

UDC 595.794.799.19

**FAUNA AND ECONOMIC IMPORTANCE BEE POLLINATORS
(HYMENOPTERA, APOIDEA) OF ALFALFA IN AZERBAIJAN****Kh.A.Aliev, G.A.Huseynzade**

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The article gives information on the study of the species composition and effective pollinators of a valuable fodder plant-the alfalfa for increasing its seed growing potential in Azerbaijan. As a result of research on alfalfa crops, 124 species of bees were found in various regions of the Republic, promising species were identified, certain ecological features were studied (daily activity, population dynamics, pollination rates in different climatic conditions, etc.), recommendations on protection, increasing the number, attracting to alfalfa fields, carrying out agro technical measures.

Keywords: alfalfa, bees, number, pollination percentage, daily activity

As a result of research carried out by scientists of many countries, it was established that the role of honey bees in pollination of alfalfa is much less than in comparison with wild bees: if the increase in the number of honey bees in crops leads to an increase in yield by 14%, then with the involvement of wild bees, the yield increased by 27-28%. American scientists revealed that the percentage of pollination of females *Nomia melanderi* Cockerell and *Megachile rotundata* F. is 81 and 78%, males 61 and 51%, and honey bees 22% [1].

Reduction of the number of wild bees in 100 years by 50% and the crisis of beekeeping led to a shortage of pollinators and a decrease in the productivity of agricultural plants. In this regard, it is very important to develop a strategy for increasing the number of wild bees and attracting them to agricultural lands. The restoration of populations of wild bees can be the beginning of a new stage in agriculture, ensuring sustainable development and obtaining environmentally friendly products. There is no technology that can replace insects in pollination.

Alfalfa is the most common fodder plant in modern agriculture. AzNIXI varieties are cultivated in Azerbaijan - 262 (1944), AzNIXI - 5 (1962), AzSXI - 1 (1967), Absheron (1989), Aran (1996), Ağstafa -1 (2011). Under favorable conditions, alfalfa is cut 3-4 times a year and yields 350-400 q / ha of green mass. De-

spite this, the seed productivity of this plant is very low, even with timely agrotechnical measures, productivity is 3-5 c/ha. Pollination of alfalfa flowers occurs only due to the forced opening of flowers by insects. The honey bee is an inefficient pollinator, as it takes nectar from the side of the flower without revealing it and pollination does not occur. Disclosure of flowers of alfalfa is carried out by wild bees. Alfalfa has an explosive type of pollination. Without the disclosure of flowers, the alfalfa pollination hardly occurs (less than 1%). Wild bees, when collecting nectar, sit on the flower boat, resting their head on the sail, thrust the head and proboscis into the corolla tube and at the same time break the flower locks. Anthers and stigmas when thrusting the column (thripping) forcefully strike the jaw of a wild bee, in the chest or in the base of the throat recess, where a lump of pollen from different flowers accumulates and cross-pollination occurs. Currently, to improve seed production, mainly chemical (pesticides in pest control) and agro technical methods are used. As a result of the uncontrolled use of chemical plant protection products, which cause the death of tens of thousands of bee colonies every year and the almost complete destruction of wild insect pollinators, pollination does not occur.

The purpose of this study is to study the entomophilous factor in the seed production of

a valuable fodder plant - alfalfa, the current state of pollinators, the identification of the most effective species. Studies were conducted during 2014-2016 in various regions of Azerbaijan (Ganja-Gazakh and Shamakhi-Ismaili regions, Salyan and Absheron regions).

A systematic study of bees in Azerbaijan has been carried out since the 1970s and about 150 species of bees are found on alfalfa [2,3,4,5]. As a result of this study, 124 species of bees belonging to 5 families and 31 genera were identified. But due to various reasons, many of these species (some are rare species, some are few, some are numerous, but due to their small size, their role in pollination is not great, some of the species are males and clepto-parasitics that visit flowers for the sake of nec-

tar) are not effective pollinators of alfalfa. Of the species identified, 71 nests are arranged in the soil, the rest are nested in various understratum. It is the soil species that are more susceptible to the effects of the anthropogenic factor. 21 species leads a social way of life, 5 species are clepto-parasitics, the remaining are single species. Social species form large colonies and play an important role in pollination.

