Effects of *Saccharomyces Cerevisiae* hydrolysate on growth performance and gut health of broilers

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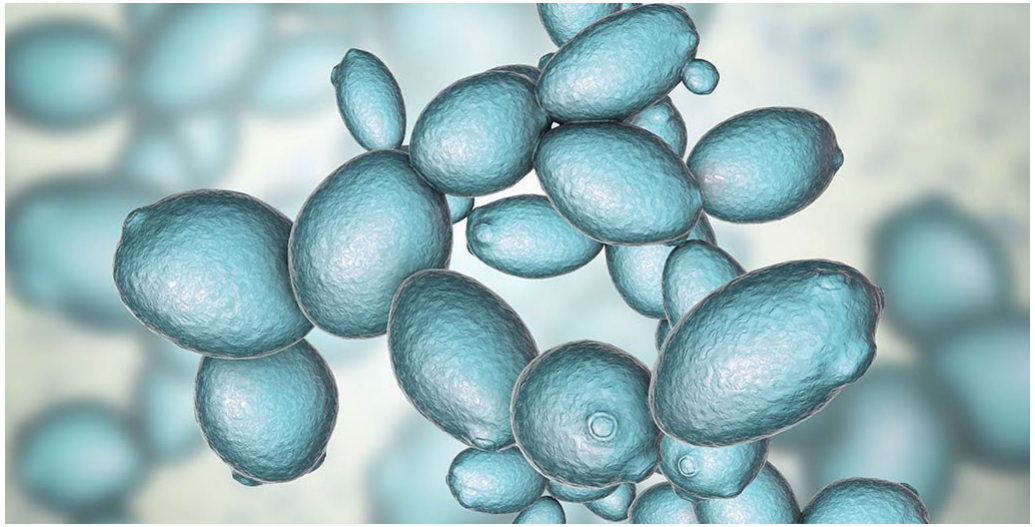
Yeasts: single-cell eukaryotic microorganisms largely employed in animal nutrition for their beneficial effects

→ cellular components and bioactive compounds (mannans, β-glucans, nucleotides, mannan oligosaccharides, …)

Type of products

- Probiotics
- Prebiotics

- Other yeast-derived products (e.g. hydrolyzed yeast)



→ Hydrolyzed yeast

- Autolysis or hydrolysis *(Talkoo et al., 2020)*
- Total content of the yeast residue from the lysis process (B-vitamins, amino acids, nucleotides, ß-glucan, mannan oligosaccharides, …)

Main target: **gut health** *(Shehata et al., 2022)*

- Intestinal structure integrity
- Gut microbiota composition
- Immune response

AIM: To evaluate the effects of hydrolyzed *Saccharomyces cerevisiae* in wheat-based diets on growth performance, and intestinal health in broiler chickens

Experimental groups and diets

- 300 male 1-day-old chicks (ROSS308)
- 2 experimental groups
  - **CONTROL** : basal diet
  - **SCH**: basal diet + *Saccharomyces cerevisiae* Hydrolysate (I-Care®provided by Prosol S.p.A.)

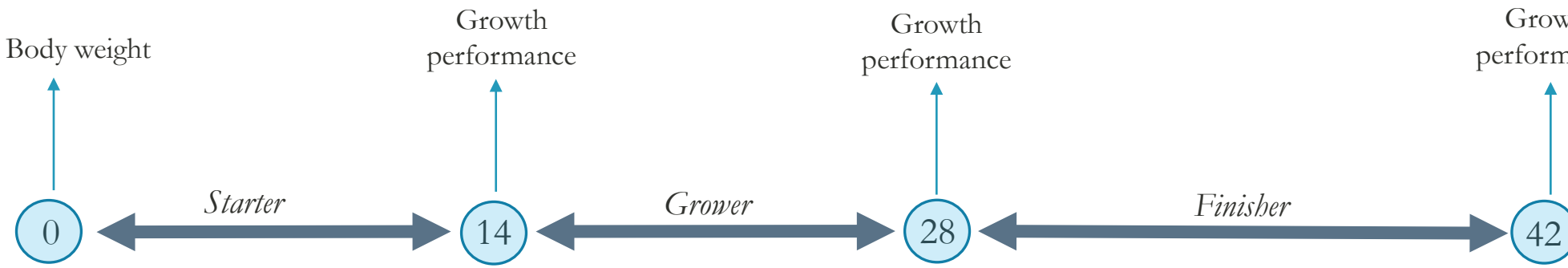
    - **500 ppm** STARTER feed (0-14 d)
    - **500 ppm** GROWER feed (14-28 d)
    - **250 ppm** FINISHER feed (28-42 d)

