Pollen Analysis and Protein Estimation of Honey Bee Pollen Loads

A. M. Katgaye and S. A. Kalkar
Department of Botany, Institute of Science, Nagpur (M.S) India
anitabuddhe@gmail.com

Abstract:

Honey bees collect pollen to provide nutrition for young larvae and nest building. Five pollen load samples were collected from bee hives of Apis dorsata F. from forest region of Gadchiroli district. Samples were analyzed for its pollen contents and classified as per method described by Loveaux et al (1978). The Lowry's method was used for protein estimation. Among five pollen loads analyzed, three were assigned to unifloral, one to bifloral and one to multifloral. The pollen load that could be identified on the basis of flora varied in protein content viz. unifloral load of Careya arborea (100%) with 0.360mg/100g , unifloral load of Syzigium cumini (100%) with 0.180mg/100g , unifloral load of Bombax ceiba (100%) with 0.260 mg/100g , bifloral load of Careya arborea (55%) and Butea monosperma (45%) with 0.830mg/100g and multifloral load of Poaceae (30%) , Citrus spp.(26%) , Terminalia arjuna (19%) , Bombax ceiba (12%), Unidentified pollen (3%) with 0.280mg/100g of protein.

Keywords: Apis dorsata, pollen load , pollen analysis, protein.

Introduction:

Melissopalynology is the branch of Palynology which studies the botanical and geographical origin of honey by subjecting honey sediment, and therefore pollen and other fungi imperfecti contained therein, to microscopic analysis. Melittopalynology is one of the applied branches of Palynology that deals with the study of pollen in honey. The term Melittopalynology is derived from the Greek words Melitta and Melissa meaning a bee as well as honey. The Latin word Mel (Mellis) also means honey (Agashe 2006).

Melittopalynology encompasses a critical microscopic and field study involving qualitative and quantitative analysis of the pollen contents of honeys and pollen loads from diverse and geographical regions (Ramanujam 1991). Through Melissopalynology it is also possible to trace the geographical origin of a particular type of honey, since its pollen spectrum i.e. pollens in the sediment as a whole, reflects the floral situation of the place where that particular type of honey was produced. Different geographical areas present particular floral associations and the greater the climatic difference the more conspicuous the variation in the floral association. The pollen encountered in honey and pollen load constitute the only reliable source of recognition of bee forage plants. The pollen load analysis gives the idea about the plants visited by honey bees as pollen source. Kumar (2003) studied the pollen and nectar sources of Apis mellifera L .honey bees at Kadasikadau, Idukki in Kerala. Kalkar and Shende (2006) studied 91 pollen loads of Apis dorsata from Wardha District, (M.S.), India.

Foraging behavior of honey bees can well be studied which will be helpful to Botanist , Agriculturist , Aerobiologist , Entomologist , Plant breeders and other related research field . Honey bees are good pollinators. During their visit to various

plants for nectar, pollen sources they pollinate the flower hence therefore increase the yield.

Material and Methods:

Collection of material - Pollen loads were collected from Tahsil Kurkheda of Gadchiroli District during the summer season in 2012. Each pollen load was separated from hives and dried in desiccators and then subjected to analysis.

Analysis of loads - Pollen loads were subjected to acetolysis method by Erdtman (1960) and slides were prepared. These slides were analyzed for pollen spectra by Loveaux et al, (1978) method. Identification was done by reference slides prepared and standard literature.

Protein content of load - Protein estimation was carried by Lowry et al method (1951). Microphotography was performed in Research lab of Botany Department, Institute of Science, Nagpur.

Result and Discussion:

Bee pollen load analysis yielded three unifloral loads viz. Careya arborea (PL-1), Syzigium cumini (Pl-2), Bombax ceiba (PL-3), one bifloral load of Careya arborea and Butea monosperma (PL-4) and one multifloral load (PL-5). Multifloral load showed pollen grains of Poaceae (30%) , Citrus spp.(26%) , Terminalia arjuna (19%) , Bombax ceiba (12%), and Unidentified pollen (3%) (Table 1).

Highest protein content was observed in PL-4 (0.830mg/100g), followed by PL-1 (0.360mg/100g), PL-5 (0.280mg/100g), PL-3 (0.260mg/100g), PL-2 (0.180mg/100g) (Fig.). The pollen percentages and protein quantity obtained from each group was correlated. Shende (2006) made an analysis of the 120 pollen loads studied from Karanja range of Wardha district and assigned 33 pollen loads to be multifloral. The common pollen types were Syzigium cumini, Bombax ceiba, Terminalia spp., Poaceae and Coriandrum sativum.

The present study recorded Careya arborea in pollen load, which was not reported earlier in this region. Though Careya arborea was recorded in honey samples of Yavatmal forest region of Maharashtra (Kalkar and Gawande, 2012). Hence, Careya arborea can now be considered as nectar as well as pollen source of honeybees particularly Apis dorsata.

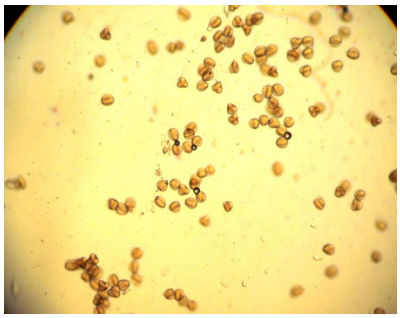
Bee pollens are the good source of proteins. It also contains all the 28 minerals required for the growth. The study is in progress and further may be helpful in conservation of bee forage plants, developing bee keeping industry, social forestry and even commercial honey production.

