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## Development of *Agrotis segetum* (Lepidoptera: Noctidae) in sugar beet agroecosystem of Azerbaijan

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### Abstract

The article provides information on *Agrotis segetum* bioecology, phenology and damage rate of autumn noctuidae, which is one of the most dangerous pests of sugar beet, as a result of studies conducted in sugar beet fields in Imishli region of Azerbaijan during 2015-2017 years. Studies have revealed that caterpillars of the first-generation are operating in areas from late May to early July. By the end of June, they penetrate the depths of 3-5 cm in the soil, and make special caves and bubble down there. In the summer, the development of pupae ends for 7-9 days, and the second generation of butterflies begin to fly. The second-generation of butterfly flies to areas by the end of September. Turnip moths' egg-laying appears in the second decade of July and continues until September. The roles of entomophages such as *Trichogramma evanescens* Westwood, 1836, *Habrobracon hebetor* Say, 1836 and *Apanteles kazak* Tel, 1988 are great in regulating the number of pests in sugar beet fields.

**Keywords:** Sugar beet, polyphage, turnip moth, beet agroecosystem, phenology

### Introduction

The only raw material source for sugar production in Azerbaijan is sugar beet. And it is one of today's most urgent issues. The production of sugar beet is one of the socially important industries that provide food security. Damage to sugar beet by pests leads to loss of plant and crop. Quality of sugar decreases, fewer products are consumed, which has a significant impact on the economic value of the product. Sugar beet is damaged by more than 100 insect species. Many of them are more dangerous. The pests that damage the beet are divided into two groups according to their lifestyle. The first group is a group of polyphagous insects that are considered to be dangerous pests of many agricultural plants including sugar beet, and carry a certain stage of their development period in the fields of sugar beet. This group of insects live in the land and they are ground polyphage pests. Wireworms which are larvae of Elateridae, are the most popular among them.

The other group of pests are damaging all surface and underground parts of the plant, starting with the seeds of the sugar beet. This group of phytophages includes the beet weevil, beet root weevil, grey beet weevil, beet bug, bean aphid and so on. These pests are also polyphage, but they damage the sugar beet differently at all stages of their development.

Taking into account that *Agrotis segetum* (Denis & Schiffmüller, 1775) (Lepidoptera: Noctuidae) in the beet fields is more common, some of its biological characteristics, distribution and development have been studied in agroecosystem.

### Materials and methods

The researches were carried out in sugar beet agroecosystem in the Imishli district of Azerbaijan during 2015-2017 (Pic.1). Special study areas have been selected for observations and experiments. Method of Polyakov<sup>[6]</sup> were used to determine the depths of wintering of the *Agrotis segetum* in the soil and in the summer, while Kojanchikov<sup>[4]</sup> and Fasulati<sup>[7]</sup> methods were used in the phenological and environmental observations. Thus, in the special study area with the measure of 0,5×0,5 m (0,25 m<sup>2</sup>) and different depth (to 50 cm) soil layers was taken carefully and have been observed. On the phenological observation sugar beet and their pests have been isolated with special cover. Then this experiments have been repeated several times. In the same time these experiments carried out in special containers which isolated from external intervention and noted daily.

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**Pic 1:** Sugar beet agrocnosis

### Results and Discussion

*Agrotis segetum* is a cosmopolitan species spread throughout Europe part of Russia, Western Siberia, Far East, Sakhalin islands, Ukraine, Central Asia, Western Europe, Africa, Mongolia, Japan, China, India, Madagascar islands, Near Eastern countries, Caucasus, and so on [1,5].

The pest is a polyphus, causing damage to grain crops, corn seeds, millet, corn, potatoes, cotton, tobacco, grapes, tea, new-grown trees, shrubs, ornamental plants and melons and vegetables. Although various information on bioecological and damaging characteristics of this pest in the cotton and tobacco fields has been given in Azerbaijan [1-3], its relationship to beet plant, its development in sugar beet agrocnosis and the pesting characteristics have not been studied before our researches.

Studies conducted in sugar beet farming areas of Imishli region in 2015-2017 have revealed that *Agrotis segetum* significantly damages the beet plant. Thus, after wintering at depths of 15-20 cm of soil the elderly larvae of this pest climbs to the upper layers of the soil when the soil temperature is more than 11-12 °C and nourishes the underground parts of the plants and goes to the pupa stage. Pupa phase may last up to 2-3 weeks, depending on the temperature (Pic 2.).

The appearance of butterflies from the pupa is mainly recorded in early May and is observed until the beginning of July. The mass flight of butterflies coincides with the second half of May.

Sometimes the summer's warm weather causes the butterflies to fly one by one in late April.

Butterflies mostly spend the night life. During the day they are hiding under the grass, the leaves of the soil, the leaves of plants, and they are activated at night. The butterflies are fed for several days after leaving the pupa and begin the process of mating and eggging.

Typically, female individuals place their eggs one by one and, in some cases, in smaller lumps, close to the bottom of the leaves or near the plant. The embryonic development within the egg can last for 5-17 days, depending on the temperature.

The caterpillars are firstly fed by the nearby plants, and then by passing through the surrounding beet plants, they damage both the leaf and the root system. As a result, the plant is either destroyed absolutely or weakens and its productivity falls down.

It should be noted that the first-generation cereals are operating by the end of May until the beginning of July. They penetrate the depths of 3-5 cm in the soil, by the end of June, and make special caves and bubble down there.



**Pic 2:** Pupa of *Agrotis segetum*

In the summer, the development of pupa ends in 7-9 days and the second generation of butterflies begin to fly. The second-generation butterfly flies in the areas by the end of September. Butterflies' eggging happens in the second decade of July and continues until the beginning of September (Table 1).

Caterpillars begin to be hatched from the second generation of eggs in early August. The hatched caterpillars are fed till the second half of October and go to winter for the last age. Their wintering continues up to the spring of the next year in various small planting areas with weeds and at the edges of the fields.

During the studies, it was established that turnip moth gave mainly two generations in the territory of Imishli. In fact, the beets are damaged by caterpillars leaving the wintering and the first-generation caterpillars. Thus, the development of those caterpillars is due to the early development of the beet plant, they reduce fertility by sowing the seeds, their root system and young leaves.

The second-generation caterpillars are more likely to be fed on the autumn sowing fields.

It should be noted that the role of many entomophags in the regulation of the number of turnip moth in beet fields was determined. *Trichogramma evanescens* Westwood, 1836 parasite from the eggs collected from the fields, and the entomophages such as *Habrobracon hebetor* (Say, 1836) and *Apanteles kazak* (Tel 1988) appeared from the caterpillars approved it.

**Table 1:** Phenology calendar of *Agrotis segetum* in the beet agrecenosis (Imishli, 2015-2017)

Months	March	April	May	June	July	August	September	October	November-February
decade	1 2 3	1 2 3	1 2 3	1 2 3	1 2 3	1 2 3	1 2 3	1 2 3	
I generation	(-) --	◆◆◆	+++ ●● -	+++ ●●● -- ◆	- ◆◆◆				
II generation					+++ ●●	+++ ●●● ---	+++ ● ---	- (-) (-)	(-) (-) (-) (-)

**Note:** (-) – wintering caterpillars

-- active caterpillars

◆ – pupa

+ – imago

● – eggs

### Conclusion

It is desirable to take into account phenology and bioecological features we obtained during the observations upon planning the integrated fighting measures against the *Agrotis segetum*.

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