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Effect of Diatomaceous Earth as an Ectoparasiticide for the Control of Red Mite in Poultry

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ABSTRACT

Poultry rearing is an important occupation among the agricultural community in India. It provides egg, meat and manure as a source of income to farmers. External parasites such as tick, mite and lice possess a significant threat to both production and health of poultry birds. Dermanyssus gallinae, the poultry red mite is a haematophagous ectoparasite of poultry. Due to its bloodsucking nature, it causes illness, lack of sleep, irritation and self pecking. Severe infestation results in cannibalism, anaemia and even death that results in heavy loss to farmers. Ten poultry farms with red mite infestation were selected in Chidambaram taluk and mites were collected and counted before and after treatment with diatomaceous earth. Population of mites before treatment was 267.5 ± 6.28 and after treatment, it was 85.3 ± 2.08 in the 1st week, 50.4 ± 4.39 in the 2nd week and 9.1 ± 0.94 in the 3rd week. There was a significant decrease ($p \leq 0.01$) in mite population after treatment with diatomaceous earth. Our present study reveals that diatomaceous earth is effective in controlling mite infestation in poultry.

KEY WORDS: Poultry, mite, Dermanyssus gallinae, Diatomaceous earth

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INTRODUCTION

Poultry plays a significant role in providing a livelihood to the farming community. Farmers rear poultry in their backyard for its egg and meat which are rich sources of protein, vitamins and minerals. It provides organic manure for agriculture field and acts as a source of income. Poultry industry provides employment not only to farmers but also to persons engaged in allied activities in the poultry sector. In spite of its growth, external parasites such as tick, mites, lice possess a significant threat to both production and health of poultry birds. Dermanyssus gallinae, the poultry red mite is a haematophagous ectoparasite of poultry. Due to blood-sucking nature, it causes illness, lack of sleep, irritation and self pecking. Severe infestation results in cannibalism, anaemia and even death that results in heavy loss to farmers. Higher noise volume in the farm is a symptom of mite infestation. Increased self-grooming due to anxiety was noticed in artificially infested hens[1]. Environmental factor such as extreme heat favours the proliferation of red mite and cause death of large number of hens during summer. Kowalski and Sokol (2005) [2] observed that mite infestation leads to somatic stress and immunosuppression and results in 1.5 times increase in corticosterone blood levels and a 22% decrease in β-globulin levels. Due to psychogenic stress, the adrenaline levels were elevated to more than twice as high as in the control animals.

Red mites are also causing nuisance to human. D.gallinae is involved in the transmission of zoonotic pathogens like Salmonella enteritidis which is responsible for one of the most widespread zoonoses worldwide, non-typhoidal salmonellosis. This disease has the highest global human mortality rate of any zoonotic disease, with most cases being of foodborne origin, and poultry products are one of the most common sources of the disease [3]. Borrelia burgdorferi, the causative agent of Lyme disease, and avian influenza A virus are zoonotic pathogens potentially transmitted by D. gallinae [4]. D. gallinae infestation is causing human dermatological lesions called gamasoidosis in people working in close proximity to poultry [5]. For all these reasons, poultry red mites infestation is widely recognized as an animal welfare issue by the scientific community [6].

Studies suggest there is an urgent need to uncover specific control strategies. Diatomaceous earth (DE) powder is a natural insect controller and is effective in killing red mite of poultry. It controls both internal and external parasites, improves feed efficiency, increases egg production and non toxic[7]. The objective of the present study is to assess the efficiency of DE in controlling the population of Dermanyssus gallinae in poultry.

MATERIALS AND METHODS

Ten poultry farms with red mite infestation were selected in Chidambaram taluk. Mites were collected using corrugated cardboard trap placed in each of the poultry farm. Traps were collected

one week before treatment (BT) and each week after treatment with DE for three weeks. Treatment was done by dusting of each mite infested birds with 10g of diatomaceous earth powder once in a week for three weeks. The collected traps were kept in sealed plastic bags and sent to the laboratory of Division of Animal Husbandry for mite recovery. At the laboratory the mites were frozen at -20^{o}C and subsequently counted using binocular magnification. Means of respective mite population were analyzed by multiple t-test with Bonferroni's correction. In addition to the evaluation of mite population, symptoms and physical lesions present in the poultry before and after treatment was also assessed.

