Research Notes

Effect of Halofuginone (Stenorol) on Chukar Partridge (Alectoris chukar)

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ABSTRACT
This study was conducted to assess the effect of the coccidiostat halofuginone (Stenorol) on growth, feed consumption, and survival of Chukar partridge. Halofuginone was fed to three replicates (14 chicks per replicate) of chukar chicks from 2 to 7 d of age at levels of 0, 1.5, 3.0, 6.0, and 12 ppm. Mortality from 2 to 7 d was 0, 0, 0, 11, and 21 birds, respectively, by treatment. Seven-day body weight showed a significant linear decrease with increasing halofuginone level (P < 0.01). On the 7th d, replicates receiving 6.0 and 12.0 ppm halofuginone were transferred to unmedicated feed for the remainder of the test due to excessive mortality.

INTRODUCTION

Poultry feeds are sometimes fed to various species of game birds. A commercial farm experienced mortality after feeding chukars a turkey diet formulated to contain 3 ppm of the coccidiostat, halofuginone. No data could be found on the toxicity of halofuginone in chukar partridge. Norton and Wise (1981) reported that 6 ppm halofuginone reduced body weight gain of red-legged partridge from 0 to 13 d of age and that 3 ppm reduced weight gain to 20 d of age. Weight gain of pheasants was not affected by 3, 6, or 9 ppm halofuginone (Norton and Wise, 1981).

Morrison et al. (1979) reported a linear weight depression of broiler chicks reared in batteries when 0, 3, 6, and 9 ppm halofuginone was fed without exposure to coccidia. Keshavarz and McDougald (1982) also reported that 3 ppm halofuginone reduced weight gain of broiler chicks in wire floor batteries without intentional exposure to coccidia; 9 ppm halofuginone did not increase mortality in this experiment. Halofuginone at 3 ppm has been reported to increase skin tears and decrease skin strength of broiler chickens (Angel et al., 1985; Granot et al., 1991). Waible et al. (1987) reported improved weight gains of floor-reared turkeys receiving diets containing 1.5 or 3.0 ppm halofuginone. These results suggest that species may differ in their tolerance to dietary levels of halofuginone. This experiment was conducted to determine the effect of feeding halofuginone to chukar partridge on early growth, feed consumption, and chick survival.

MATERIALS AND METHODS

Chukar chicks were obtained from a commercial hatchery and randomly divided into 15 pens in a Petersime starting battery at 2 d of age. Pen floors were covered with fine mesh plastic mats to accommodate the smaller chukar feet. Water was provided inside the pen in a small jar equipped with a plastic base designed for young quail. Feed was provided on an egg flat and in a small trough. Feed papers were removed at 1 wk of age when chicks could eat comfortably from the interior feeder. As the chukars grew, they were gradually transferred to the external feeders and water troughs provided with the battery.

Halofuginone premix was obtained and mixed into unmedicated turkey starter feed to provide levels of 0, 1.5, 3.0, 6.0, and 12.0 ppm halofuginone. Each diet level was randomly assigned to three replicate pens of 14 chicks each. Feed consumption and body weight were measured weekly and mortality was recorded daily. All groups were observed daily for signs of halofuginone toxicity as indicated by reduction in feed intake. After the chicks had received these diets for 5 d, high mortality and low feed consumption were observed among chicks receiving 6 and 12 ppm halofuginone. At

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TABLE 1. Effect of halofuginone on survival (SP) and mean body weight of chukar partridge chicks

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Halofuginone level (ppm)</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SP^1</td>
<td>SP^2</td>
<td>SP</td>
<td>SP</td>
<td>SP</td>
<td>SP</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>100</td>
<td>24.8</td>
<td>100</td>
<td>90.0</td>
<td>100</td>
<td>241.5</td>
</tr>
<tr>
<td>2</td>
<td>1.5</td>
<td>100</td>
<td>24.0</td>
<td>100</td>
<td>73.4</td>
<td>95</td>
<td>159.1</td>
</tr>
<tr>
<td>3</td>
<td>3.0</td>
<td>100</td>
<td>21.6</td>
<td>100</td>
<td>69.3</td>
<td>95</td>
<td>137.8</td>
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<tr>
<td>4</td>
<td>6.0</td>
<td>100</td>
<td>18.7</td>
<td>100</td>
<td>60.5</td>
<td>95</td>
<td>175.1</td>
</tr>
<tr>
<td>5</td>
<td>12.0</td>
<td>100</td>
<td>15.6</td>
<td>100</td>
<td>54.7</td>
<td>95</td>
<td>200.6</td>
</tr>
</tbody>
</table>

^a,b,cMeans within a column with no common superscript differ significantly (P < 0.05).

