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# Identification and Introduction of The Medicinal Plants Used by Honeybees in Markazi Province

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## ABSTRACT

Medicinal plants contribute greatly to increase the therapeutic properties of bee products such as honey, pollen, royal jelly, and propolis. In fact, the pharmaceutical value of honeybee products is associated with the plants that attract honeybees. In this study, pollinating plants used by honeybees were gathered and identified from different regions of Markazi province through direct observation. Simultaneously, to supplement the data, the pollens of these plants were gathered and examined by Erdtman acetolysis. Over 132 plant species from 32 families were found to be used by honeybees. Of these plants, 56 species were from medicinal plants. The highest number of medicinal plants were related to Composite (8 species), Rosaceae (8 species), Labiatae (7 species) and etc. This study will help to identify the medicinal plants occurring in Markazi province, the pattern of distribution and dispersion of these plants in the region under study, and the botanical and pharmaceutical data on them.

**Key Words:** Medicinal plants, Honeybees, Markazi province, Iran.

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## INTRODUCTION

Today, the plant source of honey is important in honey market. This can be attributed to the pleasant taste, unique color, and pharmaceutical properties of some types of honeys, making beekeepers or customers question the plant sources of high quality types. Currently, over 80% of the population worldwide prefers to use plant-based extracts or their effective compounds for primary health care [1]. Medicinal plants frequently use by local people and are one of valuable sources for prevention and treatment of disease [2-11]. Honey as a healing food product is concerned. Also, it has been shown which honey has pharmacological activity [12].

Therefore, beekeepers in Iran have to produce specific honeys, especially of herbal sources, to gain success in international markets. Through identifying the pollinating plants of different regions, beekeepers can transfer the beehives to the regions where the desired honey plants occur abundantly to obtain the honey from these plants. Some large studies have been conducted to investigate the pharmaceutical properties of the honey obtained from medicinal plants [13-15]. In a study, it has been shown that the growth of human gastritis-inducing bacteria stopped completely after addition of 2% honey to the culture of these bacteria [16]. Also, wound ointments such as nitrofurazone on burn by adding honey showed additional benefit of removing the swelling and the inflammation due to wound more quickly with no side effects [17]. This study aims to gather and identify the pollinating plants used by honeybees from different regions of Markazi province in Iran through direct observation. This study will help to identify the medicinal plants occurring in Markazi province in Iran, the pattern of distribution and dispersion of these plants in the region under study, and the botanical and pharmaceutical data on them.

