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DEVELOPMENT CHARACTERISTICS OF APPLE FRUIT BORER (*Cydia pomonella* (Linnaeus, 1758)) IN GUBA DISTRICT OF AZERBAIJAN

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ОСОБЕННОСТИ РАЗВИТИЯ ЯБЛОННОЙ ПЛОДОЖОРКИ (*Cydia pomonella* (Linnaeus, 1758)) В УСЛОВИЯХ ГУБИНСКОГО РАЙОНА АЗЕРБАЙДЖАНА

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Abstract. The research works were carried out in the years 2021–2023 in farms located in the Guba district of Azerbaijan (41°04′27″ N 48°36′32″ E). During the research, as the apple fruit eater hibernates both in the caterpillar and pupal stages, their coming out of hibernation in the spring season of the next year coincides with different times. It is for this reason that this pest can be found in agrocenosis from spring to autumn. Because the development of generations is mixed together and creates a complex phenological calendar. Apple fruit borer produce 2 complete generations in the study areas. The third generation hibernates in different stages (caterpillar and pupa).

Аннотация. Научно-исследовательские работы проводились в фермерских хозяйствах Губинского района Азербайджана в 2021–2023 гг. В результате исследований установлено, что в связи с тем, что яблонная плодожорка в этом регионе, уходит на зимовку как в стадии гусениц старшего возраста, так и в стадии куколки, выход из зимовки у них также наблюдается в разные сроки. В связи с этим начиная с весны до конца сентября в агроценозах можно встретить гусениц вредителя. Выяснено, что в регионе исследований яблонная плодожорка развивается в двух полных поколениях, а третье поколение уходит на зимовку в стадии гусениц внутри кокона и в стадии куколки.

Keywords: Cydia pomonella, Azerbaijan, phenology.

Ключевые слова: яблонная плодожорка, Азербайджан, фенология.

The apple fruit borer (*Cydia pomonella*; Lepidoptera, Tortricidae) is a serious pest of 2, causing a large amount of damage to farms every year. The distribution area of this pest is very wide, covering Western and Eastern Europe, Central Asia, Eastern and Western Siberia, the Far East, North and South Africa, the Middle East, South and North America, Tasmania, New Zealand, the Caucasus, etc. [1-4]. It should be noted that this pest is found in all geographical zones where apples are grown. Depending on the climate, it can produce from one to four generations. Fruits damaged by the pest fall prematurely, before ripening. At the same time, the fruits damaged by the pest become a breeding ground for other microorganisms. Therefore, the study of bioecological characteristics and phenology of this pest in the area where it lives has great scientific and practical importance (https://goo.su/fnvENz).

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Material and Methods

The research works were carried out in the years 2021-2023 in farms located in the Guba district of Azerbaijan (41°04′27″ N 48°36′32″ E).

In order to determine the autumn and winter stages of the pest, attractive belts made of special material were attached to the trunks of the trees, using the individuals there to determine the wintering stages of the fruit borer, and at the same time, using those individuals, their grouping, flight (emerging from the pupa) and egg-laying periods of the butterflies were specified. At the same time, research was conducted around the selected trees, in the top layer of the soil, under the leaf balls and in the cracks of the tree bark. Phenological observations were carried out regularly throughout the year, according to seasons.

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Research related to the biological characteristics of the pest, development periods of individual stages, the number of generations and hibernation were investigated based on methods adopted in entomology both in the laboratory and in natural conditions [5, 6].

Analysis of the Obtained Results

The butterflies of the apple fruit borer are dark gray in color, and there are light stripes on the wings. The size of the wings in the open state can be up to 18-20 mm. On the apex of the forewings there is a circular brown shiny spot. The eggs look like small drops of wax. Newly laid eggs are dull whitish, then light pink. Shortly before the caterpillars hatch, their blackish heads can be seen at the top of the eggshells. The caterpillars are yellowish white in the first age, their heads are black or brown and very mobile. The pupae are yellowish-brown in color and are located in a white solid web cocoon.

Determining the number of generations of the pest and determining their development periods is of great importance for the implementation of the measures to be taken against it.

