



Research Paper

**SEASONAL CHANGES IN PROTEINS PRESENT IN HONEY STOMACH OF
*Apis mellifera***

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Abstract

Honey bees are economically very beneficial to man due to their major role in pollination of plants. During this process honey bees get the reward as nectar or honey dew which is collected from different flora and stored in crop or honey stomach of honey bee. Nectar is a natural source of carbohydrates which provides energy for different tasks performed by honey bees. For growth and healthy colony development nectar plays a significant role along with pollen. In the present studies the concentration of proteins in honey stomach or crop of bees was compared in different seasons and it was observed that protein concentration was more in spring and autumn as compared to summer and winter.

Key words: Nectar, *Apis mellifera*, Protein, Honey stomach.

INTRODUCTION

Honey bees are well known social insects (Seeley 1989) and pollinators. Colonies of honey bees consist of one reproductive female called queen, sterile female workers and drones. The worker are further divided according to the task performed by them inside the hive or outside the hive such as cleaning, brood tending, food storage and foraging bees. Forager bees work outside the hive and collect pollen, nectar, raisin material and water etc. as per the need of the colony (Mc Caughey, 1980; Van Der Steen, 2015). Pollen is a rich source of proteins and primarily a source of amino acids required for growth and development (McCaughey 1980); nectar is natural source of carbohydrates collected from flowers and carried in the honey stomach or crop to the hive (Brodschneider and Crailsheim, 2010) where it is further processed with enzyme secretions of worker honey bees and later regurgitated it in the form honey. Honey is used as food and energy source by the bee performing different duties in and outside the hive. The main components of the nectar are sugars (Baker and Baker, 1973; Baker 1977) and the three main sugars present in nectar are sucrose, glucose and fructose in different proportion (Freeman *et. al.*, 1985, Roberts, 1979). In present studies the difference in protein concentration of the contents honey stomach of in *Apis mellifera* was determined in different seasons.

MATERIAL AND METHOD

Sample collection

Samples (*Apis mellifera*) were collected from hives of *Apis mellifera* kept in an apiary in village Dhannas, Chandigarh, in different seasons and stored at -20 °C for further studies.

Preparation of sample

Forager worker bees were dissected (n =20). The crop region was carefully cut off from the alimentary canal in 1 N saline. The samples were homogenized in 1N saline and the homogenate was further used for the biochemical estimation.

Estimation of proteins was done by Lowry's method.

RESULTS AND DISCUSSION:

The concentration of protein in the contents of the honey stomach of *Apis mellifera* in different seasons is presented in Table 1 and Figure 1.

Table 1: Concentration of Proteins in honey stomach of *Apis mellifera* in different season

Seasons	Spring	Summer	Autumn	Winter
Conc. of protein mg/ml±S.D.	160.67±3.51	98±2.89	123.67±3.06	80.67±3.51

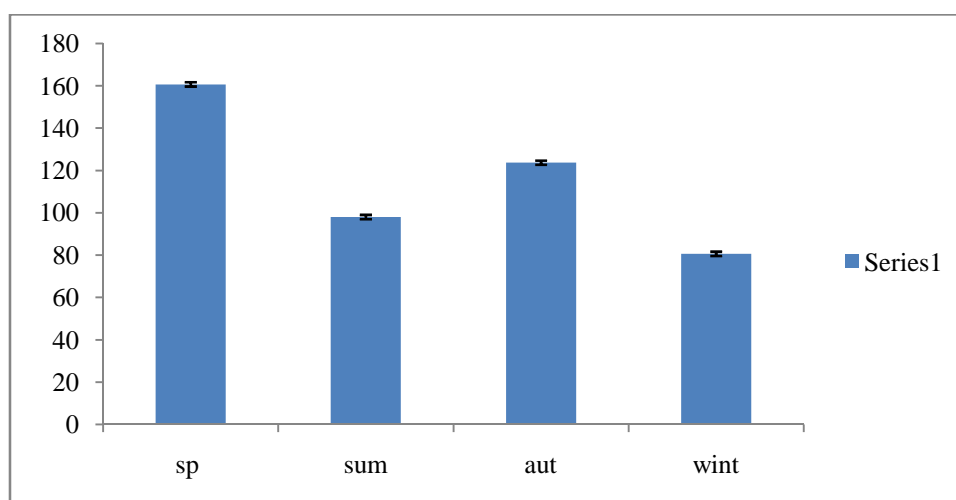


Fig 1. Histogram showing concentration of proteins in honey stomach of *Apis mellifera* in different seasons

