

Rosehip (*rosa L.*) pest in Uzbekistan: biology and distribution

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Abstract. This article presents the results of studies on the study of biology, distribution and degree of damage to pests of wild rose species, widespread vitamin plants in Uzbekistan. To date, the sanitary state of plantations and natural thickets of wild rose is in an unsatisfactory condition, since they are damaged by various pests, because of them the yield of bushes is low and the quality of medicinal raw materials harvested from them does not meet the requirements. In the course of the research, 6 pests were identified that damage fruits, seeds, leaves and rosehip shoots: *Laspeyresia roseticolana* Z.; *Rhagoletis alternate*, Fall.; *Megastigmus aculeatus* Sued; *Rhodites fluctum* Riibs; *Rhodites centifoliae* Hart; and, *Rhodites Mayri* Schllcht. Among them, the most dangerous and widespread pest is *Rhodites Mayri* Schllcht.

1 Introduction

Today, a great deal of attention is paid to the development of the pharmaceutical industry and the expansion of the production of medicines based on medicinal plant raw materials [1, 2]. Biologically active substances (vitamins, micronutrients, and antibiotics) prepared on the basis of plant fruit raw materials are valuable medicinal components that prolong the average life expectancy and ensure the ability to work, and have a wide range of opportunities to improve human health. Rosehip is a valuable multivitamin plant, the fruits of which are a raw material for the pharmaceutical industry. The fruit of rosehip is called a concentrate of natural vitamins, because the fruit contains a large amount of vitamin C (up to 6%) and vitamins B₁, B₂, P₁, and E [3, 4].

Medicinal products such as rosehip fruit and its extract, rosehip juice, and rosehip balm have pharmacological activity and are effective in the treatment of anemia, psoriasis, hemophilia, and atherosclerosis [5, 6].

In recent years, the increase in demand for rosehip fruit has led to an increase in the scale of its cultivation in many cultural ways - on plantations [7]. At present, more than 2,500 hectares of rosehip plantations have been established in the forestry system of Uzbekistan, from which 200 tons of dried rosehip fruits are produced annually [8].

Thus, this valuable multivitamin plant is a leader in the world of beneficial plants and the scale of its practical use, and scientific research aimed at improving the agronomic techniques of their effective cultivation and protection from pests is relevant.

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2 Materials and methods

These studies were conducted using field visual observations and laboratory experiments. Of the 17 naturally occurring species of rosehip (*Rosa* L) in Uzbekistan, 14 are found in the Western Tien Shan [9, 10]. These species of rosehip and the pests they encounter have been taken as the main object of study.

In conducting entomological research and identification of pests used the manual "Identifier of damage to forest, ornamental and fruit trees and shrubs" [11]. Infected fruits, seeds, leaves, and grains were collected from the shrubs, and pest imaging, larval length, diameter, and plant damage characteristics were studied.

Infected plant organs were stored under laboratory conditions in test tubes covered with nylon mesh until spring. In the spring, the flight times of pest imago were determined, their systematic relevance, life cycle and morphological features were studied. The degree of damage was assessed on a 3-point scale.

3 Results and discussion

The scientific study of rosehip pests began in the 60s of last century. In the existing scientific literature, mainly the European species of rosehip (*R. cinnamomea*, *R. rugosa*, *R. laxa*, *R. acicularis*, and *R. canina*) are affected by rosehip and leafhoppers [3].

Little is known about the pests that infect Uzbek beetles. F.N. Rusanov [1] noted that the canines of the *Canina* section of the genus are more infested with *Rhodites*. I.K. Makhnovsky [2] provided information on the biology and ecology of the thin-bodied golden beetle that infects rosehip.

This study identified the following 6 pests that occur in rosehip species and infect their fruits, seeds, and shrubs to varying degrees (Table 1).

Table 1. Systematization of pests identified in rosehip species and degree of infestation.

Detachment	Family	Name of pests	Damaging degree, three-scale	Description of damage
<i>Lepidoptera</i>	<i>Tortricidae</i>	<i>Laspeyresia roseticolana</i> Z	I	Damages fruits and leaves
<i>Diptera</i>	<i>Trypetidae</i>	<i>Rhagoletis alternate</i> Fall	I	Damages the fruit flesh
<i>Hymenoptera</i>	<i>Callimomidae</i>	<i>Magastigmus aculeatus</i> , <i>Sued</i>	II	Damages the seeds
	<i>Cunipidae</i>	<i>Rhodites fluctum</i> , <i>Ribs</i>	II	Damages the fruit flesh
		<i>Rhodites centifolise</i> Hert	I	Damages fruits and leaves
		<i>Rhodites Mayri</i> <i>Schlecht</i>	II	Янги новда, гунчалар, меваларни зарарлайди

***Laspeyresia roseticolana* Z.** Small pest, 6-8 pairs of legs, the upper part is reddish-pink, the lower part is a light red worm, which is characterized by the separation of excrement from the fruit.