Wheat-based diet

- 6 replicates/group, 25 birds/replicate

	Starter (1-14 d)	Grower (15-28 d)	Finisher (29-42 d)
Wheat	64.87	66.26	68.15
Soybean meal (46 CP)	16.04	12.10	8.65
Corn gluten meal (60 CP)	4.00	4.50	5.00
Cottonseed meal	3.00	3.00	3.00
Rapeseed meal	2.00	2.50	2.85
Wheat middlings	2.00	2.00	2.50
Soybean oil	3.45	5.50	5.90
Dicalcium phosphate	1.50	1.25	0.98
Limestone	1.35	1.22	1.28
Salt	0.20	0.18	0.17
DL-Methionine	0.23	0.17	0.16
L-lysine.HCl	0.62	0.58	0.60
L-threonine	0.16	0.13	0.13
Vitamin Premix	0.02	0.02	0.02
Mineral Premix	0.20	0.20	0.20
Choline chloride (50%)	0.10	0.10	0.10
Sodium bicarbonate	0.20	0.23	0.25
Phytase	0.01	0.01	0.01
NSP enzymes	0.05	0.05	0.05
Total	100.00	100.00	100.00
Nutrient levels			
AME (MJ/kg)	12.35	12.97	13.18
Crude protein, %	22.00	21.00	20.00
Calcium, %	1.00	0.90	0.85
Available phosphorus, %	0.40	0.35	0.30
Lysine, %	1.25	1.10	1.05
Methionine, %	0.57	0.50	0.48
Methionine+cystine, %	0.90	0.81	0.80
Threonine, %	0.81	0.72	0.68
Tryptophan, %	0.24	0.21	0.20

Experimental design



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- Gene expression
  - Immune parameters (TNFα, IL-1β, IL-6, INF-γ)
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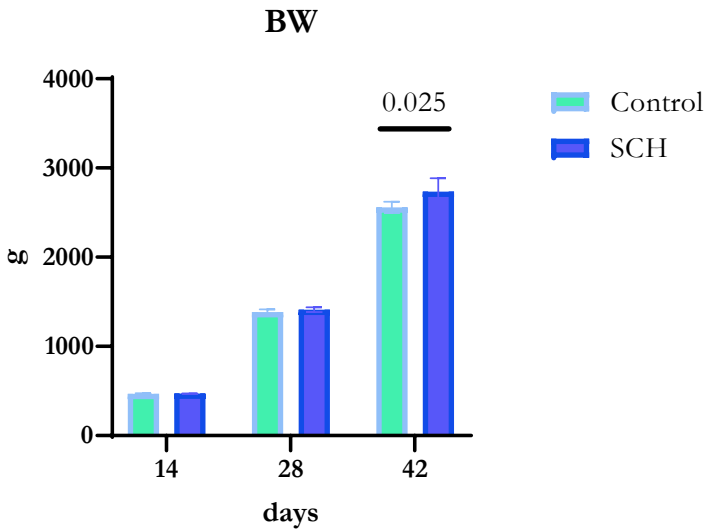
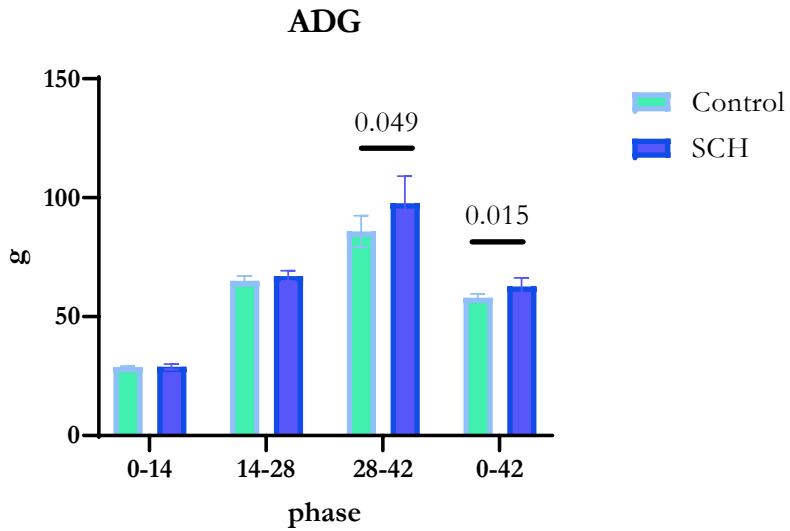
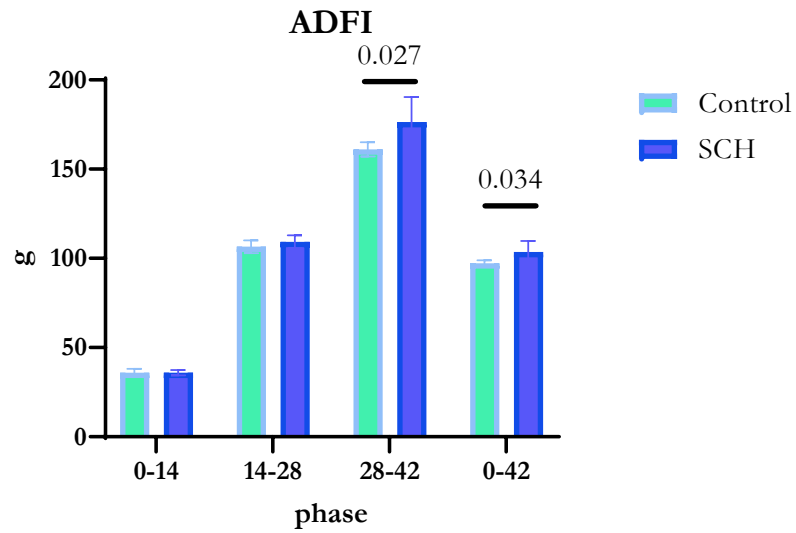
- Gene expression
  - Immune parameters (TLR2, TLR4, TNFα, IL-1β, IL-6, INF-γ)
  - Intestinal barrier protein (ZO-1, Occludin, Claudin1)
- Ceca microbiota (16s rRNA)

