

# A novel approach to support the monogastric gut ecosystem in laying hens

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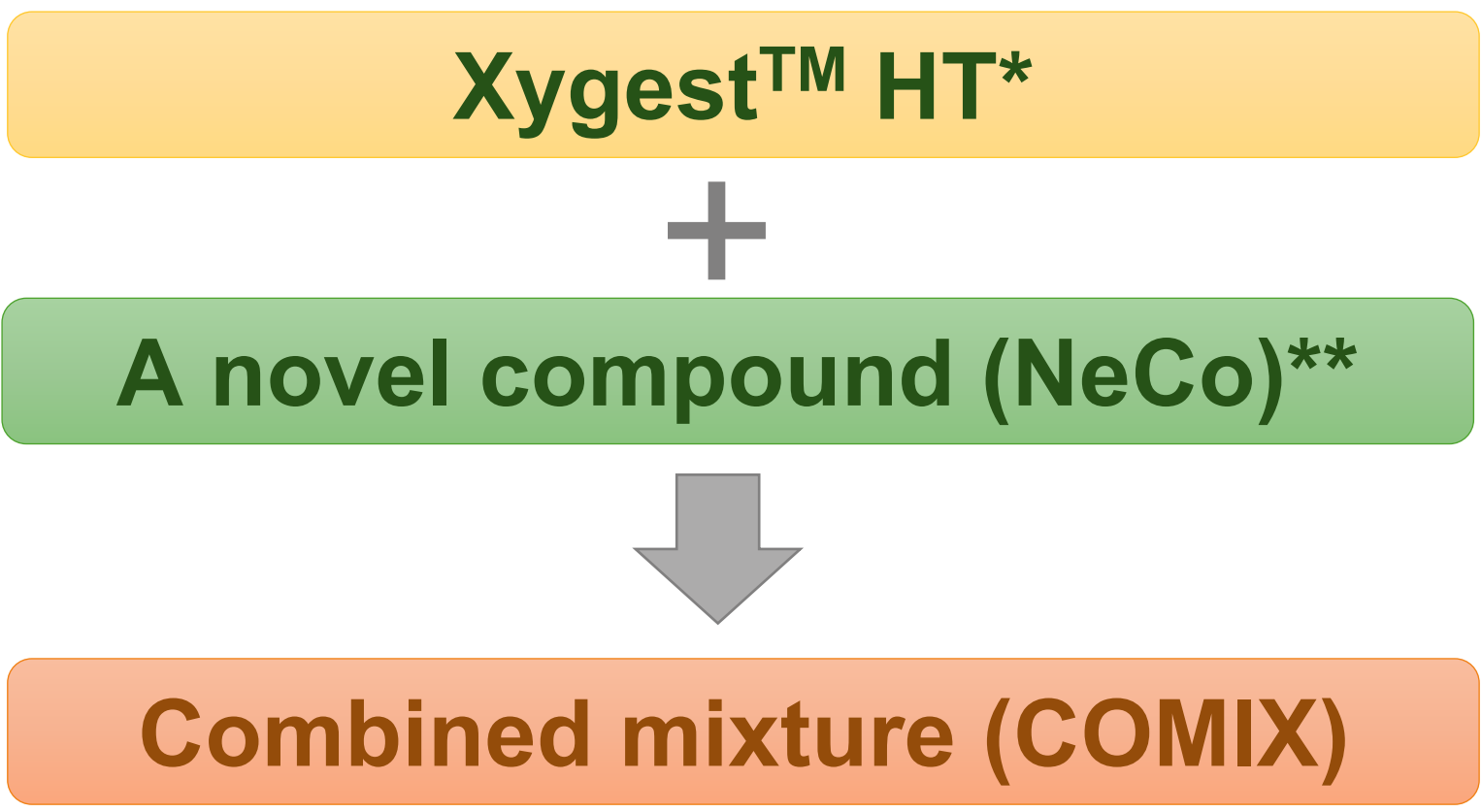


## Introduction

Xylanases are commonly added to poultry feed to degrade non-starch polysaccharides (NSP) for improving zoo-technical performance and nutrient digestibility.

