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POLLEN GRAINS OF POISONOUS PLANTS

I. Poisonous pollen in honey samples from Western Ghats (India)

BY

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Nectars and pollen grains of poisonous plants contain various toxic ingredients. Bees generally do not visit these plants as long as there is a good supply of nectar and pollen from their usual forage plants. But every locality has a floral gap during the seasonal cycles when there is an acute shortage of normal nectars and pollen grains. If a colony has not stored adequate food reserves to tide it over such adverse periods, starvation impels them to forage even on unpalatable poisonous plants.

The poisonous plants, particularly in the Western Ghat Forest (altitude 4500 feet, latitude 17°.56′ N, long. 73°.40′ E) in India, which may thus be visited by bees, include species of Ranunculaceae, Solanaceae, Euphorbiaceae (Deodikar *et al.* 1958), Campanulaceae, and Thymelaeaceae. A morphological characterisation of the pollen grains of such poisonous plants is presented here with a view to facilitating their detection in local honey samples.

Material and Method

Honey samples were obtained from various apiaries scattered through the Western Ghats under the management of the Apicultural Laboratory, Mahabaleshwar and Poona. Permanent pollen slides for identification and reference study were prepared by the methods of Wodehouse (1935) and Erdtman (1952). Pollen grains were examined at ×1000 and camera lucida drawings were made at a uniform magnification of ×400 at bench level. The terminology used by Erdtman (1952, 1957, 1961) has been followed in the description of the pollen grains.

Morphological characteristics of poisonous plant pollen grains encountered in the various unifloral and multifloral honey samples

Clematis gouriana Roxb. (Fig. 3; Api. Lab. 4B)

Pollen grains 3-colpate (slightly goniotrême), suboblate (average size 26 ×35 μ). Apocolpia small. Colpi relatively broad, tapering towards the rounded apices. Colpus membrane smooth. Exine, as in the two following species, coarsely granular.

Clematis wightiana Wall. (Fig. 6; Api. Lab. 3)

Pollen grains 3-colp(or)ate, spheroidal (average size 29 ×28 μ). Apocolpia small. Colpi relatively broad, tapering towards the rounded ends. Ora (germinal papillae?) conspicuous, slightly protruding, their surface smooth.

Datura arborea L. (Fig. 2; Api. Lab. 493)

Pollen grains 3-colporate, (oblate) spheroidal (average size 37 × 40 μ). Apocolpia large. Colpi relatively long, narrow, with pointed ends, distinct margins and smooth membrane. Ora distinct, lolongate. Exine striate (striae chiefly meridional; striation usually faint or absent at and near the poles).

Euphorbia geniculata Ort. (Fig. 1; Api. Lab. 245)

Pollen grains 3-colporate, spheroidal (average diameter 45 μ). Apocolpium diameter about 19 μ. Length of colpi about 28 μ. Exine reticulate.

Lasiosiphon eriocephalus Decne. (Fig. 4; Api. Lab. 241)

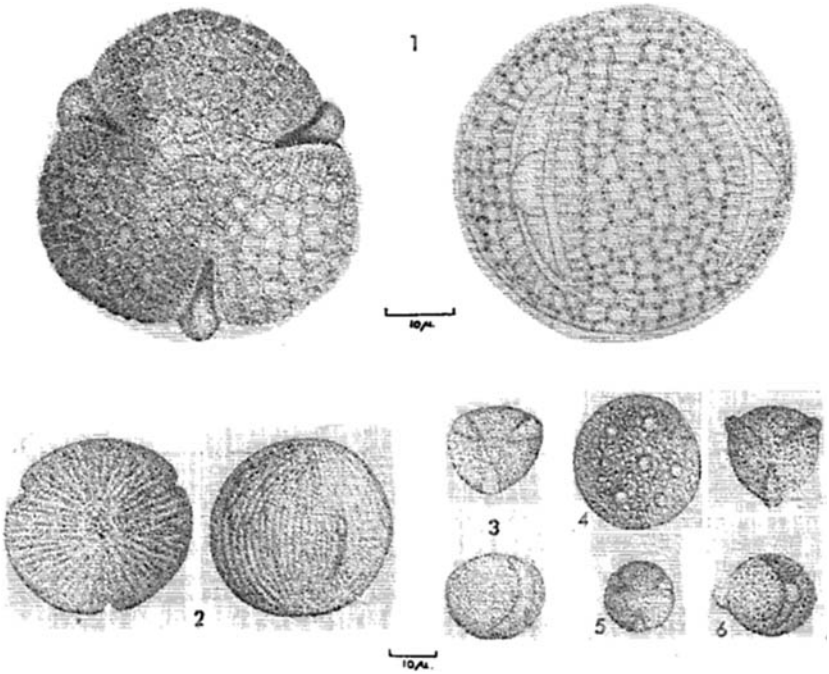
Pollen grains pantoporate, spheroidal (average diameter 30 μ). Exine reticulate (with "Croton-pattern").

