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ANALYSIS OF ANTIPARASITIC ACTIVITY OF WILD PLANTS OF EASTERN AND NORTHERN KAZAKHSTAN

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ABSTRACT

Various helminthoses and other parasitic infections are widespread among farm animals. Helminthic infections are typically treated with anthelmintic drugs; however, resistance to these drugs is becoming an increasingly serious problem. Investigating potential herbal antiparasitic agents, which are inexpensive and widely available, could be a promising alternative. Anthelmintic properties have been identified in oil, hydroalcoholic, and most aqueous extracts of *Filipendula vulgaris* Moench., *Pinus sylvestris*, *Picea abies* L., *Abies sibirica*, *Pinus sibirica* DuTour, *Juniperus communis* L., and *Paeonia anomala* L. from forest ecosystems in Eastern Kazakhstan, as well as in *Ferula tatarica* Fisch., *Pulsatilla uralensis* (Zămels) Tzvel., and *Serratula coronata* L. from ecosystems in Northern Kazakhstan. The greatest impact and fastest death of annelids were observed with alcohol tinctures, while aqueous extracts had the least effect. The best anthelmintic properties were found in the aqueous-alcoholic extracts of the underground part of *Pulsatilla uralensis* (Zămels) Tzvel. and the alcohol tincture of the aboveground part of *Serratula coronata* L. For the first time, the antiparasitic activity of both the aboveground and underground parts of *Pulsatilla uralensis* (Zămels) Tzvel., growing in Northern Kazakhstan, has been described

Keywords: antiparasitic activity, anthelmintic properties, coniferous trees, shrubs, herbaceous plants.

INTRODUCTION

Various helminthiases and other parasitic infections are widespread in farm animals [1]. Gastrointestinal parasitic diseases have become a major health issue, affecting billions of people and livestock worldwide, especially in developing countries. These diseases impact an estimated 3.5 billion people globally, with 450 million showing symptoms and over 200,000 deaths reported annually [2]. Gastrointestinal parasites in animals also create a significant disease burden and result in substantial economic losses in food production across many regions [3, 4].

Gastrointestinal helminths are a major cause of mortality and morbidity in ruminants, leading to high costs and production losses worldwide [5]. For instance, the annual cost of gastrointestinal nematode infections in Europe is estimated at €686 million [6]. One example of a gastrointestinal parasite affecting livestock is *Haemonchus contortus*, a highly virulent parasite of small ruminants in tropical, subtropical, and warm temperate regions [7, 8]. This parasite can cause ascites, weight loss, anemia, and death [9, 10, 11].

Protozoan parasites also pose a significant threat to the livestock industry, with *Cryptosporidium*, *Giardia*, and *Eimeria* species being among the most important. These infections affect a wide range of host animals worldwide, including cattle, sheep, goats, and pigs, leading to substantial growth and productivity losses [12]. Infected animals may exhibit clinical signs such as growth retardation, weight loss, decreased productivity, reduced appetite, dehydration, and diarrhea, which, in severe cases, can result in death [13, 14, 15, 16, 17, 18].

Helminthic infections are typically treated with anthelmintic drugs; however, resistance to these drugs is becoming an increasingly serious issue [1]. The growing evidence of multidrug resistance in these parasites, coupled with the adverse effects of currently available synthetic drugs, has spurred increased research into alternative treatments. The study of potential plant-based antiparasitic agents, which are inexpensive and widely available, presents a promising alternative [19].

Various plants, both medicinal and wild, are regularly analyzed for the presence of biologically active substances (BAS) with bactericidal, fungicidal, and helminthicidal properties. Coniferous plants, in particular, are well-known for their beneficial properties and effective BAS.

Coniferous trees contain a diverse range of biologically active substances in their bark, needles, and seeds. Among conifers, the Siberian fir is particularly noted for its medicinal properties and is a significant source of various phytochemicals with pharmacological importance. The pharmacological uses of fir include several effects, such as anthelmintic properties, especially when combined with other non-pharmacological applications [20]. Concentrated tannins in feed have been reported to reduce the helminth load in small ruminants. Bark extracts from pine (*Pinus sylvestris* L.), spruce (*Picea abies* L.), and birch (*Betula pubescens*) are good sources of tannins in cold climates [1]. Additionally, the seeds of Siberian pine or cedar pine (*P. sibirica*), commonly known as pine nuts, are valued for their medicinal properties due to the presence of both lipophilic and hydrophilic biologically active substances [21].

Shrubs, including coniferous ones, also offer valuable medicinal properties. For example, the needles of Siberian juniper (*Juniperus sibirica* L.) contain ADP, lignin, cellulose, lignin/cellulose, lipids, phenolic compounds, proanthocyanidins, flavonoids, and essential minerals such as N, C, Ca, Mg, K, Mn, Zn, P, S, Al, and Fe [22], as well as sabinene [23, 24], which have antioxidant, anti-inflammatory, and antimicrobial effects [25, 26].

Flowering plants also exhibit a wide range of biologically active substances. *Meadowsweet* (*Filipendula ulmaria*) is traditionally used for treating fever, pain, inflammatory diseases (such as arthrosis, rheumatism, and arthritis), gastric disorders, liver dysfunction, and gout. Phytochemical studies reveal several active compounds in *F. ulmaria*, including phenolic acids, flavonoids, tannins, terpenoids, and salicylic acid and its derivatives, which contribute to its diverse therapeutic activities [27].