### Objective of the study

The present study aimed to identify potential synergistic effects between the supplementation of a new intrinsically thermostable xylanase and a novel feed compound in a wheat-based broiler diet, on bird performance, digestibility and gut health



\*Xygest HT, an intrinsically thermostable endo-1,4-beta-xylanase enzyme produced by *Komagataella phaffii*, KEMIN Europe n.v.)  
\*\* A novel compound with numerous physiological benefits including antibacterial, antioxidant and anti-inflammatory properties, described to result in positive impacts on production performance, gut health and immunity

## Experimental design

### Animals

- 40 white Hisex laying hens
- 22 weeks old
- Duration: 60 days
- 10 replicates, 1 bird per replicate
- basal diet based on wheat (~55%), soybean and sunflower meal

### Treatments

Group 1	Group 2	Group 3	Group 4
Control	NeCo	Xygest™ HT	COMIX
Basal diet (BD)	BD + NeCo (50 mg/kg feed)	BD + Xygest™ HT (15 mg/kg feed)	BD + NeCo (50mg/kg feed) + Xygest™ HT (15 mg/kg feed)

### Read outs

- Laying hens' performance
- Egg quality
- Nutrients digestibility
- Jejunal morphology
- Serum cytokines as biomarkers for immune and inflammatory response
- Cecal microbiome



## Results

### Nutrient digestibility

Parameters	Control	NeCo	Xygest HT	COMIX	SEM	P-value
DM Digestibility (%)	64.82 <sup>b</sup>	67.36 <sup>a</sup>	68.32 <sup>a</sup>	68.88 <sup>a</sup>	0.620	0.0002
OM Digestibility (%)	68.65 <sup>b</sup>	70.92 <sup>a</sup>	71.50 <sup>a</sup>	72.44 <sup>a</sup>	0.562	0.0003
CP Digestibility (%)	73.97 <sup>c</sup>	77.59 <sup>b</sup>	79.53 <sup>ab</sup>	81.43 <sup>a</sup>	0.833	<0.0001
Nitrogen Retention (g/kg)	20.95 <sup>c</sup>	21.81 <sup>bc</sup>	22.60 <sup>ab</sup>	23.09 <sup>a</sup>	0.236	<0.0001
AMEn (kcal/kg)	2725.9 <sup>b</sup>	2805.0 <sup>a</sup>	2824.2 <sup>a</sup>	2843.9 <sup>a</sup>	20.20	0.0012
AMEn (kcal/kg)	2553.7 <sup>b</sup>	2625.7 <sup>ab</sup>	2638.5 <sup>a</sup>	2654.0 <sup>a</sup>	19.39	0.0042
GE Digestibility (%)	70.10 <sup>b</sup>	71.70 <sup>ab</sup>	72.49 <sup>a</sup>	72.93 <sup>a</sup>	0.518	0.0025
CF Digestibility (%)	74.02 <sup>b</sup>	79.63 <sup>a</sup>	80.45 <sup>a</sup>	81.32 <sup>a</sup>	0.667	<0.0001
CFi Digestibility (%)	3.26 <sup>c</sup>	15.88 <sup>b</sup>	23.26 <sup>a</sup>	23.61 <sup>a</sup>	0.633	<0.0001

DM= dry matter, OM = organic matter, CP = crude protein, GE= gross energy, CF = crude fat, CFi = crude fiber

