

## ANNUAL CYCLE OF DEVELOPMENT AND QUANTITY OF THE GENERATIONS OF THE RED FRUIT MITE FOR THE YEAR (*Panonychus ulmi* Koch.)

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**Abstract.** Studies to study the annual cycle of development and the number of generations of the red fruit mite was continued until the middle of September, since after this period no development was observed in the laid eggs. On the basis of the conducted studies, it was found that the duration of development of the red fruit mite generation varies with temperature and relative humidity, with a combination of high temperature and high humidity accelerating development, while high humidity and low temperature do not accelerate development. At high temperature and low humidity, the mites die. In northeastern Azerbaijan, the red fruit mite on vegetable crops and wild grasses multiplies in seven generations during the growing season.

**Keywords:** mite, phases of development, annual cycle, generation, season.

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### 1. Introduction

The study of the number and duration of pest generation is one of the main provisions enabling researchers to compile more substantiated control measures.

Presently, significant studies have been carried out to identify the number of the pest mites in the individual zones. So, according to the data of some authors [1, 4] in the conditions of the semi-deserts of Azerbaijan the common spider mite develops in 16 generations.

Red fruit mite - mite of the spider's family *Tetranychidae* is spread everywhere. It is a polyphage, it causes harm, mainly to the fruit and forest trees.

Some authors gave modern ideas about the fauna, systematics and ecology of the mites of certain territories, their medical and veterinary importance, and also described traditional and modern methods of collecting, fixing and manufacturing of the permanent and temporary preparations, methods of their cultivation in laboratory and field conditions [2]. Beglyarov points out that in the Krasnodar Territory the hawthorn mite develops in 8-9 generations, and the brown fruit mites develop in 4-5 generations.

According to Boenko in the Crimea, *Oligonychus brevipilosus* has 7-8 generations, and *Pentamorismus taxi* develops in two generations. In the first case, for the development of one generation about 217°C of effective temperatures are required, and in the second case - 567-682°C.

The number of the generations and the total duration of development of the red fruit mite are relatively well studied. Thus, in USA (Virginia) the pest

develops in 9-10 generations [6], in West Germany - in 5 [7], in Norway - in 3-4 [8].

Based on literature data, in [7] it was found that for the development of the full cycle of development of the red fruit mite, the sum of the effective temperatures at the lower bound of 8°C is 210°C, 98°C from which is for embryonic development and 112° for postembryonic development.

An analysis of the above literary data shows that the mite in different geographical regions, depending on the characteristics of the thermal regime, can have from three to nine generations [3, 5].

Depending on the geographic distribution and climate of the region, the duration of the development of the red fruit mite varies from 15.8 to 34.1 days with an average of 21.0 days in Canada [8], from 18.6 to 25.3 with an average of 21.7 days in Bulgaria [2] and from 27.4 to 42.2 with an average of 33.0 days in West Germany.

In Azerbaijan, the number and duration of generations of the red fruit mites have not been studied. The geographic location and natural and climatic conditions of this region differ sharply from the regions where biology and their ecology were studied.

## **2. Materials and methods of research**

The number of the generations and their duration were studied with their individual content on young leaves of vegetable crops (beans) in petri dishes, covered with gauze. The starting material was the mite larvae obtained from the overwintered eggs. In nine Petri dishes nine mites were brought up. Each Petri dish was viewed daily under the magnifying glass and the time of appearance of larvae, nymphs and imago was recorded. Later on, the appeared females, after copulation, were planted one by one on new fresh bean leaves in new Petri dishes and monitoring of the new generation was continued. In this sequence, the study was continued until the middle of September, since after this period no developmental eggs were observed.

## **3. Results of the research**

These materials demonstrate that in the Guba region on the vegetable crops red fruit mite develops in seven generations. The duration of the development of the generations varies from 13 days to 26, an average of 19.1 days. The duration of development of the generations of red fruit mite varies with temperature and relative humidity, and the combination of high temperature and high humidity accelerate the development, while high humidity and low temperature act on development in the opposite direction. At high temperature and low humidity, the mites die.

The optimal combination of the temperature and humidity for the rapid development of the mite in the conditions of northeastern Azerbaijan is the temperature of 23°C and humidity of 67-68%. These optimum combinations of air temperature and humidity in the zone of the vegetable fields of the Guba region

are observed in July and August, i.e. when the development of the third to sixth generation of the pest occurs.

The flow velocity of both the full generation of the red fruit mite and the individual stages of its development is affected, in addition to temperature and humidity, and by the host plant on which development takes place. It is established during the study of the dependence of the duration of development of the mites feeding on different plant species (Table 1).

The results of these studies are summarized in Table 2, from which it can be seen that the life longevity on the different plant species occurs at different times. The shortest period of development is noted when mites feed on a cucumber plant. This apparently can be explained by the fact that the leaves of cucumbers are more tender, soft and juicy, that is, on the leaves of cucumbers the food is more easily accessible for the mites. Apparently, the composition of cell juices is more suitable for the development of mites.

On cucumber plants, the duration of individual phases of the mite development is 1-2 days shorter than on the amaranth, and 2-5 days shorter than on the convolvulus.

In general, the development of a single generation of red fruit mites in the northeastern Azerbaijan on cucumber plants is from 2-3 to 4-5 days shorter than on the amaranth and convolvulus.

**Table 1.** Number and duration of generations of red fruit mites in the conditions of northeastern Azerbaijan

Generations	Oviposition	Appearance of the larvae	Appearance of nymphs	Appearance of imago	Development duration of the generation	Average daily temperature	Average relative humidity (at %)
First	Hibernating Eggs	27.IV	5.V	13.V	-	11°C-IV 16°C-V	72-68
Second	16.V	26.V	3.VI	9.VI	24	16°C-V 19°C-VI	68
Third	12.VI	21.VI	27.VI	30.VI	19	19°C-VI 23°C-VII	64
Fourth	2.VII	9.VII	13.VII	17.VII	15	23°C-VII	68
Fifth	19.VII	25.VII	29.VII	1.VIII	13	23°C-VII	67
Sixth	2.VIII	10.VIII	13.VIII	20.VIII	18	21°C-VIII	67
Seventh	23.VIII	2.IX	11.IX	18.IX	26	17°C-IX	75

**Table 2.** The development duration of the generations of the red spider mite on different plant species (Guba, 2015-2016)

Number of the tests	Egg laying time	Time of appearance of the larvae	Time of appearance of nymphs	Time of appearance of nymphs	Duration of development of one generation (days)	Average daily temperature	Average relative humidity (%)
On the leaves of cucumber							
5	5.VII	10-11.VII	14-15.VII	18-19.VII	13-14	23° C	68
6	6.VIII	13-14.VIII	18-19.VIII	23-24.VIII	17-18	21° C	67
On the leaves of amaranth							
5	5.VII	11-12.VII	15-16.VII	20-21.VII	15-16	23° C	68
6	6.VIII	15-16.VIII	21-22.VIII	25-27.VIII	20-21	21° C	67
On the leaves of bindweed							
5	5.VII	12-13.VII	17-18.VII	22-23.VII	17-18	23° C	68
6	6.VIII	16-17.VIII	23-24.VIII	27-29.VIII	22-14	21° C	67

Summarizing the results of the research, one can conclude that in the northeastern Azerbaijan the red fruit mite on the vegetable crops and wild herbs multiplies in seven generations during the growing season. The duration of the development of the generations depending on temperature conditions and forage plants are different.

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