PRODUCTION AND ECONOMICS OF FOUR IMPORTED AND TWO AUSTRALIAN LAYER STRAINS IN TWO CAGING SYSTEMS

J.V. NOLAN, J. R. ROBERTS, E. THOMSON, W. BALL and R.B. CUMMING

Summary

Egg production, egg quality and profitability of 6 strains of commercially available layers (four imported and two Australian strains) were evaluated at the University of New England’s poultry farm ‘Laureldale’ in 1996-97. Mortality from Marek’s Disease and cannibalism was much higher in imported birds (23-44%) than in Australian strains (5.7-7.7%). In this comparison, profitability differed markedly between strains: an Australian strain was the most profitable under our conditions when eggs were marketed by the dozen. Birds housed in one shed at 3/cage were more profitable than those in another shed at 5/cage.

I. INTRODUCTION

Imported strains of laying hens are likely to be subject to a wider range of environmental, disease and management stresses in Australia than in their countries of origin. High mortality of imported layers from Marek’s disease and cannibalism have been major sources of economic loss in recent years.

A comparison was made at the University of New England in 1996-97 of the production and profitability of imported (Lohmann Brown, Hy-Line Brown, IsaBrown, HiSex) and Australian (Hy-Line CB, Tegel Black) strains of layers up to 66 weeks of age under management conditions that are typical of many Australian poultry farms.

II. MATERIALS AND METHODS

All birds were hatched between 16 and 30 January, 1996 and then subjected to identical treatment, after leaving their hatcheries of origin, until 66 weeks of age. All chickens were vaccinated at their hatcheries against Marek’s Disease and Infectious Bronchitis (IB) and reared in wire-floored cages near Tamworth. At 3 weeks of age, they were re-vaccinated for IB (A3 virus; in-contact method) and at 14 weeks for Avian Encephalomyelitis and IB (Vic S; in contact). The birds were beak-trimmed at 10 days and at 8 weeks of age. At 17-18 weeks of age, they were moved to the ‘Laureldale’ poultry farm (University of New England) where they were housed in single-deck laying cages, at either 5 birds/cage (Harrison cages; Shed 1) or 3 birds/cage (Californian cages; Shed 2). At this stage, the birds were accustomed to 14 h daylight. Daylength was then increased in steps of 20 min/week to 16 h (at 24 weeks). Imported strains were selectively beak-trimmed at 31 weeks of age.

All strains were given, ad libitum, a commercial chick starter diet from 0 to 6 weeks, a commercial grower diet from 6 to 18 weeks and a commercial pre-layer diet from 18 to 22 weeks. From 22 weeks of age, all birds were offered a crumbled diet formulated to provide (per kg) 11.6 MJ of metabolizable energy, 175 g crude protein and 37 g calcium (Millmaster, Tamworth).

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Shed 1 had 11 replicates each of 40 birds for each of 4 strains, i.e. Hy-Line CB, IsaBrown, Tegel Black and Hisex strains were each represented by 440 birds (5 birds/cage in 88 cages), whereas the Lohmann Brown and Hy-Line Brown strains were represented by 12 replicates and 480 birds/strain. In Shed 2, each strain had 4 replicates each of 33 birds (132 birds/strain). The replicates were evenly placed throughout each shed.

Birds that died were replaced up to 25 weeks of age. Post-mortem examination was made on all birds that died to 66 weeks of age. Feed intakes and egg productions of birds were determined from 22 to 66 weeks of age. Eggs were collected (30/strain) at random from all treatments at intervals of 4 weeks for egg weight measurements. Costs and returns were recorded to enable net returns per bird housed to be determined.

Results were analysed statistically by analysis of variance.

III. RESULTS

Mean liveweight of pullets at 18 weeks of age ranged from 1.48-1.75 kg, increasing to 2.18-2.37 kg at 66 weeks of age.

Cumulative mortalities for each strain across treatments and sheds are given in Fig. 1.

![Cumulative mortality in each of 6 strains of layers from 18-66 weeks of age.](image)

Post-mortem examinations indicated that the majority of deaths were due to Marek's disease (MD) and cannibalism. Of the imported strains, the Hy-Line Brown and IsaBrown had the highest incidence of MD, whereas the Hisex and Lohmann birds showed some MD resistance: deaths due to cannibalism occurred in all imported strains and were greater (P<0.05) in 5-bird than 3-bird cages, and highest for Lohmann birds. The Australian genotypes were almost totally free of MD and the 2-3% of deaths attributed to cannibalism was apparently not affected by the number of birds/cage. Lohmann Brown, Hisex and Hy-Line Brown hens were first into lay, reaching 50% hen-day production at 21-22 weeks of age. All strains reached peak hen-day production at about 27 weeks of age. Hen-day egg production peaked at over 90% for the Australian strains, and between 84 and 90% for the imported strains. Hen-day production declined more rapidly in the Australian strains and was lower (P<0.05) than in the imported strains after 45 weeks of age. Differences (P<0.05) in
hen-housed egg production between the strains were smaller than in hen-day egg production as the fall in egg production from 45-66 weeks in the Australian strains was offset by their lower mortality (Figure 2). Egg weight increased in all strains as the hens aged, but the Australian strains laid lighter eggs at all times (Figure 3) and, as a consequence, had a lower egg mass production at all times (Figure 4). Feed intake, and feed conversion ratio (feed intake/egg mass) were higher (P<0.01) in the two Australian genotypes than in the imported strains (Table 1).