Paeonia anomala L., a member of the Paeoniaceae family, is found in Asia, Europe, and western North America. Over 180 compounds have been isolated from nine species within the *Paeonia* genus, including terpenes, phenols, flavonoids, essential oils, and tannins. The rich phytochemical composition and bioactivity of peony, particularly due to its polyphenols and flavonoids, have been well-documented [28]. There are known differences in the content of biologically active substances between the above-ground and underground parts of plant shoots. Traditional healers and medicinal plant reference books often specify which part of the plant should be used to obtain a higher concentration of biologically active substances or the most effective components.

In *Serratula coronata* L., cultivated in Siberia, at least 14 phenolic compounds (7.3%) have been identified, including quercetin, which is highly effective in treating cerebral edema, gout, and cardiovascular diseases due to its angioprotective properties [29, 30]. The biocomponents of *Serratula coronata* L. have also proven effective in treating and preventing various skin diseases, particularly psoriasis [31, 32].

Several studies have explored the antiparasitic properties of *Ferula assa-foetida*, including its activity against *Trichomonas vaginalis* [33], *Schistosoma mansoni* [34], *Strongylus* spp. [35], *Fasciola hepatica*, and *Dicrocoelium dendriticum* [36]. Aqueous extracts of *Ferula foetida* resin were tested for anthelmintic activity against *Pheretima posthuma*, with three concentrations (25, 50, and 100 mg/ml) evaluated. The extract exhibited significant anthelmintic activity at 100 mg/ml, proving more effective than the drug Piperazine citrate [37].

The herb and roots of *Pulsatilla* species, or pasqueflower, are widely used for various therapeutic purposes. The extract from the leaves of *Pulsatilla pratensis* has strong bactericidal and fungicidal effects, provides sedation, and is used in both folk and veterinary medicine as a sedative, sleep aid, analgesic, expectorant, and liver function stimulant [38].

Studying the current state of forest plants in Kazakhstan is crucial for assessing their species diversity and resource potential. Given the increasing problem of parasite resistance to conventional anthelmintic drugs, developing herbal antiparasitic treatments from domestic raw materials is highly relevant. Therefore, investigating the anthelmintic effects of biologically active substances from wild forest plants in Kazakhstan seems particularly timely.

The aim of the research was to investigate the antiparasitic activity of wild medicinal plants, including both conifers and herbaceous perennials, to evaluate their pharmaceutical potential.

2. MATERIAL AND METHODS

he material for the study comprised 10 plant samples collected during the 2020 expedition. Samples of Scots pine (*Pinus sylvestris*), Norway spruce (*Picea abies* L.), Siberian fir (*Abies sibirica*), Siberian cedar pine (*Pinus sibirica* DuTour), common juniper (*Juniperus communis* L.), peony (*Paeonia anomala* L.), and meadowsweet (*Filipendula vulgaris* Moench) were collected from the forest ecosystems of the mountainous region in the Kazakhstan part of Altai. Additionally, samples of *Ferula tatarica* Fisch., *Pulsatilla uralensis* (Zămels) Tzvel., and *Serratula coronata* L. were gathered from forested areas in Northern Kazakhstan.

During sample collection, the coordinates of each site were recorded, geobotanical descriptions were made, and species were identified using established plant identification guides [39, 40].

The biological activity of the extracts was analyzed at the Research Platform for Agricultural Biotechnology of the S. Seifullin Kazakh Agrotechnical Research University. The plant samples were dried to an air-dry state on shelves indoors. Averaged samples were prepared by grinding both the above-ground and underground parts and thoroughly mixing them. From these averaged plant samples, oil, alcohol, and water extracts were prepared following the State Pharmacopoeia of the Republic of Kazakhstan (2008) [41].

Infusions and tinctures were allowed to infuse for 2 weeks in a dark place, while decoctions were prepared immediately before use. Sterilizing filtration of the preparations was performed using filters with a pore diameter of 0.45 µm. The extracts were stored at 2-8°C in a household refrigerator for no more than three days.

The anthelmintic activity of the plant materials was assessed using a modified technique on annelids – specifically, ringed worms (*Lumbricus terrestris*), which served as the test objects. Observations of worm behavior in Petri dishes containing solid nutrient medium with wells filled with the extracts were conducted at 3, 6, and 12 hours on the first day, and every 8 hours over the next two days. A corresponding extractant served as the negative control, and a solution of piperazine citrate (20 mg/100 ml) was used as the positive control.

The presence of anthelmintic effects was evaluated based on the following criteria: natural behavior of the worms, their tendency to approach or move away from the wells, death within a certain period, the presence and intensity of decomposition odor if death occurred, and the presence and intensity of hemolysis. Each criterion was recorded with the following notation: +++ for pronounced effect, ++ for moderate effect, + for slight effect, and – for no effect. Based on the results, the total number of "+" signs were calculated, and points were assigned [42]. The results were interpreted using standard statistical methods.

3. RESULTS

The results of the study on the antiparasitic properties of plant extracts from coniferous trees are presented in Figure 1.