**Table 1.** Medicinal plants used by honeybees in Markazi province, Iran

| Climatic distribution | | | Type of action | | The rate of honeybees action | | | | Flowering period | | Vegetative form | Family | Scientific name | Row |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | B | A | Both | Pollen | Nectar | Very much | Much | Average | Termination | Initiation | | | | |
| * | * | * | * | | | | * | | Middle June | Late of April | A.F | *Compositae* | *Acroptilon repens L.* | 1 |
| | * | * | | * | | * | | | Middle of July | Early of June | A.F | *Malvaceae* | *Alcea ficifolia L.* | 2 |
| | * | * | * | | | | * | | Middle of August | Middle of July | P.F | *Liliaceae* | *Allium cepaL* | 3 |
| | * | * | * | | | | * | | Early of August | Middle June | P.F | *Liliaceae* | *Allium sativum L* | 4 |
| | * | * | | | * | | * | | Early of July | Late of May | A.F | *Compositae* | *Anthemis kotschyana Boiss* | 5 |
| | * | * | * | | | | | * | Middle of September | Middle of August | A.F | *Cruciferae* | *Bras'sica campestris L* | 6 |
| | * | * | | * | | | * | | Middle of August | Late of April | A.F | *Cruciferae* | *Capsella bursa pastoris(L.) Medicus* | 7 |
| | * | | * | | | * | | | Late of June | Middle May | A.F | *Cruciferae* | *Cardaria draba (L.)Desv* | 8 |
| | * | * | | | * | * | | | Middle of August | Late of April | P.F | *Compositae* | *Centaurea depressa M.B* | 9 |
| | * | * | * | | | * | | | Middle of May | Early April | A.R | *Rosaceae* | *Cerasus avium (L.) Moench* | 10 |
| | * | * | * | | | * | | | Late of May | Early April | A.R | *Rosaceae* | *Cerasus vulgaris Miller* | 11 |
| * | | | * | | | | * | | Early of August | Middle of June | P.F | *Compositae* | *Cichorium intybus L.* | 12 |
| * | * | * | * | | | | | * | Middle of July | Middle of May | P.F | *Convolvulaceae* | *Convolvulus arvensis L.* | 13 |
| | * | * | | | * | | * | | Late of June | Middle of May | P.F | *Leguminosae* | *Coronilla varia L.* | 14 |
| * | * | | | * | | | * | | Late of June | Late of May | A.F | *Cucurbitaceae* | *Cucumis melo L.* | 15 |
| * | | | * | | | | | * | Middle of July | Middle of June | A.F | *Cucurbitaceae* | *Cucumis melo L. var. reticulatus* | 16 |
| * | * | * | | * | | | * | | Middle of Jun | Middle of May | A.F | *Cucurbitaceae* | *Cucumus Sativus L.* | 17 |
| | | | | * | * | | * | | Late of Jun | Early of Jun | A.F | *Cucurbitaceae* | *Cucurbita moschata Duchartre* | 18 |
| | | | * | | | | * | | Late of April | Late of March | A.R | *Rosaceae* | *Cydonia oblonga Mill.* | 19 |
| | | | | * | | | | * | Late of May | Middle of April | S.U | *Thymelaeaceae* | *Daphne mucronata Royle* | 20 |
| | * | * | | | * | | | * | Early of September | Early of August | A.F | *Umbellifera* | *Daucus broteri Ten* | 21 |
| | | | | * | | | * | | Late of May | Early of April | A.F | *Cruciferae* | *Descurainia Sophia L.* | 22 |
| | | | | | * | | * | | Late of May | Middle of August | P.F | *Compositae* | *Echinops ritro L.* | 23 |
| * | * | * | | | * | | * | | Middle of July | Early of Jun | P.F | *Compositae* | *Echinops ritrodes Bunge* | 24 |
| * | * | * | * | | | * | | | Late of May | Early of April | A.R | *Elaeagnaceae* | *Elaeagnus angustifolia L.* | 25 |
| * | * | * | | * | | * | | | Middle of Jun | Middle of April | A.F | *Cruciferae* | *Eruca sativa Lam* | 26 |
| | | * | | * | | * | | | Early of May | Middle of April | P.F | *Umbellifera* | *Ferula gumosa Boiss* | 27 |
| | * | * | | * | | | * | | Late of July | Early of Jun | A.F | *Rubiaceae* | *Galium verum L.* | 28 |
| * | | | * | | * | | | | Middle of May | Early of March | A.F | *Geraniaceae* | *Geranium tuberosum L.* | 29 |
| * | | | | | * | | * | | October | Late of Jun | A.F | *Malvaceae* | *Gossypium herbaceum L.* | 30 |
| | * | * | | * | | * | | | Late of Jun | Late of April | A.F | *Compositae* | *Gundelia tournefortii L.* | 31 |
| | | | | | | * | | | Late of August | Early of Jun | A.F | *Compositae* | *Helianthus annus L.* | 32 |
| | | | | | | * | | | Middle of Jun | Middle of April | S.U | *Hypericaceae* | *Hypericum scabrum L.* | 33 |
| | | | | | | | * | | Late of April | Early of March | P.F | *Lridaceae* | *Iris hymenospatha Mathew.et wendelbo* | 34 |
| * | * | * | * | | | | | * | Late of May | Middle of March | P.F | *Amaryllidaceae* | *Lxilirion tataricum* | 35 |

## MATERIALS AND METHODS

First, the colonies were set up across the selected regions and the regions were visited to a 3-km radius at least twice a week. During the visits, the plants hosting worker honeybees were detected and carefully collected from the regions. The strain, genus, and species as well as the pharmaceutical properties of the collected samples were determined [18, 19]. To supplement the findings of direct observations, the seeds of these plants' pollens were gathered and identified by Erdtman acetolysis [20, 21]. To do this, we sorted out the pollens samples after collecting and keeping them separately in special containers. Then, the microscopic slides of the pollens' seeds were taken, their morphological structures were observed by an optical microscope (40× and 100× magnification), and their photographs were taken. The pollens were identified by the comparison between the findings and reliable references.

## RESULTS AND DISCUSSION

The results indicated that 132 plant species from 32 families were found to be used by honeybees. Overall, 56 medicinal plants used by honeybees were identified. Besides that, the flowering period and the regions of occurrence of these plants are shown in Table 1. Medicinal plants used by honeybees influence on our lives. These plants, may be beneficial, directly or through the honey obtained from them, to treat diseases and hence highly efficacious in promoting community health care [12].

According to the findings of this study, most of the pollinating plant species are from family Compositae such *as Matricaria chamomilla* and *Cichorium intybus*. Compositae family plants have medicinal properties. There is also appealing and nutritious substances in the pollen of these plants [22].