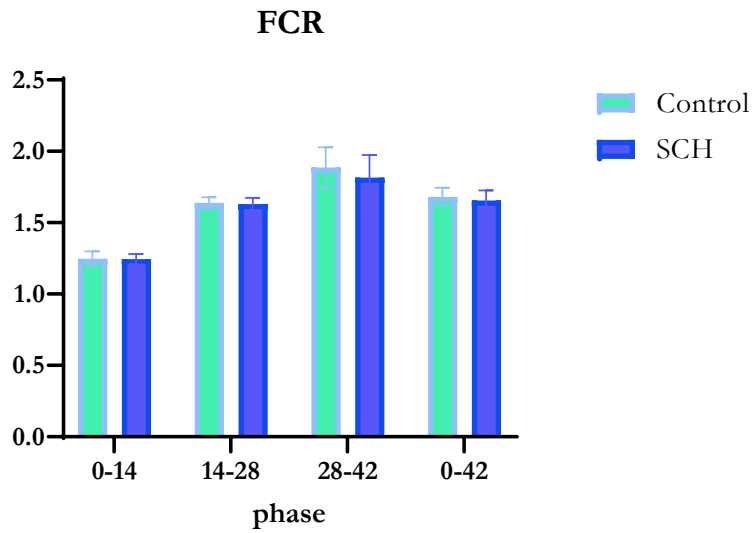
- Pen was considered experimental unit for growth performance and single animal was considered experimental unit for all others parameters evaluated
- Data are reported as means and standard deviations
- Data were checked for normality and subsequently analyzed by one-way ANOVA, followed by a least significant difference post-hoc multiple comparison test.
- $P \leq 0.05$ is statistically significant, while $0.05 < P \leq 0.10$ is a near-significant trend.

