

ЕКОЛОГІЧНІ ТА ЕПІДЕМІОЛОГІЧНІ АСПЕКТИ ПОШИРЕННЯ ПОПУЛЯЦІЙ ПТАШИНОГО ЧЕРВОНОГО КЛІЩА

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The poultry red mites are blood-sucking parasites which belong to Parasitiformes mites. The most famous representatives of them are in the poultry industry. Action of this parasite adversely affects the health of chickens, by sucking blood and ability to carry different kinds of diseases. This facultative parasite which comes hunting at night and during the day can hide out in the slits and nest of chickens. However, other countries are increasingly Dermanyssus gallinae receiving complaints attendants poultry farms dermatological nature, so the poultry red mite becomes wider significance.

The objective of our work is to investigate the impact and spread of *D. gallinae* infestation on poultry enterprises in Ukraine and make analysis of data of the European Union which is the most common that blood-sucking parasite. Determine the action and value this ectoparasite.

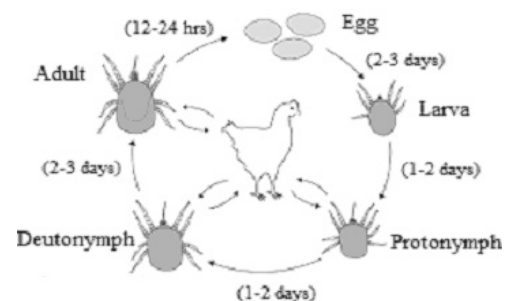
Materials and methods. The methodological basis of our research is general theoretic methods of scientific knowledge, systematically-structural and abstractly-logical analysis.

Research results. The blood-sucking parasites, including an order Mesostigmata or Gamasida and into which the *Dermanyssus gallinae*, representing a significant biological threat to industrial and private poultry. Characteristic features of the populations of red poultry mite is their genetic plasticity, resistance, adaptation to different conditions, the ability to consume on blood. The life

cycle of hematophagy can make under optimal conditions only 6 days, adult mite can live without food (out of birds) 5-10 months [1].

The mite *D. gallinae* is harmful and causes a threat to egg laying hens in many parts of the world including the US, Europe, Japan and China [2]. Analyzing the data spread, red poultry mite, in the past decade to 11 countries of the European Union, can be concluded that every year the number of population in *D. gallinae* on poultry enterprises for obtaining egg products is growing rapid-

Figure 1
Life cycle of *Dermanyssus gallinae*. Eggs are laid in clutches (4–8 eggs) in refugia where larvae may remain without feeding prior to their first moult. Each female may lay up to eight clutches of eggs in-between feeding bouts, typically laying around 30–50 eggs in a lifetime. Image adapted from Maurer [24].



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Мета роботи – дослідити вплив та поширення інвазії пташиного червоного кліща на птахопідприємствах України та зробити аналіз даних країн Європейського Союзу, в яких найбільш поширений цей кровосисний паразит. З'ясувати дію та значення цього паразита.

Матеріали та методи досліджень. Методологічною основою нашого дослідження є загальнотеоретичні методи наукового пізнання, системно-структурний та абстрактно-логічний аналізи.

Результати. Показано негативний вплив *Dermanyssus gallinae* на виробництво птахопродукції, передусім яєць. У країнах ЄС за останні десятиріччя виявлено високий відсоток поширення паразита завдяки його високим адаптивним властивостям, резистентності до акарицидів, швидкому життєвому циклу в умовах високих

оптимальних температур та можливості довго існувати без джерела живлення (до 10 місяців). З'ясовано, що паразит може потрапляти на птахогосподарства за допомогою синантропної птиці. Кліщі здатні переносити збудники небезпечних інфекцій та вірусів, викликаючи трансмісивні та інвазійні захворювання. Це все завдає економічних збитків птахопідприємствам через зростання смертності поголів'я (зниження ваги та анемія) та значного зменшення яйценосності та якості яєць у курей-несучок. Відповідні наслідки призводять до значних фінансових втрат для знешкодження популяцій паразита, дезінфекції приміщень та лікування птиці. Також показаний згубний вплив *D. gallinae* і на організм людини, що викликає хвороби шкіри (свербіж та дерматити). Таким чином, виникає необхідність досліджувати популяції кліщів з метою запобігання їх нападів на працівників птахогосподарств та для екологічно безпечного вирішення цієї проблеми.
Ключові слова: пташиний червоний кліщ, трансмісивні хвороби, інвазійні хвороби, паразитизм, вплив на людину, екологічні особливості.