The larvae are 10–14 mm long, 1.5–1.7 mm thick, with a brown head and distinct abdominal legs. The average mass of the worm was 0.04 g. One insect is recorded in one

fruit. In the test tube, all the worms overwintered in a silk cocoon. In nature, they eat mainly fruit flesh and leaves, i.e. polyphagous pests.

Although hypanthium does not damage the seeds inside, it negatively affects their normal formation. The degree of infestation of fruits with this pest reaches 12–14% and occurs in all natural distribution regions of rosehip.

***Rhagoletis alternata* Fall.** Mature flies (imago) of this pest undergo a life cycle in June–July. Its imago puts the seeds on the ripening fruit of rosehip in June.

The larvae that emerge from the seeds pass through the fruit flesh and feed on the fruit flesh, and their subsequent development takes place in this part of the fruit. The larvae are white, legless, worm-shaped, and shrinking towards the tip, 4.0–4.5 mm long, 1.4–1.5 mm thick, with a small black dot on the head [1, 2].

Up to 5–6 pest larvae can develop on one fruit. These larvae feed on the flesh of the fruit, but do not damage the top and inner shell of the fruit, so it is somewhat difficult to distinguish infected fruit from undamaged fruit.

Larvae collected from damaged fruits were placed in a test tube in early September, which gradually wrapped around the cocoon and turned into a sponge inside the cocoon. By mid-September, 60%, at the end of the month, all the remaining larvae had turned into cocoons. False cocoons are somonis-yellow, ribbed, 4.5–5.1 mm long and 2.0 mm in diameter. The flight of the first flies (imago) of the pest from these cocoons was recorded in late March, and the mass flight in late April. The size of *Rhagoletis alternata* Fall. is up to 3 mm long and the legs are brown. The wings are clear and transparent, with light brown broad stripes on 4–5 crossbars.

The wingspan is 2.5–2.7 mm and the width is 1.3–1.5 mm. The upper part of the imago, the shoulders are purple, the eyes are in the form of black dots. In the wild, the rosehip flies in April–May and feeds on plant flowers.

In September–October, the larvae of the pest pierce the skin of the fruit, looking for shelter for the winter, and the cocoon turns into a mushroom and winters that way. Hence, the generation of rosehip cypress can be considered as annual. The incidence of this pest is 15–20%. In the following years, after the barren years, there is a sharp decline in the population of rosehip cypress.

***Megastigmus aculeatus* Sued.** The infestation rate of these pest worms can reach up to 40% in some years. Pest generation is one-year, mostly young larvae overwinter in the seeds. The life cycle of the imago takes place in May–June. In early summer, the elongated rosehip seeder lays an egg in the seed kernel by piercing the flesh of the fruit and the seed coat, which has not yet hardened enough, with a long egg yolk. Typically, one egg is laid on each seed core [1].

Their embryonic period lasts 15–22 days. The larvae that hatch from the eggs feed on the seed core, then on the sap coming into the seed during the growing season and spend the winter inside the seed. In the spring, they wake up, continue to feed, and turn into mushrooms. The sponge period is around 30 days. The flight of the mature imago was recorded in laboratory conditions in late April (in nature in May), the mass flight - in the second decade of May. Traces of eggs laid on the seed core, pierced by the seeder in the shell of the damaged seeds, are visible in the form of brown dots. To fly, the pest gnaws a wooden hole with a diameter of 0.6–0.8 mm, biting the wooden shell of a sturdy nutmeg seed and flies away.

The imago of the pest is black, 3.0–3.5 mm long. The wingspan is 2.5–2.7 mm long and 1.0–1.2 mm wide, with a black dot on the front of the wings. The legs are brown. Occasionally there are images of entire brown. The length of the egg yolk is 3 mm, turned upside down. The pest is found in all mountainous areas where rosehip species are widespread.

***Rhodites fluctum* Riibs.** This pest imago lays eggs on the flesh of the fruit in early summer by piercing the flesh of the fruit of the pea with an egg holder. Their embryonic period lasts 18–24 days, during which the larvae hatch from eggs and feed on the flesh of the fruit and the nutrients that come to it [1, 2].

Larvae are 2.0–2.5 mm long, white, without legs, but mobile. Over time, in the place of the larva, a round chamber with an inner size of 2.5–3.0 mm in diameter is formed, and its walls gradually harden and become woody. Such cells have been reported to occur up to 4 times in a single fruit, but a single larva usually develops in a single cell. Occasionally there are two chambers attached to each other, but there is a solid wall between them.

The pest damaged parts of the fruit can be easily identified in the flesh of the red fruit: they are greenish-brown in color and slightly deformed. Damaged areas in such a fruit are more likely to be located in the lower part of the fruit close to the fruit band. Pest generation is one year.

The flight of the pest imago occurs in mid-March, and the mass flight occurs in late March. In the spring, the adult imago emerges from the fungus, opens a flight hole 0.9–1.0 mm in diameter, and flies away.