Lobelia nicotianaefolia Heyne (Fig. 5; Api. Lab. 141)

Pollen grains 3-colpate, prolate spheroidal (average size 26 ×23 μ). Apocolpia large. Colpi relatively broad, their membrane smooth.

Discussion and general remarks

Certain persons may show violent allergic reactions even to honeys derived from non-poisonous plants if their nectars or pollens contain specific protein bodies to which they may be oversensitive. Apart from such exceptional cases, persons are generally susceptible to the dangerous effects of honeys contaminated with nectars and pollen grains from poisonous plants. In this respect the poisonous plants may be classified in relation to their adverse effects on bees or human



Figs. 1–6. Pollen grains of some poisonous plants.—1: *Euphorbia geniculata;* 2: *Datura arborea;* 3: *Clematis gouriana;* 4: *Lasiosiphon eriocephalus;* 5: *Lobelia nicotianaefolia;* 6: *Clematis wightiana.*

beings or both. Some plants are poisonous both to bees and human beings. Some are poisonous to bees even in small traces, whereas human beings can tolerate fairly high doses, and vice versa.

In the case of plants that are highly poisonous to bees, the chances of honey stored in hives being contaminated with poisonous pollen grains of nectar are relatively slight. But where bees are more or less immune, their honey stores may nevertheless be highly dangerous for human consumption. Thus, for example, *Lasiosiphon eriocephalus* Decne. provides a major source of pollen during acute dearth periods (January to March) and bees usually collect it freely to feed their brood and maintain colony strength. If the next extraction during the major April flow is heavily contaminated with *Lasiosiphon* pollen, the honey will cause severe nausea and vomiting.

Instances of honey poisoning have been recorded over a very long period. Xenophon lost many soldiers along the shores of Black Sea 400 B. C. due to consumption of local honeys derived from

Rhododendron. Virgil mentions poisonous honey derived from Corsican Yew tree and Pliny records that dark goats-bane honey induced violent sneezing and convulsions. There are many such cases of poisonous honeys derived from certain plants, particularly around the shores of Black and Caspian Seas.

Archangelsky (quoted by Pryce-Jones 1944) found that *Rhododendron* honey contains the toxic components rhododendrin and ericolin. Certain Turkish honeys contain saponins causing violent sneezing and the bitter honeys from *Arbutus unedo* have a toxic ingredient, arbutin, a glucoside containing hydroquinone (Sanna 1931) "Noor Honey" gathered from *Euphorbia* species in Africa causes violent throat burning and nausea. Other reported cases of such toxic honeys include those derived from *Kalmia latifolia, Gelsemium sempervirens, Helenium autumnale,* etc. (Pryce-Jones 1944). In all these cases the honeys, though dangerous for human consumption, do not seem to have any adverse effects on the bees.

There are many reported cases of plant nectars or pollen being highly toxic to bees, often with immediate lethal effects. Vansell and Watkins (1933, 1934) have observed large scale deaths of bees foraging on species of *Astragalus* and *Veratrum.* In central Europe, milkweeds (*Asclepias* sp.) cause large scale deaths of bees due to the presence of highly toxic galitoxins (Pryce-Jones 1944). Nectar of *Aesculus californica* contains selenium which is highly toxic to bees. In India large scale deaths of bees foraging on *Euphorbia geniculata* have been repeatedly observed (Deodikar *et al.* 1958).

Apart from nectar and pollen, sugary honey dew secreted by some insects on lime trees (*Tilia platyphylla*) causes severe bee paralysis and deaths due to certain heat resistant water soluble toxins lethal even in highly diluted aqueous solutions. Honey dew secreted by certain aphids on some species of oak, beech, sycamore etc. are also toxic (Butler 1943).

Melitto-palynology provides a solution to many problems in modern apiculture. Besides making it possible to identify unifloral and multifloral honeys along with their possible geographical origins, it also provides a guard for the consumer against possible dangers from certain poisonous honeys and facilitates the diagnosis of certain bee maladies incidental to their foraging on various poisonous plants.

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