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Short Review Paper

The Poultry Mite: *Dermanyssus gallinae.* - A Review

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Abstract

Dermanyssus gallinae is an ectoparasite of poultry commonly known as red mite or chicken mite, is a vector and spread several major pathogenic diseases in fowl. It includes several species in wild birds and mammals and even in humans. It resembles the northern fowl mite, Ornithonyssus sylviarum in size and appearance. They normally take their meal by feeding on the breast around and legs of the fowl, at night as they are obligate blood feeders, that causes irritation, pain, feather loss, anemia resulting in decrease in egg production. The life cycle includes four basic stages egg, larvae, nymph and adult, that can be from a week to month depending on the factors like temperature and humidity, resulting in rapid increase of the population. To protect the flock and to increase in production of eggs of hens, preventing measures are required to be taken. preventing measure infestation in fowl house, by regular washing and cleaning and keeping warm can be performed periodically and the walls and floor can be treated with silica dust or carbolineum before introducing new hens in the house

Keywords: *Dermanyssus gallinae*, vector, blood feeder, temperatures, washing.

Introduction

Poultry mites are very tiny, microscopic, transparent crawling parasites of flock of chicken in the poultry farms. Mites are of cosmopolitan distribution. They are classified as the member of Phylum Arthropoda, Class Arachnida, Subclass Acari, Order Acarina family demanyssidae[1]. They are microscopic, 300-500 micron in length, approximately 100 micron in diameter. They may be terrestrial or aquatic, free living predators, preys, or may be contaminants or free living bio control agents, may act as decomposers that decomposes various organic matters like dead parts of plants and animals which helps in recycling of materials in ecosystem[2], are parasites allergens causing diseases in sensitive human beings, animals and plants[3], and also act as vectors carrying diseases from place to place in fowls, poultry farms and poultry workers.

Dermanyssus gallinae is an ectoparasite of poultry commonly known as red mite or chicken mite. It is a vector and spread several major pathogenic diseases in fowl. It includes several species in wild birds and mammals and even in humans. It resembles the northern fowl mite, *Ornithonyssus sylviarum* in size and appearance. It spread by the mite infected birds into the flock, or by wild birds, even rodents. It can also spread by shoes or clothing of poultry workers.

They live on the body of chicken, in cracks in the walls, in the coops, under roofs, and even in the bedding material in the day time. They normally take their meal by feeding on the breast around and legs of the fowl, at night as they are obligate blood feeders that causes irritation, pain, feather loss, anemia resulting in decrease in egg production.

To protect the flock and to increase in production of eggs of hens, preventing measures are required to be taken. Preventing measure infestation in fowl house, by regular washing and cleaning and keeping warm can be performed periodically, and the walls and floor can be treated with silica dust or carbolineum before introducing new hens in the house. Thus treatment should be repeated to eradicate mites completely from the poultry house.

Distribution

Dermanyssus gallinae is found worldwide. Mites are found in the world over, partially cosmopolitans and are common in dry regions. They are found in many areas of Europe, Japan, China, United States, and even in Asian Countries. It has been found that some external mites like pig mites, bird mites, chicken mite, pigeon mite, fowl mite, groundnut might have migrated in the intramural environment ecosystem and have inhabited those habitats in intramural ecosystem[4]. D. *gallinae* effects the birds that are kept for meat and eggs production, and is found in breeder farms most commonly[5].

Classification

Mites are tiny small, transparent, microscopic belongs to the largest invertebrate phylum, the arthropods. Within the arthropods, mites are the most diverse representative of an ancient lineage[6]. Mites belong to the Order Acarina of

Subclass Acari and Class Arachnida. Higher classification of mites is described and represented which comprises the Class Arachnida, Subclass Acari which in turn is divided into two major groups the Antinotrichida and Actinotrichida, and are further divided into respective order Acarina[7]. The alternative names of these orders and suborders are given by various authors for higher classification of mites[8-11].

Scientific Classification[12]

Kingdom: Animalia, Phylum: Arthropoda, Class: Arachnida, Subclass: Acari, Order: Mesostigmata, Family: Demanyssidae Genus: *Dermanyssus*, Species: *gallinae*, Binomial name: *Dermanyssus gallinae*

Morphology, Biology

The Red Mite D. Gallinae resembles the northern fowl mite, *Ornithonyssus sylviarum* in size and appearance. They normally take their meal by feeding on the breast around and legs of the fowl, at night as they are obligate blood feeders, that causes irritation, pain, feather loss, anemia resulting in decrease in egg production. They do not stay on the fowl body all times, feeding generally at night and rarely during the day[13].

