



Research Paper

Distributions of Natural Enemies of Different Phenological Periods at *Papaver somniferum* L. in Uşak Province of Turkey

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ABSTRACT:

The aim of this study was to determine the natural enemy's 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 of Uşak province Banaz, Karahalli, Merkez, Sivas Ulubey and Eşme districts. 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. Every 1000 decares of surveillance is taken as a sampling site.

As a result of the controls, 4 naturel enemies of pests related to Hemiptera, Coleoptera, Diptera and Neuroptera were detected. however, many natural enemies have been identified in the families Coccinellidae, Chrysoperla, Anthocoridae, Lygaeidae, Syrphidae, Nabidae, Reduviidae, Carabidae and Staphylinidae.

KEYWORDS: Poppy field, Natural enemies, Uşak, Density,

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I. INTRODUCTION

Poppy, *Papaver somniferum* L. (Papaveraceae) is a very important plant used as a food for its seeds and oil, and is 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 (Incekara, 1972). 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 (Incekara, 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 October prohibition, the poppy plantation area, Afyon, Burdur, Denizli, Isparta, Kutahya, 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 a 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, natural enemies 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, in the future, 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, Karahalli, Uşak, Sivasli and Ulubey in 2014 and 2015 in order to determine natural enemies of pests in poppy cultivation areas in Usak. The surveys were carried out in the poppy fields determined in each district, during the initial development (rosette), stalking, bud-flowering,

drawing (green growth) and ripening periods. The average of each thousand decade of poppy area in the province of Uşak was taken as a sampling area of a decade. (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, Naturel enemies of Poppy fields of Uşak and surveyed areas and number of fields taken

District	Area (decare)	Average area of survey (decare)	Number of fields
Merkez	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, 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, pupae) are brought to the laboratory to obtain the adult 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 It was obtained. For the determination of soil pests, root and root strains of plants have been investigated.

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

III. RESULTS AND DISCUSSION

Initial Development Period (Badge)

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 2 naturel enemies were identified in the poppy plant. Naturel enemies seen in this period are given in Table 1.

Table 1. Naturel enemies of pest seen in first development period (rosette) in Uşak province

Order	Genus	Species	Location
Coleoptera	<u>Coccinellidae</u>	<i>Coccinella septempunctata</i>	Banaz, Uşak
<u>Neuroptera</u>	<u>Chrysoperla</u>	<i>Chrysoperla carnea</i>	Sivasi, Uşak

During the controls carried out in this period, it was determined that the number of natural enemies found was quite limited, as the air temperature did not overheat. During this period, very few natural enemies were found, namely *Coccinella septempunctata* (Coleoptera; Coccinellidae) and *Chrysoperla carnea*. (Neuroptera; Chrysoperla). As "Bride beetle" or "Ladybug" among the public the known Coccinellidae family, due to its coverage of beneficial insect species. It is one of the most striking families in the Coleoptera. Coccinellidae species belonging to the family, aphids, crustaceans, floury and mummies, red spiders and some of the orders of Thysanoptera, Lepidoptera and Coleoptera in biological warfare programs as they feed on the larvae of the species and therefore it has an important place in integrated combat programs. It is known to be common in regions. Hodek (1973) and Frazer (1988) reported that more than 5000 coccinellid species diagnosed. In Turkey It is estimated that there are more than 120 coccinellid species (Appropriate, 1981). This ladybird feeds on aphids. Experiments have shown that larvae can consume about 100 to 1000 aphids per day and the adult from 100 to 200 larvae.

Although Chrysopidae family species are generally predators of aphids, they feed on many insect groups such as mites, thrips, pre-mature stages of whiteflies and leafhoppers and are common in many parts of the world (Stark and Whitford, 1987). The fact that it is quite common in natural ecosystems, the ease of mass production, high consumption power and exploration capabilities, and its early appearance in the region after the use of chemical drugs increase the interest in this group in all war and biological control studies (Jeppson et al., 1975). As in the world, species belonging to this group are quite common in our country and draw the attention of many researchers due to their biological characteristics (Şengonca, 1980. As in other regions, it is reported that *Chrysoperla* species are widely found in agricultural and non-agricultural areas in Turkey and are an important predator of aphids.

