An alternate to insecticides: Chemical residues free natural Ectoparasiticidal formulation assessment in poultry houses

Katoch R, Adarsh, Maini S, Kotagiri R

Abstract
A study was conducted to evaluate the efficacy of herbal ectoparasiticidal- Keetguard liquid (M/s Ayurvet Limited) against louse infestation and to control the population of Musca domestica in poultry houses. Keetguard liquid efficacy compared with Deltamethrin. Keetguard liquid application was significantly (p<0.05) effective to decrease the lice count (Lipeurus caponis) by day 7th, 14th, 21st and 28th and results were in comparison with Deltamethrin. Fly repellent efficacy of Keetguard liquid was also in well comparison with Deltamethrin. 7th day, on post Keetguard liquid and Deltamethrin treatment birds showed increase in body weight. At the end of the study on 28th day body weight gain varied non significantly among Keetguard liquid and Deltamethrin treated birds but varied significantly (p<0.05) from untreated control group birds. Feed consumption was improved in ectoparasiticidal treated birds. Based on the results, it can be concluded that the Keetguard liquid showed very good efficacy against louse infestation (Lipeurus caponis) in birds and as a fly (Musca domestica) repellent in poultry houses. No toxicity/ adverse effects of Keetguard liquid in birds were noticed during the study.

Keywords: Bioinsecticides, herbal ectoparasiticidal, Lipeurus caponis, weight gain.
efficiency and lice count were studied on day 0, day 7, day 14, day 21 and day 28 post-treatment. To study the fly repellent activity, keetguard spray was used in 1:40 dilution, 2 applications per week and Deltamethrin spray was used in same concentration (25 ppm), 2 applications per week. In present study, the treatments were made with manually operated hand sprayer with an attached spray nozzle hose into the building at the front and back entrances (2 liters). Assessment of house fly populations was made by using white cards (6x6 inches) sheets. Two sheets were kept per building. New cards were placed after every counting. Fly population was studied on 1 hour, 6 hour, 24 hour, 3 day and 5 day and 1 week post-treatments. All the results were analyzed statistically by analysis of variance to determine the means and standard error.

Results and Discussion

Louse infestation

In louse infestation, Lipeurus caponis (wing louse) was recorded as the predominant species. Feather louse may pierce the pulp of the feather or the skin by their biting mandibles and excrete the blood which is extremely dangerous for young birds [13]. To check the ectoparasitidal efficacy randomly ten birds were selected for lice count from each group. Lice were counted per square inch area (total 2 areas randomly ten birds were selected for lice count from each building). On day zero lice count (per square inch area) varied non significantly among the all groups. Day 7 post treatment lice count was significantly (p<0.05) decreased in Keetguard liquid (herbal ectoparasitidal) and Deltamethrin treated birds i.e. 1.5 and 0.5 respectively (table 1) in comparison to untreated control group birds (lice count, 4.5). On 14th, 21st and 28th day after Keetguard liquid (herbal ectoparasitidal) and Deltamethrin treatment the lice count was found to be 0 in comparison to untreated control building A birds (table 1). Keetguard liquid a poly herbal formulation contains extracts and essential oils from herbs viz. Cedrus deodara, Pongamia glabra which possess both insecticidal and larvicidal properties [14, 15, 16]. Sulphur as an ingredient of Keetguard liquid, studies shows its anti-lice and anti-mange activity [19].

Fly repellent efficacy

House fly is vector for several pathogenic organisms such as enterovirus, protozoa cysts, helminth parasites and bacteria [18, 19, 20, 21]. Resistance to chemical insecticides have developed in house fly [22] and these chemicals have hazardous effect on environment and health [23]. Bioinsecticides, especially those derived from plant origin are recently considered eco-friendly alternatives to conventional synthetic pesticides [24, 25]. At day 0 fly counts were higher in all buildings. One hour after Keetguard liquid (herbal ectoparasitidal) and Deltamethrin treatment the fly count was significantly (p<0.05) reduced to 0.5 in comparison to 3 in untreated building A (table 2). This fly count decreasing trend was continued till day 3rd after 1st spray application. After 2nd (day 3rd) spray application of both Keetguard liquid (herbal ectoparasitidal) and Deltamethrin, the fly counts on day 5th were 0 in both Buildings B and C, varied significantly (p<0.05) in comparison to untreated building A i.e. 29 (table 2). One week after Keetguard liquid and Deltamethrin application the count was reduced to 7 and 5 respectively, significantly (p<0.05) less in comparison to untreated building A (32) (table 2). Previously reported studies on essential oils and natural terpenes, claimed them potential alternatives and environmental friendly insecticides [26, 27, 28, 29].

