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**STUDIES OF HONEY SAMPLES COLLECTED FROM AMRAVATI (M.S.) REGION
FOR ASSESSING POLLEN DIVERSITY**

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ABSTRACT

The Amravati region displays diversity in Flora. Pollen grains present in the honey represents the plant diversity of the foraging area of honeybees. For aging activity of honey includes nectar along with the pollen grains. Keeping such perspectives investigation is made for assessment of pollen diversity in six different sampling sites from Amravati region. Color and texture of honey is also depends on the foraging site of honeybees. Out of six sampling sites Pohara showed the highest i.e. thirteen different pollen types in the collected honey and least variation in pollen diversity of honey was recorded from Tapovan site i.e. four. Sculpturing pattern and ornamentation of exine in pollen is very specific to particular plant species. Such morphological features of pollen were utilized for identification of pollen grains.

KEYWORDS

Honey, Acetolysis, Mellitopalynology, Pollen and Honeybees.

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INTRODUCTION

Mellitopalynology is an applied branch of Palynology dealing with the study of pollen grains in honey samples and its application in Apiculture. Investigations on pollen analyses of Honey samples in India are fragmentary and significant work has been reported by earlier workers^{1,2,3,4}.

Honey is of great importance for commercial purpose and the important source of nourishment for people. The taste, smell and colour of honey changes according to the nectar of the flowers. Honey bee belongs to order Hymenoptera and family Apidae. They occur throughout India. Honey can incorporate diverse components such as pollen

grains, bee wax, small part of the bees and many other substances with known biological properties such as enzymes, vitamins, amino acids, pigments, phenolic acids, flavonoids⁵. High pollen content in honey may be due to its availability on the flower or to the size of the smaller pollen grains are more easily transported and incorporated into honey⁶.

Morphological diversities of pollen surface are used as main tool in the field of taxonomy and phylogeny along with vegetative and floral characters of flowering plants. The acetolysis method of Erdtman⁷ involves the use of mixture of Acetic Anhydride and Sulphuric Acid (ratio 9:1) which dissolve the protoplasm and the inlay there by making the exine clear for morphological studies. Analyses have been used as an alternative to identify the floral origin because of contributions such as taste (especially acids and sweetness), odour, viscosity and colour⁸. Chemical composition of pollen from different plant species varies over a fairly wide range, generally it contains proteins 7-40%, fats 1.5-2.3%, carbohydrates 7-12 %, minerals 2.8-10.6% and traces of enzymes, hormone, vitamins, pigments and other components⁹.

Bees and certain flowering plants have evolved a well adjusted system of interdependence and mutual relationship between the flowering plants and their pollinators is one of the most significant events in organic evolution. A pollen analysis of honey is the most important aspect of melittopalynology.

This study presents the pollen analyses of 6 floral honeys from the some areas of Amravati region in Maharashtra. Not much information is available related to pollen analyses in these areas. Thus the present work was carried out to determine the critical analyses of different honey samples and to identify the pollen types of different honey samples of Amravati district, Maharashtra.

MATERIAL AND METHODS

For the present study six honey samples were collected from six different sites of Amravati region (Maharashtra). Fresh honey samples were collected from bee hives in the period January to June in

2015. Bee's hives were collected from different plant during morning hours.

All honey samples were raw and unprocessed. The honey samples were collected in sterilized glass bottles. The honey was filtered through muslin cloth to remove suspended particles like dirt, beeswax and other impurities. Later it was stored in bottle at room temperature for further analysis¹⁰.

Pollen Preparation

Pollen grains are well preserved in the honey; acetolysis destroys fungal hyphae, yeast and algae. Since most explanation in palynological literature are based on acetolysis method, hence this procedure is adopted for the present investigation. The acetolysis was carried out to remove impurities so that the exine characters would be made clear in order to facilitate better identification of pollen⁷. The slide was cleaned with a cotton cloth and examined under the microscope Trinocular fluorescence microscope (Carl Zeiss). Glycerin jelly for mounting the pollen samples was prepared according to the method by Agashe⁹.

Qualitative analysis

The qualitative analysis was made to know the specific nature of the pollen grain. The pollen types thus observed provided the information about foraging species. For the purpose of qualitative analysis already proposed method were followed^{11,12,13}. Pollen was identified by utilizing pollen morphological characters.

RESULTS AND DISCUSSION

Color is generally the first characteristic feature observed by consumers and it can be a possible indicator of honey flavour and floral origin. The minerals in honey come from nectar that is dependent on plant absorption capacity and soil conditions and can greatly enhance honey color. *Eucalyptus* and Cambarahoneys are generally much darker and it is usually richer in minerals¹⁴.

