Study of the Efficacy of the Powder Form of Cypra 20% EC against Ectoparasites in Sheep

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Abstract. This article provides detailed information about the prevalence and seasonal dynamics of ectoparasites found on sheep in farms and households specializing in sheep breeding in the foothill regions of Tashkent province - namely, the Ohangaron, Parkent, and irrigated Qibray districts - as well as about the new effective methods and means used to combat these ectoparasites. As a result of the conducted research, the effects of various concentrations and a 0.05% powder form of the Cypra 20% EC preparation, produced in India, were tested against sheep ectoparasites in the "Kholturayev Oybek XM" sheep-breeding farm in the Ohangaron district, in the "So'qoq To'rtko'l" farm in the Parkent district, and in the households of the "Iqtidor", "Alisherobod", "Chingeldi", and "Haydarobod" neighborhoods of the Qibray district. When applied 5 - 6 times a year against ticks and lice (Bovicola spp.) found on sheep and goats, the preparation led to a sharp reduction and elimination of ectoparasites and ticks on the animals' bodies. Furthermore, this scientific article notes that infestations by lice (Bovicola spp.) - one of the main entomoses affecting sheep-reach their highest levels during the winter and spring seasons. The degree of sheep infestation with tick-borne diseases (ixodidosis) depends on both air temperature and the cleanliness of the pens where the sheep are kept. The seasonal activity of ixodid ticks is mainly observed when the weather becomes warmer, particularly during the period when sheep are taken to pastures. It was recorded that during this time, sheep are most likely to become infested with ticks.

Keywords: Sheep, ectoparasite, ixodid tick, Bovicola, parasitosis, parasitocide, entomosis, acariasis, powder, infestation, Cypra, deacarization, sheepfold

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1 Introduction

Today, parasitic and vector-borne diseases are widespread in many countries around the world [1, 2], causing significant economic losses to livestock farming, particularly to sheep-breeding enterprises. At present, combating these parasitic diseases and controlling the number of harmful insects that act as specific (vector) transmitters of such diseases have important scientific and practical significance.

According to literary sources, "Ectoparasites cause severe discomfort to animals and a sharp decline in their productivity, leading to more than 2.2 billion USD in economic losses annually." [1, 3].

Within zoobiocenoses, approximately 9,950 species of zoophilic and synanthropic parasitic insects and about 123 species of acariform and 100 species of parasitiform mites live in parasitic and biocenotic association with humans and agricultural animals and are of great veterinary and sanitary importance [3].

Moreover, these parasitic mites and zoophilic insects, living parasitically on humans and domestic animals, act as transmitters of numerous transmissible–infectious and viral parasitic diseases such as plague, tularemia, hemorrhagic fever, ephemeral fever, tick-borne encephalitis, trypanosomiasis, leishmaniasis, malaria, theileriosis, typhus, and relapsing fever. These vectors pose serious threats because our region is located in an epizootiological and epidemiological risk zone where natural evolutionary foci of such diseases exist.

Taking into account anthropogenic factors and ecological successions, it becomes evident that this issue deserves serious attention. Even today, there is a risk of the reemergence of previously eradicated diseases such as plague, tularemia, Crimean-Congo hemorrhagic fever, tick-borne encephalitis, and arachnoentomoses, as well as the emergence of new diseases like Zika, Ebola, avian influenza, influenza-like viral infections, lumpy skin disease, and others. Therefore, timely and effective control of these highly harmful parasites holds critical scientific and practical importance.

It is known that hard ticks (Ixodidae) transmit natural focal diseases to humans and vertebrate animals. However, when a tick is feeding on its host's blood, it injects a toxic substance that has an anesthetic effect on the host's body, and during the blood-sucking process, the blood does not coagulate.

Among ticks, there are also predatory species. They parasitize humans and animals, feeding on their blood and body fluids. In addition to sucking blood, these ticks transmit dangerous diseases such as spotted and relapsing fevers, tick-borne encephalitis, tularemia, as well as rickettsiosis, piroplasmosis, anaplasmosis, and theileriosis among large livestock and other animals.