1SP = percentage of chicks surviving at the end of the week.

Body weight reduction was linear (P < 0.01).

Body weight reduction was linear (P < 0.05) at levels of 0, 1.5, and 3.0 ppm halofuginone.

This level fed only during Week 1.

1 wk, these groups were returned to control feed, whereas the other two halofuginone levels were continued until all chicks reached 6 wk of age.

Data were analyzed using a two-way analysis of variance model and regression analysis (MSTAT Development Team, 1989) with mean separation using LSD ranges.

RESULTS AND DISCUSSION

Chukars that received starter diets containing 6 or 12 ppm halofuginone experienced significantly reduced percentage survival by 1 wk of age (Table 1). Chukars receiving diets containing 0, 1.5, or 3 ppm halofuginone did not differ in percentage survival to 1 or 6 wk of age. It is clear from these results that the chukar partridge is less tolerant of dietary halofuginone than the chicken (Keshavarz and McDougald, 1982) or ringnecked pheasant (Norton and Wise, 1981).

When the chukar chicks reached 1 wk of age, mean body weights of those receiving 3, 6, or 12 ppm halofuginone were significantly lower than weights of the unmedicated controls (Table 1). The groups receiving 6 and 12 ppm were then placed on unmedicated feed and weight gain increased rapidly, so that by 4 wk of age their mean weight was not different than that of the unmedicated controls (Table 1). Chukar chicks that continued to receive feed containing 1.5 or 3 ppm halofuginone exhibited significant weight depression by 2 wk of age (Table 1). A linear depression was observed in 3-, 4-, 5-, and 6-wk body weight with increasing halofuginone level within the first three treatment levels (P < 0.05). This response indicates a much more severe weight depression than that observed in broilers chickens (Morrison et al., 1979; Keshavarz and McDougald, 1982).

Feed consumption was reduced by 3 ppm halofuginone during the 2nd and 3rd wk of the test (Figure 1) but did not differ during Weeks 4, 5, and 6. Cumulative feed consumption of chicks receiving 3 ppm halofuginone was significantly reduced from 2 through 5 wk of age (Figure 2). Keshavarz and McDougald (1982) also reported that 6 ppm halofuginone reduced feed consumption of broiler chicks to 4 wk of age.
TABLE 2. Effect of halofuginone on feed conversion of chukar partridge chicks

<table>
<thead>
<tr>
<th>Halofuginone level (ppm)</th>
<th>Week 2 (g:g)</th>
<th>Week 3 (g:g)</th>
<th>Week 4 (g:g)</th>
<th>Week 5 (g:g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.39&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.91</td>
<td>2.60</td>
<td>2.36&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>1.5</td>
<td>1.70&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.41</td>
<td>2.56</td>
<td>2.65&lt;sup&gt;ab&lt;/sup&gt;</td>
</tr>
<tr>
<td>3.0</td>
<td>1.37&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.23</td>
<td>2.70</td>
<td>3.00&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a,b</sup>Means in columns with no common superscript differ significantly (P < 0.05).

Feed conversion was significantly increased at the 1.5 ppm halofuginone level during Week 2 and at the 3 ppm level during Week 5, but not during any other time period (Table 2). Morrison et al. (1979) reported no difference in feed conversion of broiler chicks fed diets containing 0, 3, 6, or 9 ppm halofuginone, whereas Keshavarz and McDougald (1982) reported an increase in feed conversion when 6 ppm halofuginone was fed to broiler chicks.

The results of this experiment strongly suggest that chukar partridges are more sensitive to halofuginone than broiler chickens. Although dietary levels of 1.5 and 3 ppm halofuginone significantly reduced growth of chukar partridges in this experiment, these levels were compared with a control group that did not have a significant exposure to coccidia. If the control group had experienced a significant growth depression from coccidiosis, the weight of chukars fed halofuginone might easily have exceeded that of controls. However, as our data indicate that the safety margin for halofuginone use in chukar partridge is small, we would not recommend its use as a coccidiostat for this species.

ACKNOWLEDGMENTS

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REFERENCES