The all honey samples collected from different sampling sites (Table No.1) shows the presence of various pollen grains belonging to the different taxon. As per these observations the honey samples collected were found to be multifloral (Table No.2).

The highest number of foraging tax on reported from all samples is thirteen belongs to Pohara region and the lowest is four belongs to Tapovan region i.e. four. (Table No.1). The most common pollen type was *Coriandrum sativum* and *Vernonia cineria* found at all sites except Tapovan. The pollen types restricted to single sites are *Acacia arabic*, *Amaranthaceae*, *Cucurbitaceae*, *Bauhinia* sp, *Delbergia sisso*, *Tecoma stans* (Table No.2).

Sabo¹⁵ analyzed honey samples from Varazdin county. Six out of eight analyzed samples were identified as unifloral honeys and 2 samples were identified as multifloral honeys. The highest percentage of pollen grains in the analyzed honey sample was of the species *Castanea sativa* Mill, *Brassica napus* L., and *Trifolium pratensel*.

The thirteen pollen types reported from sampling site Pohara are *Acacia Arabica*, *Amaranthaceae*, *Coriandrum sativum*, *Cucurbitaceae*, *Gramineae*, *Tridax procumbance*, *Vernonia cineria*, *Cassia* sp, *Delbergia sisso*, *Malphigiaceae*, *Hyptis squaveloans*, *Parthenium hysterophorus* and *Murraya koenighii* (Table No.2, Figure No.1). Whereas sampling site Wadali shows only seven foraging tax on viz. *Coriandrum sativum*, *Vernonia cineria*, *Bauhiniasp*, *Cassiasp*, *Asteraceae*, *Brassica Compestris* and *Clitorea ternatea* (Table No.2, Figure No.1). From Navsari site six pollen types were reported, these are *Coriandrum sativum*,

Vernonia cineria, *Bauhinia* sp, *Cassia* sp, *Asteraceae*, *Brassica compestris* and *Clitorea ternatea* (Table No.2, Figure No.1). Badnera showed the presence of eight different pollen grains such as *Coriandrum sativum*, *Tridax procumbance*, *Vernonia cineria*, *Cassia* sp, *Malphigiaceae*, *Asteraceae*, *Meliaceae* and *Brassica compestris* (Table No.2, Figure No.1). Lowest count of pollen types was shown at Tapovan by *Malphigiaceae*, *Hyptis squaveloans*, *Parthenium hysterophorus* and *Tecoma stans* (Table No.2, Figure No.1). Last sampling location under study was Rahatgaon showed six types of pollen like *Coriandrum sativum*, *Vernonia cineria*, *Butea monosperma*, *Brassica compestris*, *Murraya koenighii* and *Clitorea ternatea* (Table No.2, Figure No.1).

Table No.1: Honey sampling sites in Amravati region

S.No	Sites	Area	Source of honey	Name of village	Plant from hives obtained	Number of pollen species
1	Region I	Forest area	Hives	Pohara	<i>Acacia arabica</i>	13
2	Region II	Agriculture field	Hives	Navsari	<i>Mangifera indica</i>	7
3	Region III	Forest area	Hives	Wadali	<i>Acacia arabica</i>	6
4	Region IV	Agriculture field	Hives	Badnera	<i>Agelemarmelos</i>	8
5	Region V	Agriculture field	Hives	Tapovan	<i>Ailanthus excelsa</i>	4
6	Region VI	Agriculture field	Hives	Rahatgaon	<i>Acacia arabica</i>	6

Table No.2: Qualitative analysis of different Honey samples from Amravati region

S.No	Name of the pollen Tax on	Different sampling sites					
		Pohara	Wadali	Navsari	Badnera	Tapovan	Rahatgaon
1	Gramineae	+	-	-	-	-	-
2	<i>Delbergia sisso</i>	+	-	-	-	-	-
3	<i>Vernonia cineria</i>	+	+	+	+	-	+
4	<i>Butea monosperma</i>	-	-	-	-	-	+
5	Amaranthaceae	+	-	-	-	-	-
6	<i>Tridax procumbance</i>	+	-	-	+	-	-
7	<i>Acacia arabica</i>	+	-	-	-	-	-
8	<i>Coriandrum sativum</i>	+	+	+	+	-	+
9	Asteraceae	-	+	+	+	-	-
10	Cucurbitaceae	+	-	-	-	-	-
11	<i>Cassia sp.</i>	+	+	+	+	-	-
12	<i>Clitorea ternatea</i>	-	+	+	-	-	+
13	<i>Parthenium hysterophorus</i>	+	-	-	-	+	-
14	Meliaceae	-	-	-	+	-	-
15	<i>Bauhinia sp.</i>	-	+	+	-	-	-
16	<i>Brassica compestris</i>	-	+	+	+	-	+
17	<i>Tecoma stans</i>	-	-	-	-	+	-
18	<i>Hyptis squaveloans</i>	+	-	-	-	+	-
19	<i>Murraya koenighii</i>	+	-	-	-	-	+
20	Malphiaceae	+	-	-	+	+	-