Table 1: Effect of Keetguard liquid and Deltamethrin against louse infestation

<table>
<thead>
<tr>
<th>Group</th>
<th>Lice count days post-treatment (mean±SEM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Untreated control (A)</td>
<td>3.5 ±1.5</td>
</tr>
<tr>
<td>Keetguard Treated (B)</td>
<td>4.0 ±2.0</td>
</tr>
<tr>
<td>Deltamethrin Treated (C)</td>
<td>3.5 ±0.5</td>
</tr>
</tbody>
</table>

Mean with different superscripts (a, b) in the same column differ significantly at the level of 5%.

Table 2: Fly repellent activity of Keetguard liquid and Deltamethrin

<table>
<thead>
<tr>
<th>Group</th>
<th>Time post-treatment (1st spray)</th>
<th>2nd spray</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0d</td>
<td>1h</td>
</tr>
<tr>
<td>Untreated control (A)</td>
<td>24.5 ±3.5</td>
<td>3.0</td>
</tr>
<tr>
<td>Keetguard Treated (B)</td>
<td>21.5 ±1.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Deltamethrin Treated (C)</td>
<td>23.0 ±2.0</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Mean with different superscripts (a, b) in the same column differ significantly at the level of 5%.

Eucalyptus globules, Pinus longifolia as Keetguard liquid ingredient herbs possess repellent, acaridical and larvicidal activities [30, 31, 32, 33] this may be the reason for the fly repellent activity of Keetguard liquid.

Body weight gain

Heavy loads of parasites can pose health implications for the hens such as impaired weight gain and growth, decreased egg production, increased mortality, and possibly anaemia [14, 35, 36]. So using herbal ectoparasiticide can have beneficial effect on poultry health. In this study, the body weight gain was significantly (p<0.05) more on 7th day in both Keetguard liquid (herbal ectoparasitidal) (147.1) and Deltamethrin (148.1) treated birds in comparison of untreated birds (143.7). At the end of the study, on 28th day body weight gain was significantly (p<0.05) more in Deltamethrin treated birds i.e. 1176.6 varied non-significantly from Keetguard liquid (herbal ectoparasitidal) treated bird i.e. 1156.2. The body weight gain in treated group birds varied significantly (p<0.05) from untreated control group birds (1117) (table 3).

Table 3: Mean body weight gain (g) (+SEM) in the respective groups of birds

<table>
<thead>
<tr>
<th>Group</th>
<th>Body weight gain (g) days post-treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Untreated control (A)</td>
<td>46.4±0.51</td>
</tr>
<tr>
<td>Keetguard Treated (B)</td>
<td>46.7±0.48</td>
</tr>
<tr>
<td>Deltamethrin Treated (C)</td>
<td>46.9±0.49</td>
</tr>
</tbody>
</table>

The mean with different superscripts (a, b) in the same column differ significantly at the level of 5%.~ 303 ~
Feed efficiency
Ectoparasites may cause indirect harm including behavioural disturbances, such as increased frequency of rubbing or scratching, leading to reduced time in feeding and retarded development [37, 38, 39]. Feed efficiency was higher in Keetguard (1.75) and Deltamethrin (1.76) treated birds in comparison to untreated birds (1.72) (table 4), this may be because of improvement in feeding habits as ectoparasites load decreased in treated birds.

Table 4: Feed efficiency in the respective groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Feed efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated control</td>
<td>1.72</td>
</tr>
<tr>
<td>Keetguard Treated</td>
<td>1.75</td>
</tr>
<tr>
<td>Deltamethrin Treated</td>
<td>1.76</td>
</tr>
</tbody>
</table>

Conclusion
The Keetguard liquid (herbal ectoparasiticidal) showed very high efficiency against louse infestation in birds and as a fly (Musca domestica) repellent in poultry houses. The results of Keetguard liquid were in well comparison with results of Deltamethrin, and in future chemical insecticides can be replaced by Keetguard liquid. No toxicity or adverse effect of Keetguard liquid on the birds was observed during the study.

Acknowledgment
The authors are thankful to Ayurved Limited, Baddi, India and Division of Veterinary Parasitology, SKUAST- Jammu, India for providing the required facilities, guidance and support.

References
24. Srinivasan R, Jambulingam P, Gunasekaran K, Boopathidoss PS. Tolerance of house fly, Musca domestica (Diptera: Muscidae) to dichlorvos (76% EC) as an insecticide used for fly control in the tsunami-hit...


34. Ruff MD. Important parasites in poultry production systems. Veterinary Parasitology 1999; 84(3-4):337-347. [PMID: 10456422]