The analysis of the materials showed that the bees belonging to the families *Halictidae* (37%), *Anthophoridae* (20%) and *Andrenidae* (13%) are the most numerous, and the bees of the genera *Halictus* and *Andrena* are born by genera, then *Lasioglossum* (6.1%), *Eucera* (5.5%), *Bombus* and *Megachile* (each at 4.9%) (Diagram 1.2).

Diagram 1. Distribution of pollinators of alfalfa by family

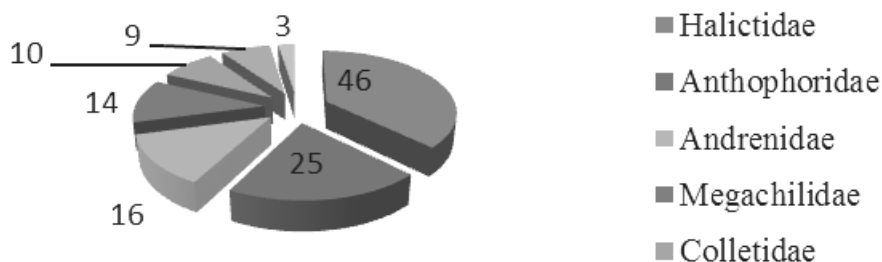
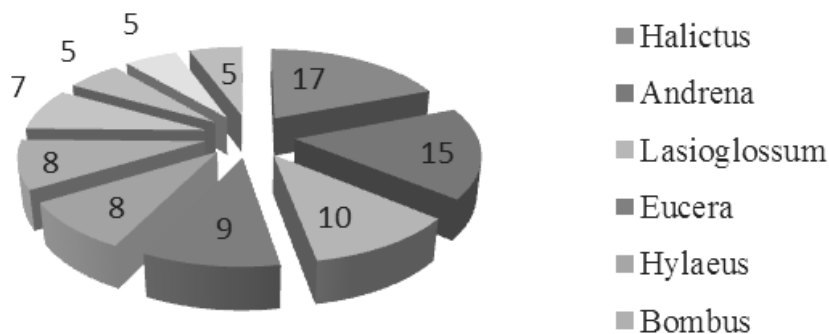


Diagram 2. Distribution of pollinators of alfalfa by genera



In 2014, due to unfavorable weather conditions (precipitation), flowering was observed later in all areas and, consequently, the low number of bees on alfalfa fields. In Salyan region, an average of 3,700, in Shamakhi - 1000, and in Agstafa - 5200 specimen/ha were found. During the season the species composition and abundance were variable. In the flowering phase of the 1st mowing (late May - early June) in the fields there were more bees from the genera *Andrena*, *Eucera*, *Rophites*, *Megachile*. In July - early August, before the second mowing, there was an increase in the number of bees from the genera *Halictus* and *Bombus*. On the few opened flowers due to the low amount of nectar, the number of bees in the fields was low. And wild bees and nectareous flew, mostly on weeds at the edges of the fields. In Shamakhi region, on the sites of seed alfalfa of the Ivanovka collective farm it was impossible to collect seed production in the areas of seed alfalfa of the collective farm this year, and in Salyan and Agstafa regions the gathering was very low - 0.4-0.6 centners per hectare.

In 2015, a drought lasting about 2 months (June-July) in Shamakhi region (Damirchilar, Chuhuryurd, Pirkuli, Nagarakhana) caused premature drying of half of the plants in the fields of alfalfa and for this reason the number of bees was low. The main part of the material is collected in row-spacing - on weeds (chamomile, spurge, sage, etc.) and around fields on bushes of barberry, blackberry, dogrose. Species diversity was also meager, bees are collected from only 4 genera - *Halictus*, *Lasioglossum*, *Andrena* and *Colletes*.