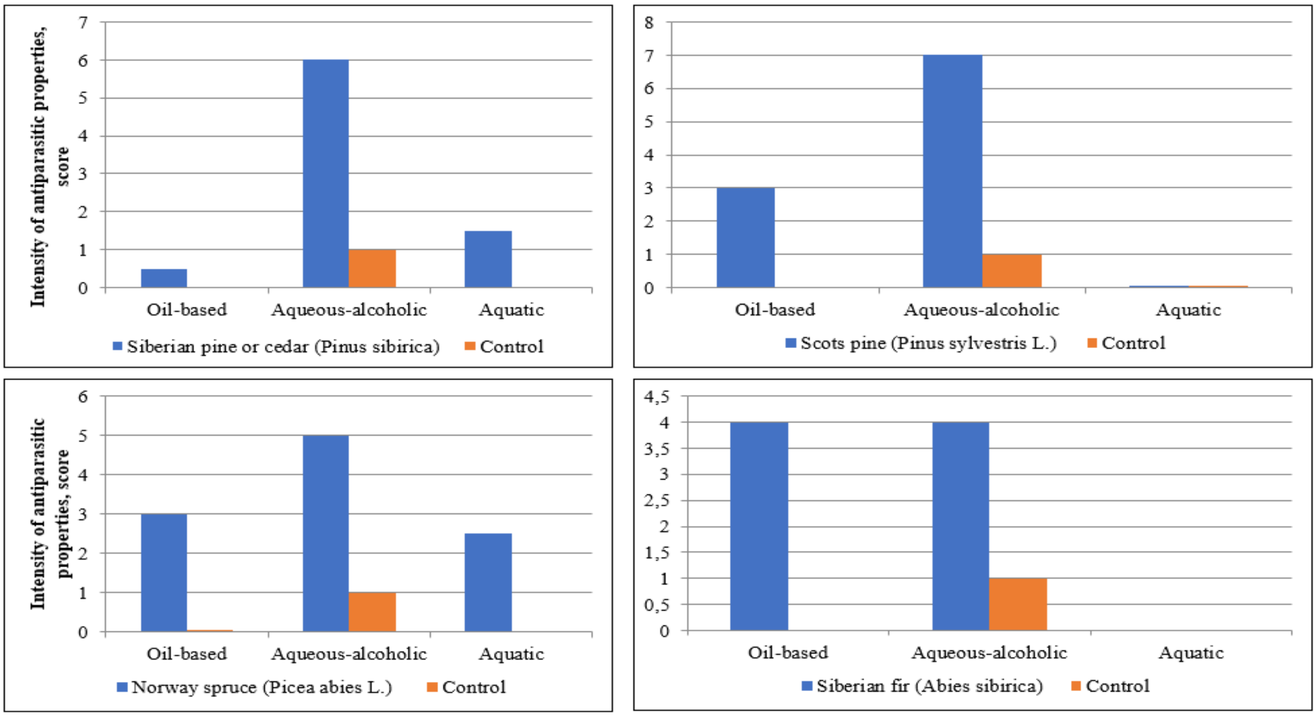

Figure 1 – Intensity of anthelmintic properties of various coniferous tree extracts.

The data indicate that plant extracts from wild coniferous forest trees exhibit antiparasitic properties. Among the extracts, alcohol tinctures from Scots pine and Siberian pine (cedar pine) demonstrated the most significant antiparasitic effects. Conversely, Siberian fir showed the least pronounced antiparasitic properties. Of the oil extracts, Siberian fir was the most effective against *Lumbricus terrestris*. Norway spruce and Scots pine extracts exhibited moderate effectiveness, while cedar pine had minimal antiparasitic impact.

Among the aqueous solutions, Scots spruce and cedar pine extracts showed a weak effect on worms, while aqueous extracts of Scots pine and Siberian fir had no impact on the behavior of *Lumbricus terrestris*. Additionally, extracts of various chemical natures obtained from coniferous shrubs, including juniper, also displayed varying degrees of antiparasitic activity (Figure 2).

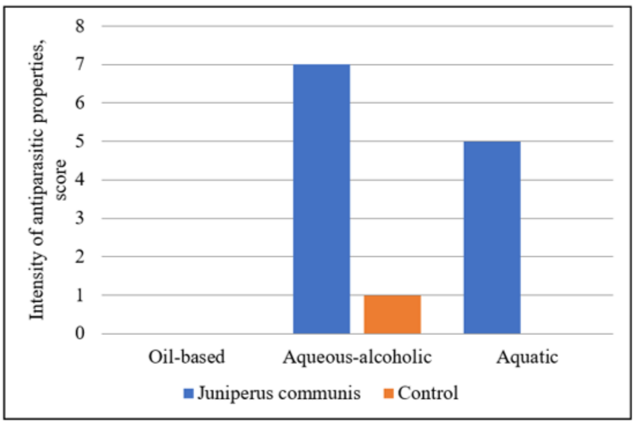

Figure 2 – Intensity of anthelmintic properties of various extracts of *Juniperus communis* L. (common juniper).

The results for plant extracts of common juniper show that alcohol tinctures and water extracts were the most effective, while the oil extract of common juniper had no effect on the behavior of *Lumbricus terrestris*.