RESULTS AND DISCUSSION

Total number of mites (means ± SEM) trapped in corrugated cardboard traps (n=10) before treatment was 267.5 ± 6.28. After treatment with diatomaceous earth it was 85.3 ± 2.08 in 1st week (TW1), 50.4 ± 4.39 in 2nd week (TW2) and 9.1 ± 0.94 in 3rd week (TW3). There was a significant difference ($p \leq 0.01$) in mite population before and after treatment with DE. The mite population decreases with increase in duration of exposure.

Regular usage of chemical ectoparasiticide to control mites is potentially hazardous to poultry farmers as well as to poultry. It results in laying of eggs with chemical residues that are unsuitable for human consumption if proper withdrawal period is not followed. Researchers have reported effective control of mites by spraying the vent area of birds with a 10% garlic solution in water [8]. Other vent-applied treatments have been reported to be effective in controlling northern fowl mites [9]. High concentration of sulfur solution (> 5.3%) eliminated mites for 8–10 weeks. The effect was not as long-lasting with lower concentrations (0.9%). Azadirachtin at 0.06% concentration reduced mite population but did not eliminate mites for 3–4 weeks. Kaolin clay in solution (12% by weight) reduced mites for only one week. Repeated treatments are required with these products as it has no effect on the eggs.

DE is effective in controlling not only external parasites such as mites, fleas, lice but also internal parasites in poultry. It also acts as a mineral supplement. It is highly effective natural and chemical free method to destroy external parasites such as red mite in egg-laying hens and to increase egg production[10] .

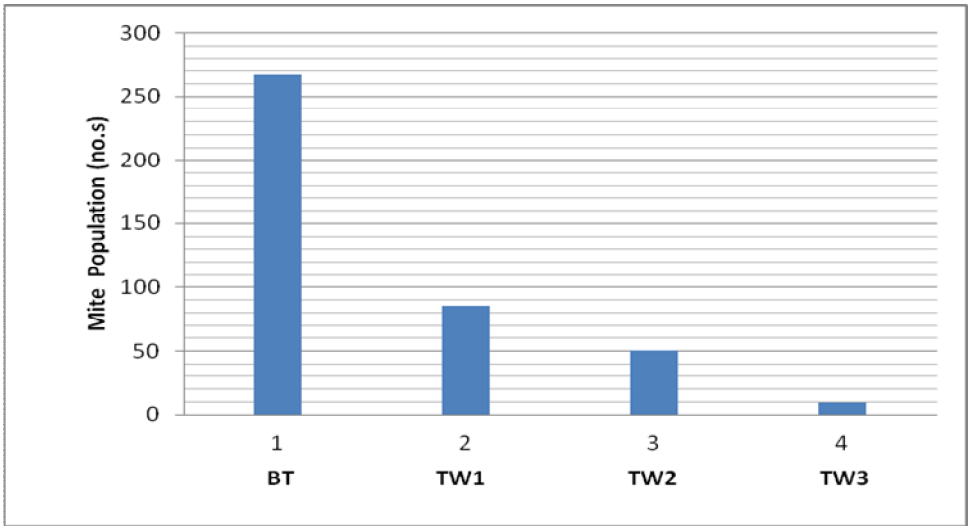
DE kills insects by desiccation and by its abrasive qualities it will remove the oily or waxy cuticle layer on the outside of the insect. Removal of waterproof cuticle layer results in dehydration and death. Regular use of DE in dust baths has shown a significant reduction in parasite infestation[7]. Our present study reveals that diatomaceous earth is effective in controlling mite population in poultry

Table 1: Population of mite (mean±SEM) before treatment (BT) and after treatment with diatomaceous earth in 1st week (TW1), 2nd week (TW2) and 3rd week (TW3)

Treatment	BT	TW1	TW2	TW3
Mite Population (n=10)	267.5 ± 6.28^{a}	85.3 ± 2.08^{b}	50.4 ± 4.39^{c}	9.1 ± 0.94^{d}

*****Means with different alphabets as superscripts indicates significant difference ($p \leq 0.01$) among treatment groups

Graph 1: Population of mite before treatment (BT) and after treatment with diatomaceous earth in 1st week (TW1), 2nd week (TW2) and 3rd week (TW3)



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