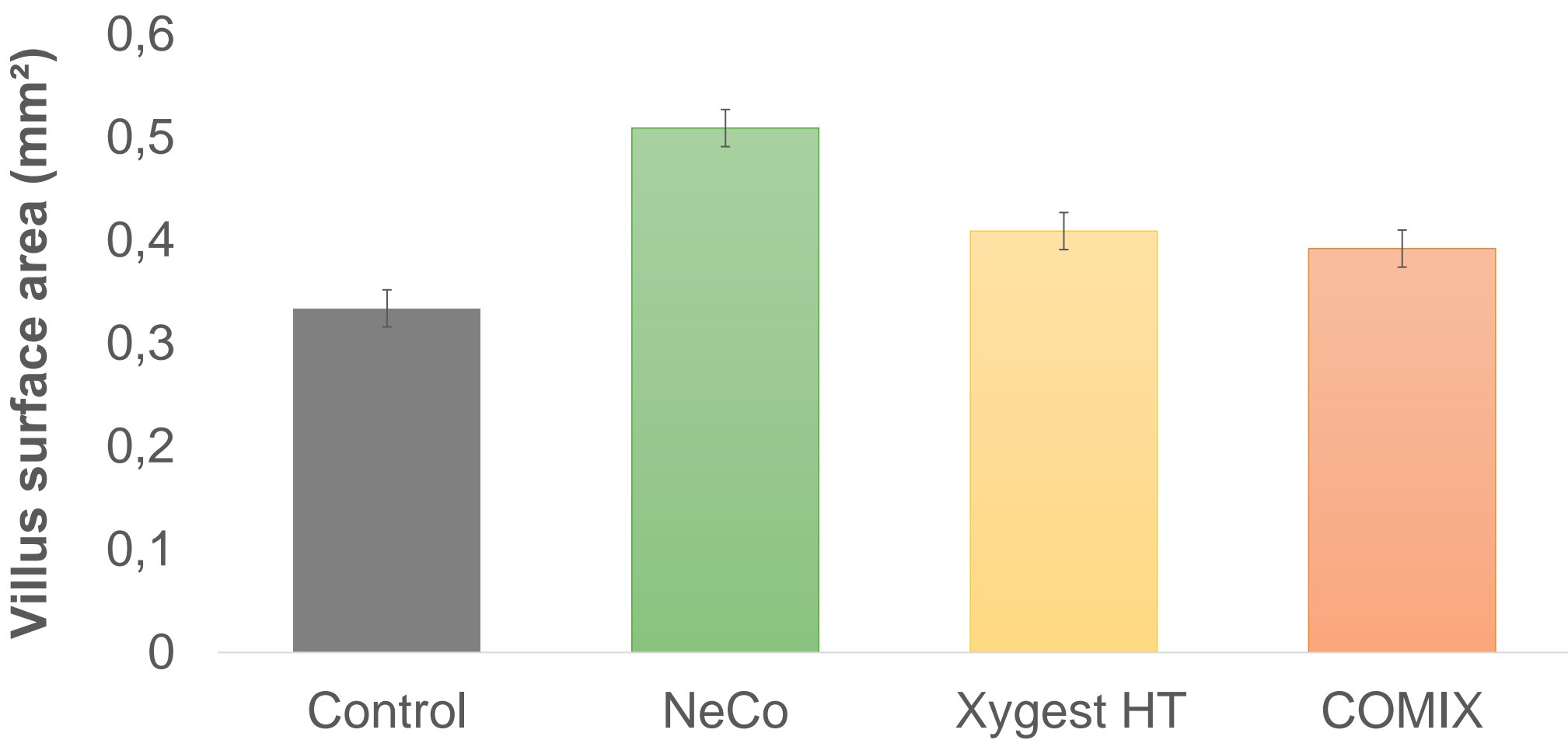
### Serum cytokines

Parameters (pg/ml)	Control	NeCo	Xygest HT	COMIX	SEM	P-value
TNF-α	283.0 <sup>a</sup>	94.7 <sup>b</sup>	65.3 <sup>b</sup>	55.3 <sup>b</sup>	34.4	<0.0001
IL-1α	687.3 <sup>a</sup>	135.3 <sup>b</sup>	234.3 <sup>b</sup>	111.0 <sup>b</sup>	114.7	0.003
IL-1β	146.2	105.4	97.1	60.1	21.5	0.060
IL-6	1870.6	1731.7	1744.0	1953.5	95.8	0.313
IL-10	228.9 <sup>a</sup>	181.8 <sup>b</sup>	164.2 <sup>b</sup>	173.2 <sup>b</sup>	11.7	0.002