Natural Enemies of Pests in During Stalk Period

Stalk period is the period when the weather is warmed and the plants immediately following the rosette period. Naturel enemies of pests seen in this period are given in Table 2. In this period, in addition to *C. septempunctata* and *C. carnea* seen in the Initial Development Period, two other Hemipter natural enemies were identified. The first of these is the Orius species. Orius has been shown to be an effective control for thrips. Also, Orius are generalist predators that consume a variety of pests including mites, aphids, and small caterpillars (Brodsgaard, 1994). They are most effective for pests with life stages that inhabit flowers (such as flower thrips). Females lay 2 eggs per day, with an average of 30 eggs in their life time. Eggs are laid in plant tissue (main stem, leaf vein, flowers or petioles) with the top of the egg sticking out of the leaf. Eggs hatch in 4-5 days. Optimum conditions are temperatures over 15°C with relative humidity over 60%. Both adults and younger stages can be found on leaves and along stems, but they are more difficult to find (Shipp, 1995).

Table 2. Naturel enemies of pest seen in stalk period in Uşak province

Order	Genus	Species	Location
Coleoptera	Coccinellidae	<i>Coccinella septempunctata</i>	Banaz, Ulubey, Sivash, Uşak
Neuroptera	Chrysoperla	<i>Chrysoperla carnea</i>	Banaz, Ulubey, Sivash, Uşak
Hemiptera	Anthocoridae	<i>Orius</i> spp.	Banaz, Ulubey, Sivash, Uşak, Karahallı
Hemiptera	Lygaeidae	<i>Geocoris</i> spp.	Uşak,
Diptera	Syrphidae	<i>Episyrphus</i> spp.	Banaz,

Another natural enemy seen during the stalling period are *Geocoris* spp. Their adults and nymphs have oval bodies and broad heads. Their most distinguishing characteristic is their large, bulging eyes. They have relatively short antennae that are slightly enlarged at the tip. They are white to tan with a distinctive red spot. Both the adults and immatures feed by sucking juices from their prey through a needle-like beak (Tillman and Mullinix, 2003). The beak is folded under the insect's body when it is not feeding. *Geocoris* spp feed on a wide variety of prey smaller than themselves. They feed on eggs and small larvae of most lepidopteran pests on the eggs and nymphs of plant bugs and on all life stages of whiteflies, mites and aphids (Tamaki and Weeks, 1972).

Another natural enemy seen during the stalling period are *Episyrphus* spp. *Episyrphus* spp., sometimes called the marmalade hoverfly, is a relatively small hoverfly (9–12 mm) of the Syrphidae family, widespread throughout the Palaearctic region. The upper side of the abdomen is patterned with orange and black bands. Two further identification characters are the presence of secondary black bands on the third and fourth dorsal plates and faint greyish longitudinal stripes on the thorax. Its color patterns may appear wasp-like to other animals, such as birds, protecting it from predation (Peck, 1988). *Episyrphus* spp can be found throughout the year in various habitats, including urban gardens, visiting flowers for pollen and nectar. They often form dense migratory swarms, which may cause panic among people for their resemblance to wasps. It is among the very few species of flies capable of crushing pollen grains and feeding on them. The larva is terrestrial and feeds on aphids (Sadeghi, 2003).

Bud + Flowering Period

The natural enemies seen during the Bud + Flowering Period are given in Table 3.

Table 3. Natural enemies of pest seen in Bud + Flowering Period period in Uşak province

Order	Genus	Species	Location
Coleoptera	Coccinellidae	<i>Coccinella septempunctata</i>	Banaz, Ulubey, Sivash, Uşak
Neuroptera	Chrysoperla	<i>Chrysoperla carnea</i>	Banaz, Ulubey, Sivash, Uşak
Hemiptera	Anthocoridae	<i>Orius</i> spp.	Banaz, Ulubey, Sivash, Uşak, Karahallı
Hemiptera	Lygaeidae	<i>Geocoris</i> spp.	Uşak,
Diptera	Syrphidae	<i>Episyrphus</i> spp.	Banaz,
Hemiptera	Nabidae	<i>Nabidae</i> spp.	Banaz, Ulubey, Sivash,
Hemiptera	Reduviidae	<i>Ectrychotes</i> ssp	Sivash

It has been determined that most of the natural enemies seen in this period consist of natural enemies seen in the other two periods. The most important of the natural enemies seen in this period is *Nabidae spp.* They range in all regions of the world, but they are very abundant in the tropics. Probably all are predators as nymphs and adults on various stages and groups of phytophagous insects, e.g., aphids, lepidopterous eggs and young larvae, leafhoppers (Henry, 2009). They may be commonly found on low herbaceous vegetation, shrubs and grasses. They may be beneficial in naturally occurring control. Species in the genus *Nabis* are very common and abundant in fields of legumes such as alfalfa, but they can occur in many other crops and in non-cultivated areas. They are yellowish in color and have large, bulbous eyes and stilt like legs. They are generalist predators, catching almost any insect smaller than themselves, including members of their own species. They are soft-bodied, elongated, winged terrestrial predators. Many species grasp onto their prey with their forelegs, quite like the preying mantids, and the proboscis is inserted through a cut (Wagner, 1971).