They are found in different colors, are oval, transparent or opaque and are eight legged creatures[14]. The adult *D. Gallinae* measures 0.75-1mm in length[15], usually have long legs with a grayish - white, dark brown or red body when are small, hardly visible with naked eyes, which becomes reddish - brown when fed. The body consists of the sac-like idiosoma and the gnathosoma, which carries the mouthparts and sensory organs and adults have eight legs, The idiosoma is rounded or oval and the dorsal surface sclerotized with shield-like plates. The anal shield is relatively large and is wide as the genital-ventral plate. idiosoma oval, in females a pair of 3-segmented chelicerae are well developed, weak sclerotisation and pairs of setae is found on dorsal surface are present in the male and female[16], Figure-1 and 2[17].

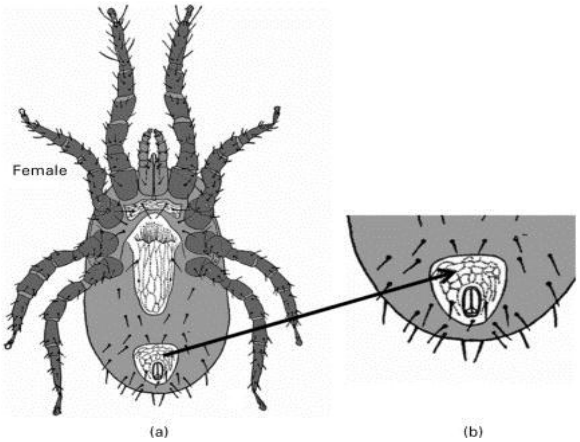

Figure-1: (a) *Dermanyssus gallinae*. (b) Details of the anal plate (*arrow*) with three anal setae[17].

Figure-2: Adult chicken mite, *Dermanyssus gallinae*[17].

Life cycle of *Dermanyssus gallinae*

The adult male and female *D. Gallinae* undergo mating off the host. Males can mate up to four times in four days, and the longest fertile period of females lasts three weeks[18]. After mating, the female lays 75-100 eggs in her life span and takes a blood meal between each batch for 3 days consecutively. A total of 30 eggs are produced in a lifetime, and most are produced after the third, fourth and fifth blood meal. The highest numbers of eggs are laid at temperatures of 20-25°C and 70% relative humidity. At 5°C eggs do not hatch but they are still alive, and at 45°C they dehydrate in a short time[19,20]. The eggs are oval, elongated or cylindrical, cream-coloured, sclerotized and approximately 0.4mm long, laid in nests, cracks and crevices around roost sites of poultry house. Depending upon the favorable environmental conditions the eggs hatches into larvae immediately. Eggs mature into a minute, oval, grayish, hexapod larvae after 13-51 hours, measuring approximately 100 micron in length and 20 micron in width. The newly hatched larvae moults into octopod protonymphs after 24 hours without feeding[21,22]. The protonymphs take blood meals, like the adults, usually during the night, before moulting into eight legged deutonymphs. Deutonymphs again need a blood meal and moults into tritonymph which is bigger, with well developed four pairs of elongated legs on ventral side, differentiated mouth parts and chelicerae. Tritonymph needs a blood meal occasionally and moult into adult with well developed male and female genital organs, two pairs of genital papillae and adanal suckers[23]. The sex ratio is 1:1. The life cycle of *D. Gallinae* is of from 5 to 7 days at 25-37^{o}C and maximum long as 17 days at 20^{o}C. Hence *D. Gallinae* has five stages in its life cycle: the eggs, larvae protonymphs, Deutonymphs and Tritonymph, and the adult, Figure-3[24]**,** Figure-4 and 5[13].

During daytime mites live or hide in all possible crevices, as in walls, floors, under the cribs and roosts, of the poultry house, or on dried litter, egg conveyor belts, cardboard boxes and transportation cages used in poultry house. They can be found in

clusters formed by thigmokinesis where the larval stages usually stay in the center with the females on the outside, and the males on the top of the group[25].

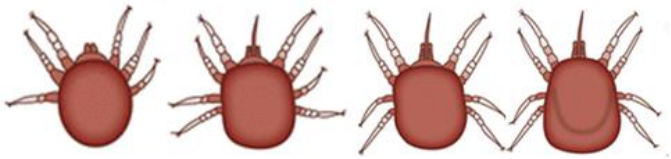

Figure-3: *Dermanyssus gallinae* life stages. Six-legged protonymph larva and eight-legged deutonymph larva, Tritonymph and adult[24].

