Eco. Env. & Cons. 26 (3) : 2020; pp. (1166-1169)
Copyright@ EM International
ISSN 0971–765X

The number of main species of bark beetles (Scolytinae) and protective measures in the mountain forests of the Zaili Alatau

Nurzhan Mukhamadiyev, J. Bolat, A. Koigeldina and Gulnaz Mengdibayeva

JSC "Kazakh Scientific-Research Institute for Plant Protection and Quarantine", 1 Kultobe Str., Rakhat, Nauryzbayski Region, Almaty City, 050070, Republic of Kazakhstan

(Received 2 May, 2020; Accepted 19 June, 2020)

ABSTRACT

In 2018-2019, the hanging of traps was carried out from April 15 to April 30, and they were inspected regularly every 7-12 days. From the family of bark beetles (Scolytinae), there were 17 species, including the purple or small spruce bark beetle Hylurgops palliatus Gyllenhal, which we collected earlier in Central Asia in the Tien Shan. The largest number was found - gauser's bark beetle (Ips hauseri Reitt.). In laboratory conditions, experiments were conducted to evaluate the biological effectiveness of the mushroom preparation actarofit. It was found that on the 8th day, the bark beetle mortality rate was 77.5%, in the control variant, the beetle mortality rate was 2.5%. Biological product "Actarofit Ke" D. V. aversectin C, 0.2% - a natural mixture of avermectins. produced by the soil fungus Streptomyces avermitilis. The mechanism of action of the drug is based on the ability of a highly virulent strain of Streptomyces avermitilis to infect pests. Affecting the fat body and hemolymph of the insect, the microorganism produces a number of entomotoxins that lead to the death of the pest.

Key words *: Spruce spruce, The bark, The agent, Pheromone, Fungal strain.*

Introduction

Forests perform important climate-regulating, environment-forming, water-protection and sanitary-hygienic functions and are natural resources of the biological reserve of the Republic (Azbaev, 2013). Xylophage insects are a collective ecological group of insects whose larvae feed on the tissues of tree trunks and lead a hidden lifestyle.

Location of research

Research carried out in the forests of Zaili Alatau, in the laboratory of LLP "KazRIPPQ named after J. Jeenbaeva", in collaboration with the laboratory of dendrochronology of the University of Arizona, USA (Irina Panyushkina and Anna Lynch, Keith Conner) and Saint Petersburg state forest technical University named after S.M. Kirov (M. Y. Mandelshtam). When conducting research, we were guided by generally accepted methods in plant protection, forest entomology, and forest pathology surveys (Kataev, 1984; Mandelshtam, 2017).

Research results

The Tien Shan spruce is home to a number of bark beetles that are absent from other coniferous species. They cause great harm and often contribute to the mass death of stands. Foci on healthy trees develop under the condition of migration of pests from old foci or when they are imported with tim-

ber. This is how the six-toothed bark beetle and other species were imported to the Zaili Alatau with timber in the 50s. The migration centers of mass reproduction of the bark beetle Ips hauseri, partially-Pityogenes perfossus in pine plantations, which were periodically observed on the Tien Shan, are much more dangerous. Unsettled, inaccessible mountain spruce forests due to weakened trees, winds, frequent mudflows constantly contain a high number of these species of bark beetles. They systematically attack artificially grown pine trees and destroy them in some years. Pine shrinks not because of bark beetles that breed on it, but as a result of the arrival of Ips hauseri from the surrounding spruce stands. The main reasons for the weakening of spruce stands on the territory of the Zaili Alatau in recent years are wind and windfall, which subsequently breed bark beetles (Ips hauseri, etc.).

System of protective measures against bark beetles

Protection of the forest from pests and diseases is carried out by various methods and means that provide favorable conditions for growth, prevent damage to trees by harmful organisms, reduce the degree of spread and harmfulness, in case of threat of damage, destroy pests and diseases. Pest control will be successful if it is carried out systematically and professionally using available and effective means, using the full range of protective measures: preventive measures, supervision, forestry measures, biological, chemical, physical and mechanical methods.

Preventive control

Forest prevention is at the heart of measures aimed at creating conditions that are unfavorable for the reproduction of harmful organisms. It involves the implementation of all forest management measures aimed at increasing the biological stability of plantings. As a result, prevention of mass reproduction and spread of harmful organisms in the forest is provided. Preventive measures include organizational, forestry and forest protection methods, supervision and forecast, and plant quarantine.

