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Distributions and Damages of Poppy Pests in Different Phenological Periods in Uşak Province of Turkey

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Abstract: *The aim of this study was to determine the harmful insect fauna in the cultivation areas of poppy, Papaver somniferum L. (Papaveraceae) in Uşak Province in 2014 and 2015. For this purpose, surveys were carried out in poppy cultivation areas in Banaz, Karahallı, Merkez, Sivas Ulubey and Eşme districts of Uşak Province. Surveys were made in 5 different phenological periods of the plant, during the first development (rosette), stalk up, bud + flowering, drawing (green formation) and ripening periods. Samples were collected by controlling the whole plant, soil germination and roots control. Every 1000 decares of survey is taken as a sampling site.*

As a result of the studies, 21 pests related to Thysanoptera, Hemiptera, Coleoptera, Orthoptera, Hymenoptera and Passeriformes were detected. Among these species, it is thought that Ethelcus denticulatus Schrank (Coleoptera: Curculionidae), Aphis fabae Scop., Acyrthosiphon ilka Mordyilko (Homoptera: Aphididae), Thrips tabaci Lindeman (Thysanoptera: Thripidae) and Pachycephus smyrnensis Stein (Hymenoptera: Cephidae) may be important pests of poppy.

Keywords: *Density, damage situation, poppy, poppy pests, Uşak*

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I. Introductıon

Poppy, *Papaver somniferum* L. (Papaveraceae) is a very important plant used as a food for its seeds and oil, and also used for medicinal purposes from the alkaloids contained in capsules. Although the oil content of the seeds varies, it contains 42-58% fat. The oil obtained from the seeds is high quality cooking oil (Erdurmuş and Öneş, 1990). The oil contains 11.0% palmitic, 0.4% palmitoleic, 1.9% stearic, 15.0% oleic, 71.3% linoleic and 0.6% linolenic fatty acids (Atakişi, 1999). One of the main reasons of poppy cultivation is to obtain alkaloids. Up to 20 alkaloids of poppy capsules are used in the preparation of many drugs in medicine (İncekara, 1972). Poppy cultivation in Turkey until 1933, while opium production and trade freely, with published law was brought under control in 1933 and continued until 1971. Poppy cultivation is banned in Turkey in 1971, opium production is obtained by plotting the capsule in 1974 banning the production unscored poppy capsule is released (Anonymous, 2013). After the banning of the culture prohibition, the poppy plantation area, Afyon, Burdur, Denizli, Isparta, Kütahya, Tokat and Uşak Provinces are allowed to be cultivated in some districts of Konya. Although poppy cultivation area in terms of Turkey with a share of 48%, has 18% share in terms of morphine production. This is due to the fact that the production efficiency and the morphine content of the poppy capsules produced in our country are lower than in other countries (Anonymous, 2013). It is known that poppies have been attacked by some pests in the field during different development periods.

In this study, it was aimed to determine the types, damage and distribution areas of insect pests in different phenological periods in poppy cultivation areas in Uşak Province. The results of the research will help to create the Poppy Integrated Struggle programs prospectively in Turkey. Thus, the use of unconscious drug will be prevented in the future and the environment and human health will be preserved and it is thought that it will contribute to the national economy.

II. Material and Method

The study was conducted in Banaz, Karahallı, Uşak, Sivaslı and Ulubey in 2014 and 2015 in order to determine the pests in poppy cultivation areas in Uşak. The surveys were carried out in the poppy fields to determine in each district, during the initial development (rosette), stalking, bud-flowering, drawing (green growth) and ripening periods. The average of each thousand decares of poppy area in the province of Uşak was taken as a sampling area of a decare. (Bora and Karaca, 1970). Accordingly, the poppy fields and surveyed areas in our city and the number of fields corresponding to these areas (number of farms sampled) are given in Table 1.