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ly (Fig. 2). Nearly 83% of EU egg poultry farms area affected by chicken mite [3, 1].

Economic losses from parasites account for 0,29 ₺ on the hen as a result of lower production per-

tion have been analyzed and generalized on most widespread bacterial and viral pathogens associated with *D. gallinae*. For example, a survey of British farms, published in 2004., indicated that 60% of invasion red

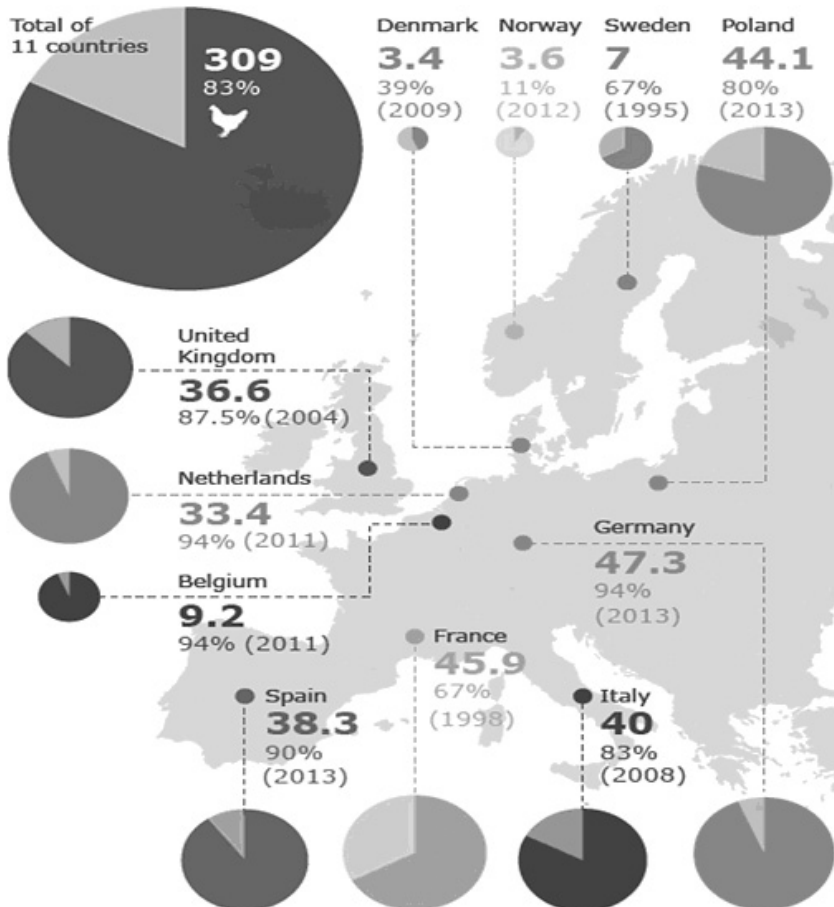
mites have undergone the acaricidal resistance [8] and figures worsen later [9]. Foreign researchers also pointed out that the development of resistance to acaricides makes control of populations *D. gallinae* complicated. The most resistant countries to acaricides pest is i.e. United Kingdom [10, 11], Sweden [12], France [13] and Italy [14]. The table below listed the most common bacterial and viral pathogens associated with *D. gallinae*.

The main disease that causes red poultry mites called dermanisioz - invasive disease of poultry, synantropic and wild birds all sex and age structures, with acute or chronic course [15]. It is characterized by anemia, reduced productivity, exhaustion and death of birds, especially young animals under three months [16]. The disease is recorded everywhere including Ukraine and can cause serious economic losses in poultry industry.