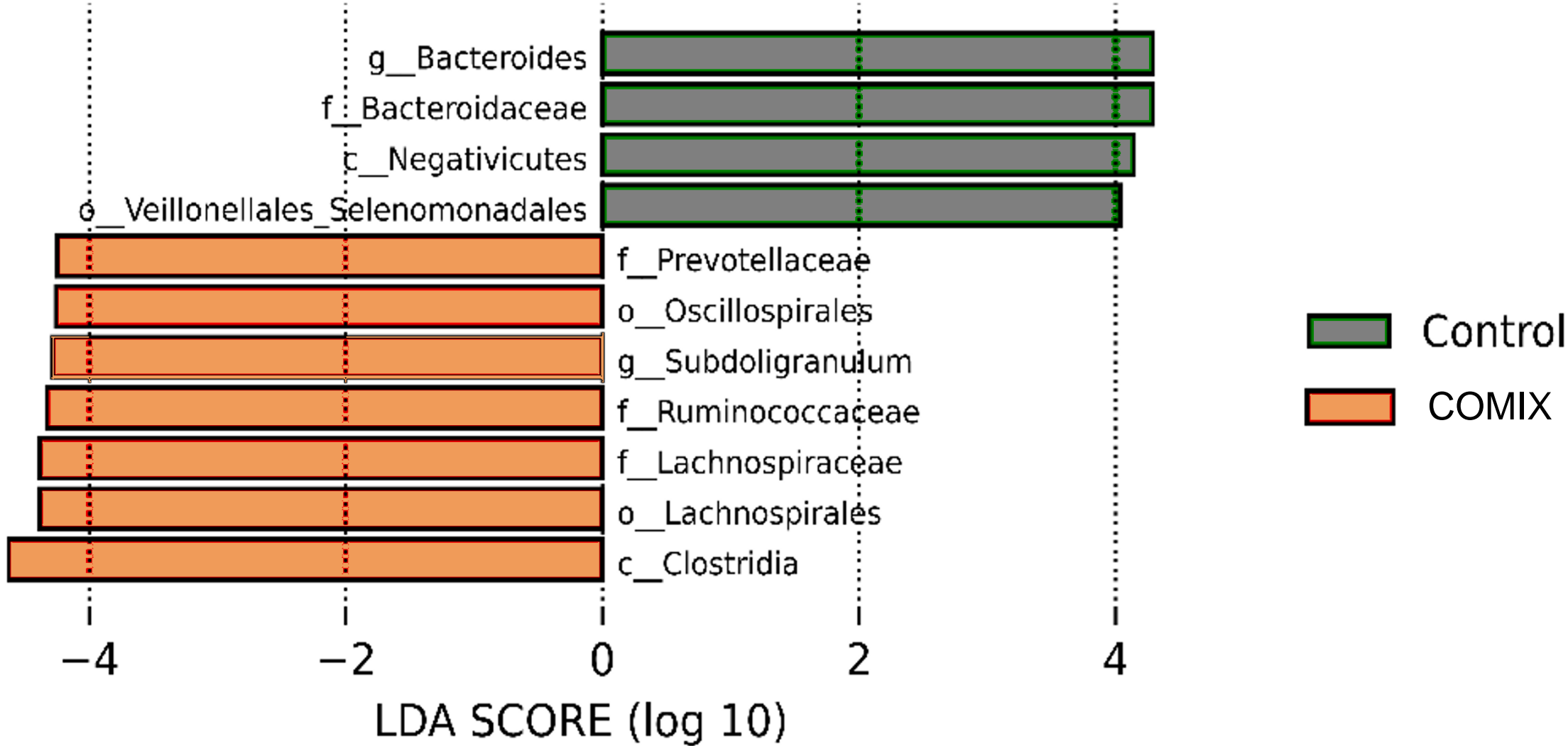
### Laying hen performance and egg quality

Parameters at end	Control	NeCo	Xygest HT	COMIX	SEM	P-Value
Body weight (g)	1612.1 <sup>b</sup>	1620.5 <sup>ab</sup>	1628.4 <sup>ab</sup>	1634.6 <sup>a</sup>	5.61	0.0420
Av. Daily Feed intake (g/hen/day)	111.4 <sup>a</sup>	107.8 <sup>ab</sup>	105.9 <sup>b</sup>	105.3 <sup>b</sup>	1.015	0.0006
FCR (g feed/g egg mass)	2.034 <sup>a</sup>	1.895 <sup>b</sup>	1.840 <sup>c</sup>	1.802 <sup>c</sup>	0.012	<0.0001
Laying rate (%)	93.5	94.7	94.7	95.0	0.673	0.4496
Egg Weight (g)	58.5 <sup>d</sup>	60.1 <sup>c</sup>	60.8 <sup>b</sup>	61.6 <sup>a</sup>	0.184	<0.0001
Egg Mass (g/hen/day)	54.7 <sup>b</sup>	56.9 <sup>a</sup>	57.6 <sup>a</sup>	58.5 <sup>a</sup>	0.414	<0.0001
Yolk Color Score	4.7 <sup>b</sup>	5.3 <sup>b</sup>	6.7 <sup>a</sup>	7.3 <sup>a</sup>	0.325	<0.0001
Albumen Height (mm)	6.5 <sup>c</sup>	7.2 <sup>b</sup>	7.9 <sup>a</sup>	8.1 <sup>a</sup>	0.239	<0.0001
Haugh Unit (HU)	79.5 <sup>b</sup>	84.4 <sup>a</sup>	88.7 <sup>a</sup>	89.0 <sup>a</sup>	1.720	0.0004
Shell Breaking Strength (kg.force)	3.8 <sup>bc</sup>	4.3 <sup>b</sup>	4.7 <sup>ab</sup>	5.1 <sup>a</sup>	0.182	<0.0001

### Jejunal morphology (p<0.0001)



### Cecal microbiome



LDA = Linear Discriminant Analysis, represents the effect size of each abundant species in the cecal microbiome (Harakh et al. 2020)

## Conclusion

Both the novel component (NeCo) and Xygest™ HT increased digestibility in **nutrients** and promoted a better gut health as seen in **more villi surface for nutrient absorption**, a **reduced inflammation/ higher immune response** and positive impact on the cecal **microbiome**. This resulted in an **improved laying hen performance, feed efficiency** and **egg quality** compared to hens that where not supplemented. However, their **combined inclusion (COMIX)** provided an additional, even significant better effect, which indicates a valuable **synergy** between both compounds in supporting an **optimal laying hen production** .