ANALYSIS OF FERTILITY IN BROILER BREEDER FLOCKS – MALE SIDE APPROACHES

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Introduction

- Problem with fertility decline in broiler breeders
- The main reason of it has genetic origin:

![Effect of selection on body weight on reproduction traits](image)

Reddy & Sadjadi, 1990
Introduction

- Presumptions of physiological reasons of reduced fertility

  - From the male side
    - Presumed decrease in sperm quality by ageing
    - Decrease in mating activity by ageing

  - From the female side
    - Faster release of spermatozoa from the SSTs by ageing (Brillard, 1993)
Aim of the study

to clarify the role of males’

- number (sex ratio)
- age (spiking)
- exchange between flocks

on the fertility rate of broiler breeders in the second half of the reproduction cycle.
Materials and methods

• **Animals:**
  - ROSS 308 broiler breeders, 26 weeks of age
  - Separated floor pens/ 7 flocks - 80 ♀ and 8 ♂/flock
  - Feeding and keeping according to the management guide
### Experimental design

<table>
<thead>
<tr>
<th>Experimental flocks</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatments</td>
<td>100 % spiking</td>
<td>Decreasing of male number (management manual)</td>
<td>Complete exchange of cockerels</td>
<td>50 % spiking</td>
<td>Increasing of male number</td>
<td>Complete exchange of cockerels</td>
<td>Maintaining of male number</td>
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<tr>
<td>Sex ratio at the age of 26 weeks</td>
<td>80 ♀ + 8 ♂</td>
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<tr>
<td>Changes in sex ratios</td>
<td>36 weeks of age</td>
<td>- 1 ♂</td>
<td>- 1 ♂</td>
<td>- 1 ♂</td>
<td>- 1 ♂</td>
<td>+ 1 ♂</td>
<td>- 1 ♂</td>
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<tr>
<td></td>
<td>40 weeks of age</td>
<td>- 1 ♂</td>
<td>- 1 ♂</td>
<td>- 1 ♂</td>
<td>- 1 ♂</td>
<td>+ 1 ♂</td>
<td>- 1 ♂</td>
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<tr>
<td></td>
<td>44 weeks of age</td>
<td>- 1 ♂</td>
<td>- 1 ♂</td>
<td>- 1 ♂</td>
<td>- 1 ♂</td>
<td>+ 1 ♂</td>
<td>- 1 ♂</td>
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<tr>
<td></td>
<td>49 weeks of age</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+ 1 ♂</td>
<td>-</td>
</tr>
<tr>
<td>Spiking (exchange of old cockerels for young ones)</td>
<td>44 weeks of age</td>
<td>100 %</td>
<td></td>
<td></td>
<td>50 %</td>
<td></td>
<td></td>
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<tr>
<td>Exchange of cockerels</td>
<td>44 weeks of age</td>
<td></td>
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<tr>
<td>Final sex ratio at the age of 49 weeks</td>
<td>80 ♀ + 5 ♂</td>
<td>80 ♀ + 5 ♂</td>
<td>80 ♀ + 5 ♂</td>
<td>80 ♀ + 5 ♂</td>
<td>80 ♀ + 13 ♂</td>
<td>80 ♀ + 5 ♂</td>
<td>80 ♀ + 8 ♂</td>
</tr>
</tbody>
</table>
**Materials and methods**

**Fertility determinations**

- **Kosin test**
  - Naked eyes

- **Perivitelline sperm penetration assay**
  - Light microscope

- **Propidium iodide staining**
  - Fluorescent microscope

- **Candling fertility**

  - In freshly laid eggs
  - In incubated eggs
Materials and methods

- **Kosin test**
- Reliability 55 - 90%
- Poor information value

Infertile germinal disc

Fertile germinal disc
Materials and methods

- **Perivitelline sperm penetration assay**
- Precise analysis of fertility
- Reliability 100%
- 20-30 eggs/flock weekly
Materials and methods

Perivitelline sperm penetration assay

Schematic figure of sperm penetration through the inner perivitelline membrane

Electron microscopic view of the sperm penetration

Light microscopic view of more and less holes with dark background
Materials and methods

- **Determination of ‘true’ fertility**
- In incubated eggs selected as ‘clears’ during candling
- Propidium iodide staining

*Image of fertile germinal disc 200 x*
*Image of infertile germinal disc 200 x*

*(Liptói et al., 2004)*
Results

Changes in holes' number and fertility in control flock (2)

Changes in holes' number and fertility in flock with increasing male number (5)

Changes in holes' number and fertility in flock 4

Changes in holes' number and fertility in flock 1
Conclusion

• In the second half of reproduction cycle the candling fertility decreased in all flocks, while the true fertility has not decreased in such degree, which indicates the increase of the early embryo death in this period, mainly in the case of young cockerels.

From the practical point of view:
• either the changes in sex ratios (increasing or maintenance of males’ number)
• or the wide spread used practice of expensive and labor intensive spiking (even 50-100%)
• or the complete exchange of cockerels between flocks

could not improve significantly the fertility level in the second half of the reproduction cycle, therefore it seems to be absolutely useless

• The results support the ideas that for the shortened persistency of fertility in broiler breeders - above the genetic, rearing and other managements’ reasons - rather the females than the males are responsible.
Thank you for your attention!