Table. 1- Classification of pollen loads according to Loveaux et al (1978)

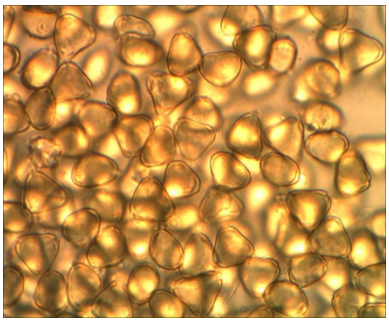
Sr.No.	Date	Forest range	Type of load	Pollen frequency (%)
PL-1	26/02/12	Dhanora	Unifloral	*Careya arborea* (100%)
PL-2	14/03/12	Wadsa	Unifloral	*Syzigium cumini* (100%)
PL-3	19/03/12	Kurkheda	Unifloral	*Bombax ceiba* (100%)

PL-4	22/04/12	Dhanora	Bifloral	*Butea monosperma* (45%), *Careya arborea* (55%)
PL-5	15/05/12	Dhanora	Multifloral	*Citrus* spp. (26%), *Terminalia arjuna* (19%), *Bombax ceiba* (12%), Poaceae (30%), Unidentifed (3%)

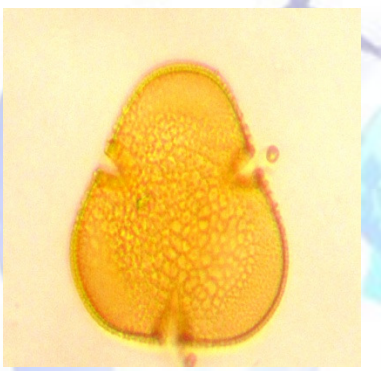
Plate-I



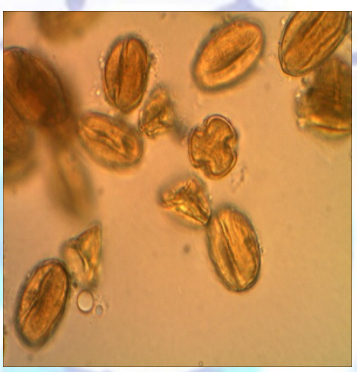
a. Unifloral - *Careya arboea*



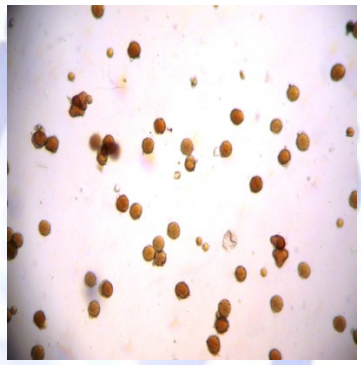
b. Unifloral - *Syzigium cumini*



c. Unifloral- *Bombax ceiba*



d. Bifloral
(*Careya arborea* , *Butea monosperma*)



e. Multifloral
(*Citrus* spp., *Terminalia arjuna*, *Bombax ceiba* , Poaceae)

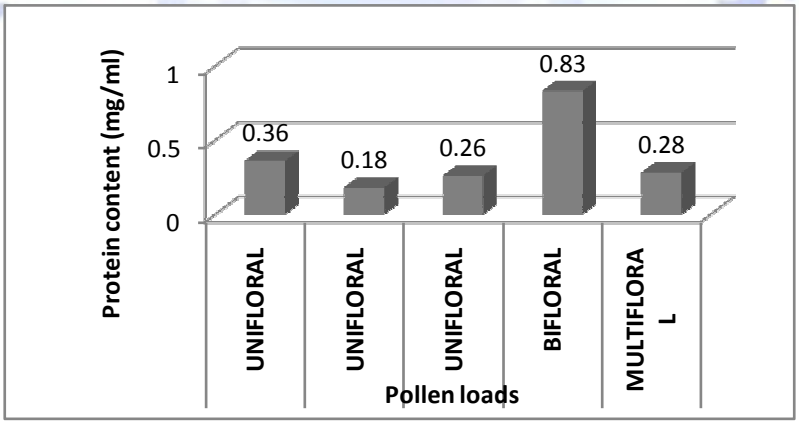


Figure. 1- Protein content of pollen loads

References:

Agashe, S. N. 2006. Palynology and its application Ed. Dr. S N Agashe, Publisher Oxford and IBH Press.

Erdtman, G. 1960. The acetolysis method, A revised description. Seven. Bot. .Tidskr., 54: 561-564

Kalkar Surekha and Chandranil Shende. 2006. Melittopalynology of citrus honey from Wardha district and its significance Ind. J. pure and Applied biology Vol.21 (2): 281-288.

Kalkar S.A. and Gawande M.C. 2012. Pollen analysis of honey and its relevance to conservation of bee flora Nisargmitra Vol.1: 1-9

Kumar , R. 2003. Studies on pollen and nectar sources to Apis mellifera L. honey bees at Kadasikadavu, Idukki , Kerala, Geophytology 31, (2and 2): 34-37

Loveaux J, Maurizio A, Vorwhol G. 1978. Methods of melissopalynology .Bee world 59: 179-191

Lowry, O H, Rosenbrough M J; Farr H L; Randall, R I (1951) Protein measurement with folin phenol reagent J Bio Chem 193: 256-275.

Shende, C. R. 2006. Melissopalynological investigation of some forest tracts in Wardha District, Maharashtra. Ph.D. thesis submitted to RTM Nagpur University.