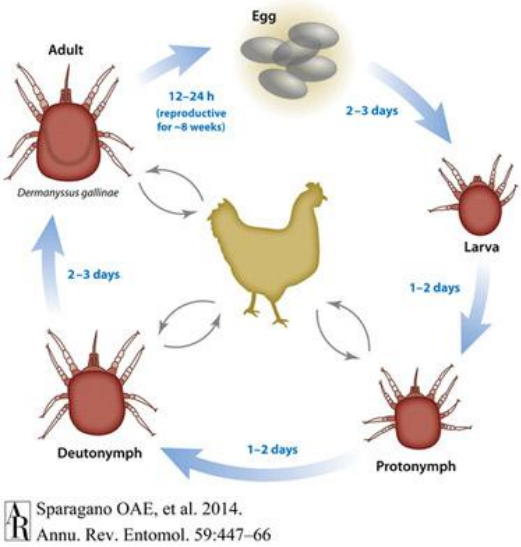

Figure-4: The life cycle of the chicken mite, *Dermanyssus gallinae*[13].

Figure-5(a): Cluster of *Dermanyssus gallinae*[13].

Figure-5(b): Cluster of *Dermanyssus gallinae*[13].

Methods for preventing infestation in hen houses

Infestation: Because of their longer production cycle, *D. gallinae* is one of the major problems in caged laying hens, than in broiler industries. *D. gallinae* can find more hiding places resulting in high infestation rate due to less intensive farming systems such as barns, free range and organic farming. The chicken mite affects the losses of egg industries that are associated with egg production, egg-laying hens in many parts of the world and the control of *Dermanyssus gallinae* estimation per year[26]. As a vector, *D. gallinae* spread St. Louis encephalitis virus such as fowl pox virus, Newcastle virus, and fowl cholera, as well as causing illness[27]. *D. gallinae* also infests flocks with symptoms including sleep loss, anemia, increase stress levels or feather pecking pecking[13]. It has been proven experimentally *in vitro* that red mites can become infected with *Salmonella* through cuticular contact or via a contaminated blood meal[28]. *D. gallinae* has become a most important problem in poultry farms because it not only affects chickens, ducks, turkeys but also wild birds, dogs and rodents, having both direct and indirect pathogenic effects[29].

Control measures: Control measures are usually taken against red mites because of the economic losses caused by this pest - irritation and anaemia of the birds, leading to reduced egg production). In the past chemical pesticides were mainly relied to control the infestation of mites that led to the development of resistance[30]. All of this has seriously hampered red mite control in laying flocks in recent years[31]. Following are some methods for preventing infestation of mites in poultry houses: i. use oils, different plant extracts and so-called inert dusts[31]. ii. the walls and floors should be Treated with silica products before introducing the new hens into the hens house including diatomaceous earth and synthetic[32]. iii. on the basis of epidemiologic studies, silica dust is considered a lung carcinogen for humans[33]. iv. Recently red mites can be controlled by the use of entomopathogenic fungi and a vaccine is developed that produces antibodies[34]. v. maintaining the

temperatures of henhouse above 55°C/131°F, and regular washing and cleaning and keeping warm can remove large numbers of mites[35].

Mites Affecting Humans: *D. gallinae* also bite or cause irritation to not only humans, but *D. gallinae* also bite mammals, including cats, dogs, rodents, rabbits, and horses. The infestation is known as gamasoidosis. Infestations can be persistent, as they digests mammalian blood. People commonly feel itchy and notice bites when they wake up in the morning when feeded by mites at night[36], dermatitis[37], with common symptoms pruritus and popular urticaria[38].

The red mites don't die in freezing temperatures: Red mites or poultry mites causes considerable irritation among chicken keepers. The red mite population is splinted in different stages: eggs, larvae and adult mites, because of this all mites do not freeze to death in the chicken coop. However, eggs can survive in the winter where temperature is below 0°C and hatches when the temperature rises again. The larvae hides in nooks and crannies, preventing themselves from cold and from the treatment with products undergoes hybernation. The mites start laying eggs when the temperature rises above 5°C. When temperature rises in between 10°C and 12°C, the eggs hatches[39]. And there is a sudden outbreak in mites warmer weather in spring comes. So keeping red mites in control is a year-round job.

