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Yield potential of products of Italian honey bee (*Apis mellifera* L.) in Ambikapur, Surguja district of Chhattisgarh, India

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Abstract

The present investigation entitled “Yield potential of products of Italian honey bee (*Apis mellifera* L.) in Ambikapur, Surguja district of Chhattisgarh, India” was carried out at Honey Bee Park of Raj Mohini Devi College of Agriculture and Research Station, Ambikapur during 2022-2023 under All India Coordinated Research Project on Honey Bees and Pollinators at Surguja District (C.G.). Maximum mean honey production was observed in the month of October i.e., 4.45 kg/5 hives, maximum pollen collection was observed in the month of October i.e., 41.18 gm/5 hives, maximum propolis collection was recorded in the month of February i.e., 11.68 gm/5 hives, maximum bee venom collected in the month of February i.e., 0.13 mg/5 hives.

Keywords: Honey bee, pollen collection, propolis, venom

Introduction

The hive product honey is a natural sweet substance produced by honeybees from collected plant nectars, plant secretions and excretions of plant sucking insects, which are transformed, dehydrated and stored in honeycombs for ripening (FSSAI, 2017) [20]. The western honey bee (*Apis mellifera* L.) is a native species from Africa, Europe, and Western Asia (Ruttner 1988) [24]. In India, the total honey production per annum increased from 3.7 thousand metric tonnes in 2017 to 4 thousand metric tonnes in the year 2018 (Anonymous, 2019) [17]. Beekeeping is a long standing practice in the farming communities of Ethiopia (Ayalew and Gezahegn, 1991) [1]. More than one million households are estimated to keep bees using traditional, intermediate and modern hives (Gidey and Mekonen, 2010) [4]. Pollen complementary diets play a significant part in honey bee health as well as honey production. For the purpose of brood development, honey bees needs pollen and nectar to encourage foraging flights (De Grandi-Hoffman *et al.*, 2008) [19]. BV apamin is known as a neurotoxin from the central nervous system hyperexcitability through inhibition of the axonal potassium channels (Son *et al.* 2007, Pedarzani *et al.* 2008) [26, 23]. Western honey bees (*Apis mellifera* L.) produce propolis (also called bee glue) from resins that they collect from different plant organs and with which they mix beeswax. The term “propolis” is of Greek origin: “pro” meaning “in front of/for” and “polis” meaning “city”, that is, in front (or for defence) of the city. Propolis is used by bees as a building material in their hives, for blocking holes and cracks, repairing combs, and strengthening the thin borders of the comb. Propolis, a gummy and balsamic substance, is a honeybee product obtained from resinous material. It is collected by bees from flowers, buds, and exudates of plants and is known to have a broad spectrum of biological properties (Mello and Hubinger, 2012; Toreti *et al.*, 2013) [21, 27]. Apiculture, often known as the raising of honeybees, has gained prominence economically and makes a substantial contribution to the nation's economy, but traditional beekeeping practices are still practiced in many parts of the nation, particularly in tribal areas. As a result of rising demand in both domestic and international markets, beekeeping is becoming more and more popular. Honeybees have been demonstrated to have a significant part in crop pollination and the maintenance of biological variety in addition to being a source of numerous useful goods such pollen, honey, royal jelly, beeswax, propolis, and bee venom (Johannesmeier and Mostert, 2001) [6]. Honey bees generate significant items such as royal jelly, bee pollen, propolis, and bee venom that have nutritional and medicinal advantages in addition to honey and wax and functioning as pollinators. Honey bees are eusocial insects that provide valuable goods to humans such as pollen, honey,

royal jelly, bees wax, propolis, and bee venom. The abundance of honey bees wax, brood, pollen, nectar, and favourable environmental habitat accessible within the hive attracts a variety of foes. During its embryonic phases, honey bee brood is susceptible to a variety of illnesses caused by bacteria, fungus, viruses, protozoa, and mites, among others, all of which make bee colonies too weak to survive (Evans *et al.* 2006) [18]. Beekeeping is a long standing practice in the farming communities of Ethiopia (Ayalew and Gezahegn, 1991) [1]. More than one million households are estimated to keep bees using traditional, intermediate and modern hives (Gidey and Mekonen, 2010) [4].