In order to study the dynamics of the number of alfalfa pollinators, harvest was gathered at various times of the day: between 800 - 1100, 1300-1500 and 1700-1900. In the morning hours, on average, 27 were collected from all areas, 53 in the afternoon, and 42 specimens/m² of bees in the evening.

In the Mingechevir region, bees from the genera *Colletes*, *Andrena*, *Halictus*, *Nonioides* and *Lasioglossum* were noted on the sites of alfalfa. Most species are of social.

In different years, the species composition and number of bees per hectare in zones and sometimes also in the fields of the same

farm proved to be variable. For example, in the investigated areas of the alfalfa of the Salyan region, on an average, 3,700 have been found on average, in the Shamakhi region of 4350, in the Ismayilli region due to the drought in 2014, 1000, in the Agstafa region 5200 specimen/ha. In all cases, the species composition and abundance were higher in the fields that are located near non-plowed, virgin land and forest belts. This is due to the fact that in such places there are large, long-term colonies of public bees. There are many parasitic species of bees, the presence of which once again proves the existence of large colonies.

The dynamics of the daily activity of the alfalfa pollinators was determined by the results of the studies. It is known that most bees visit flowers during the hours of active selection of nectar. Wild bees, unlike melliferous, collect pollen mainly for feeding larvae. There were 2 peaks of maximum in summer dynamics: between 1100-1300 and 1500-1800 hours. The first activity is due to the abundance of nectar, and the second is the abundance of pollen. In the hottest hours of the day - 1300-1500 there is depression.

During studies in high activity hours, the number of bees and the percentage of pollination was recorded. If we take into account that on each m² an average of 15-20 plants grow, in each bush 10-12 inflorescences and in each inflorescence of 5 flowers, then counting the number of ovaries can determine the percent of pollination. The results are shown in Table 1.

As can be seen from the table, the percentage of pollination in all areas of research is very low. This proves that there are not enough pollinators for effective pollination of alfalfa in the fields. The reasons of them are many - this is the deterioration of the ecological situation, and anthropogenic impact. First of all, this is due to the fact that the applied agro technical measures do not correspond to pollination by natural pollinators: the cultivation of monocultures led to the depletion of fauna, as a result of cultivation of virgin lands, the habitat of bees is destroyed, excessive, uncontrolled, scientifically unjustified application of pesticides has led to a reduction in the number of pollinators.

Table 1

The number of pollinators and the percentage of pollination in the hours of activity

Regions	2014		2015		2016	
	specimen/m ²	number of ovaries /m ²	specimen/m ²	number of ovaries /m ²	specimen/m ²	number of ovaries /m ²
Agstafa	20-22	350 (4,7%)				
Ismailli	10-12	200 (2,7%)				
Shamakhi	40-42	500 (6,7%)				
Salyan	32-38	400(5,3%)	45-47	550 (5,7%)		
Mingechevir					35-40	430(5,7%)

Despite the variability and difference in environmental factors, 30-35 species are constantly found on alfalfa. The following effective species were identified as a result of the research: *Megachile rotundata*, *Andrena flavipes*, *A. dorsata*, *A. ovatula*, *Melitta leporina*, *Melitturga clavicornis*, *Megachile centuncularis*, *Osmia coerulescens*, *Bombus agrorum*, *B. hortorum*, *Nomia deversipes*, *Rhophitoides canus*, *Halictus albohispidus*, *L. laterale*, *L. leucozonium*, *Evylaeus elegans*. Of these, the most promising are *Megachile rotundata*, *Andrena flavipes*, *A. dorsata*, *Melitta leporina*, *Melitturga clavicornis*, *Megachile centuncularis*, *Osmia coerulescens*, *Bombus agrorum*, *Eucera clypearis*, *Bombus agrorum*, which in all the investigated sites accounted for about 60% of all bees. These species actively disclose alfalfa flowers and if the density of promising species is in the right amount, then they can provide high seed production of alfalfa. According to the literature data, the speed of opening flowers of promising species is as follows: *Rhophitoides canus* opens and pollinates 7-9, *Andrena flavipes* 6-7, *Melitta reporina* 9-16, *Melitturga clavicornis* 15-17, *Megachile centuncularis* 11-13, *Bombus agrorum* 10-12 flowers in minute. Studies of Polish scientists revealed that to obtain 100 kg of seeds from 1 hectare in a field, 320-400 females of *Melitta reporina*, or 320-345 bumblebees, 1100-1200 megahilides, 1100-2000 *Rhophitoides canus* are required in the field [6].