Forestry activities

Forest management measures are those that simultaneously implement forest protection measures: selection of seed and planting material, soil treatment, cultivation of sustainable plantings, logging, clearing of logging sites, etc. Without technically competent and timely implementation of forest management measures, it is impossible to eliminate foci of pests and diseases in forests. Silvicultural methods of struggle are reduced to the most important activities to ensure biological sustainability of plantations: the right choice of system logging (methods of felling, methods of application of cutting areas, felling direction, direction of cutting, width of cutting areas): all possible reduction of perimeter edges, the timely implementation of measures ways of caring for the forest: a thorough implementation of the requirements of sanitary rules in the forests (to combat clutter, the elimination of detuned plants, timely removal of harvested wood, etc.). Cluttered areas of the forest, not eliminated stumps, not okorennye remnants of wood serve as a source of reproduction and distribution of stem pests (barbels, goldfinches, bark beetles, etc.). Therefore, it is necessary to comply with the forest sanitary rules of logging. Creating plantings that are resistant to adverse growing conditions. In the stands that are drying up on the root, sanitary felling is carried out and hunting trees are laid out. Continuous sanitary logging is carried out in heavily infected stands and in overstressed disturbed areas of the forest.

Supervision and forecast

The basis for timely and high-quality implementation of forest protection measures is the data of forest pathology supervision. When making optimal economic decisions in forestry to protect plantings from harmful organisms, it is necessary to create a scientific base based on reliable and specific knowledge about the dynamics of the number of insects and diseases. Such a framework can be created by organizing a system for monitoring the dynamics of the number and state of populations of forest pests.

Physical and mechanical measures

Physical and mechanical methods of fighting include various fighter techniques using mechanical means, manual devices, pheromone, light traps. These methods of control are labor-intensive, and are usually used in small areas with a low and average pest population. To attract large pine weevil beetles or root beetles, use pieces of fresh pine bark, spreading it out with a bast to the ground and pressing down with a piece of earth or turf. Spraying bast with attractive substances increases the attractive properties of traps. Especially against the threat of

stem pests (beetles, jewel beetles) used trapping trees. After full colonization of the wood and the cessation of egg laying insect-trapping trees should be okonite, bark and branches to burn.

Pheromone traps should be used over large areas, since the pheromone attracts bark beetles up to 7 km away. Beetles fly from all the surrounding plantings and strike not only the tree on which the pheromone trap is installed, but also nearby trees. As an alternative, use a method of scaring bark beetles with anti-pheromones (as repellents). In each case, a protection scheme is selected that will be most effective for trees of this breed, age, and condition. It is possible to select products that are completely safe for the environment and humans, but still provide reliable protection of trees.

Biological activities

Currently, the attention of foresters is drawn to the wide use of biological methods in the fight against forest pests. From the number of predators a large role in the destruction of the typographer is played by beetles: ants, pied Pipits, baby birds, spangles, and blackbirds. Carp, black-bellied, spangled, mottled larvae eat eggs, larvae and pupae of the bark beetle, and mottled beetles destroy the bark beetles themselves. By the beginning of oviposition, beetles fly to the breeding sites of bark beetles and are able to destroy up to 60% or more of their eggs and larvae. Among the parasites, the most active are Tomicobia seitneri Rusch., Rhoptocerus xylophagorum Ratz., Coeloides bosirychorum Gir. In the fight against bark beetles, a comprehensive use of the activities of parasites and predators is provided. According to our observations in 2014, the number of entomophages (rice rider) was very low, and in relation to bark beetles was 1-5%, which is due to the fact that the habitat conditions and microclimate in the altitude profile were different everywhere. For example, at the site below 1700 m n.m., the numbers of entomophages and the duration of their development were significantly higher than at the sites 2000 and 2200 m n.m. (cimbulak). The ratio of bark beetles to their predators was low in 2012-2014. During the observations, it was found that the most promising in reducing the number of bark beetles is the predator ant beetle, which is relatively easy to reproduce in the laboratory and therefore it can be used by seasonal colonization in the centers of bark beetles. In order to increase the role of parasites and predators in suppressing the foci of bark beetles typographers should pay attention to the following measures: Do not cut down trees where 50% or more of the bark beetle's moves contain cocoons of parasites or bark beetles infected with tomibokia. If it is necessary to cut down all trees inhabited by bark beetles, it is necessary to remove the bark from them in chunks in early spring and put them in bundles in the forest. After the departure of parasites, the bark should be burned immediately; Transfer parasites in pieces of removed bark from decaying to emerging or active centers of reproduction of the bark beetle typographer, placing them there in medium lighting conditions and humidity; Attract predators to areas where the typographer's bark beetle spreads to bait. To do this, in early spring, fresh stumps should be moistened with birch SAP and spread out in the forest pieces of fresh bark with a part of bast fibers, wetting them with water. Creating artificial nesting sites for entomophages and birds.