Other plants identified in this study were mainly from Rosaceae, Labiatae and Cruciferae families (Figure 1). Studies have shown that most plants from family

Labiatae have valuable pharmaceutical properties, including *Salvia officinalis, menthe piperitha*, *Mentha Longifolia* L, and *Thymus fallax.* Labiatae plants have been used as one of the important plant families for bees. Plants in this family via valuable medicinal properties are highly regarded by local people**.** Interestingly, the honey obtained from *Salvia officinalis* nectar never granulated in maintenance, in addition to being pharmaceutically valuable. Therefore, this honey can be mixed with other types of honeys to prevent them from granulated [23].

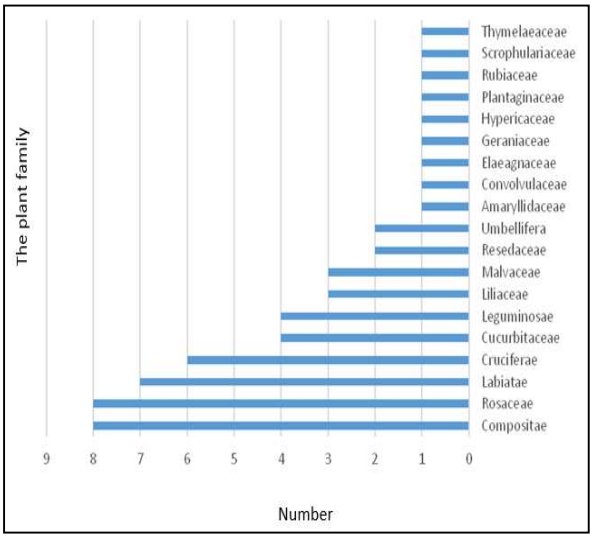


**Figure 1.** The number of medicinal plants used by honeybees in each plant family in Markazi province

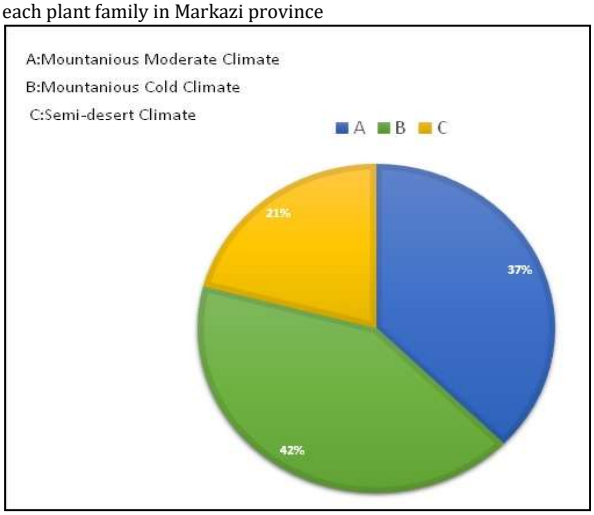


**Figure 2.** Distribution of the medicinal plants used by honeybees in three different climates of Markazi province

According to some studies, *Mentha piperita* used in feeding broilers leads to highly pleasant effects on weight gain, conversion coefficient, and survival of chicken [1]. Moreover, other studies have demonstrated that menthol in *Thymus vulgaris* has a significant effect on *acarapis woodi* L. of honeybees. In this regard, some studies have shown that a topical formulation of the honey of some plants had significant effects in improving topical wounds in rats [17]. Also, it has been shown that some extracts from medicinal plants used by bees can be used for biological control of pests of bees, including Varroa mite [24]. Our results indicated that honeybees referring, type, and action rate were different for the studied plants, because certain environmental and botanical factors such as flower color may influence honeybee's action.

In this regard, it has shown that pollination by bees petals of some flowers has lines or signs that lead bees to nectar source [25]. For example, yellow pollen plants due to absorption of ultraviolet light on some of the flowers attract bees [26].

In our study, we found that the most common medicinal plants used by bees were in the cold weather of the mountainous region of the city of Saveh and Stagecoach (Figure 2).

Precipitation, environmental temperature, and wind blowing are some other factors that influence on honeybees action rate on the above plants. According to some studies, suitable precipitation may contribute to the stimulation of the plants to produce nectar and hence the increase in honeybees actions [27-29]. Besides that, the best temperature for honeybees to act in deserts has been estimated 20-30°C. Therefore, beekeepers and other people interested in identifying pollinating medicinal plants should pay great attention to these points.

## CONFLICT OF INTEREST STATEMENT

We declare that we have no conflict of interest.



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