The antiparasitic properties of herbaceous plant extracts from *Paeonia anomala* L. (peony) and common meadowsweet (*Filipendula vulgaris*) are presented in Figure 3.

The data on the antiparasitic properties of peony extracts indicate that alcohol tinctures produced the best results. These tinctures caused convulsions, a tendency for worms to move away from the wells, and rapid death. Hemolysis and rapid decomposition were observed post-mortem. Peony oil extracts also showed a marked effect, causing hemolysis and rapid decomposition. In contrast, water infusions of peony did not affect earthworms.

Meadowsweet preparations, despite their relatively weak anthelmintic effect, demonstrated specific activity, leading to worm mortality by the end of the third day. Both oil and alcohol extracts of meadowsweet exhibited similar levels of anthelmintic activity, while the water extract was twice as effective as the water infusion of peony.

The anthelmintic properties of extracts from the above-ground and underground parts of *Pulsatilla uralensis* (Zămels) Tzvel. (yellow pasqueflower), *Ferula tatarica* Fisch. ex Spreng (Tatar ferula), and *Serratula coronata* L. (crowned sickleweed) on *Lumbricus terrestris* are presented in Figure 4.

As shown in the diagram, the best anthelmintic properties were demonstrated by the extracts from the underground parts of the analyzed plants. Among these, the aqueous-alcoholic extracts of both the above-ground and underground parts of *Pulsatilla uralensis* (Zămels) Tzvel. (yellow pasqueflower) were more effective than the oil and water extracts. Notably, the alcoholic tincture of the above-ground part of *Serratula coronata* L. (crowned sickleweed), along with the aqueous-alcoholic extract of the underground part of *Pulsatilla uralensis*, exhibited some of the highest antiparasitic effects, leading to very rapid death of the worms.

The intensity of these antiparasitic properties was especially pronounced, even in the presence of a positive control

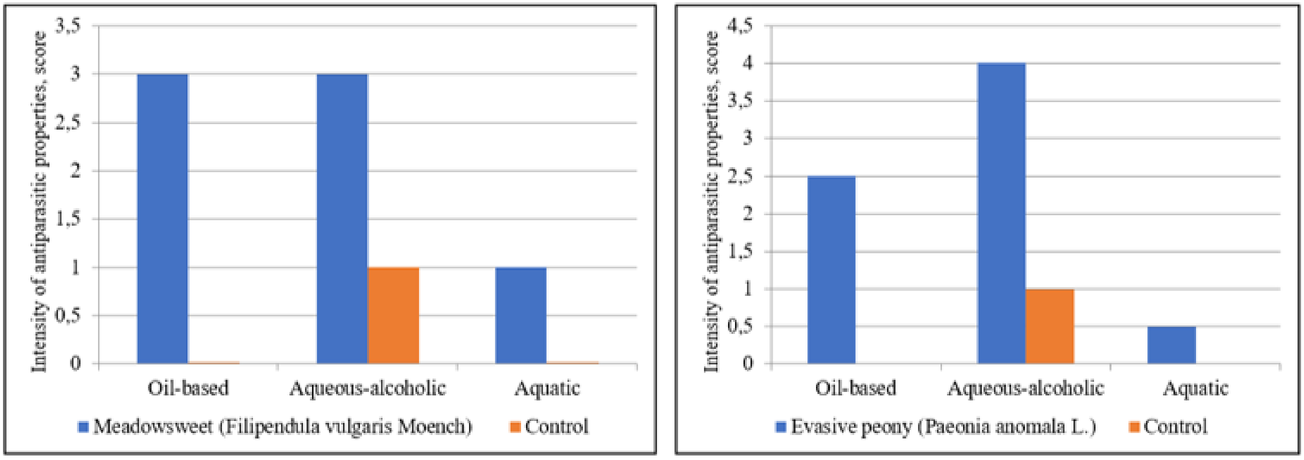

Figure 3 – Intensity of anthelmintic properties of various extracts of *Paeonia anomala* L. (peony) and *Filipendula vulgaris* Moench. (meadowsweet).

(an aqueous solution of ethyl alcohol). Oil extracts of *Serratula coronata* also demonstrated a significant antiparasitic effect, with worms dying within 6 hours of initial observation. In contrast, aqueous extracts from both the above-ground and underground parts of *Serratula coronata* showed no antiparasitic activity.

All extracts of *Ferula tatarica* Fisch. ex Spreng exhibited minimal impact on the behavior of *Lumbricus terrestris*, although they did cause worm mortality. The most pronounced effect and rapid death of annelids were achieved with alcohol tinctures, while oil extracts were less effective.

4. DISCUSSION

From the analysis of available literature, it is evident that several plants exhibit antiparasitic and anthelmintic properties. For example, extracts from the bark of various tree species, including pine (*Pinus sylvestris* L.), spruce (*Picea abies* L.), and birch (*Betula pubescens*), have been tested for their anthelmintic efficacy against the infectious nematode of sheep, *Teladorsagia circumcincta*. These studies demonstrated the anthelmintic activity of both aqueous and acetone extracts of these tree barks through two independent in vitro assays: egg hatching and larval motility assays [1].