Table 1. Poppy fields of Uşak and surveyed areas and number of fields

District	Area (decare)	Average area of survey (decare)	Number of fields
Uşak	1.576	1.5	2
Banaz	703	0.7	1
Eşme	1.285	1.3	1
Karahallı	261	0.3	1
Sivaslı	1827	2.0	2
Ulubey	475	0.5	1

Five plants were selected side by side at 5 different points (middle and corners) of the field to represent the sampling area. The whole of the selected plant (leaf, flower, and capsule) was visually checked and the adults were collected by hand or by a mouth aspirator and taken to the tubes. The collected samples were brought to the laboratory. Insects in different developmental periods (eggs, larvae, nymphs, and pupae) are brought to the laboratory to obtain the adult in 20 x 30 x 25 cm size plastic jars in the temperature of 26 ° C, 60% proportional humidity, 16: 8 hours illumination: culture in dark conditions. For the determination of soil pests, root and root strains of plants have been investigated.

In addition, the root and root straits of succulent, cut and yellowed plants that can be seen within sampling sites were also investigated (Zümreoğlu and Akbulut, 1984). For observing insects, a total of 15 leaves of a plant from the top, middle and bottom of each plant were brought to the laboratory separately by taking the plastic bags containing the drying paper. The leaves brought to the laboratory were examined under binocular and counted (Zümreoğlu and Akbulut, 1984). In flowering and capsule period of poppy, counts were made in 5 flowers or capsules of the plant (Zümreoğlu ve Akbulut, 1984).

The living samples collected as a result of the surveys were brought to the laboratory and the samples were killed in 70% alcohol and using ethyl acetate or killing bottle.

III. Results and Discussions

a- Initial Development Period (Badge) Pests

It is the period when winter poppy plants are entering winter and leaving the winter, and it is the period when summer plants are in rosettes. In this period, only subsoil pests were identified in the poppy plant. Observed pests in this period are given in Table 1.

Table 1. Observed pests in first development period (rosette) in Uşak Province

Order	Family	Species	Location
Lepidoptera	Noctuidae	*Agrotis* sp.	Banaz, Uşak
Orthoptera	Gryllotalpidae	*Gryllotalpa gryllotalpa*	Sivaslı

One of the pests observed in the seedling period of the poppy plant is *Agrotis* sp. (Lepidoptera: Noctuidae). It is the most important underground pest in Uşak Province. In the surveys, it was found that this pest was located in Banaz and Uşak districts. It was determined that this pest was a problem in summer planting rather than winter planting. Armyworm larvae are harmed by eating fresh leaves and shoots of plants in their first and second periods. In later periods, it only feeds at night and causes the plant to dry out. However, this damage is significantly reduced with the development of the pile root system (Anonymous, 2008).

European mole cricket, *Gryllotalpa gryllotalpa* L. was discovered in a field in the Banaz district. Adults and nymphs damage all kinds of plant roots and tubers they encounter when opening a gallery in the soil. In particular, the newly planted or new germinated vegetable seedlings cut off the roots and cause them to dry. They damage the tubers of the tuberous vegetables under the ground by gnawing. Major damage to plants occurs when European mole cricket density is high (Anonymous, 2008). In the field of poppy, this pest, more than a year ago, vegetables were cultivated and it was reported to be found in poppy fields near the village (Giray, 1985).

b- Pests in During Stalk Period

Stalk period is the period when the weather is warmed and the plants immediately following the rosette period. Observed pests in this period are given in Table 2.

Table 2. Observed pests in stalk period in Uşak Province

Order	Family	Species	Location
Coleoptera	Curculionidae	*Ethelcus denticulatus*	Banaz, Ulubey, Sivaslı, Uşak
Homoptera	Aphididae	*Aphis fabae*	Banaz, Ulubey, Sivaslı, Uşak
		Acyrthosiphon ilka	Sivaslı, Uşak
	Tettigometridae	*Tettigometra hexaspina*	Uşak, Sivaslı
Orthoptera	Tettigoniidae	*Isophya* sp.	Banaz, Ulubey, Sivaslı, Uşak, Eşme, Karahallı
	Acrididae	*Dociostaurus maroccanus*	Banaz, Ulubey, Sivaslı, Uşak, Eşme, Karahallı
	Catantopidae	*Thisoicetrinus pterostichus*	Banaz, Ulubey, Sivaslı, Uşak, Eşme, Karahallı