Conclusion

Dermanyssus gallinae is also known as the red mite, poultry mite, red poultry mite, roost mite and chicken mite. It is an ectoparasite of poultry birds and other bird species. the life cycle of *D. gallinae* consists of mating of adult male and female, egg laying by females, hatching of eggs into larvae protonymph, deutonymph and tritonymph, ultimately developed into adult male or female that are ready for next mating. Thus poultry mite completes its life cycle within 2-4 months depending upon species. Normally the mites feed around the breast and legs of chicken that causes pain, irritation to the birds. Which decreases egg production and feather loss may develop. If they are present in large numbers, *D. gallinae* can cause anemia in chicken. Chicken mites live on chicken, but they can bite humans causing skin irritation. The red mite population could not survive in extreme heat and cold, though eggs and young mite can survive in the winter. The mites protect themselves by hiding in nooks and crannies, from seeing them and thus reaching them with treatment by products too.

References

1. Colloff, M.J. (1998). Taxonomy and identification of dust mites. Allergy, 53, 7-12.

2. Kern (1921). Dust sensitization in bronchial asthma. *Med. Clin. N. America.*, 5, 751-758.

3. Maurya, K., Jamil, Z. and Dev, B. (1983). Prevelance of Astigmatid mites (Acarina) in the domestic environment of North eastern and Northern India. *Biol. Mem* , 2, 207-215.

4. Jogdand, S.B. (1996). Extramural mites found in intramural ecosystem. *Res. J. Pl. Environment.*, 12, 81- 84.

5. Ruff, M. (1999). Important parasites in poultry production systems. *Veterinary Parasitology*., 84, 337-347.

6. Walter, D.E. & Proctor, H.C. (1999). Mites, ecology, evolution and behaviour. *CAB International, Wallingford.*, 322.

7. Evans, G.O. (1992). Principles of Acarology. *CAB International, Wallingford.*, 563.

8. Van, Der. Hammen. L. (1972). A revised classification of the mites (Arachnida, Acarida) with diagnosis, a key, and notes on phylogeny. *Zool Meded Leiden*., 47(22), 273–292.

9. Krantz, G.W. (1978). Manual of acarology. 2nd edn. *Oregon State University Book stores*., 509.

10. Kethley, J. (1990). Acarina: Prostigmata (Actinedida). In: Dindal, D. L. (ed.) Soil Biology Guide, Wiley, New York., 667–756.

11. Connor, M.O. (1984). Mites (Acari). Medical and Veterinary Entomology (Third Edition) 2019., 26, 533-602.

12. De Geer (1778). *Dermanyssus gallinae*. Norw. J. Entomol., 52, 117-125.

13. Sparagano, O., George, D., Harrington. D. and Giangaspero, A. (2014). Significance and control of the poultry red mite, *Dermanyssus gallinae*. *Annual Review of Entomology*, 59, 447-466.

14. Proctor, H. & Owens, I. (2000). Mites and birds: Diversity, parasitism and coevolution *Trends in Ecology and Evolution.*, 15, 358-364.

15. Roberts, V. (2013). Diseases of farmyard poultry part 4 - External and internal parasites of chickens. *National Animal Disease Information, Service. http://www.nadis.org.uk/bulletins/diseases-of-farmyard-poultry/part-4-external-and-internal-parasites-of-chickens.aspx.* Retrieved July 15, 2014.

16. Baker, A.S. (1999). Mites and ticks of domestic animals. An identification guide and information source. *The Stationery Office, The Natural and History Museum, London.*, 240.

17. Lyle-J-Buss (2019). Clover Mite Bryobia Practiosa Koch1 - Adult-Balaustrium-Mite. *Scientific Figure on Research Gate. University-of-Florida-fig*, 2-238674334.

18. Hutcheson, J.H. & Oliver, H.J. (1988). Spermiogenesis and Reptoductive Biology of *Dermanyssus Gallinae* (DeGeer) (Parasitiformes: Dermanyssidae). *Journal of Medical Entomology*, 25(5), 321-330.

19. Maurer, V. and Baumgarther, J. (1992). Temperature influence on life table statistics of the chicken mite *Dermanyssus Gallinae* (Acari: Dermanyssidae). *Exp Appl Acarol*., 1, 27-40.

20. Nordenfors, H., Höglund, J. & Uggla, A. (1999). Effects of Temperature and Humidity on Oviposition, Molting, and Longevity of *Dermanyssus gallinae* (Acari: Dermanyssidae). *Journal of Medical Entomology.*, 36(1), 68-72.

21. Axtell, R. (1999). Poultry integrated pest management: Status and future. *Integrated Pest Management Reviews*, 4, 53-73.

22. Tucci, E. C., Prado, A. P., & Araújo, R. P. (2008). Development of Dermanyssus gallinae (Acari: Dermanyssidae) at different temperatures. Veterinary parasitology, 155(1-2), 127-132.