Delbergia sisso *Vernonia cineria* *Butea monosperma* *Tridax procumbance* *Acacia arabica*



Coriandrum sativum Asteraceae Cucurbitaceae *Cassia sp.* Amaranthaceae

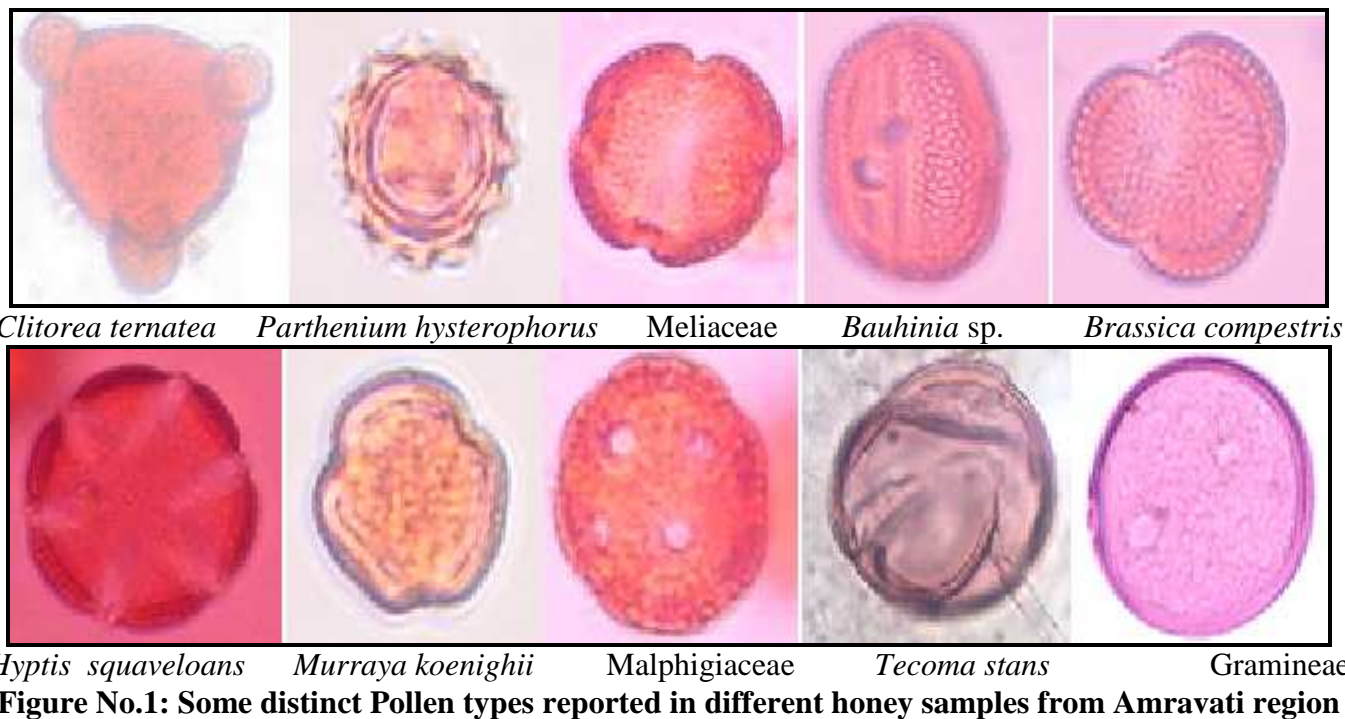


Figure No.1: Some distinct Pollen types reported in different honey samples from Amravati region

CONCLUSION

Present melissopalynological studies will served to provide the basis for identifying origin of honey in terms of locality and bee flora of Amravati region (M.S.). From the pollen qualitative analysis of different honey samples it is concluded that this region have wide diversity in bee flora and majority of the pollen loads belongs to the family Asteraceae and Brassicaceae.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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