The most important pest of this period is Poppy rootworm, *Ethelcus denticulatus* Schrank (Coleoptera: Curculionidae). It has been reported that it can be damaged until branching, budding, flowering and even mature capsule period which started to be seen during seedling period (Zümreoğlu and Akbulut, 1984). Adults were fed through holes in the lower part of the leaves. Damage occurs when the plant is 8 cm long and 10-12 leaves. As a result of rapid development of the plant, it is not affected by the adult damage. It is determined that plants are more susceptible due to the fact that the plants are still developing in summer planting (Anonymous, 2008). Main harmful was caused by larvae. It causes damage by opening superficial galleries on the roots 5-10 cm below the soil surface. Damaged poppy plants bloom, capsules bind, or even capsules ripen; but these plants break with a slight wind effect; the root becomes black, the leaves turn yellow, in very intensive contamination the plant weakens and dies. In a plant root 10-25 larvae can be found in 1 m^2 area and 4-30 adult. In sandy and light soils, the number of adult and larvae of pests is higher than that of heavy soils (Anonymous, 2008). It was determined that the aphids were an important pest of poppies starting from the seedling period until the mature capsule period (Zümreoğlu and Akbulut, 1984; Giray, 1984).

In surveys, *Aphis fabae* Scop. and *Acyrthosiphon ilka* Mordyilko (Homoptera: Aphididae) species were found to be widespread in Uşak Province in 2014 and 2015. *Aphis fabae* was observed in Uşak, Sivaslı, Ulubey and Banaz districts, whereas *A. ilka* was found only in the Uşak and Sivaslı districts. It has been reported that leaf aphids are damaged by feeding and secreting fumagine on leaves and capsules of poppy plant (Anonymous, 2008).

Another pest in poppy fields is *Tettigometra hexaspina* Klt. (Homoptera: Tettigometridae). It has been reported that this harmful plant, which begins to be seen later in the seedling period of the poppy plant, may be found until the period of flowering and even flowering. In the study, poppy cultivation areas were found only in Uşak and Sivaslı districts. However, Zümreoğlu and Akbulut (1984), poppy plants in the roots of the abundance of eggs and this plant is an important pest of the opinion that the plant. In addition, Müller (1956) described the fact that *T. hexaspina* in Yugoslavia made significant damages by absorbing plant sap in the body of this culture plant.

Another insect group of poppy cultivation in Uşak was found to be of Tettigoniidae, Acrididae and Catantopidae family. In the poppy areas of Uşak Province, *Isophya* sp., *Dociostaurus maroccanus* (Thunberg) (Orthoptera: Acrididae) and *Thisoicetrinus pterostichus* (Fischer de Waldheim) (Orthoptera: Catantopidae) have been found to be commonly in each district. It is also reported that all of the populations grown in poppy crops cause damage by eating the plants, cutting the stems and causing losses up to 100% in the years and places where the damage is very high, especially in young plants. (Anonymous, 2008).

c- Bud + Flowering Period

Table 3. Observed pests in bud + flowering period in Uşak Province

Order	Family	Species	Location
Thysanoptera	Thripidae	*Thrips tabaci*	Banaz, Ulubey, Sivaslı, Uşak
	Aelothripidae	*Aelothripis collaris*	Banaz, Ulubey, Sivaslı, Uşak, Eşme
Coleoptera	Chrysomelidae	*Entomoscelis adonidis*	Sivaslı, Uşak
		Pygopleurus foina	Sivaslı, Uşak
	Scarabaeidae	*Oxthyrea cinctella*	Banaz, Ulubey, Sivaslı, Uşak
	Scarabaeidae	*Tropinata hirta*	Banaz, Ulubey, Sivaslı, Uşak, Eşme
		Omophlus sp.	Sivaslı, Uşak
	Melodiae	*Alosimus* sp.	Uşak
Hymenoptera	Cephidae	*Pachycephus smyrnensis*	Uşak

The thrips, which are found intensively in all of the poppy cultivation areas of Uşak Province, are fed by absorbing the juice by damaging the plant cells with their mouth parts. It is reported that thrips plants cause deformations in leaves, flowers, shoots and fruits, and produce damage by producing silvery or black spots on the leaves. In addition to the damage caused directly by feeding the thrips, many vectors have been reported to be harmful to the plants indirectly (Allen and Broadbent, 1986; Anonymous, 2008). The thrips appear after flowering on the poppy plants, which can also be the host (Zümreoğlu and Akbulut, 1984).