Foreign scientists G.N. Minch and O.O. Mochutkovsky were the first in the world to discover that blood-sucking insects can transmit infectious disease pathogens, including those of relapsing and typhus fevers. T. Smith and F. Kilborne determined that piroplasmosis pathogens are transmitted by arachnids - ticks. Thus, by the late 19th and early 20th centuries, the understanding that arthropods could transmit diseases became widespread. From this perspective, scientific research aimed at combating blood-sucking parasites, providing rapid diagnosis, treatment, and prevention of diseases in infested animals is of great importance.

In developing the economy of our republic, the advancement of sheep farming holds a special place. Increasing the profitability and development of sheep breeding in limited

liability companies, farms, and household enterprises depends on increasing the number of sheep, improving their productivity, ensuring the birth of healthy lambs, providing proper care, and protecting them from various diseases. In this regard, protecting sheep from different infectious and non-infectious diseases, their carriers, and especially ectoparasites, is one of the most important tasks [3].
The aim of this study was to investigate the effects of the powdered form of the Cypra 20% EC preparation against sheep ectoparasites and to determine its most effective concentration in sheep-breeding farms and household flocks located in the foothill regions of Tashkent province-specifically in the Ohangaron, Parkent, and irrigated Qibray districts.

2 Materials and methods

The scientific research was carried out between 2021 and 2024 at the Arachnoentomology and Acarology Laboratory of the Veterinary Research Institute, as well as in several sheep-breeding farms:
Kholturaev Oybek XM" farm in Ohangaron district, Tashkent region (with 2,300 sheep), "So'qoq To'rtko'l" farm in Parkent district (with 600 sheep), private households in "Iqtidor", "Chingeldi", "Alisherobod", and "Haydarobod" neighborhoods of Qibray district, and also in experimental animals Scientific Research Institute of the Veterinary a total of about 5,000 sheep.
In the above-mentioned farms, our research focused on studying the seasonal dynamics of ectoparasite distribution among sheep, the extent of infestation with ixodid ticks and bovicole lice, and the effectiveness of pyrethroid-based preparations against the pathogens of these diseases through experimental trials [2, 4].
Bioecological, phenological, parasitological, migration, sanitary-hygienic, therapeutic, prophylactic, economic, and other types of research were carried out using modern biomethodology and techniques commonly accepted in veterinary and medical sciences (E. Odum, A.N. Severtsov, V.N. Sukachev, K. Villi, Dete, Jaroslav Weiser, Herbert Ross, Paul De Bach, G.Ya. Bei-Bienko, V.A. Dogel, A.S. Monchadskiy, Yu.S. Balashov, V.N. Beklemishev, K.P. Andreev, N.I. Agrinskiy, V.V. Yakhontov, P.A. Petrishcheva, G.V. Gulyaev, A.A. Nepoklonov, E.B. Kerbabayev, S.D. Pavlov, A.R. Ruzimurodov, and others), as well as specialized manuals and identification guides (keys).
In recent years, anthropogenic impacts, anomalous natural phenomena, and technogenic pressures on nature have led to significant bioecological shifts and successions. As a result, the ratio between harmful and beneficial species in biocenoses (zootcenoses) has been disturbed (biological imbalance), leading to the emergence of atypical, persistent, mutant, resistant biopathogens, as well as new parasitic systems and populations (a new evolutionary state).
Consequently, the risk of re-emergence of extremely dangerous transmissible and natural focal diseases (such as plague, tularemia, Uzbekistan hemorrhagic fever, ephemeral fever, tick-borne encephalitis, leishmaniasis, and dozens of others) has increased.
To prevent such diseases, it is necessary to carry out disinsection and deacarization measures against the main "vector" carriers — blood-sucking (parasitic) insects (Insecta) and ticks (Ixodidae) - in a timely and planned manner.

Among animals, especially sheep, ticks belonging to the genera Rhipicephalus, Ixodes, Boophilus, Hyalomma, Dermacentor, and Haemaphysalis are most frequently found. Their faunistic composition varies somewhat depending on ecological stations — in some areas, certain species may be absent, or they may be dominant, subdominant, or rare in number. Therefore, studying the local ixodid fauna has significant parasitological and epizootological importance. The migration of ixodid ticks was studied using stationary and route inspection methods.

Stationary observations were conducted on specially selected livestock farms or at designated pastures (stations), Route inspections were carried out once a month during field visits to different farms.

Stationary inspections were performed every 7–10 days throughout the year. From each herd, 10–15 animals of various ages (including calves up to 5–6 months, heifers up to 18–20 months, and adult cows and bulls) were examined.