The pest imago is a double-winged black fly with a long mustache of 3.0–3.2 mm. Imago wings are transparent and dark, 2.3–2.5 mm long, and the legs are black. Fruits infested with wavy walnut larvae do not develop well, are deformed and twisted. The damage rate is 12–30%.

***Rhodites centifoliae* Hart.** The imago of this pest lays its eggs on the surface of the fruit, petals and leaves of the nectar using an egg trap. The larvae that hatch from eggs live at the expense of nutrients in the fruit and leaves. Larvae are white, without legs, 2.0–2.1 mm long. Over time, nutty grains are formed in the parts of the fruit band and larvae on the leaves [1, 2].

They are 4.0–4.5 mm in diameter, first greenish-pink, and then brown. The larvae overwinter in these spherical grains. Pest generation is one-year. In the spring, the imago opens a hole in the grain wall with a diameter of 0.8–0.9 mm and flies away. The flight of the imago was recorded in the first decade of March.

The imago is a shiny, bronze-colored fly. Length up to 3 mm, legs brown and long. The wings are transparent, 1.8–2.0 mm long. The length of the ovipositor is 1.0–1.2 mm. The plant damage rate is 14–18%.

***Rhodites Mayri* Schlicht.** The imago of the Mayer nut is black, 3–4 mm long; the wings are transparent, 2.5 mm long and 0.7–0.8 mm wide. There is a black dot between the wings. The eggshell of the imago is 2.0 mm long and turned upwards. In the spring, when the days begin to heat up, in late March-early April, one by one, flies begin to fly out of the hole opened by the nutty grain. The nutty grain is usually multi-chambered, and most flies are able to get out only after passing through 2-3 chambers. The holes created by the rodents of this pest are 0.6–0.8 mm in diameter [1, 2].

This imaginary pest, which flies in May, lays 6 to 26 eggs on the three parts of the newly emerging branches of the nectar. Their embryonic period is 16–22 days. Larvae developed from eggs feed on plant sap, under the influence of biologically active compounds in their saliva, plant cells are affected, grow, that is, undergo hypertrophy (Fig. 1).



Fig. 1. Infected rosehip bush by *Rhodites Mayri* Schllcht. pest.

The larvae of this pest cause pathological, anatomical and physiological changes in plant tissues, resulting in the formation of oval, uneven, deformed grains on the branch with a diameter of 3–40 mm.

The grain is green in color, then hardens into wood and turns brown (Fig. 2). The surface of the stalks is sometimes covered with deformed leaves and thorns. They are multi-chambered, with one larva developing in each chamber. The number of cells corresponds to the number of larvae. The larva of the pest is white, without legs, 2–2.3 mm long, very mobile.



Fig. 2. Rosehip grains formed under the influence of *Rhodites Mayri*, Schllcht. larvae.

During the growing season, the larvae grow and develop in a separate cell inside the grain, that is, they live a latent lifestyle. Such pests are included in the category of *caprobionites*. Pest generation is one-year. Its larval period lasts 8–9 months. After the plant enters a dormant period at the end of the growing season, the larvae fall into the diapause during the cold season and do not feed for 4–5 months [1].

In the spring, as the days get warmer and the sap begins to move on the plant, the larvae also feed and turn into fungi. The sponge phase lasts 20-30 days. In early April, the adult imago flies away (Fig. 3).



Fig. 3. Imago of *Rhodites Mayri* Schlicht.

This pest damages the annual branches and fruit twigs of rosehip, causing the formation of grains (swellings) and sharply reduces yields. This pest belongs to the genus *Caninae* of the genus *Rosa* L., *Rosa canina*, *R. arnoldii*, *Rosa ambigua*, *R. transturkistanica*, and *Rosa transturkestanica*.

In the rosehip bush it can be found 30-40 grains formed by such a pest, the damage rate sometimes reaches 60-70%. Currently, there is an increase in the population of these pests, and the amount of damage they cause has also increased. The main reason for this is that no measures have been developed to combat it. A simple control measure is recommended - the grain is harvested from the twigs in late autumn and burned, which leads to a sharp decline in pest populations.

The following pests that infect rosehip seedlings were also noted during the study: the appearance of rosehip sap (lice) - *Metapolophium dirhodum* Walk on the leaves and twigs in the growing part of the seedlings in the nursery. A partial spider *Totranuchus urticae* C. L. Koch insect was observed in seedlings. The rosehip worm eats the leaves of the rosehip seedling completely in May-June, causing damage to the seedlings.

4 Conclusions

Currently, the sanitary condition of plants in rosehip plantations and natural rosehip is unsatisfactory; they are damaged by various pests, low yields and the quality of prepared medicinal raw materials. The most dangerous and currently widespread pest among them is *Rhodites Mayri* Schllcht.

Pests that infect rosehip seedlings were also recorded during the study: the appearance of rosehip sap (lice) - *Metapolophium dirhodum* Walk on the leaves and twigs in the growing part of the seedlings in the nursery, partially observed in seedlings spider *Totramuchus urticae* C. L. Koch insect

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