Gamasid mites can inflict harm not only to animals but also people and their bites cause itching of and to transfer various diseases. More cases of gamasid mites which cause a threat to the people, usually were registered in the XVII century and documented in a leading medical literature since 1920 [17] and reviewed over the last 15 years [18].

Table 2 generalized information about gamasid mites as vectors of human diseases and partly as vectors of diseases of various animals. These data may help researchers navigate the search of carriers in studying of new or little-known disease.

Figure 2
Number of laying hens per country in millions (2012) and the percentages of farms infested by *Dermanyssus gallinae*. Image reproduced from Mul; ©Wageningen UR Livestock Research



formance indicators and ₺ 0,14 have to be spend per the bird for treatment of red mites. In the EU scale this figure is ₺ 130 million annually [4].

The most dangerous is that *D. Gallinae* serves as a carrier of pathogens of transmissible and invasive diseases. Gamasid mites can carry almost all groups of disease agents (viruses, rickettsiae, bacteria, spirochetes), single-celled organisms (Haemosporidia, Haemogregarina, flagellates) and act as intermediate hosts of same parasitic worms, is the bearer of many pathogens of diseases such as mycoplasmosis, pasteurellosis, borreliosis, psittacosis, cholera and plague poultry, Q fever, salmonellosis, and others. Even small mite population can have a significant negative impact, and serve as a carrier of transmissible diseases [5]. Any separate mite is a potential hidden carrier of several pathogenic microorganisms [6, 7]. The informa-

Table 1
Bacterial and viral pathogens 'associated' with *Dermanyssus gallinae*

Pathogen	Association
Bacteria	
Salmonellagallinarum	Isolated from mites
Pasteurellamultocida	Transmissiondemonstrated
Erysipelthrixrhusiopathiae	Isolated from mites
Listeriamonocytogenes	Isolated from mites
Coxiellaburnetii	Transmissiondemonstrated
Nocardiabrasiliensis	Isolated from mites
Mycoplasmasynoviae	Isolated from mites
Viruses	
Newcastle disease	Isolated from mites
Fowlpox virus	Transmissiondemonstrated
St. Louis encephalitis	Isolated from mites
Tick bourneencephalitis	Isolated from mites
Eastern equineencephalitis	Transmissiondemonstrated
Western equineencephalitis	Transmissiondemonstrated
Venezualan equineencephalitis	Transmissiondemonstrated

ЭКОЛОГИЧЕСКИЕ И ЭПИДЕМИОЛОГИЧЕСКИЕ АСПЕКТЫ РАСПРОСТРАНЕНИЯ ПОПУЛЯЦИЙ ПТИЧЬЕГО КРАСНОГО КЛЕЩА

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Цель работы: исследовать влияние и распространение инвазии птичьего красного клеща на птицепреприятиях Украины и сделать анализ данных стран Европейского Союза, в которых наиболее распространен этот кровососущий паразит, выявить действие и значение этого паразита.

Материалы и методы исследований. Методологической основой нашего исследования являются общетеоретические методы научного познания, системно-структурный и абстрактно-логический анализы.

Результаты исследований и выводы. Показано негативное влияние *Dermanyssus gallinae* на производство птицепродукции, прежде всего яиц. В странах ЕС за последние десятилетия обнаружен высокий процент распространения паразита благодаря его высоким адаптивным качествам, резистентности к акарицидам, быстрому жизненному

циклу при высоких оптимальных температурах и возможности долго существовать без источника питания (до 10 месяцев). Выяснено, что паразит может попадать на птицеводства с помощью синантропной птицы. Клещи способны переносить возбудителей опасных инфекций и вирусов, вызывающая трансмиссивные и инвазионные заболевания. Это все наносит экономический ущерб птицеводствам из-за повышения смертности поголовья (снижение веса и анемия) и значительного уменьшения яйценосности и качества яиц у кур-несушек. Соответствующие последствия приводят к значительным финансовым затратам для обезвреживания популяций паразита, дезинфекции помещений и лечения птицы. Также показано пагубное влияние *D. gallinae* и на организм человека, вызывающее болезни кожи (зуд и дерматиты). Таким образом, возникает необходимость исследовать популяции клещей с целью предотвращения их нападений на работников птицеводств и для экологически безопасного решения этой проблемы.

