Available online: December 17, 2018

Commun.Fac.Sci.Univ.Ank.Series C
Volume 27, Number 2, Pages 115-119 (2018)
DOI: 10.1501/commuc_0000000205
ISSN 1303-6025 E-ISSN 2651-3749
http://communications.science.ankara.edu.tr/index.php?series=C

EVALUATING HONEY BEE PRODUCTS AS AN INDICATOR OF MANAGED POLLINATION STUDIES: A CASE STUDY ABOUT *ALLIUM CEPA* L.

CIGDEM OZENIRLER, NAZLI MAYDA, OMUR GENCAY CELEMLI, ASLI OZKOK, KADRIYE SORKUN

ABSTRACT. *Allium cepa* (onion) is a monocotyledonous plant which belongs to the family Liliaceae. Although self-pollination frequently occurs, most plants are highly self-incompatible. There are several studies about the managed honeybees increasing the seed yield of onion.In this study, the honey bee products which were obtained from the hives located in the onion fields examined. The honeybees were managed by the producers to increase seed yield. Our aim was to evaluate the composition of honey and honeybee pollen to decide if the honeybees foraged on *Allium cepa* or on the other plants during the flowering time of onion. As a result of the melissopalynological analysis, it was determined that Liliaceae pollen was minor with the ratio of 7,2 % in honey and not found in honeybee sample.

1. INTRODUCTION

Allium cepa L. (onion) is a monocotyledonous plant which belongs to the family Liliaceae [1]. It is an extensively grown biennial bulb crop, with world production of 74,250,809 tones from an area of 4,364,000 hectares [2]. Although self-pollination frequently occurs, most plants are highly self-incompatible [3]. There are several studies about the managed honeybees increasing the seed yield [4, 5]. The amount of sugar and nectar concentration in the plant nectar affects the foraging behaviors of bees [6].

Honey bees tend to prefer nectar from nectaries with sucrose concentrations in the 50–65% range [7] The pollen production potential of *Allium cepa* is minor and the honey production is trace [8].

Our aim was to evaluate the composition of honey and honeybee pollen to decide if the honeybees foraged on *Allium cepa* or on the other plants during the flowering time of onion.

Received by the editors: December 02, 2018; Accepted: December 05, 2018.
Key word and phrases: *Allium cepa*, pollination, melissopalynology, honeybee pollen.
Submitted via II. Aerobiology and Palynology Symposium 07-10 October 2018 (APAS 2018)

2018 Ankara University
Communications Faculty of Sciences University of Ankara Series C: Biology

2. Materials And Methods

a. Honeybee products

Onion seeds producers who used honeybees as managed pollinators in their field harvested honey from those hives and collected bee pollen with pollen traps during the blooming period of *Allium cepa*.

b. Melissopalynological analysis

In order to determine the botanical origin of honey, pollen preparations were prepared according to Wodehouse and Sorkun methods [8, 9].
The mixed honeybee pollen was classified according to their color. Analyses were carried out assuming that a pollen load was collected from only one plant species [10-12] After this process, pollen slides were prepared for examination by light microscopy according to the Wodehouse method[9].

Pollen identifications were carried out with Nikon Eclipse E400 microscope by using several taxonomic keys [8, 13-17]. Observed pollen types were classified into three categories: dominant pollen (≥ 45%, D), secondary pollen (16–44%, S), important minor pollen (> 3–15%, M) and rare pollen (3%<) [18].

3. Results And Discussion

As a result of the melissopalynological analysis, it was determined that Liliaceae pollen was minor with the ratio of 7,2 %. The rare pollen composition of the honey was Plantago (2,88%), Papaveraceae (1,44 %), *Salix* spp. (0,96%), Apiaceae (0,48%) and Poaceae (0,48%). Rosaceae family was represented with the ratio 8,17%. While Asteraceae species were secondary pollen (18,2 %), the dominant pollen taxa were belong to Fabaceae.

According to the results from microscopic analysis, it is determined that the pollen samples collected by honey bees belong to 10 different taxa (Asteraceae, Apiaceae (type 1-3), Brassicaceae, Convolvulaceae, Lamiaceae (type1-2), Rosaceae and Fabaceae).

As a result of the melissopalynological analysis, it was determined that Liliaceae pollen was minor with the ratio of 7.2 %. According to the results from microscopic analysis of honeybee pollens, no Liliaceae pollen was detected. Our results were compatible with the previous studies. It was already found that honeybees foraging on onion flowers are primarily nectar –gatherers and none collect pollen without also collecting nectar. Most of the bees that become dusted with pollen while collecting nectar subsequently comb it from their bodies and discard it, and only a small proportion of them pack it into their corbiculae. The flower visiting behavior of bees with and without pollen loads appears to be identical. Observations on the foraging behaviors' of managed bees in the blooming seasons are also necessary to understand the pollination ecology of the entomophilous plants. Also the sampling methodology could be erroneous. To a better understanding, during the blooming period of the target plant, more detailed investigations have to be done.