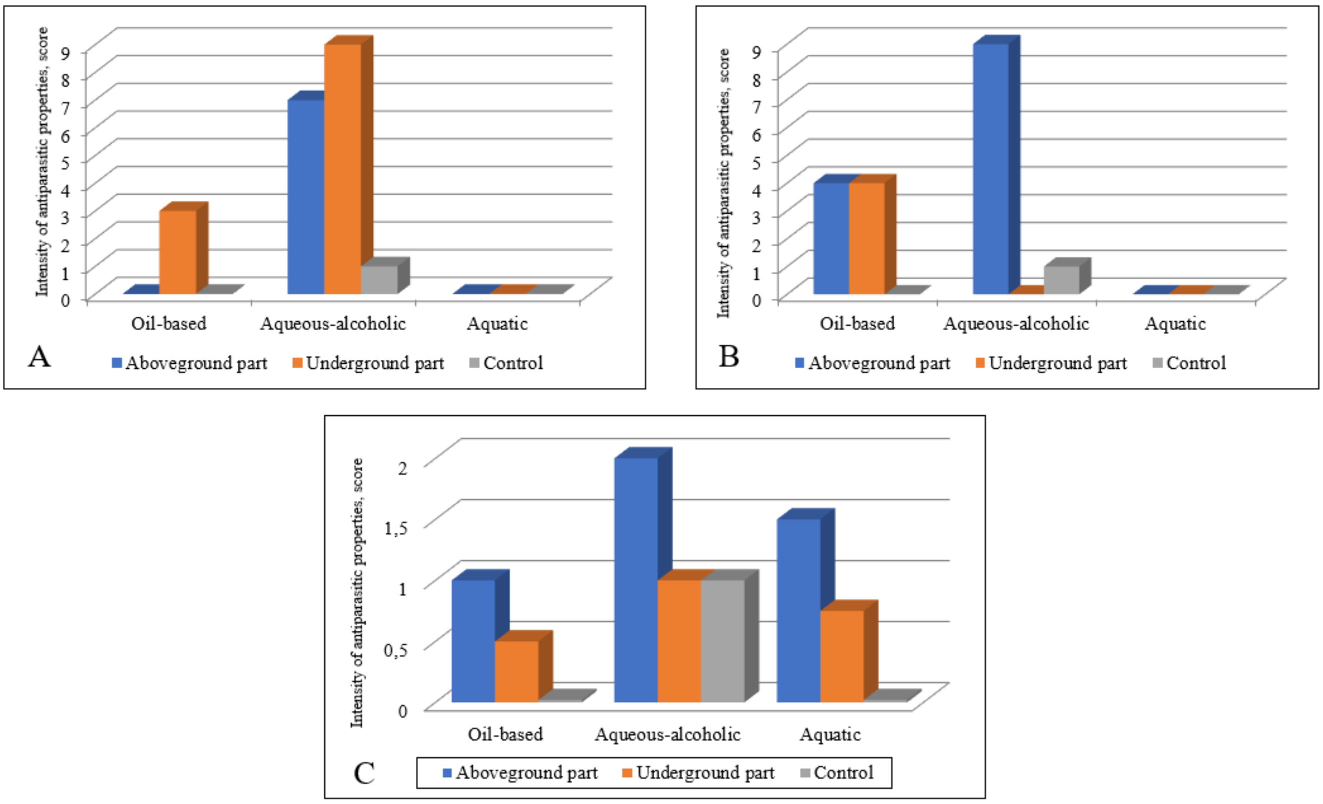

Figure 4 – Intensity of anthelmintic properties of various extracts from the above-ground and underground parts of herbaceous plants: A - Yellow pasqueflower (*Pulsatilla uralensis* (Zămels) Tzvel.), B - Crowned sickleweed (*Serratula coronata* L.), C - Tatarian ferula (*Ferula tatarica* Fisch. ex Spreng).

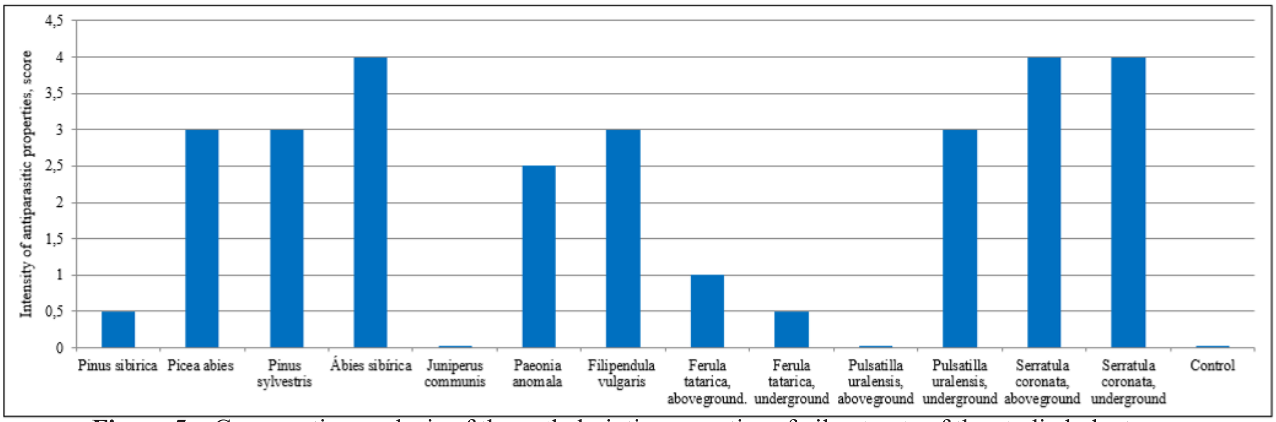

Figure 5 – Comparative analysis of the anthelmintic properties of oil extracts of the studied plants.