Materials and Method

The field experiment was carried out in the apiary under All India Coordinated Research project on Honey Bee & Pollinators, Department of Agricultural Entomology in Rajmohini Devi College of Agriculture and Research Station, Ambikapur from 2022-2023. The design used was a Completely randomized design (CRD) with Six treatments and five replications. The different products from the apiary were collected in the following manner:

- **Extraction of honey from bee-hive:** Five bee colonies of *Apis mellifera* were selected for monthly observation for honey production. The honey was extracted with the help of four frame Italian honey centrifuge extractor.
- **Pollen Collection:** The pollen was collected once a month with the help of a pollen trap which was placed at the hive entrance gate. The collected pollen were weighted by digital weighing machine in Entomology Laboratory and were averaged for data analysis.
- **Propolis Production:** Propolis screen were placed on the

top of the bee hive, once a month the total collected propolis were averaged.

- **Bee Venom:** Bee venom extractor was placed at the entrance gate for 45 minutes and the venom was extracted from the screen.

Results and Discussions

Honey production

Five bee hives were selected for honey collection with the help of centrifuge honey extractor. Data was recorded from September to February.

Extraction of honey from combs is done with the help of Centrifuge honey extractor. First, the comb should be uncapped with an ordinary uncapping knife by heating in boiling water followed by placing the frames into a honey extractor, It carries 4 frames at one time and the extractor is spun by hand crank. The extractor holds a frame basket which spins and flings the honey out of the combs. With this method the wax comb stays intact within the frame and can be reused by the bees.

The data collected is as follows, in the month of October maximum honey was collected i.e., 4.45 kg/5 hives due to highly bee activity and availability of wide range of bee flora, followed by in the month of February maximum honey was collected i.e., 3.97 kg/5 hives, followed by maximum collection is recorded in the month of November i.e., 3.96 kg/5 hives, after that maximum collection is observed in the month of January i.e., 3.15 kg/5 hives, afterward maximum collection is observed in the month of September i.e., 2.97 kg/5 hives, followed by maximum collection is observed in the month of December i.e., 2.57 kg/5 hives.

Table 1: Product collected by honey bee *Apis mellifera*.

Month	All products collected from/5 hives			
	Honey Production (Kg)	Pollen collection (gm)	Propolis collection (gm)	Bee venom collection (mg)
September	2.97	32.19	9.13	0.10
October	4.45	41.18	10.80	0.12
November	3.96	38.96	10.12	0.11
December	2.57	36.87	5.82	0.06
January	3.15	34.57	8.93	0.11
February	3.97	21.46	11.68	0.13
SE(m) ±	0.39	2.45	0.86	0.01
CD (5%)	1.16	7.14	2.53	0.03

