, R.P. (1981). Pollen analysis of Indian honeys. I. Honey from litchi (*Nephelium litchi*) and jamun (*Syzygium cumini*). *Proc. IV Int. Palynol. Conf. Lucknow* 3: 491-498.