Siberian fir is noted for its anthelmintic properties, among other effects, in combination with other non-pharmacological uses [20]. Siberian juniper (*Juniperus sibirica* L.), when used as a decoction, is recommended for rheumatism and arthritis, while an infusion is suggested for neuroses, liver, and kidney diseases [21]. Essential oils from Siberian juniper needles have demonstrated antibacterial properties and a bacteriostatic effect against certain gram-negative bacteria [43], though an anthelmintic effect has not been described.

Pharmacological assessments of *Filipendula ulmaria* (meadowsweet) have highlighted its anticoagulant, antiarthritic, analgesic, anti-inflammatory, antioxidant, anticancer, antimicrobial, immunomodulatory, gastroprotective, and hepatoprotective activities [29]. The presence of anthelmintic action has been noted for phenolic compounds from *Filipendula ulmaria*, as well as from *Agrimonia spp.* (burdock) and *Crataegus spp.* (hawthorn) [44].

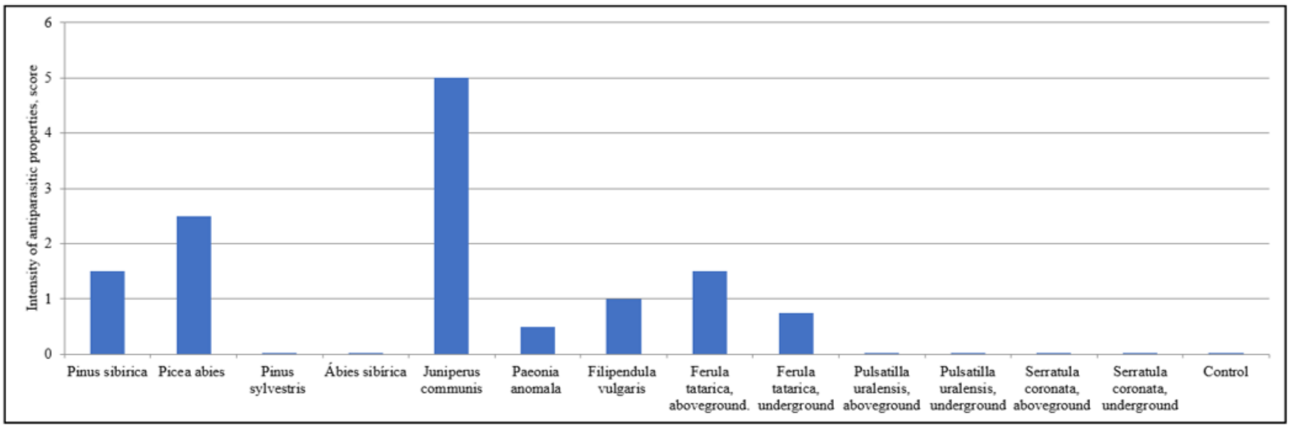

Figure 6 – Comparative analysis of the anthelmintic properties of aqueous extracts of the studied plants.

Paeonia anomala L. exhibits a range of pharmacological activities, including antibacterial, antifungal, anticoagulant, inhibitory, phytotoxic, and insecticidal effects, along with lipoxygenase and beta-glucuronidase activities, and radical scavenging activity [45]. However, the anthelmintic effects of Kazakhstani populations of *Paeonia anomala* have not been described.

The active components of *Serratula coronata* L. extracts are known to exhibit various biological effects, including antiparasitic properties [46]. The anthelmintic effects of *Ferula assa-foetida* extracts against *Fasciola hepatica* and *Dicrocoelium dendriticum* were confirmed through in vitro assays and scanning electron microscopy (SEM). SEM images of *F. assa-foetida* extract (200 µg/ml) treated worms showed excessive damage, including the complete loss of sensory papillae and destruction of discernible network structures and tegument vesicles. Increased time and concentration led to higher mortality rates among trematodes, confirming the anthelmintic properties of *F. assa-foetida* [36].

Pulsatilla pratensis is known for its anti-inflammatory, antibacterial, antifungal, antimicrobial, antimalarial, and antitumor properties. However, data on the composition and biological properties of *Pulsatilla uralensis* growing in Kazakhstan are limited and focus mainly on the antimicrobial properties of its essential oils [38, 47]. Our analysis shows that almost all studied oil extracts of wild plants negatively affect the vitality of annelids, specifically *Lumbricus terrestris*, used as the test object (Figure 5).

