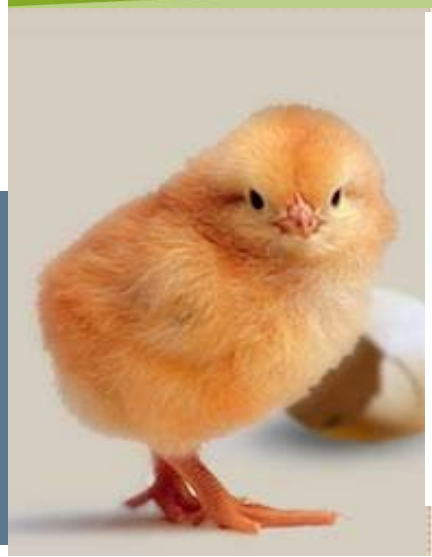
Efficacy of essential oils on broiler growth performance in a semi-commercial scale facility

M.H.L. Bento[1], J.D. van der Klis[2] and H. Schulze[1]



Abstract No.3086
Session 18
25 August 2008

[1]Danisco Animal Nutrition, Marlborough, UK
[2]Schothorst Feed Research, Lelystad, Netherlands
Corresponding author: helena.bento@danisco.com

Outline

DANISCO
First you add knowledge...

- Introduction
- Objective of the study
- Materials and methods
- Results
- Conclusions

Introduction

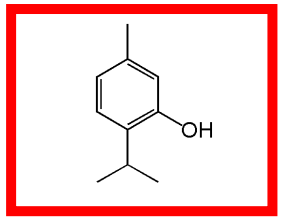
DANISCO
First you add knowledge...

- EU ban of the use of antibiotics as growth promoters in animal feeds (2006)
- Alternatives to antibiotic growth promoters are needed to maintain the health status and performance
- Consumer preferences for healthy and drug-free food
- Essential oils (EOs) have been proposed due to their antimicrobial properties and their effect on the stimulation of growth performance

Mode of action of essential oils

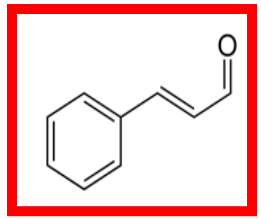
DANISCO
First you add knowledge...

Monoterpene phenols
Thymol, Carvacrol
Limonene



- Interact with the cell membrane by **H** bonding rendering the membranes and mitochondria more permeable
- Inhibit the growth of gram (-) bacteria by disintegrating the outer cell membrane

Phenylpropanes
Cinnamaldehyde,
Eugenol



- Bind with proteins through their carbonyl group preventing the action of important cell enzymes
- Growth inhibition among the gram (+) bacteria

Synergy between single activities

thymol + cinnamaldehyde

- Modulation of gut microflora towards the inhibition of pathogenic bacteria (*E. coli*, Salmonella) without affecting the growth of *Bifidobacterium* or *Lactobacillus* (Lahtinen *et al.*, 2008)
- Indirect impact on growth performance

Objectives of the study

DANISCO
First you add knowledge...

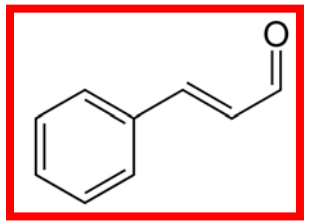
- To evaluate the effect of supplementation of an EO blend on growth performance in broilers fed diets containing feed enzymes and coccidiostats

- To investigate the efficacy of an EO blend on broiler performance after the withdrawal of coccidiostats from the diet

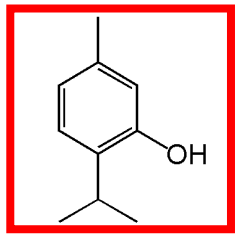
Essential oil blend (EOB)

DANISCO
First you add knowledge...

- Optimised blend of two essential oils, cinnamaldehyde and thymol, in their nature identical form
- Dosed at 5 g cinnamaldehyde and 15 g thymol per tonne treated diet
- Cinnamaldehyde is a phenylpropane



- Thymol is a monoterpene phenol



Experimental Design

DANISCO
First you add knowledge...

