

LADYBUGS AND THEIR SIGNIFICANCE IN AGRICULTURE

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ANNOTATION

In the article, the biology, life cycle and ecological characteristics of coccinellids, domestic and foreign scientific researches on the composition of the species are analyzed, the ecological characteristics of coccinellids, wintering characteristics in the conditions of the studied valley, and information on determining the ways of protection are studied. Also, great attention is paid to the scientific literature that can be the basis for the development of scientifically based measures in the fight against pests of agricultural crops.

Keywords: Pest, description, ecological feature, protection, economic importance.

БОЖИ КОРОВКИ И ИХ ЗНАЧЕНИЕ В СЕЛСКОМ ХОЗЯЙСТВЕ

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АННОТАЦИЯ; В статье проанализированы биология, жизненный цикл и экологическая характеристика кокциnellид, отечественные и зарубежные научные исследования по видовому составу, экологическая характеристика кокциnellид, особенности зимовки в условиях изучаемой долины, сведения по определению изучаются способы защиты. Также большое внимание уделяется научной литературе, которая может стать основой для разработки научно обоснованных мероприятий в борьбе с вредителями сельскохозяйственных культур.

Ключевые слова: вредитель, экологический признак, охрана, хозяйственное значение.

Goal: identifying the role and significance of the ladybug in the life of nature and a person.

Tasks: to study the features (appearance, nutrition, lifestyle) of ladybugs;

- reveal the secrets of ladybugs;
- find out if there is any benefit or harm from bugs;
- get acquainted with folk signs, superstitions associated with these insects;
- find the image of ladybugs in literature, art.

Ladybugs, or coccinellids (lat. Coccinellidae), are a family of beetles. The body of these beetles is convex, round or oval. They are clearly visible due to the bright "warning" color, represented by various combinations of red, yellow, white and black, mostly with black spots on the main light background, less often - vice versa. Body length from 0.8 to 18 mm, usually 4-7 mm. When disturbed, the beetles secrete droplets of caustic orange-colored hemolymph from the knee joints, due to which they are inedible for most insectivorous vertebrates. Ladybugs and their

larvae are predators that feed on aphids, mealybugs and other small insects, few species are herbivores. The family includes about 8,000 species. They are distributed almost throughout the globe, with the exception of Antarctica and permafrost zones.

DESCRIPTION

Small beetles with body length from 0.8 (genus *Carinodulinka*) to 18 mm (genus *Megalocaria*). The body is oval or round-oval in shape, strongly convex from above, practically hemispherical or ovoid. The underside of the body is almost flat or slightly convex. In some groups of ladybugs, the body is oblong-oval, flattened to one degree or another. Body surface predominantly glabrous, without hairs and setae, rarely covered with fine hairs. The head is short, small in size, can be elongated in the longitudinal or transverse direction. The eyes are large, often with an indentation at the anterior margin. Antennae varying in length, sometimes longer than the head, consisting of 8-11 segments, attached on the sides of the anterior margin of the head and capable of bending under the head. The end of the antenna is sharply widened and forms a thickening - a club. The shape of the last and penultimate segments of the club of the antennae varies in different genera, which is taken into account when identifying the species. Mouth apparatus gnawing type. The upper jaws are massive, sickle-shaped. In herbivorous species (subfamily *Epilachinae*), they have numerous teeth at the top. In predatory species and plants that feed on fungi and pollen (subfamily *Coccinellinae*), the upper jaws have two sharp teeth at the top. The lower lip is elongated, rarely transverse.

The prothorax is movably articulated with the mesothorax, which, in turn, is fixedly connected to the metathorax. The anterior and mesothorax are elongated transversely. The metathorax is wide, almost square, much longer than the mesothorax. The prothorax of ladybugs is straight at the top, has developed keels, which may sometimes be absent. The mesothorax in most species is straight, in representatives of some genera in front with a triangular notch. The shield is well developed. The pronotum is usually widened at the base and rounded, convex and transverse, wider than the head, and has a notch of various shapes on the anterior margin. It is usually spotted or with a pattern of merged spots.