To determine the tick localization on the host, all parts of the animal's body were examined, and as many ticks as possible were collected. Ticks were mostly removed by hand or with tweezers. When infestations were heavy and complete removal was impossible, partial samples were taken from each topographic area, and the remaining ones were counted visually.

Collected ticks were preserved in 70% alcohol inside test tubes. Each sample was labeled with the sample number, farm name, location, date, animal species, age, and body part examined. Labels were handwritten with pencil or ink on white paper.

In the field notebook, the following data were recorded: time, animal species, sex, age, condition of the skin and wool, body condition (fatness), livestock housing conditions, total number of animals, sites of insect and tick infestation, locations of egg laying, and counts of eggs, larvae, and adults, air temperature and humidity in the barn, as well as outdoor conditions. Each animal's data were recorded separately.

Tick species were identified in the Arachnoentomology Laboratory using the identification keys and sources such as "Atlas of Ixodid Ticks" (Moscow: "Kolos", 1968), and identification manuals by I.M. Ganiev, A.A. Aliverdiev, and D.I. Blagoveshenskiy (1959). The identified species were stored in dry test tubes labeled with their scientific names.

Experimental Studies: Experiments were conducted first in laboratory conditions, then in livestock farm conditions.

a) Laboratory experiments: Ticks collected from animals were used. Various concentrations of the new preparation (0.0001–0.1%) were prepared and sprayed onto filter papers placed in Petri dishes until slightly moistened, or immersed for a few seconds. The volume applied per surface area (cm^2) was measured — usually 200 ml/m^2 for absorbent and 50–100 ml/m^2 for non-absorbent surfaces.

Ten freshly collected ticks were placed on the treated surface and kept there for 15 minutes, then transferred to clean containers and stored in a warm environment or thermostat. After 1, 3, 6, 12, and 24 hours, the numbers of dead and live ticks were counted, and the efficacy percentage was calculated.

For control samples, clean water was applied instead of the preparation. Based on the results, LC_0 (non-lethal concentration), LC_{50} (50% lethal concentration), and LC_{100} (100% lethal concentration) were determined. The speed of mortality was used to assess the potency and activity of the preparation.

The treated surfaces were checked daily during the first week, and then every 3–7 days until the insectoacaricidal effect ended (by re-exposing ticks).

b) Field (farm) experiments:

These were conducted directly on animals using the concentration that showed 100% efficacy in laboratory conditions. Preparations were tested in dry powder (dust) or liquid suspension/solution forms. Entire flocks or groups of 10–20 animals were treated. The liquid preparation was applied using sprayers (automax or similar equipment) — at doses of 0.5–1 L per lamb and 1–2 L per adult sheep, ensuring even coverage. Control animals infested with ticks were sprayed with clean water. Before and after treatment (on days 1, 2, 5, 7, 9, 12, etc.), the degree of infestation (II) by parasites in small ruminants was assessed and compared to determine the efficacy of the preparation. Highly persistent insectoacaricides (with long-lasting effects) are recommended for dry application, as they are cost-effective and should be safe and non-toxic.

3 Results

Experimental studies were conducted at the Arachnoentomology and Acarology Laboratory of the Veterinary Research Institute to investigate the insectoacaricidal properties of the Cypra EC preparation [4]. In laboratory conditions, the acaricidal effectiveness of different concentrations of the powder form of Cypra EC against ixodid ticks was studied, and the following results were obtained.

Before using the preparation on sheep, laboratory tests were carried out to determine its insecticidal efficacy against ixodid ticks. The experiments were performed as follows:

Experiment 1: Three Petri dishes were lined with filter paper, and 30 freshly collected ixodid ticks were placed on each. The Cypra EC 20% insecticidal powder was applied at a 0.05% concentration by dusting it through gauze onto the ticks in all three dishes. After 10 minutes, the treated ticks were transferred to clean Petri dishes and placed in a thermostat at +35°C. Observations were made at 1, 3, 6, and 24 hours after treatment.

Experiment 2: The same procedure as above was followed, except that the 0.01% powder form of Cypra EC 20% was tested.

Experiment 3: The same procedure as above was followed, except that the 0.02% powder form of Cypra EC 20% was tested.

Experiment 4: The same procedure as above was followed, except that the 0.03% powder form of Cypra EC 20% was tested.