Growth performance

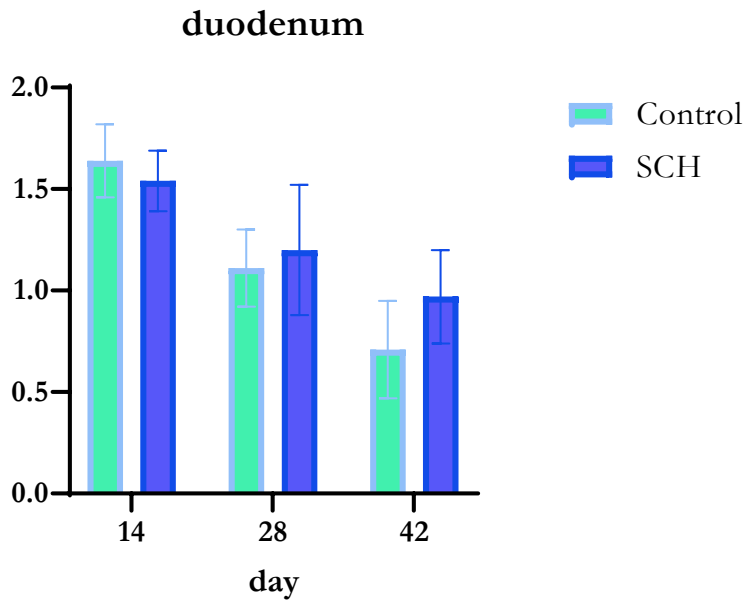


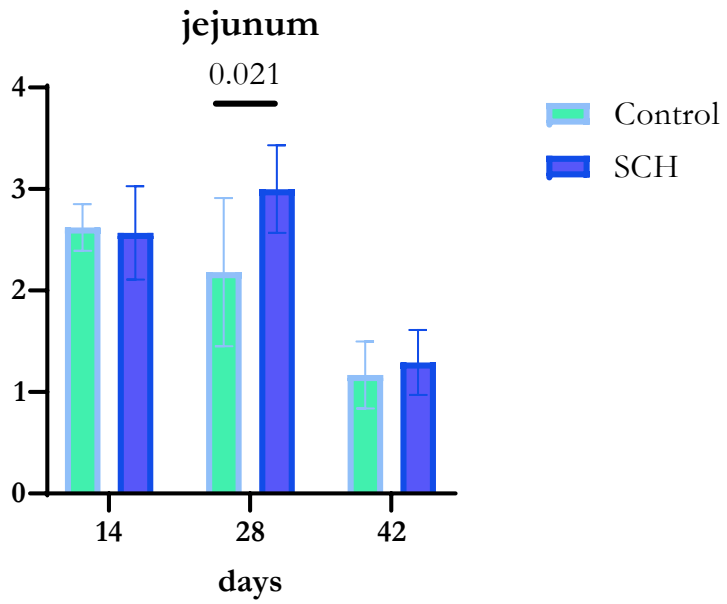


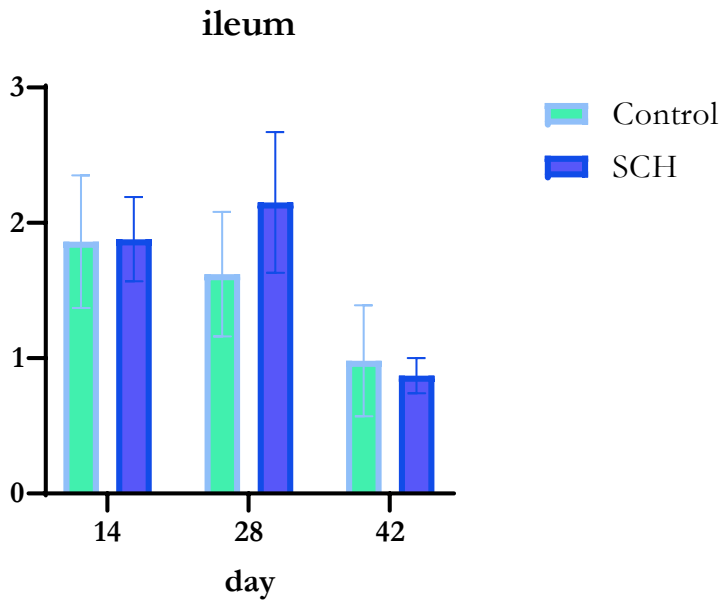




Intestinal relative index







d14 → no significant differences

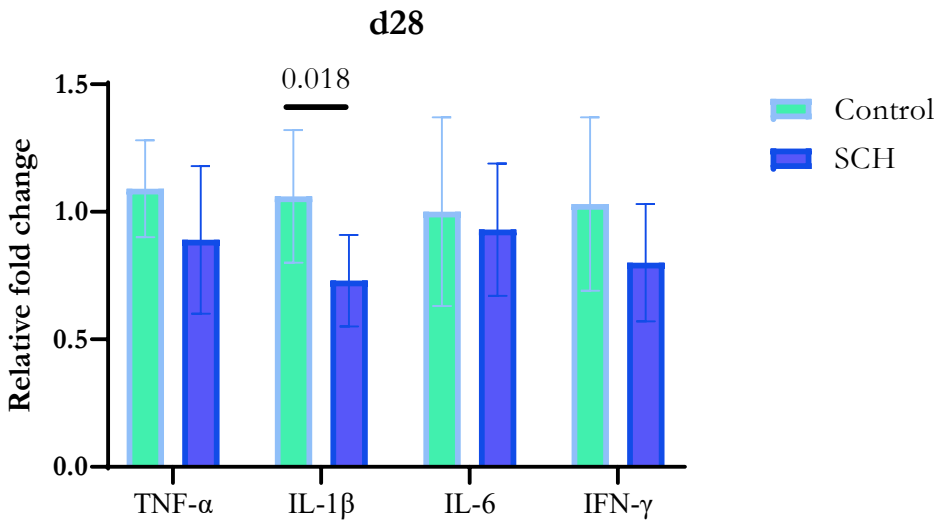
d28

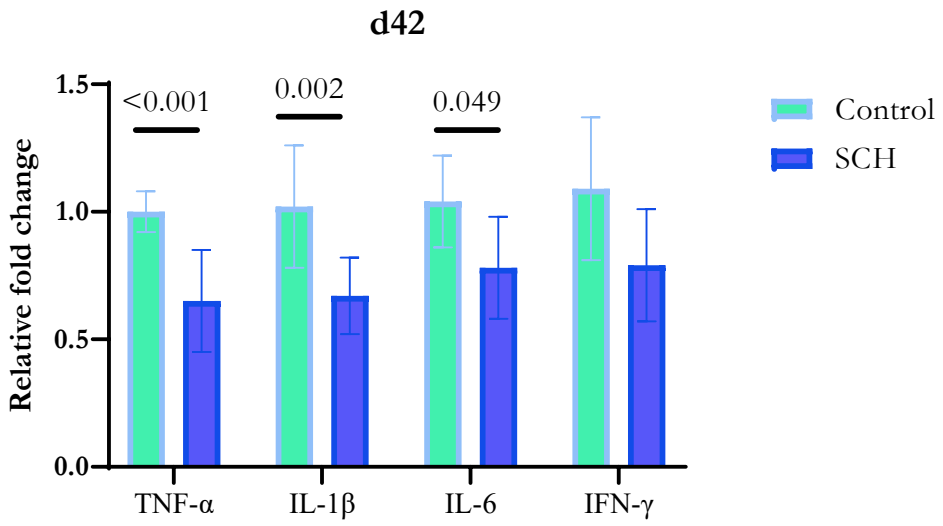
Item		CONTROL	SCH	P-value
Duodenum	VH (µm)	1545.68±359.31	1705.38±198.64	0.725
	CD (µm)	199.47±41.06	180.27±26.59	0.707
	VCR	8.08±0.54	8.86±0.92	0.155
Jejunum	VH (µm)	1160.73±126.08	1255.54±147.01	0.278
	CD (µm)	167.09±26.58	152.15±30.43	0.407
	VCR	7.12±0.75^{b}	8.39±1.08^{a}	0.035
Ileum	VH (µm)	657.37±49.31^{b}	729.923±32.93^{a}	0.013
	CD (µm)	151.42±17.25^{a}	129.97±12.06^{b}	0.032
	VCR	4.35±0.22^{b}	5.66±0.73^{a}	0.002