The edges of the pronotum can be bordered: they have a side and are separated from the disc by a depressed line - edging.

The elytra of ladybugs are rounded, rarely their outer edges are parallel to each other. Usually the elytra are narrowly bordered, in some genera (*Halyzia*) flattened. The lateral margin of the elytra is bent to the underside, partially covering the lateral parts of the mesothorax, metathorax, and abdomen and forming epipleurae (ventrally folded edge of the elytra) separated from the rest of the elytra by a kink. Epipleura usually wide or narrow, in *Hyperaspis* with pits. In some species, the elytra at the top have a transverse fold or a small notch along the seam. The shape and color of the elytra differ in each species and are an important systematic feature of individual taxa. Elytra predominantly red, orange, yellow, brownish with black or white spots, which often merge into longitudinal or transverse stripes and bands, thereby forming a variable pattern; there are also elytra black with red or yellow spots. Representatives of the family have a wide polymorphic variability in the color of the elytra.

The wings themselves are elongated and wide. The type of venation is cantharoid: the main part of the M2 vein forms a recurrent vein, which is connected to the main stem at an inflection

in the form of a hook. In some species of ladybugs, the wings are reduced (for example, *Subcoccinella 24-punctata*).

Abdomen almost completely flat ventrally, much flatter than elytron dorsally. The abdomen consists of 10 tergites, of which the first 5-6 are visible, membranous, and the rest chitinous. The genital opening opens between the 8th and 9th sternites. The sternite of the first abdominal segment is usually the widest and has the so-called. the femoral lines, which may be incomplete or complete, bifurcate in the shape of the letter V. An important systematic feature (for example, for Scymnini) is the structure of the genitalia of males, sometimes females.

The legs are always well developed. They are moderately long, covered with dense short hairs. Legs and thighs are thin. The tarsi are four-segmented or hiddenly four-segmented (they seem to be three-segmented, since the third, very small, segment, together with half of the fourth, is hidden in the furrow of the two-lobed second segment. Only in representatives of the tribe Lithophilini, the legs are clearly four-segmented. The last segment of the paw usually has 2 claws, of different structure in different species taxa.

Sexual dimorphism is weakly expressed. In most species, the apex of the 5th or 6th sternite in males has a notch or fossa, while in females it has a tubercle. In males of some species, the 1st segment of the fore and middle tarsi is expanded. Sometimes females and males differ in the pattern on the pronotum.

Larvae-larvae of coccinellids belong to the campodeoid type - they are mobile, have an elongated body and three pairs of long thoracic legs. The appearance of the larvae of the representatives of the family is very diverse. The larvae of most Palearctic species belong to the so-called coccinelloid type, which is characterized by a spindle-shaped body, large head, and long legs.

The head of the larvae is rounded-quadrangular, approximately the same width and length. Its sides are rounded to one degree or another or straight. There are antennae on the head. Two-segmented and one-segmented antennae are characteristic of specialized genera feeding falsely on scale insects. Variations in the structure of the antennae are represented by combinations of different lengths of the basal and apical segments (genus *Hyperaspis*, *Nephus*). The mandibles of the larvae are triangular or sickle-shaped, protruding or weakly protruding. Mandibles according to their structure can be divided into 2 types. The first - multi-toothed triangular shape, with no retinaculum - are characteristic of species (*Subcoccinella*) with a herbivorous way of life. Mandibles of the second type are characteristic of Coccinellinae; they are crescent-shaped, have 1-2 sharp teeth at the apex, and the retinaculum is developed. Three simple eyes are located on the sides of the head. Abdomen 10-segmented, without caudal filaments at the end. The legs are long, more than the width of the body. The dorsum has various structures, armed bristles, or is covered with white waxy filaments.