Experiment 5: The same procedure as above was followed, except that the 0.04% powder form of Cypra EC 20% was tested.

Experiment 6: The same procedure as above was followed, except that the 0.05% powder form of Cypra EC 20% was tested.

Control group (Experiment 7): The same procedure was followed, but pure chalk powder was used instead of the preparation.

After 1, 3, 6, 12, and 24 hours, the numbers of dead and surviving ixodid ticks were recorded, and the efficacy rate (percentage) was calculated based on the number of dead ticks.

As a result, the following values were determined for the preparation:

LC_0 – non-lethal concentration,
LC_{50} – concentration lethal to 50% of ticks,
LC_{100} – concentration lethal to 100% of ticks.

Based on the number of dead and surviving ixodid ticks after 24 hours, the effective doses of the preparation were determined (see Table 1).

Table 1. Acaricidal Effect of the Powder Form of the CYPRA Preparation Against *Hyalomma* Genus Ticks Under Laboratory Conditions

No	Preparation Concentration (powder form, %)	Number of Treated Ticks (specimens)	Number of Dead Ticks After 24 Hours (specimens)	Efficacy (%)
1	0,01	30	9	30
2	0,02	30	12	40
3	0,025	30	15	50
4	0,03	30	24	80
5	0,04	30	27	90
6	0,05	30	30	100
	Control (treated with pure chalk powder)	30	0	0

In laboratory experiments, it was recorded that the powdered form of Cypra 20% EC at a 0.05% concentration demonstrated 100% acaricidal efficacy against ixodid ticks.

Figure 1. Infestation of sheep with *Rhipicephalus bursa* blood-sucking ticks

Figure 2. Laboratory process of identifying collected *Hyalomma anatolicum* tick samples

It should be noted that the powdered form of Cypra at a 0.05% concentration was proven to exhibit 100% acaricidal efficacy against ixodid ticks under laboratory conditions.

Based on the results of laboratory tests and experimental studies, the powdered form of Cypra that showed the highest effectiveness (0.05%) was further tested under field conditions against sheep ectoparasites in sheep-breeding farms and household flocks located in the Qibray, Parkent, and Ohangaron districts of Tashkent province.

Experiment 1. When 22 sheep from the "Haydarobod" neighborhood of Qibray district were examined, they were found to be infested with Hyalomma genus ticks and lice (Bovicola spp.) (Fig. 1). To combat these ectoparasites, experimental treatments were carried out using the powdered form of Cypra at a 0.05% concentration, applied through gauze dusting at a rate of 200-300 g per animal.

After 24–48 hours of treatment, all ixodid ticks and the larval and adult stages of Bovicola lice were found to be 100% eliminated. However, since the preparation did not affect Bovicola eggs, the treatment was repeated after 10 days. Upon examination 24 hours after the second treatment, B. ovis ectoparasites were also found to be completely eradicated (100%).

No adverse effects such as itching, restlessness, or behavioral changes were observed in the treated sheep. The insectoacaricidal efficacy of the 0.05% powdered form of Cypra was 100%.

Experiment 2. When 26 sheep from the "Alisherobod" neighborhood of Qibray district were examined, they were also found to be infested with Hyalomma ticks and Bovicola lice. The same treatment was applied using the 0.05% powdered form of Cypra at a rate of 200–300 g per animal through gauze dusting.

After 24–48 hours of treatment, both ixodid ticks and the larval and adult stages of Bovicola were completely destroyed (100% mortality). As in the previous case, the preparation did not affect lice eggs, so the procedure was repeated 10 days later. After 24 hours of the second treatment, B. ovis ectoparasites were also found to be 100% eradicated.

No negative reactions, itching, or restlessness were observed in the sheep. The insectoacaricidal effectiveness of the 0.05% powdered form of Cypra was again recorded as 100%.

Experiment 3. When 42 sheep from the "Kholturayev Oybek XM" sheep-breeding farm in the Ohangaron district of Tashkent province were examined, they were found to be heavily infested with ixodid ticks and Bovicola ovis ectoparasites. To combat these parasites, experimental treatments were carried out using the powdered form of Cypra at a 0.05% concentration, applied through gauze dusting at a rate of 200–300 g per animal.