Nutrition is important for growth and development and so it is also required for the proper growth of honey bees. Season influences the flowering of plants and production of nectar and pollen (Winston *et.al.*, 1987). The change in season also effects the distribution of flowers on which honey bees are dependent for food (Thuiller *et. al.*, 2005). Season changes the quality of floral environment and development of honey bees colony (Le Conte and Navajas, 2008). In the present study the concentration of proteins in the honey crop of *Apis mellifera* was observed to vary according to seasons. In spring and autumn it was higher being 160.67 and 123.67mg/ml as compared to summer and winter where it was found to be 98 and 80.67 mg/ml. Crailsheim (1990) also reported that during summer the concentration of protein decreased. In spring and autumn the flora is in abundant amount and so the honey bees collected more nectar and pollen in these seasons as compared to winter when food is not available outside the hive due to death of flora. The quality and quantity of floral food sources during different seasons

therefore influenced the concentration of protein in the honey crop contents as also supported by the observations of Wille *et. al.* (1987) and Winston *et.al.* (1987).

REFERENCES

1. Baker H.G. 1977. Non-sugar chemical constituents of nectar. *Apidologie*, 8: 349-356.
2. Baker H.G. & Baker, I. 1973. Some anthecological aspects of the evolution of nectar producing flowers, particularly amino acid production in nectar. In: Heywood, V.H. (Ed.) *Taxonomy and ecology*. Academic Press, London, UK
3. Brodschneider R. and Crailsheim K. 2010. Nutrition and health in honey bees. *Apidologie*, 41:278-294.
4. Crailsheim K. 1990. The protein balance of the honey bee worker. *Apidologie*, 21: 417-429.
5. DeGroot A.P. 1953. Protein and amino acid requirement of the honey bee (*Apis mellifera* L). *Physiol. Comp. ecol.*, 3:197-285.
6. Le Conte Y. and Navajas M. 2008. Climate change: impact on honey bee population and diseases. *Rev. sci. tech. off. Int. epiz.*, 27(2):499-510.
7. Freeman C.E., Worthington R.D. and Corral R.D. 1985. Some floral nectar-sugar compositions from Durango and Sinaloa, Mexico. *Biotropica*, 17: 309-313.
8. McCaughey W.F. 1980. Amino acid and protein adequacy for honey bees of pollens from desert plants and other floral sources. *Apidologie*, 11(1): 75-86.
9. Roberts R.B. 1979. Spectrophotometric analysis of sugars produced by plants and harvested by insects. *Journal of Apicultural Research*, 18: 191-195.
10. Seeley T.D. 1989. The honey bee colony as a superorganism. *Am. Sci.*, 77:546-553.
11. Thuiller W., Lavorel S., Araujo M.B., Skyes M.T. and Prentice I.C. 2005. Climate change threats to plant diversity in Europe. *Proc. Natl Acad. Sci. USA*, 102(23):8245-8250.
12. Van der Steen J.J.M., 2015. The foraging honey bee. *The British bee journal*, 10:42-46.
13. Winston M.L. 1987. The biology of the honey bee. Harvard University Press, Cambridge, Massachusetts.
14. Wille H, Wille M, Kilchenmann V, Imdorf A. 1987. Die pollenrahrung des uberwinternden und auswinternden bienenvolkes. Forschungsanstalt fur milchwirtschaft. *Mitteilungen der sektion bienen*, 2:11-15.