23. Chauve, C. (1998). The poultry red mite *Dermanyssus gallinae*. *Veterinary Parasitology*, 73, 239-245.

24. De Geer. (1778). Current situation and future prospects for control. *Veterinary Parasitology*, 73, 239-245.

25. Sparagano, O., George, D., Harrington, D. and Giangaspero, A. (2014). Significance and control of the poultry red mite, *Dermanyssus gallinae*. *Annual Review of Entomology.*, 59, 447-466.

26. Entrekin, D. L. and Oliver, J. H. (1982). Aggregation of the Chicken Mite, *Dermanyssus Gallinae* (Acari: Dermanyssidae). *Journal of Medical Entomology*, 19(6), 671–678. https://doi.org/10.1093/jmedent/19.6.671.

27. George, D., Smith, T., Shiel, R., Sparagano, O. and Guy, J. (2009). Mode of action and variability in efficacy of plant essential oils showing toxicity against the poultry red mite, *Dermanyssus gallinae*. *Veterinary Parasitology*, 161, 276-282.

28. Hoy, M.A. (2011). Agricultural acarology: Introduction to integrated mite management. *CRC Press, Boca Raton, FL*., 325-327.

29. Moro, C. V., Chauve, C. and Zenner, L. (2005). Vectorial role of some Dermanyssoid mites (Acari, Mesostigmata, Dermanyssoidea). *Parasite*., 12, 99-109.

30. Abd El-Halim, A.S., Allam, K.A., Metwally, A.M. & AL Boraey, A.M. (2009). Seasonal variation of infestation rate with lice, tick and mite among rodents in certain Egyptian regions. *Journal of the Egypt Society of Parasitology*, 39, 617-624.

31. Mul, M., Niekerk, V., Chirico, J., Maurer, V., Kilpinen, O., Sparagano, O., Thind, B., Zoons, J., Moore, D., Bell, B., Gjevre, A. and Chauve, C. (2009). Control methods for *Dermanyssus gallinae* in systems for laying hens: Results of an international seminar. *World's Poultry Science Journal*, 65, 589-600.

32. Maurer, V., Mul, M., Niekerk, V., Chirico, J., Kilpinen, O., Sparagano, O., Thind, B., Zoons, J., Moore, D., Bell, B., Gjevre, A. and Chauve, C. (2009). Control methods for *Dermanyssus gallinae* in systems for laying hens: Results of an international seminar. *World's Poultry Science Journal*, 65, 589-600.

33. Kilpinen, O., Mul, M., Niekerk, V., Chirico, J., Maurer, V., Sparagano O., Thind B., Zoons J., Moore D., Bell B., Gjevre A. and Chauve, C. (2009). Control methods for *Dermanyssus gallinae* in systems for laying hens: Results of an international seminar. *World's Poultry Science Journal*, 65, 589-600.

34. Lacasse, Y., Selman, M., Costabel, U., Dalphin, J.C., Morell, F., Erkinjnutti-Pekkanen, R. (2009). Classification of hypersensitivity pneumonitis – An hypothesis. *Int Arch Allergy Immunol*., 149, 161-166.

35. Arkle, S., Carlos, J., Harrington, D., George, R.D., Jonathan, H. (2008). The Poultry Red Mite *Dermanyssus gallinae* as a Potential Carrier of Vector-borne Diseases. *https://doi.org/10.1196/annals*.,1428.085.

36. Nordenfors, H. & Hoglund, J. (1999). Effects of Temperature and Humidity on Oviposition, Molting, and Longevity of Dermanyssus gallinae (Acari: Dermanyssidae). *Journal of Medical Entomology*, 36(1), 68.

37. Chirico, J. & Tauson, D. (2002). Traps containing acaricides for the control of *Dermanyssus gallinae*. *Vet Parasitol*, 110(1-2), 109-116. doi: 10.1016/S0304-4017(02) 00310-2.

38. Bellanger, A.P., Bories, C., Foulet, F., Bretagne, S. and Botterel, F. (2008). Nosocomial dermatitis caused by *Dermanyssus gallinae*. *Infect Control Hosp Epidemiol*., 29(3), 282–283.

39. Moh, Abdigoudarzi., Moh, Mirafzali, S. and Hamid, B. (2014). Human Infestation with *Dermanyssus gallinae* (Acari: Dermanyssidae) in a Family Referred with Pruritus and Skin Lesions. *J Arthropod Borne Dis.*, 8(1), 119–123.

40. Beugnet, F., Chauve, C., Gauthey, M., Beert, L. (1997). Resistance of the red poultry mite to pyrethroids in France. *Vet Rec*., 140, 577–9.