Decontamination effect of a pilot pelleting process on broiler feed

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Feed Technological Research Centre

- Association of 85 members for feed production optimization and control for France (100 %) and foreigners
- Producers of Feeds, Premix, Mineral feed, Raw materials, pet food and Equipment

Missions

- Research to optimize production process
- Transfer of knowledge
- Promote technological watch and innovation
- Increase the operators safety and security
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**Context**

- Zoonotic regulation EC 2160 / 2003 stipulates that some feed for monogastrics (Specifically broilers) must be protected on salmonella contamination.
- This decontaminant effect could be presumed because the prevalence of salmonellae in the pellets is lower than that revealed in meal like Davies et al. (1992):
  - 450 meal samples: 8.0% positives
  - 1,060 pellet samples: 3.4% positives
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Context

Tracers

Enterobacteriaceae are an effective salmonellae contamination marker

- Veldman et al., 1995: an increase in pelleting temperature from 60°C to 80°C reduces the number of Enterobacteria after treatment from 3.4 to 1.1 log/g
- Cox et al., 1986, Beumer, 1992, Riemann et al., 1995 show that pelleting leads to a reduction in Enterobacteria of 2 to 7 log/g
- None propose tables indicating Enterobacteria decontamination achieved according to the gradual increase in treatment constraints
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Context

French legislation

- The treatment applied must demonstrate its ability to reduce Enterobacteria contamination by 3 log and the possibility of obtaining a final population of less than 1,000 Enterobacteria/g feed after cooling

Objectives of this study

- To define treatment scales combining retention time in the die and pelleting process temperature to achieve such Enterobacteria decontamination levels in broilers feed
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- **Equipment**
  - La Mecanicca Press pelleter CLM 12 - 11 kW

- **Measurement**
  - Horse Power
  - Temperature after steam incorporation
  - Meal and steam Input
  - Pellets output
  - Pellets temperature
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**Method**

- Only 14 trials for a total field studied
  - Die thickness: 20 to 50 mm (4 mm diameter)
  - Temperature after steam incorporation: 45 to 95°C

- Composite central experimental design
  - Test of variation with center 6 replicates (35 mm / 67°C)
Method

- Meal natural contamination insure with 1% of mill waste (Containing at least $10^6$ entero./g)
- Pellets output: 280 kg/h +/- 5 kg/h
- Retention time of the feed in the die
  - 2.3 s. for the 20 mm die plate
  - 6.3 s. for the 50 mm die plate
- Cooling of the sample in a pilot cooler
- Enterobacteria count according to standard NF V08 054 with incubation at 37°C on 20 g of meal or pellets
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Results

- Steam-treatment: - 0.3 log at 67°C
- Stress compression is more efficient: - 1.7 log at 67°C

![Bar chart showing Enterobacteriaceae CFU/g before and after steam treatment and pelleting process at various temperatures.](image-url)
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**Results**

<table>
<thead>
<tr>
<th>Temperature after steam incorporation (°C)</th>
<th>- 5 log</th>
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<tr>
<td>Die thickness (mm)</td>
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Longueur des canaux de la filetère (mm)
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Results

![Graph showing the decrease of enterobacteria (log CFU/g) against temperature at exit (°C). The graph includes a trend line and data points indicating a positive correlation between temperature and bacterial decrease.](Image)
Conclusion

- It clearly shows that it is possible to ensure a good enterobacteria decontamination of broiler feed by pelleting process if the right conditions are applied (Conditioning temperature, residence time thus input rate, die compression)

- The compression effect is more efficient than the steam incorporation

- 85 °C at die exit should be enough taking account of the variability

- It is also possible to reduce this pelleting needs (specially temperature) with a small incorporation of some acids like formic acid
Merci beaucoup
Thanks a lot

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