During the research conducted in the study area, it was determined that the apple fruit borer gives two generations a year, and the third generation goes to winter in the caterpillar and pupal stages (table). So, butterflies start flying from individuals that go to hibernate in the pupa stage in early spring — from the beginning of the second decade of April (10-12 days of the month). Butterflies are active mainly in the evening, when the air temperature is above 16-18°C.

Mating occurs between butterflies after 2-3 days of feeding. Females start laying eggs 2-3 days after fertilization. They lay their eggs mainly on the upper surface and axils of leaves. The first eggs are found in late April, early May. In these individuals, egg-laying continues until the third decade of May. Embryonic development ends in 9-10 days. The hatching of caterpillars continues from the end of the first decade of May to the beginning of the third decade. After feeding for 27-28 days, the caterpillars pupate from the first decade of June. Pupation lasts until the end of June. Butterflies of the first generation begin to emerge from the pupa on June 14-15. This process continues until the end of June. Butterflies lay eggs at the end of June (beginning of the second generation) and continue until mid-July. Embryonic development ends in 6-7 days. Caterpillars of the second generation can be found in early July. Caterpillars pupate after 20-22 days of feeding.

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Months	*March*			*April*			*May*			*June*			*July*			*August*			*September*			*October*		
Decades	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Hibernating	□	□	Δ	Δ	Δ	Δ	+	+	+															
Individuals	Δ	Δ	Δ	Δ	+	+	+																	
1st generation						●	●	●	●															
							–	–	–	–														
										Δ	Δ	Δ	Δ											
											+	+	+	+										
2nd generation												●	●	●	●	●								
													–	–	–	–	–	–						
															Δ	Δ	Δ	Δ						
																+	+	+	+					
3rd generation																	●	●	●					
																		–	–	–	□	□	□	
																				Δ	Δ	Δ	Δ	

□ — individuals overwintering in the caterpillar stage; Δ — individuals that overwinter in the pupal stage; + — butterfly; ● — egg -caterpillar

Mass pupation occurs in the first half of August. The emergence of butterflies of the second generation from the pupa is registered at the end of the first decade of August and continues until the end of the month. Butterflies lay eggs (beginning of the third generation) in the second decade of August. The process continues until the end of August. Embryonic development ends in 5-6 days. Caterpillars hatch in the third decade of August. After feeding, the caterpillars hibernate in the pupal stage until mid-September.

Individuals that hibernate in the caterpillar stage begin to pupate in early spring. Emergence of butterflies is recorded mainly in early May and continues until the end of May. Butterflies also start laying eggs up to a week later and finish later than butterflies that hibernate in the pupal stage. In general, the later stages of development of individuals that hibernate in the caterpillar stage naturally start several days (5-7) later and end later. Therefore, at the end of August and the beginning of September, the caterpillars that emerge from the eggs laid by them are unable to complete their development and go to hibernate in the adult caterpillar stage in the cocoons.

During the research, it was determined that the caterpillars feed on fruits or the main veins of young branches 30-40 minutes after hatching. They make a chamber for themselves inside by piercing the skin of the fruit. They close the hole they open with food scraps. Inside the fruits, the caterpillars change their shells four times during their development and go through five stages. In the adult stage, caterpillars feed mainly on seeds and seed chambers of fruits. After finishing feeding, the caterpillars weave a cocoon in secret places and pupate in it. Depending on the season, the development of the pupal stage of the pest lasts 1-2 weeks. When the average daily temperature is 25-27°C, embryonic development takes 5-6 days, and 9 when it is 18-20 — Expires in 11 days. Development of first-generation eggs usually lasts 9-11 days, second-generation eggs 5-6 days, and third-generation eggs 6-7 days. Butterflies lay their eggs mainly in the evenings between 19-21 hours. The egg-laying potential of one female individual varies from 50 to 120. As the apple fruit eater hibernates both in the caterpillar and pupal stages, their coming out of hibernation in the spring season of the next year coincides with different times. It is for this reason that this pest can be found in agrocenosis from spring to autumn. Because the development of generations is mixed together and creates a complex phenological calendar.

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