Another natural enemy seen in the controls during this period is *Ectrychotes ssp.* Adult insects range from about 4.0 to 40 mm, depending on the species. They most commonly have an elongated head with a distinct narrowed 'neck', long legs, and prominent, segmented, tubular mouthparts. Most species are bright in colour with hues of brown, black, red, or orange. Predatory *Ectrychotes ssp* use the long rostrum to inject a lethal saliva that liquefies the insides of the prey, which are then sucked out. The saliva contains enzymes that digest the tissues they swallow. This process is generally referred to as extraoral digestion. The saliva is commonly effective at killing prey substantially larger than the bug itself. The legs of some *Ectrychotes ssp* have areas covered in tiny hairs that aid in holding onto their prey while they feed (Ambrose, 2006)

Ripening Period 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. It has been observed that the number of natural enemies in the poppy field has increased due to the increase in air temperature and the advancement of vegetation. This increase has been observed in both the number of species and the number of individuals. In addition, two types of natural enemies that were not seen in previous periods were identified in this period. The first of these natural enemies, which cannot be identified on the basis of breed, is *Carabidae*. The *Carabidae* family, *Coleoptera*, which has approximately 35 000 species in the world It is one of the important families of the team. Body sizes, shapes and colors species in this diverse group, with phytophagous, zoophago and omnivorous feeding regimens. It attracts attention and a significant part of the species they spend on the soil or in it (Casale and Taglianti 1984).

Çizelge 4. Naturel enemies of Pest seen in Ripening Period period in Uşak province

Order	Genus	Species	Location
Coleoptera	<u>Coccinellidae</u>	<i>Coccinella septempunctata</i>	Banaz, Ulubey, Sivaslı, Uşak
Neuroptera	<u>Chrysoperla</u>	<i>Chrysoperla carnea</i>	Banaz, Ulubey, Sivaslı, Uşak
Hemiptera	Anthocoridae	<i>Orius spp.</i>	Banaz, Ulubey, Sivaslı, Uşak, Karahallı
Hemiptera	Lygaeidae	<i>Geocoris spp.</i>	Uşak,
Diptera	Syrphidae	<i>Episyrphus spp.</i>	Banaz, Ulubey, Sivaslı, Uşak, Karahallı
Hemiptera	Nabidae	<i>Nabidae spp.</i>	Banaz, Ulubey, Sivaslı, Karahallı, Sivaslı,
Hemiptera	Reduvidae	<i>Ectrychotes ssp</i>	Ulubey, Sivaslı, Uşak, Karahallı
Coleoptera	Carabidae	-	Ulubey, Eşme Sivaslı, Uşak, Karahallı
Coleoptera	Staphylinidae	-	Banaz, Ulubey,

Another family is *Staphylinidae*. *Staphylinidae* are one of the largest families of beetles, with more than 1,512 genera and over 30,035 species known as of 2000. They occur throughout the world. Important morphological characters of these "rove beetles" include filiform to clavate antennae, sometimes geniculate; elytra short, truncate, exposing several abdominal terga; exposed abdominal segments freely moveable, often elevated when running. The head is prognathous, often as wide as the pronotum. Hind wings are usually well developed and the body is elongate, depressed, with subparallel sides. Most *Staphylinidae* are predators, but many species live in fungi, eat flower pollen, or frequent caves (Schülke and Smetana, 2015). Although most entomophagous forms are predaceous, several species are primary, solitary ectoparasitoids of dipterous pupae in puparia. The adults of parasitic species also feed as predators on dipterous larvae and pupae. At least 300

species of myrmecophiles are known. The staphylinids have not been extensively used for biological control (Assing, 2013).

IV. RESULT

As a result, according to the comprehensive surveys conducted in Uşak province, 4 naturel enemies of pests related to Hemiptera, Coleoptera, Diptera and Neuroptera were detected. Besides, many natural enemies have been identified in the families Coccinellidae, Chrysoperla, Anthocoridae, Lygaeidae, Syrphidae, Nabidae, Reduviidae, Carabidae and Staphylinidae.

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