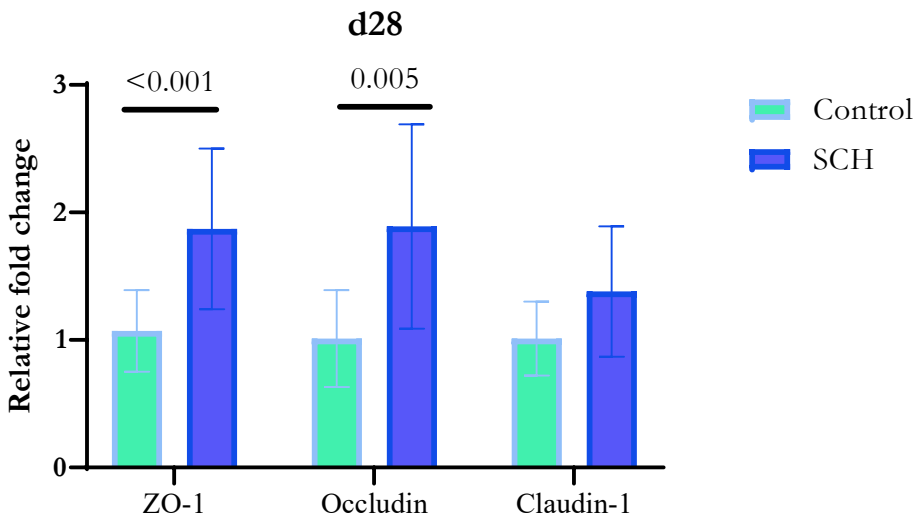
d42

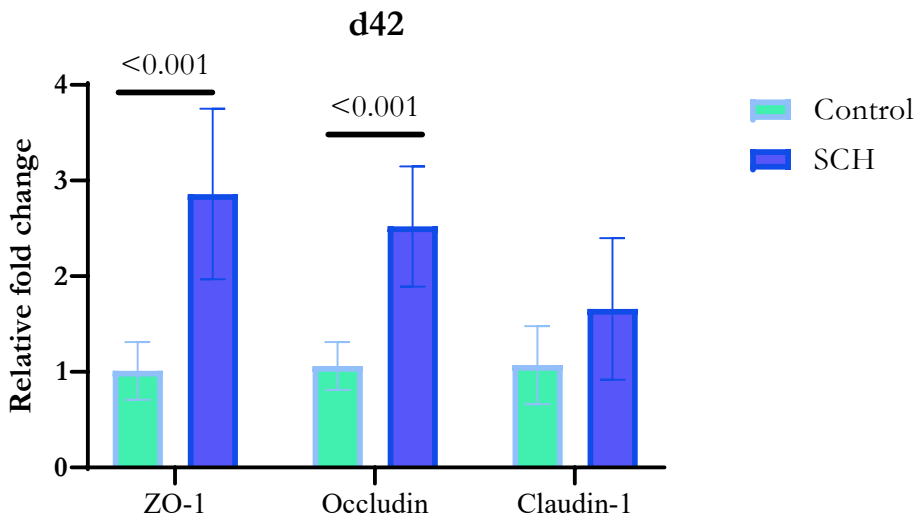
Item		CONTROL	SCH	P-value
Duodenum	VH (µm)	1642.59±237.63	1690.46±327.01	0.797
	CD (µm)	186.94±35.04	176.52±22.02	0.592
	VCR	8.86±0.59	9.51±0.69	0.152
Jejunum	VH (µm)	1248.41±180.71	1471.71±209.60	0.076
	CD (µm)	179.60±20.76	154.79±32.69	0.148
	VCR	6.96±0.74^{b}	9.65±0.91^{a}	<0.001
Ileum	VH (µm)	939.14±93.06	1076.47±139.32	0.073
	CD (µm)	158.05±16.66	139.91±21.71	0.136
	VCR	5.96±0.49^{b}	7.73±0.62^{a}	<0.001