The prothorax is much longer and narrower than the middle and metathorax. The dorsum of the prothorax has 2 or 4, rarely 6 scutes - square, rounded square or elongated, placed longitudinally. Doris mesoscutum and metathorax have 2 scutes, oval, oblong, rarely rounded, located across the segments. On their outer edges, the scutes are covered with various setae.

The legs are elongated. The abdomen is formed by 10 segments, the last of which is displaced to the ventral side and has the shape of a sucker. Tergite of segment IX most often rounded at its apex, sometimes with a cone-shaped or triangular outgrowth. Integumentary formations on

the abdomen of larvae are extremely diverse and can be used as important taxonomic characters. They are represented by: warts, outgrowths of various shapes and bristles.

The larvae go through four instars. First instar larvae are small, 0.5 to 1.2–1.7 mm long. At IV instar, the length of the larvae is 5-8 mm, and some - 17-18 mm. First instar larvae usually have a single color - dark or gray with white, yellow, orange or red spots. At older ages, the larvae acquire a bright and varied color. Bright coloration is characteristic, as a rule, of species that feed on aphids and openly live in their colonies. There is a relationship between color and their behavior: the more active the larva, the brighter it is colored (genus *Coccinella*, *Coccinula*, *Anatis*, *Harmonia axyridis*, *Aiolocaria mirabilis*, with a contrasting combination of rich black color with orange spots and stripes). Monochromatic, often dark larvae are characteristic of ladybugs that feed on false scale insects. The coloration of the larvae is subject to age and individual variability.

Beetles and larvae of most species are entomophagous predators. Only a few species feed on plant foods.

Biology and Ecology; Most of the species are confined to certain landscape and geographical zones, and each of them is usually characterized by a specific complex of species. However, some species are polyzonal, for example, *Coccinella septempunctata*, *Coccinella undecimpunctata*, *Adonia variegata*. For species of the family, attachment to certain vegetation is characteristic. Some of them live mainly on trees (*Adalia bipunctata*, *Oenopia conglobata*), others - on herbaceous vegetation (*Propylaea quatuordecimpunctata*, *Adonia variegata*, *Coccinula quatuordecimpunctulata*), others - on vegetation of any type (*Coccinella septempunctata*, *Psyllobora vigintiduopunctata*).

It is considered a beneficial insect, as it eats aphids, coccididae. However, some species, such as *Epilachna varivestis*, are herbivores. In winter, ladybugs gather in clusters under fallen leaves, under the bark of trees or stones, and there they wait for the arrival of spring. Clustering helps keep temperatures above ambient.[4] Depending on the availability of food, these insects live from several months to a year, and very rarely - up to two years. Juveniles are always bright in coloration, which gradually fades with age, while remaining a fairly convincing warning to predators who want to encroach on the insect's life.

Economic importance; Ladybugs are among the effective entomophagous insects: they destroy many pests of agricultural crops and are of considerable interest for the development of a biological method of combating them.

Herbivorous species (phytophages) are distributed mainly in countries with a warm climate, some of them are pests of agricultural crops, these include the bean beetle in Mexico and the potato ladybug in the Oriental Region. Three herbivorous species of ladybugs of economic importance live on the territory of the countries of the former CIS: *Subcoccinella vigintiquatuorpunctata* (alfalfa twenty-four-spotted), *Henosepilachna vigintioctomaculata*, *Henosepilachna chrysomelina*.

The species *Henosepilachna vigintioctomaculata* is common in the Far East, as well as in Korea, Japan, and China, where it harms potatoes and other nightshade and melon crops. In this area, the species is among the primary pests of potatoes, not inferior to the Colorado potato beetle. *Henosepilachna chrysomelina* is common in Central Asia and can damage gourds. In the southern regions of Russia, the alfalfa ladybird (*Subcoccinella vigintiquatuorpunctata* L.)

sometimes damages alfalfa and sugar beet plantations. In Smolensk, Saratov and other regions of the middle zone and the south of Russia occasionally damages alfalfa, clover and sweet clover (*Cynegetis impunctata* L.). *Bulaea lichatschovi* in Central Asia and Kazakhstan is considered a potential pest of sugar beets.