According to Figure 5, nearly all oil extracts from the studied plants demonstrate significant antiparasitic activity. Exceptions include the oil extracts of Siberian pine (*Pinus sibirica*), Tatar ferula (*Ferula tatarica*, underground part), and yellow pasqueflower (*Pulsatilla uralensis*, aerial part), which show minimal antiparasitic effects. In comparison, the water extracts of the studied plants exhibit a less pronounced antiparasitic effect on the behavior of *Lumbricus terrestris* (Figure 6).

As shown in Figure 6, the aqueous extract of common juniper demonstrated notable antiparasitic activity. In contrast, the aqueous extracts of Siberian pine, common spruce, peony, meadowsweet, and both aboveground and under-

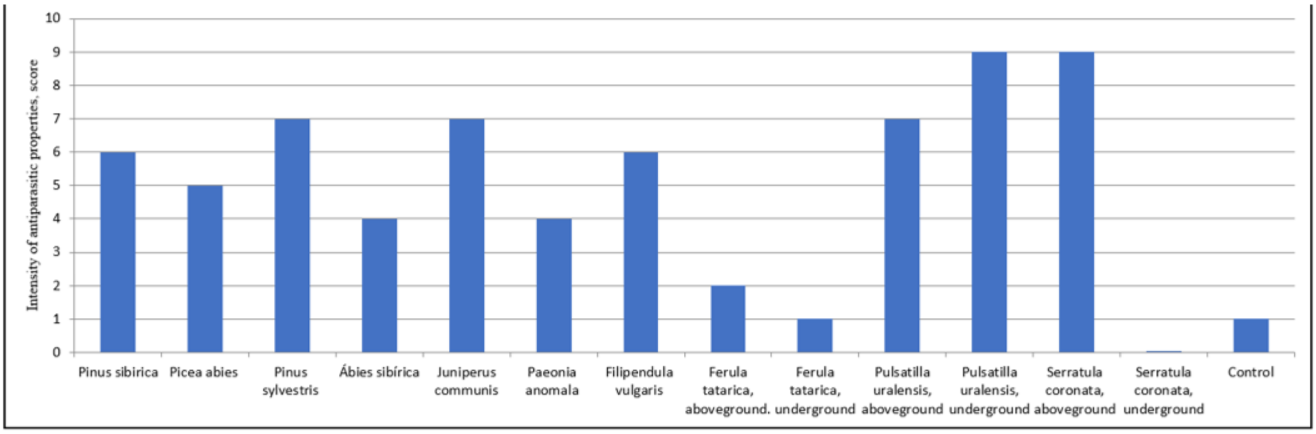

Figure 7 – Comparative analysis of the anthelmintic properties of aqueous-alcoholic extracts of the studied plants.

ground parts of *Ferula tatarica* exhibited only weak activity. The remaining aqueous extracts showed no antiparasitic activity.

Among all the wild plant preparations studied, aqueous-alcoholic extracts exhibited the best antiparasitic activity. Specifically, the aqueous-alcoholic extracts from the aboveground vegetative organs of *Serratula coronata L.* and the underground vegetative organs of *Pulsatilla uralensis* (Zămels) Tzvel. showed the most pronounced antiparasitic effects. These extracts caused convulsions, paralysis, and nearly instantaneous death of *Lumbricus terrestris* in Petri dishes. The antiparasitic effects of extracts from *Pinus sylvestris*, *Juniperus communis*, and the aerial parts of *Pulsatilla uralensis* were somewhat weaker (Figure 7).

Figure 7 shows that alcoholic extracts of *Ferula tatarica* and the underground parts of *Serratula coronata* exhibited minimal antiparasitic activity. The remaining aqueous-alcoholic tinctures produced average results, with their effects manifesting in the death of *Lumbricus terrestris* by the second day.

These findings are inconsistent with reports by Ramadan N.I. et al. (2004), Tavassoli M. et al. (2018), Gundamaraju R. (2013), and others, who identified pronounced anthelmintic properties in various species of *Ferula* (e.g., *Ferula asafetida*, *Ferula foetida*) [33-37]. This discrepancy may be attributed to regional climatic conditions or other factors, warranting further investigation.

From the data, it is evident that the most effective antiparasitic activity was observed in alcohol tinctures from the following plants: *Pulsatilla uralensis* (both aerial parts and roots), *Serratula coronata* (aerial parts), *Pinus sylvestris*, and *Juniperus communis*. Among aqueous solutions, *Juniperus communis* demonstrated a notable antiparasitic effect, whereas *Picea abies* exhibited weaker activity. In oil extracts, *Ábies sibírica* and *Serratula coronata* (both aerial and underground parts) were the most effective.

These findings align with previous studies indicating anthelmintic and antiparasitic properties in similar plant extracts [1, 34, 37-41]. Plants collected from the Altai Botanical Garden (Ridder) and the mountain forests of Western Altai in Eastern Kazakhstan displayed anthelmintic activity, though not as pronounced as those from Northern Kazakhstan.

Particularly noteworthy is the antiparasitic activity of *Pulsatilla uralensis* against *Lumbricus terrestris*, which is reported here for the first time. The pronounced biological activity observed in these plant extracts suggests their potential for use in developing domestic plant-based remedies for parasitic diseases.