Acknowledgement: This study was supported by MTN Seed.

REFERENCES

[1] V. Kuete, Other health benefits of african medicinal spices and vegetables, in *Medicinal spices and vegetables from Africa*, Elsevier, (2017) 329-349.
[2] FAO, (2017), Food and agriculture organization of the United Nations.
[3] J. Free, Insect pollination of crops. Acad*, Press, London-New York*, (1993) 172-180.
[4] A. Sajjad, S. Saeed, A. Masood, Pollinator community of onion (*Allium cepa* L.) and its role in crop reproductive success. *Pakistan Journal of Zoology*, 40(6), (2008) 451-456.
[5] D.P.Abrol, Foraging behaviour of *Apis florea* f., an important pollinator of *Allium cepa* L*., Journal of Apicultural Research*, 49(4) (2010) 318-325.
[6] L. Somme, M. Vanderplanck, D. Michez, I. Lombaerde, R. Moerman, B. Wathelet, R. Wattiez, G. Lognay, A.L. Jacquemart, Pollen and nectar quality drive the major and minor floral choices of bumble bees. *Apidologie*, 46(1), (2015) 92-106.
[7] L.D. Knopper, T. Dan, D. D. Reisig, J. D. Johnson, L. M. Bowers, Sugar concentration in nectar: A quantitative metric of crop attractiveness for refined pollinator risk assessments. *Pest management science*, 72(10), (2016) 1807-1812.

[8] K. Sorkun, *Türkiye'nin nektarlı bitkileri, polenleri ve balları*. Palme Yayıncılık, (2008).
[9] R.P.Wodehouse, Pollen grains. Their structure, identification and significance in science and medicine. *Pollen grains. Their structure, identification and significance in science and medicine,* (1935).
[10] F.C.Pellett, *American honey plants*. Orange Judd., (1947).
[11] A.C. Andrada, M.C. Tellería, Pollen collected by honey bees (*Apis mellifera* L.) from south of Caldén district (Argentina): Botanical origin and protein content. *Grana*, 44(2), (2005) 115-122.
[12] C. Ozenirler, N.P. Barkan, K. Sorkun, Aspir (*Carthamus tinctorius* L.) remzibey-05 bitkisi poleninin bal arılarının beslenme ekonomileri açısından İncelenmesi. *Sinop Üniversitesi Fen Bilimleri Dergisi*, 1(2), (2016) 69-80.
[13] G. Erdtman, *Handbook of palynology: Morphology, taxonomy, ecology: An introduction to the study of pollen grains and spores*. Munksgaard Copenhagen, (1969).
[14] V. Markgraf, H. d'Antoni, Pollen Flora of Argentina*, Tucson: Arizona, University of Arizona Press* VIII, (1978) 208 .
[15] P.D.Moore, J.A.Webb, M.E. Collison, *Pollen analysis*. Blackwell Scientific Publications, (1991).
[16] G.R. D'Albore, *Textbook of melissopalynology*. Apimondia Publishing House, (1997).
[17] K. Faegri, P.E. Kaland, K. Krzywinski, *Textbook of pollen analysis*. John Wiley & Sons Ltd., (1989).
[18] J. Louveaux, A. Maurizio, G. Vorwohl, Methods of Melissopalynology. *Bee world*, 59 (4), (1978) 139-157.

Current Address: CIGDEM OZENIRLER: Hacettepe University, Science Faculty, Department of Biology; Hacettepe University Bee and Bee Products Applied and Research Center, Beytepe, 06800, Ankara, Turkey.
E-mail : cozenir@hacettepe.edu.tr
ORCID: 0000-0003-0390-2416

Current Address: NAZLI MAYDA: Hacettepe University, Science Faculty, Department of Biology, Beytepe, 06800, Ankara, Turkey.
E-mail: nazli.mayda@gmail.com
ORCID: 0000-0002-7289-5830

Current Address: OMUR GENCAY CELEMLI: University, Science Faculty, Department of Biology; Hacettepe University Bee and Bee Products Applied and Research Center, Beytepe, 06800, Ankara, Turkey.
E-mail: gencay@hacettepe.edu.tr
ORCID: 0000-0002-2215-9552

Current Address: ASLI OZKOK: Hacettepe University Bee and Bee Products Applied and Research Center, Beytepe, 06800, Ankara, Turkey.
E-mail: asozkok@gmail.com
ORCID: 0000-0002-7336-2892

Current Address: KADRIYE SORKUN: University, Science Faculty, Department of Biology; Hacettepe University Bee and Bee Products Applied and Research Center, Beytepe, 06800, Ankara, Turkey.
E-mail: kadriye@hacettepe.edu.tr
ORCID: 0000-0003-3224-7748