The most important in agriculture are predatory ladybugs as entomophages for many pests. They can exterminate pests both in adult and larval state. Useful extermination of harmful insects, especially aphids and mealybugs; and some species eat the larvae and eggs of leaf beetles, corn moths, and other pests such as spider mites. Both adult beetles and larvae are characterized by aggressiveness, high activity, developed search ability and exceptional voracity. In nature, ladybugs are involved in the regulation of the number of many insect species, mainly aphids. In addition, these insects are very voracious: older larvae can eat up to 70 aphids per day, and adults - more than 100 aphids. Larvae and beetles are very active, looking for their prey, and adults are capable of flying over considerable distances.

The most common species of the family is also very useful - the seven-spot ladybird (*Coccinella septempunctata* L.) - introduced from the Palearctic to America to control local and imported pests. *Halmus chalybeus* was introduced to New Zealand between 1899 and 1905 to control citrus pests.

Range and habitats; More than 8,000 species of ladybugs are known, which are common in all parts of the world [9]. Some of them are found on all plants: trees, shrubs or grasses that only have aphids; others keep only on the grasses of the field; still others are in meadows adjacent to streams; the fourth - only on trees; finally, some species live on reeds and other aquatic plants; the latter are distinguished by their longer legs, which help them to stay on plants that bend easily from the wind.

Paleontology; In the fossil state, ladybugs are known only from the Cenozoic. The oldest known representatives were found in the early Eocene Oise amber (France). **Этимология и фольклор**

❖ The most common variant of the name of a ladybug indicates cattle belonging to a god or some divine character: Rus. ladybug, Polish *biedronka*, *boža krowka*, lit. *boružėlė*, Serbo-Chorv. *bozhja evchitsa*, fr. *bête à bon Dieu* ("God's animal"), *poulette à Dieu* ("God's chicken").

❖ Folklorist S. Z. Agranovich, based on the works of linguist V. N. Toporov, suggests that the Slavs associated the ladybug with Mokosh, the goddess of the earth and fertility. So, a common saying: "Ladybug, fly to heaven, bring me bread, black and white - but not burnt" is interpreted as a request to the goddess for the harvest. At the same time, the indication that bread can be burnt refers, according to researchers, on the one hand to black dots on the elytra of insects, and on the other hand, to the myth of the murder and dismemberment of Veles by the god of thunder Perun.

❖ In the Middle Volga region (Nizhny Novgorod region, Tatarstan, Mordovia, Udmurtia), the regional name "grandmother-box" is common.

❖ In English-speaking countries, a ladybug is called English. ladybird, ladybug or lady beetle. The word that unites these names is English. Lady means the Virgin Mary. Also in Catholic countries, the ladybug is considered an insect of the Mother of God (cf. German *Marienkäfer*, Spanish *mariquita*). One of the ancient names of the beetle in the German language was OE. *Freyafugle*, the bird of the goddess Freya. With the Christianization of culture, Freya was replaced by the Virgin Mary. In the Dutch language, the beetle was called

niderl. Ingetsje (little angel), netherl. Hemelbeestje (God's creation); at the moment his name is niderl. Lieveheersbeestje (The Creation of Our Righteous God). In German, the modern naming is German. Marienkäfer (Mary's beetle)

❖ Killing a ladybug is illegal in some cultures. Ladybug in Western culture is considered one of the symbols of good luck.

CONCLUSION

✓ The ladybug belongs to the beetle family, which has more than 4,000 species of these cute creatures.

✓ Ladybug is a symbol of the protector. Predator by nature, it saves plants from insect pests.

✓ Ladybugs have a good defense against predators - in case of danger, they secrete a pungent yellow substance with an unpleasant odor and taste. Almost no enemies.

✓ Ladybug plays a positive role in the life of nature and man.

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