Table 1. Cumulative mortality (% hens housed), hen-day and hen-housed egg production, mean egg weight, feed intake, total egg mass production (kg), and feed conversion ratio (FCR, g feed/g egg mass) in 6 strains of layers (from 22 to 66 weeks of age).

<table>
<thead>
<tr>
<th></th>
<th>Hisex</th>
<th>Hy-Line Brown</th>
<th>IsaBrown</th>
<th>Lohmann</th>
<th>Hy-Line CB</th>
<th>Tegel Black</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality (%)</td>
<td>21.4</td>
<td>37.5</td>
<td>30.2</td>
<td>27.8</td>
<td>5.6</td>
<td>7.9</td>
</tr>
<tr>
<td>Eggs/hen-day (%)</td>
<td>81.5</td>
<td>84.9</td>
<td>78.7</td>
<td>82.5</td>
<td>77.6</td>
<td>77.1</td>
</tr>
<tr>
<td>Eggs/hen housed</td>
<td>222</td>
<td>188</td>
<td>200</td>
<td>191</td>
<td>237</td>
<td>231</td>
</tr>
<tr>
<td>Egg weight (g)</td>
<td>63.6</td>
<td>63.2</td>
<td>63.2</td>
<td>64.0</td>
<td>56.3</td>
<td>59.2</td>
</tr>
<tr>
<td>Egg mass prod. (kg)</td>
<td>14.5</td>
<td>13.6</td>
<td>13.8</td>
<td>14.2</td>
<td>13.7</td>
<td>13.1</td>
</tr>
<tr>
<td>Feed intake (g/d)</td>
<td>133</td>
<td>137</td>
<td>129</td>
<td>132</td>
<td>134</td>
<td>135</td>
</tr>
<tr>
<td>FCR (g/g)</td>
<td>2.58</td>
<td>2.54</td>
<td>2.61</td>
<td>2.50</td>
<td>3.11</td>
<td>3.00</td>
</tr>
</tbody>
</table>

Profitability was assessed by subtracting costs (of rearing pullets, including replacements between 18 and 25 weeks, feed and packaging materials, but excluding overheads, labour and other running costs) from income (from egg sales and spent birds) (Table 2).

Table 2. Net returns ($ per hen housed) in Shed 1 (5-bird cages) and Shed 2 (3-bird cages) for 6 strains of layers (income and costs from hatching to 66 weeks of age).

<table>
<thead>
<tr>
<th></th>
<th>Hisex</th>
<th>Hy-Line Brown</th>
<th>IsaBrown</th>
<th>Lohmann</th>
<th>Hy-Line CB</th>
<th>Tegel Black</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shded 1</td>
<td>3.54(4.63)*</td>
<td>2.03 (5.16)</td>
<td>1.57 (5.31)</td>
<td>3.47 (5.68)</td>
<td>4.17 (1.63)</td>
<td>2.90 (1.75)</td>
</tr>
<tr>
<td>Shded 2</td>
<td>3.92 (6.07)</td>
<td>2.68 (5.88)</td>
<td>2.13 (5.34)</td>
<td>5.14 (7.32)</td>
<td>5.93 (3.85)</td>
<td>4.46 (3.80)</td>
</tr>
</tbody>
</table>

Net return = [return from egg sales + spent hens] - [costs of rearing + feed + egg packaging]

Assuming all eggs sold by the dozen @ $1.30. *Assuming all eggs sold by the kg @ $1.725/kg.

IV. DISCUSSION

The high mortalities among imported strains confirm the Australian industry experience and our earlier research (Nolan et al., 1997) which show there is still a major mortality problem with the recently imported strains. The imported strains are, however, capable of feed-efficient egg production which will be further improved if the mortality problems can be overcome. The profit margin obtained for each strain depended on the method used to market eggs. Selling 'by the dozen' in Armidale was more profitable for the Australian strains despite the higher packaging costs, whereas selling 'by the kg' was more profitable for imported strains. The relative returns from egg sales can markedly affect the profitability ranking of the birds.
Figure 2. Differences in hen-housed egg production (HHEP) in 6 strains of layers to 66 weeks

Figure 3. Differences in mean egg weight with increasing age between strains of layers

Figure 4. Eggmass production of 6 strains of layers from 22-26 weeks of age
Continued assessment of mortality, especially as related to the effects of the number of birds per cage, and feed conversion efficiency, will be essential. Crossing of the MD-resistant Australian strains with imported genotypes, development of more efficient vaccines, or raising young birds in isolation may be ways of reducing economic losses due to high MD-related mortality. Ways of reducing cannibalism also need to be improved. Further studies of this type will be needed to provide experimentally controlled, early and independent evaluations of new strains of layers under Australian conditions.

V. ACKNOWLEDGEMENTS

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REFERENCES