Entomoscelis adonidis Pall. (Coleoptera: Chrysomelidae) was reported on poppy flowers in Banaz and Uşak districts in 1981 and 1982 (Zümreoğlu and Akbulut, 1984). However, Giray (1985) reported that the damage was not significant.

Pygopleurus foina (Reit.) (Coleoptera: Chrysomelidae) was reported to be very dense in Banaz, Karahallı and Uşak. Zümreoğlu et al. (1984) reported that this pest was observed especially in purple flowering poppies. Furthermore, it was stated that the pest is also collected from the poppy fields in the Sandıklı district of Afyon outside our region (Lodos et al., 1978). In the poppy flowers, *Oxthyrea cinctella* (Schaum) and *Tropinata hirta* Poda (Coleoptera: Chrysomelidae) were seen in all of the survey areas. It has been reported that these species do damage to the plant and are widespread in Uşak (Zümreoğlu et al., 1985). *Omophlus* sp., (Coleoptera: Chrysomelidae) which was detected in the poppy field in Sivaslı and Uşak districts. It is seen on feeding on poppy flowers (Zümreoğlu and Akbulut, 1984) and it is among the harmful insects of the poppy has been stated (Balachöwsky, 1962; Srivastana et al., 1965). *Alosimus* sp. (Coleoptera: Meloidae) was found only in surveys conducted in Uşak. It has been reported that these species feed in greenhouse and ornamental plants with flowers of various plants such as clover and vegetables (De Long and Borror, 1963, Cengiz, 1974). *Pachycephus smyrnensis* Stein (Hymenoptera: Cephidae) is another pest, which is identified only in Uşak but not seen in other districts, which has been shown to have significant harmful potential for poppy. *Pachycephus smyrnensis* had been found in Turkey for the first time in the world (Stein, 1876), and recorded as the popping harmful (Scheibelreiter, 1978). This pest began to fly from the beginning of June, have reported by Zümreoğlu et al. (1984). They stated that the hatched larvae were fed by opening galleries in the trunk, branches and root tissues, as the development of the larvae progressed, the development of poppy plants paused and remained weak. It also reported that the capsules of the heavily damaged plants remained small and thus the quantity and quality of the product considered as capsules and seeds decreased (Zümreoğlu and Akbulut, 1984).

d- Ripening Period

When 75% of the plants reached the drawing period (green growth), the samples were taken and dried. The results obtained in this period are given in table 4.

Çizelge 4. Observed pest in ripening period in Uşak Province

Order	**Femily**	**Species**	**Location**
Passeriformes	Passeridae	*Passer domesticus*	Banaz, Ulubey, Sivaslı, Uşak
	Corvidae	*Corvus monedula*	Banaz, Ulubey, Sivaslı, Uşak
		Streptopelia turtur	Banaz, Ulubey, Sivaslı, Uşak

City sparrows, *Passer domesticus* L. (Passeridae) were found in some fields near the in Uşak Province or near the village, in fields with wooded areas near the fields. Giray (1985) reported that sparrows eat seeds in ripe capsules, while crows eat seeds by dipping plants on the edges of the fields and perforating maturing capsules. Alavi (1974) reported that some of the crows in Iran are poppy pests.

IV. Result

As a result, according to the comprehensive surveys conducted in Uşak Province, it has been determined that there is no comprehensive chemical struggle against poppy pests. However, there has been a recent trend of unconscious struggle. For this reason, it is necessary to continue to work with pests, which tend to increase in potential of poppy pests. It was determined that poppy rootstocks *(E. denticulatus*) were important pests with aphids (*A. face* and *A. ilka*) which were observed to have increased population density. In future research with poppy plants, in our country never studied and other common pests are required to be examined on other root pests. In addition, it was concluded that investigations should be carried out on poppy rootstocks *E. denticulatus*.

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