Effects of Heat Stress on Productive Capacity in Ross 308 Female Parents

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Abstract
It was studied the effect of heat stress on productive capacity at ROSS 308 female parents exposed to high temperatures during the day. The hens were reared on the floor, in intensive system. The experimental period was of 5 weeks, of which 2 weeks were high temperatures and 3 weeks were very high temperature into the house. The following parameters were monitored: egg production, egg weight, egg mass, feed intake, specific number of incubated eggs. The egg production, intake and incubated eggs were recorded daily; egg weight and egg shell thickness weekly. The productive parameters were significantly influenced by exposure to warm temperature (p≤0.05). It was observed a significant decrease in egg production and feed consumption and a high percentage of cracked eggs, which can not be utilized for incubation. The number of incubated eggs was reduced by 37%.

Keywords: heat stress, ROSS 308 females parents

1. Introduction
For the poultry, the extreme temperatures (particularly the heat) are a major stressing factor, because their mechanism of thermal regulation is less performing than in mammals. Even though currently there are automatic mechanisms which regulate the environmental conditions, they are not always efficacious and their use increases the production costs so that the poultry producers eventually give up using them. Starting from these considerations, our investigation monitored the influence of heat on the productive capacity of the ROSS 308 female parents, raised in intensive system.

2. Materials and methods
The experiments were conducted on 4710 hens aged 31 weeks. The experimental period was of 5 weeks (31-35 weeks of age). The environmental temperature was 28-32°C at 31 weeks of age; 34.4 – 36.4°C at 32-34 weeks and 30-32°C at 35 weeks, into the house. Relative humidity was 64%. The monitored parameters were egg production, egg weight, egg mass, feed intake, specific number of incubated eggs. The egg production, intake and incubated eggs were recorded daily; egg weight and egg shell thickness weekly. The diets used in our trials were iso-caloric and iso-protein, providing the requirement of nutrients according to the feeding norms. The performance data were processed statistically by ANOVA.

3. Results and discussion
Table 1 shows the experimental results. The daily average feed intake was 172 g at 31 weeks, but decreased beginning to 32 weeks like effect of increasing the temperature (Figure 1). Comparing with the results to 31 weeks (Table 2), the feed intake was lower with 16.9% at 32 weeks, 18% at 33 weeks, 19.2% at 34 weeks and 20.3% at 35 weeks. It has observed that the temperature level influenced the feed intake; the differences were significant (p≤0.05).
Table 1. Layer performance

<table>
<thead>
<tr>
<th>Age (weeks)</th>
<th>Daily average feed intake, g</th>
<th>Intensity of lay, %</th>
<th>Average egg weight, g</th>
<th>Egg mass, g</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>172±12.03</td>
<td>87.1</td>
<td>59.3±1.07</td>
<td>51.65±0.93</td>
</tr>
<tr>
<td>32</td>
<td>143±9.57</td>
<td>85.1</td>
<td>59.7±1.14</td>
<td>50.80±0.85</td>
</tr>
<tr>
<td>33</td>
<td>141±10.43</td>
<td>82.0</td>
<td>60.2±0.98</td>
<td>49.36±1.03</td>
</tr>
<tr>
<td>34</td>
<td>139±8.72</td>
<td>81.1</td>
<td>60.8±0.12</td>
<td>49.31±0.94</td>
</tr>
<tr>
<td>35</td>
<td>137±9.81</td>
<td>78.8</td>
<td>61.3±0.89</td>
<td>48.30±1.04</td>
</tr>
</tbody>
</table>

Table 2. The differences between average performances

<table>
<thead>
<tr>
<th>Age (weeks)</th>
<th>Daily average feed intake, %</th>
<th>Average egg weight, %</th>
<th>Egg mass, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>32</td>
<td>83.1</td>
<td>100.6</td>
<td>98.3</td>
</tr>
<tr>
<td>33</td>
<td>82.0</td>
<td>101.5</td>
<td>95.5</td>
</tr>
<tr>
<td>34</td>
<td>80.8</td>
<td>102.3</td>
<td>95.5</td>
</tr>
<tr>
<td>35</td>
<td>79.7</td>
<td>103.3</td>
<td>93.5</td>
</tr>
</tbody>
</table>

In the literature, it was mentioned that the feed intake obtained from the Albo hens exposed at heat was decreased with 21.2%. In same conditions, the feed intake obtained from the Roso hens was lower with 15.5% [1].

The literature [2] shows that in layers, the feed intake decreases by 1.5% for each degree of temperature within the interval 5° - 30° C, having as reference the temperatures of 20° - 21° C.

The intensity of lay (%) was 87.1% at 31 weeks, 85.1% at 32 weeks, 82% at 33 weeks, 81.1% at 34 weeks and 78.8% at 35 weeks (Table 1 and Figure 2). The differences were significant (p≤0.05).

It was observed that the heat stress has influenced significant the egg production, the decrease being dramatic. Those results are in agreement with the data presented in literature [3], who observed that both egg weight and egg quality are depressed by the heat and by the excessive humidity. In literature was noticed that only 40-50% of the adverse effects of the heat (i.e. lower egg weight and lower laying percentage) can be attributed to the lower feed intake, the balance being on the account of the hen’s capacity to acclimatize [4].

The egg mass was in average 51.65 g at 31 weeks, 50.80 g at 32 weeks, 49.36 g at 33 weeks, 49.31 g at 34 weeks and 48.30 g at 35 weeks. The differences were significant (p<0.05).

It was observed that the percent of incubated eggs was 95.7% at 31 weeks, 90.3% at 32 weeks, 83.3% at 33 weeks, 77.2% at 34 weeks and 60.3% at 35 weeks. The differences were very significant (p<0.001).

At high temperatures, as results of the higher breathing intensity, the partial pressure of CO₂ and the blood bicarbonates (HCO₃ ions) decrease [5]. In consequence, without the supply of these ions, the egg shells become thin and frail.

4. Conclusions

► Upon exposure at heat stress, the feed intake was decreased up to 20.3%.
► Also, the intensity of lay decreased significantly from 87.1% at 31 weeks age down to 78.8% at 35 weeks age.
► The exposure at heat stress had influenced the egg mass, which decreased with 6.5%.
► As results of heat stress, the percent of incubated eggs was reduced by 37%.

References

"Sustainable Animal Husbandry: Prevention is Better Than Cure", 19-23 July 2009 Vechta, Germany