- 10,000 Ross 308 broilers (as hatched) housed in 10 floor pens (1000 birds/pen)
- 3-phase dietary regimen: starter (0–14 days),

  grower (15–31 days) and finisher diet (32-37 days)
- Diets were offered in pelleted form
- 2 treatments applied from 0–37 days of age:
  - Control (diet treated with phytase & xylanase feed enzymes)
  - Control + Essential oil blend (EOB)
- Coccididiostats were included in starter (diclazuril) and grower diet (halofuginone)

Diets

DANISCO
First you add knowledge...

Ingredient (kg/tonne)	Starter (0-14 days)	Grower (15-31 days)	Finisher (32-37 days)
Wheat / triticale	**510.0**	**600.0**	**624.9**
Rapeseed meal	-	30.0	25.0
Corn	95.7	-	-
Soybean meal (hipro)	**267.2**	**207.8**	**221.3**
Potato protein / peas	37.5	76.8	35.0
Soya oil / animal fat	39.9	46.8	60.7
Salt / $NaHCO_3$	1.8	1.4	1.7
Limestone / monocalcium P	22.3	16.5	15.2
Vits/mins/AAs	20.7	15.7	11.4
Xylanase / phytase	**+**	**+**	**+**
Essential oil blend	**-/+**	**-/+**	**-/+**
Coccidiostats	**+**	**+**	**-**

Calculated nutrient analysis (CVB, 2005)

DANISCO
First you add knowledge...

Calculated Analysis	Starter (0-14 days)	Grower (15-31 days)	Finisher (32-37 days)
Protein, %	22.2	21.1	20.3
AMEn, kcal/kg	2820	2837	2907
AMEn, MJ/kg	11.8	11.9	12.2
Dig. Lysine, %	1.1	1.0	1.0
Calcium, %	0.88	0.68	0.66
Available P, %	0.43	0.41	0.38

- **Nutrients were adequate according to CVB (2005) recommendations**

Measurements

DANISCO
First you add knowledge...

- Pen body weight and feed intake monitored at 14, 31 and 37 days of age
- Adjusted FCR calculated
- Litter quality at 21 days was visually scored by 4 people

Score 0 (extremely wet) to score 10 (dry litter)

- Total foot pad scores per pen at 30 days

Score 0 (minimum lesions) to score 40 (severe lesions), calculated on 20 birds/pen

- Data was analysed using ANOVA

DANISCO

First you add knowledge...

RESULTS

Broiler performance at 0-14 days

DANISCO
First you add knowledge...

	Control	EOB	SED
Body weight gain (g)	405	419	9.96
Feed intake (g)	539	557	14.97
Feed conversion ratio	1.33	1.33	0.01
Mortality (%)	1.40	1.50	

Broiler performance at 0-31 days

DANISCO
First you add knowledge...

	Control	EOB	SED
Body weight gain (g)	1474 [a]	1547 [b]	12.90
Feed intake (g)	2314 [a]	2387 [b]	27.62
Feed conversion ratio	1.57	1.54	0.02
Mortality (%)	1.80	2.00	

4.7% improvement in BWG

[a, b] P<0.05

Broiler performance at 0-37 days

DANISCO
First you add knowledge...

	Control	EOB	SED
Body weight gain (g)	1951 [a]	2089 [b]	20.75
Feed intake (g)	3285 [a]	3465 [b]	48.25
Feed conversion ratio	1.68	1.66	0.02
Mortality (%)	2.20	2.40	
Litter score d21	4.80	5.10	
Foot pad lesions d30	36.20	34.60	

6.6% improvement in BWG

a, b ***P<0.05***

Broiler performance in the withdrawal phase (32-37 days)

DANISCO
First you add knowledge...

	Control	EOB	SED
Body weight gain (g)	481 [a]	542 [b]	20.90
Feed intake (g)	984 [a]	1082 [b]	22.40
Feed conversion ratio	2.05	2.00	0.08
Mortality (%)	0.46	0.46	

[a, b] ***P<0.05***

11% improvement in BWG

The withdrawal diet fed from 32-37 days of age contained no coccidiostats

Conclusions

DANISCO
First you add knowledge...

- The EO blend increased growth performance throughout the study and the improvement in growth was even greater with the withdrawal of coccidiostats
- The positive effects of cinnamaldehyde and thymol on gut microflora seen in our previous research are possibly associated with an improvement in feed intake and subsequently a positive impact in growth performance

DANISCO

First you add knowledge...

THANK YOU !