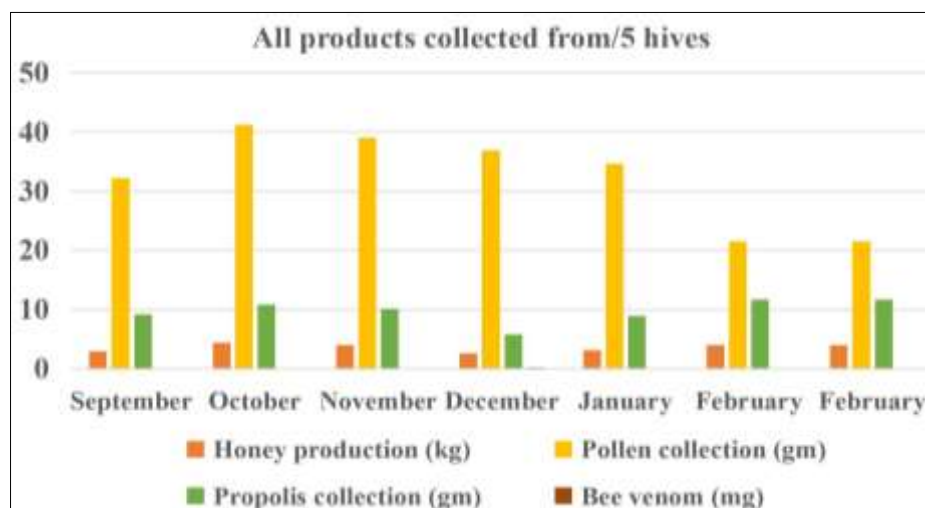


Fig 1: Product collected by honey bee *Apis mellifera*.

Pollen collection

Pollen were collected with the help of pollen traps and these traps were placed in front of hive entrance. Returning foragers bees were required to walk through a plastic mesh to enter the hive. The mesh were specifically sized such that the foragers can get through it, but large corbicular pollen loads were scraped off from the bee legs and collected into a tray. The data was recorded from the month of September to February.

The data collected is as follows, in the month of October maximum pollen was collected i.e., 41.18 gm/5 hives due to wide range of bee flora availability, followed by in the month of November maximum pollen was collected i.e., 38.96 gm/5 hives, followed by maximum collection is recorded in the month of December i.e., 36.87 gm/hives, after that maximum collection is observed in the month of January i.e., 34.57 gm/5 hives, afterward maximum collection is observed in the month of September i.e., 32.19 gm/5 hives, followed by maximum pollen collection is observed in the month of February i.e., 21.46 gm/hives.

Propolis production

The propolis were collected with the help of propolis trap (propolis screen) which were placed at the top of the hive, above the frames and under the hive lid. The data was recorded from the month of September to February.

Propolis were removed from traps by keeping the plastic sheets or fly screens for few hours in a refrigerator or freezer. Once cooled, the propolis becomes brittle and can be removed from the screen by simply pulling it over a table edge.

The data collected is as follows, in the month of February maximum propolis was collected i.e., 11.68 gm/5 hives, after that in the month of October maximum propolis was collected i.e., 10.80 gm/5 hives, followed by maximum propolis collection is recorded in the month of November i.e., 10.12 gm/5 hives, after that maximum collection is observed in the month of September i.e., 9.13 gm/5 hives, afterward maximum propolis collection is observed in the month of January i.e., 8.93 gm/5 hives, followed by maximum propolis collection is observed in the month of December i.e., 5.82 gm/5 hives.

Bee venom

Bee venom was extracted from honey bees using low voltage electrical stimulation. These electric frames were installed in honey hives and bees that come into contact with the wire, causes electrical shock. This causes bees to sting the glass thus releasing the venom without losing their barbed sting.

The data of quantity of bee venom collected were as follows, maximum bee venom was collected in the month of February i.e., 0.13 mg/5 hives due to excellent strength of bee colonies, followed by maximum bee venom was collected in the month of October i.e., 0.12 mg/5 hives, after that maximum bee venom was collected in the month of January i.e., 0.11 mg/5 hives, followed by maximum bee venom was collected in the month of September and November that is equal in quantity 0.10 mg/5 hives, after that maximum bee venom collection is observed in the month of December that is 0.06 mg/5 hives.



Honey extraction



Pollen collection



Pollen collected by honey bee



Bee venom collection

Conclusion

The maximum honey production was obtained in the month of October i.e., 4.45 kg/5 hives. Maximum pollen production was obtained in the month of October i.e., 41.18 gm/5 hives. Maximum Propolis collection was done in the month of February i.e., 11.68 gm/5 hives. Highest amount of Bee venom was obtained in the month of February i.e., 0.13 mg/5 hives.

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