Ключевые слова: птичий красный клещ, трансмиссивные болезни, инвазионные болезни, паразитизм, влияние на человека, экологические особенности.

In 2015, in the scientific literature had been reported that *D. gallinae* recently confirmed as the causal agent of gamasoidosis in five members of a Serbian household [19]. Though numerous cases of gamasoidosis, typically linked to nearby feral birds' nests and often resulting in dermatological complaints of one kind or another. *D. gallinae* have also been reported as posing a risk to poultry workers, so much so that this work proposes their presence as an 'occupational hazard' [20, 21]. For *D. Gallinae* at least, this body of literature, though currently small, confirms ingestion of human blood [22]. With laboratory study (Center of Infectious

Diseases USA, 1954) demonstrating that these mites can be induced to feed upon humans, albeit at low levels. It should be noted, other avian-ectoparasitic mites (*Ornithonyssus sylviarum*) no such ability [23]. Though reports of gamasoidosis are still relatively uncommon, unpublished accounts suggest that in some areas such as Hawaii) bird mites per se have become strongly associated with humans over a relatively short period (<10 years), this being indicative of host expansion (Eco Smart Pest Control, personal communication).

Recently reported gamasid mites more frequent, especially in

residential establishments directly into groupings synanthropic birds. Location *D. gallinae* fairly broad: residential buildings, hospitals, office buildings, industrial poultry farms and farmers. Other ectoparasites *Ornithonyssus sylviarum* was also marked with in homes, hospitals, poultry farms, but not found in the office. Figure 3 shows the dynamics of attacks on people gamasid mites over the past 70 years. As the diagram from 1936 to 1961 the population of mites were 15% and up to 2013 have increased by 4 times and have reached 62.5%. While parasite species *O. sylviarum* has increased, in range of 7% to 60%,

Table 2

Gamasid mites as vectors of disease agents

Group of pathogens	The disease and pathogen	Mites-carriers	The reservoir of the pathogen	Spreading the disease	Areal of origin	Note
Viruses	St. Louis encephalitis	<i>D. gallinae</i> , <i>O. sylviarum</i> .	<i>D. gallinae</i> .	North America, Africa .	North America	Infected people .
	Western equine encephalitis	<i>D. gallinae</i> , <i>D. americanus</i> , <i>O. sylviarum</i> , <i>O. bursa</i>	Poultry	North, Center and South America, West Indies, some tropical areas of the Eastern Hemisphere	North America	Infected people and horses. Infections receive from birds to through mosquito bites.
	Japanese encephalitis	Gamasid mites	Poultry	Asia (Japan, China, Korea, Russia)	Asia	Infected people; sensible birds, rodents, horses
Rickettsiae	Infectious nefrosis nephrite – Rickettsiapavlovskyi	Gamasid mites	rodents	Ukraine, Russia, Belarus	Ukraine, Russia	Infected people .
	Q Fever – Rickettsiaburneti	Dermanyssidae (spontaneous infection) <i>D. gallinae</i> , <i>O. bacoti</i>	Pets, birds, rodents, mites.	West Europe, Asia Minor, North Africa, North America, Australia	Ukraine, Russia Central Asia	Infected people . Infection from diseased animals, mites carriers. In the experiment, transmit rickettsiae laboratory animals through bites.
Spirochaetes	Chicken spirochetosis – <i>S. Gallinarum</i>	<i>D. gallinae</i>	-	-	-	Infected chickens

but during 1962-1987 red mite population exceeded 1.5 times. Potentially dangerous medical value *D. gallinae* enhances fact that mites can carry and transmit zoonoses as bacterial and viral etiology of infected birds to people, but now these very little published data to assert a 100% [1].

At the same time the analysis of changes in reported cases of assault on people increasing, and it has to be noticed by veterinary professionals, health workers, environmentalists.

Thus, epidemiological, ecological and epizootological features formation acaricidosis on poultry enterprises necessary to investigate and forecast depending on various conditions, abiotic and biotic factors to prevent attacks *D. gallinae* on workers of poultry farms.

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