After 24–48 hours of treatment, all ixodid ticks and the larval and adult stages of Bovicola were found to be 100% eliminated. However, since the preparation did not affect Bovicola eggs, the treatment was repeated after 10 days. Upon re-examination 24 hours after the second treatment, B. ovis ectoparasites were also found to be completely destroyed (100%).

No negative effects such as itching, irritation, or restlessness were observed in the treated sheep. The insectoacaricidal efficacy of the 0.05% powdered form of Cypra was 100%.

Experiment 4. When 56 sheep from the "So‘qoq To‘rtko‘l" farm in the Parkent district of Tashkent province were examined, they were found to be heavily infested with ticks belonging to the genera Hyalomma and Rhipicephalus (ixodidosis) as well as Bovicola ovis lice. The same treatment method was used - the powdered form of Cypra at a 0.05% concentration, applied through gauze dusting at 200–300 g per animal.

After 24–48 hours of treatment, all ixodid ticks and the larval and adult stages of Bovicola were found to be 100% eliminated. Since the preparation did not affect lice eggs, the treatment was repeated after 10 days. Upon examination 24 hours after the second treatment, B. ovis ectoparasites were also completely eradicated (100%).

No adverse reactions, itching, or restlessness were observed in the treated animals. The insectoacaricidal efficacy of the 0.05% powdered form of Cypra was recorded as 100% (see Table 2).

Table 2. Insectoacaricidal Efficacy of the 0.05% Powdered Form of Cypra 20% Preparation Against Ectoparasites

No.	Name of the farm where the experiment was conducted	Number of treated sheep (head)	Type of parasite	Amount of working powder (g/head)	Application method	Efficacy (%)
1.	"Haydarobod" neighborhood, Qibray district	22	*Rhipicephalus bursa, H.anatolicum*	200-300 g/head	Dusting	100
2.	"Alisherobod" neighborhood, Qibray district	26	*Rhipicephalus bursa, Bovicola ovis*	200-300 g/head	Dusting	100
3.	"Xolto‘rayev Oybek XM" Farm, Ohangaron District	42	*Rhipicephalus bursa, Bovicola ovis*	200-300 g/head	Dusting	100
4.	So‘qoq To‘rtko‘l" Farm, Parkent District	56	*Rhipicephlus bursa, Bovicola ovis*	200-300 g/head	Dusting	100
	Total (number of heads)	146				
5.	Control group — "Xolto‘rayev Oybek XM" Farm, Ohangaron District	10	*Rhipicephlus bursa, Bovicola ovis*	200-300 g/head (Pure chalk powder)	Dusting	0

From this table, it can be concluded that treating sheep infested with Rhipicephalus bursa, Hyalomma anatolicum, and Bovicola ovis ectoparasites with the powdered form

of the pyrethroid preparation Cypra 20% EC at a 0.05% concentration and a dosage of 200-300 g per animal through dusting resulted in 100% effectiveness.

4 Conclusion

1. It was established that sheep in sheep-breeding farms and household flocks of Tashkent province are more frequently infested with the Bovicola ovis ectoparasite—the causative agent of bovicolosis—during the winter and spring seasons compared to other times of the year. The infestation rate with Bovicola ovis reached its peak in January and February, with infection levels as high as 84–87%.

2. In the Arachnoentomology and Acarology Laboratory of the Veterinary Research Institute, the powdered forms of the insectoacaricidal preparation Cypra 20% EC at concentrations of 0.01%, 0.02%, 0.025%, 0.03%, 0.04%, and 0.05% were tested against ixodid ticks. Based on the number of ticks killed and those remaining alive 24 hours after treatment, the most effective dosage was determined. As a result, the 0.05% concentration was found to provide 100% efficacy against sheep ectoparasites.

3. The 0.05% powdered form of the pyrethroid preparation Cypra 20% EC, which demonstrated high efficacy under laboratory conditions, was also tested under production (field) conditions against ixodid ticks and lice infesting sheep. After 24–48 hours of treatment, all ixodid ticks and both larval and adult stages of Bovicola were found to be completely destroyed (100%). However, since the preparation did not affect Bovicola eggs, the treatment was repeated after 10 days. Examination 24 hours after the second treatment confirmed that B. ovis ectoparasites were also 100% eradicated.

No adverse reactions - such as itching, irritation, or restlessness—were observed in the treated animals.

Disclosure of Interests. The authors have no competing interests to declare that are relevant to the content of this article.

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