In the fight against bark beetles, a set of measures is used aimed at improving the overall condition of trees, increasing their natural resistance and barrier protection. Among the measures that improve the immunity of trees, we can note the introduction of fertilizers, growth modulators and root formation, improvement of growing conditions (regular watering of trees, improvement of soil penetration - deep and surface loosening). Application of biologics "Actarofit Ke" D. V. aversectin C, 0.2% - a natural mixture of avermectins produced by the soil fungus Streptomyces avermitilis. The protective effect of the drug lasts up to 15 days.

Barrier methods remain the main means of controlling bark beetles. This spraying of the trunks of fir trees with insecticides and biological preparations ectopic, bitoksibatsillin, etc. and intra-stem injections of medicinal drugs.

Chemical events

Chemical methods remain the main means of fighting bark beetles. These are spraying of spruce trunks with insecticides and biological preparations and intra-stem injections of medicinal drugs.

Bifentrin, clipper, etc., which are used by spraying tree trunks with insecticides, Thus, the spruce tree is protected from the attack of bark beetles for 2-4 weeks. Another method of protecting trees from bark beetles is the method of injection into the tree trunk. The insecticide gets directly under the tree's bark. The protective effect lasts for a year, and the

damage caused to the forest ecosystem is minimal. Employees of the Institute are testing technologies for introducing chemical protection agents directly into the tree tissue. To control bark beetles on separate coniferous trees, we have tested and recommend the method of injection With the Arborjet system. However, this direction requires separate studies to work out the choice of the drug and the consumption rates. When using this technology, the tree is not harmed. The holes left after such injections are sealed with special sealed plugs, and their diameter does not exceed a few millimeters. Such traffic jams are completely overgrown with bark. In addition to the active substance (insecticide), the drug must contain substances-transporters that facilitate the movement of the insecticide under the bark. These substances do not allow water-soluble insecticides to clog the vessels of the tree and evenly distribute the drug throughout the trunk. And even more so, you can not use pure drugs, such as "Bi-58" or an aqueous solution of insecticides. Oily liquids and water solutions cause trees harm, not benefit.

However, the difficulty lies in the fact that the range of approved drugs is not available, so we are working on the use of two and three component drugs.

Conclusion

The list of pesticides (pesticides) allowed for use on the territory of the Republic of Kazakhstan should be supplemented with a list of drugs used against bark beetles and other stem pests. According to our observations, in the fight against bark beetles, a positive result is obtained starting with timely pheromone monitoring and the use of complex measures: physical-mechanical, biological and, if necessary, chemical measures.

Research was conducted under grant funding by the science Committee of the Ministry of education and science of the Republic of Kazakhstan budget program 217 "Development of science", priority: life Sciences and health, project No. ÀÐ05134299 "Monitoring populations of stem pests (Scolytinae) on the endemic Shrenka spruce in the Zaili Alatau".

References

Azbaev, B.O. 2013. Current state of biological diversity and main priorities for further development. *Proceedings of the International scientific and practical conference "Development of the "green economy" and conservation of biological diversity"*, Shchuchinsk, October 8-10, 2013, pp. 3-5.

Kataev, A.O. and Mozolevskaya, E.G. 1984. *Methods of forest pathology examination of foci of stem pests and forest diseases*. Moscow: Lesnaya promyshlennost', pp. 152.

Mandelshtam, M.Yu. and Khairetdinov, R.R. 2017. Additions to the check list of bark beetles (Coleoptera, Curculionidae: Scolytinae) from Leningrad Province, Russia. *Entomological Review*. 97 (7) : 893–899. (Translated from Entomologicheskoe Obozrenie, 2017, 96(3): 512–521).