CONCLUSION

Anthelmintic Properties: Anthelmintic properties were identified in oil, water-alcohol, and most water extracts of *Filipendula vulgaris* Moench., *Pinus sylvestris*, *Picea abies* L., *Ábies sibírica*, *Pinus sibirica* DuTour, *Juniperus communis* L., and *Paeonia anomala* L. from forest ecosystems of Eastern Kazakhstan. Additionally, *Ferula tatarica* Fisch., *Pulsatilla uralensis* (Zămels) Tzvel., and *Serratula coronata* L. from Northern Kazakhstan ecosystems also exhibited anthelmintic properties. Alcohol tinctures demonstrated the greatest impact, causing rapid death in annelids, whereas water extracts were the least effective.

Most Effective Extracts: The most effective anthelmintic properties were observed in aqueous-alcoholic extracts of the underground parts of *Pulsatilla uralensis* (Zămels) Tzvel., and alcohol tinctures of the aboveground parts of *Serratula coronata* L., which exhibited some of the highest levels of antiparasitic activity.

Novel Findings: The antiparasitic activity of both the aboveground and underground parts of *Pulsatilla uralensis* (Zămels) Tzvel., from Northern Kazakhstan, is reported here for the first time.

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CONFLICT OF INTEREST

There are no conflicts of interest to declare.

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АНАЛИЗ АНТИПАРАЗИТАРНОЙ АКТИВНОСТИ ДИКОРАСТУЩИХ РАСТЕНИЙ ВОСТОЧНОГО И СЕВЕРНОГО КАЗАХСТАНА

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АБСТРАКТ

Различные гельминтозы и иные паразитарные инфекции широко распространены среди поголовья сельскохозяйственных животных. Гельминтозная инфекция обычно лечится антигельминтными препаратами, но резистентность к антигельминтным препаратам становится все более серьезной проблемой. Изучение потенциальных растительных противопаразитарных средств, которые недороги и широко распространены, может быть многообещающей альтернативой. Установлено наличие антигельминтных свойств у масляных, водно-спиртовых и большинства водных экстрактов *Filipendula vulgaris* Moench., *Pinus sylvestris*, *Picea abies* L., Ábies sibírica, *Pinus sibirica* DuTour, *Juniperus communis* L., *Paeonia anomala* L. с лесных экосистем Восточного Казахстана; *Ferula tatarica* Fisch., *Pulsatilla uralensis* (Zămels) Tzvel., (*Serratula coronata* L. из экосистем Северного Казахстана. Наибольшее влияние и быструю гибель аннелид вызывали спиртовые настойки, наименьшее – водные экстракты. Лучшими антигельминтными свойствами отличались **водно-спиртовые экстракты подземной части Прострела желтеющего** (*Pulsatilla uralensis* (Zămels) Tzvel.), спиртовая настойка надземной части Серпухи венценосной (*Serratula coronata* L.). Впервые описана противопаразитарная активность надземной и подземной части Прострела желтеющего (*Pulsatilla uralensis* (Zămels) Tzvel.), произрастащего в экосистемах Северного Казахстана.

Ключевые слова: антипаразитарная активность, антигельминтные свойства, хвойные деревья, кустарники, травянистые растения

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ШЫҒЫС ЖӘНЕ СОЛТҮСТІК ҚАЗАҚСТАНДАҒЫ ЖАБАЙЫ ӨСІМДІКТЕРДІҢ ПАРАЗИТТЕРГЕ ҚАРСЫ БЕЛСЕНДІЛІГІН ТАЛДАУ

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АҢДАТПА

Ауыл шаруашылығы жануарлары арасында әртүрлі гельминтоздар және басқа паразиттік инфекциялар кең таралған. Жүрек құртының инфекциясы әдетте антигельминтикалық препараттармен емделеді, бірақ антигельминтикалық препараттарға төзімділік барған сайын күрделі мәселе болып табылады. Қымбат емес және кеңінен қол жетімді әлеуетті шөпке қарсы антипаразиттік агенттерді зерттеу перспективалы балама болуы мүмкін. Антельминтикалық қасиеттердің болуы *Filipendula vulgaris Moench., Pinus sylvestris, Picea abies L., Ábies sibírica, Pinus sibirica DuTour, Juniperus communis L., Paeonia anomala L. e*. Шығыс Қазақстан; *Ferula tatarica Fisch., Pulsatilla uralensis* (Zămels) Tzvel., (*Serratula coronata L*. Солтүстік Қазақстан экожүйелерінен. Анелидтердің ең үлкен әсері және тез өлуі алкоголь тұнбаларымен, ең азы - сулы сығындылармен болды. Ең жақсы антигельминтикалық қасиеттері сарғыш лумбагоның (*Pulsatilla uralensis* (Zămels) Tzvel.) жер асты бөлігінің сулы-спирттік сығындыларымен және тәжді серпуханың (*Serratula coronata* L.) әуе бөлігінің спиртті тұнбаларымен ерекшеленді. Алғаш рет Солтүстік Қазақстанның экожүйесінде өсетін сарғыш любагоның (*Pulsatilla uralensis* (Zămels) Tzvel.) жер үсті және жер асты бөліктерінің паразитке қарсы әрекеті сипатталды.

Түйін сөздер: паразиттерге қарсы белсенділігі, антигельминтикалық қасиеттері, қылқан жапырақты ағаштар, бұталар, шөптесін өсімдіктер.