The results of the research showed that over the past 50 years, the number of bees on all agricultural lands, including the alfalfa fields of Azerbaijan, has greatly decreased. For rational use, in-

creasing the number of bees, complex research and practical measures are required. This is a protection of pollinators and providing them with a favorable food base. The following recommendations are proposed for the protection and involvement of wild pollinators on alfalfa fields:

- Cultivation of alfalfa near virgin, unused soils;
- Use of a wide-spread seeding method to protect soil bees and not plow rows;
- Placing artificial nests to attract bee nesting in various substrates;
- No conduction of chemical treatment during the flowering of alfalfa, in extreme cases no use of pesticides at least during the hours of active flight of bees - between 1100-1300 and 1500-1800;
- If large colonies of bees are found around the fields, guard and especially protect these areas;
- Optimize seeding time for the coincidence of summer effective pollinators and alfalfa blooms;
- For additional fertilizing of pollinators after harvesting, sow around the fields the plants that begin vegetation after alfalfa (sainfoin, phacelia, etc.);
- Collecting alfalfa before flowering, so that the bees from these fields have switched to the areas of seed alfalfa;

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AZƏRBAYCANDA YONCA TOZLANDIRICILARININ FAUNASI VƏ TƏSƏRRÜFAT ƏHƏMİYYƏTİ

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Məqalədə Azərbaycanda qiymətli yem bitkisi olan yoncanın toxumluq məhsuldarlığının artırılması üçün onun təbii tozlandırıcılarının növ tərkibi və səmərəli növlərin öyrənilməsi haqda məlumatlar verilir. Respublikanın müxtəlif rayonlarında aparılan tədqiqatlar nəticəsində yonca sahələrində 124 növ arıkimilər aşkar edilmişdir. Səmərəli növlər müəyyən edilərək onların bəzi bioekoloji xüsusiyyətləri (sutkalıq aktivliyi, say dinamikası, müxtəlif iqlim şəraitində tozlanma faizi və s.) öyrənilmiş, təbii tozlandırıcıların mühafizəsi, sayının çoxaldılması və yonca sahələrinə cəlb edilməsi, aqrotexniki tədbirlərin həyata keçirilməsi üzrə tövsiyələr hazırlanmışdır.

Açar sözlər: yonca, arıkimilər, say dinamikası, tozlanma faizi, sutkalıq aktivlik

ФАУНА И ХОЗЯЙСТВЕННОЕ ЗНАЧЕНИЕ ПЧЕЛИНЫХ ОПЫЛИТЕЛЕЙ ЛЮЦЕРНЫ В АЗЕРБАЙДЖАНЕ

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В статье даются сведения по изучению видового состава и эффективных опылителей ценного кормового растения - люцерны для повышения его семенной продуктивности в Азербайджане. В результате исследований на посевах люцерны в различных районах Республики было обнаружено 124 вида пчелиных. Были выявлены перспективные виды, изучены некоторые экологические особенности (суточная активность, динамика численности, процент опыления в различных климатических условиях и т.д.), составлены рекомендации по охране естественных опылителей, повышению их численности, привлечению в люцерновые поля, проведению агротехнических мероприятий.

Ключевые слова: люцерна, пчелиные, численность, процент опыления, суточная активность