Gene expression



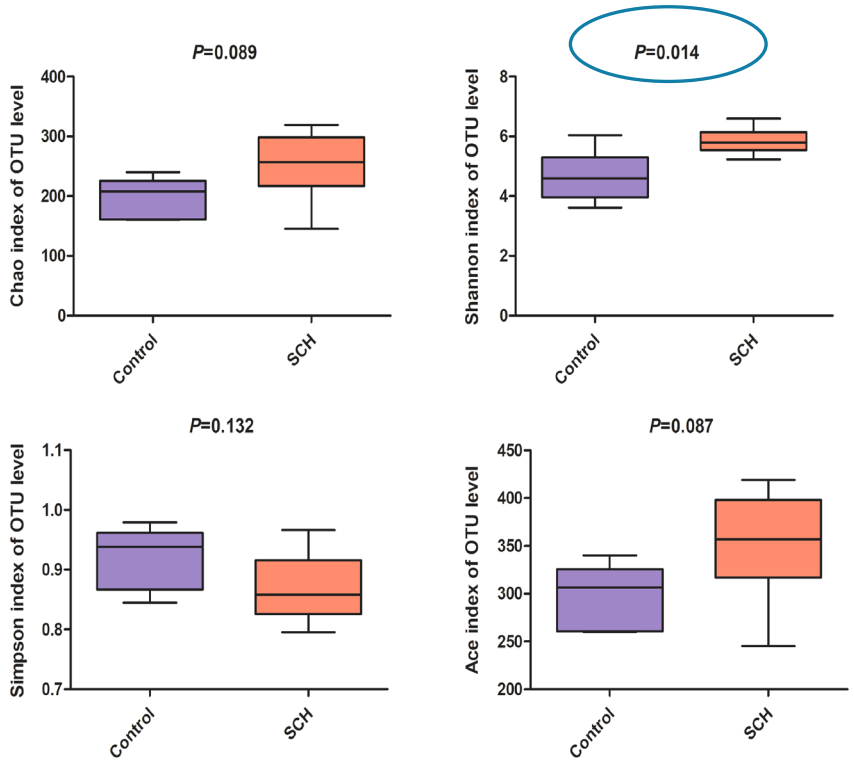




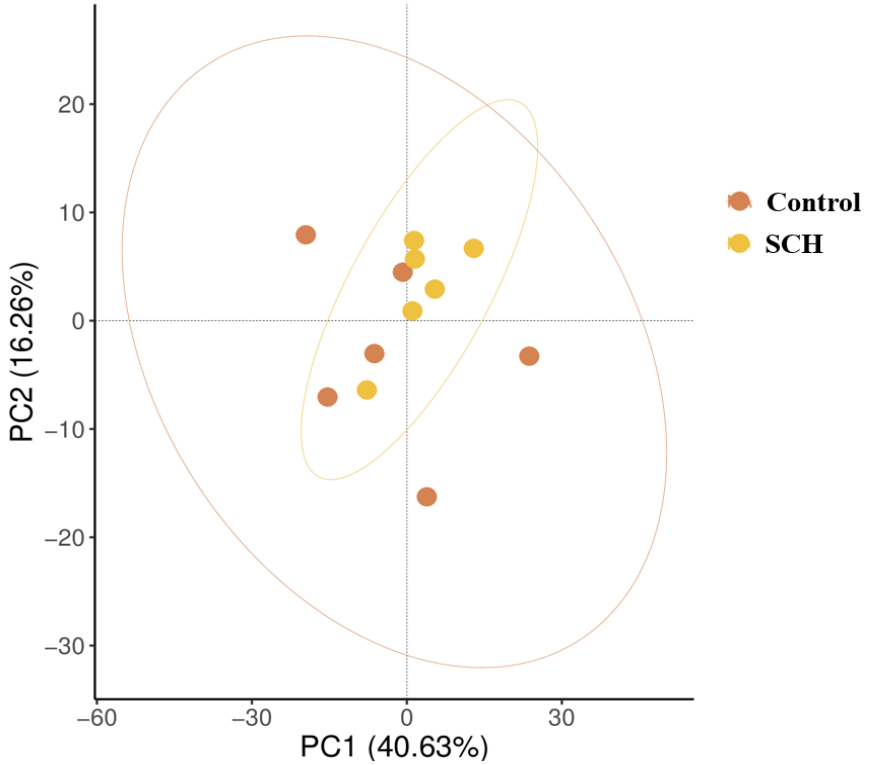


Alpha and beta diversity

- Alpha diversity

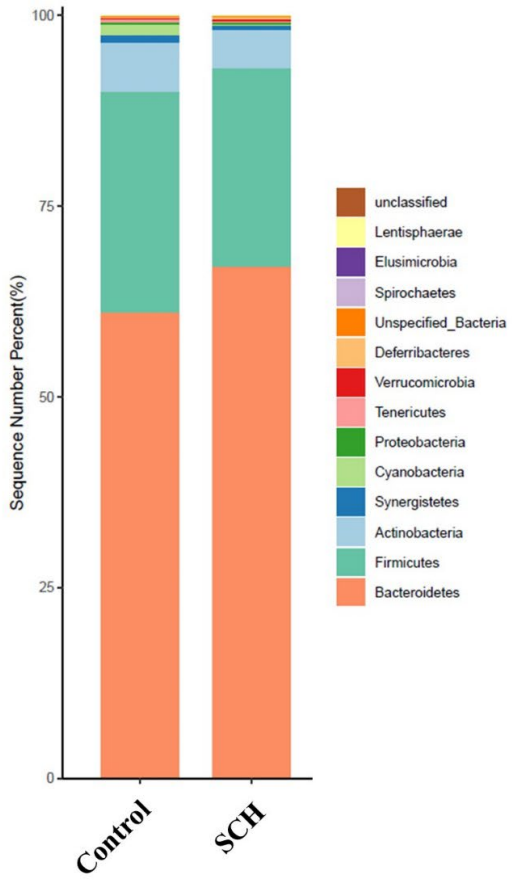


- Beta diversity (no differences)

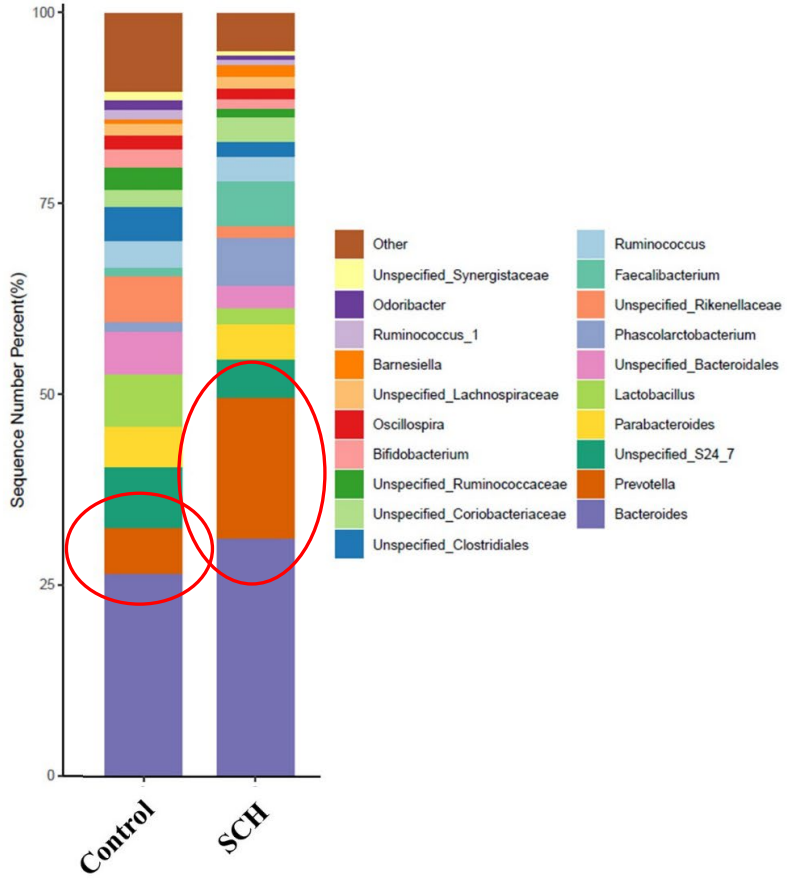


Taxonomic composition - Relative abundance

phylum



genus



Taxonomic compositions were analyzed at phyla and genus levels. The addition of SCH resulted in changes in the composition of the cecal microbiota. Compared with the control group, at the phylum level, broilers fed with SCH diet were characterized by higher relative abundance of **Bacteroidetes** and lower abundance of **Firmicutes**. At the genus level, the abundance of *Prevotella*, a probiotic involved in nutrient metabolism in the body, significantly increased ($P<0.05$).

Growth peformance	↑	**BW** (d42); **ADG & ADFI** (d 14-28; 28-42; 0-42)
Intestine morphology	↑	**VCR jejunum&ileum** (d 28 & 42)
Intestinal barrier	↑	**ZO-1, Occludin** (d 28 & 42)
Intestinal immunity	↓	**IL-1β** (d 28 & 42); **TNFα & IL-6** (d 42)
Microbial composition	↑	*Bacteroidetes*; *Prevotella*
	↓	*Firmicutes*

Taken together, SCH addition in wheat based diets could enhance the intestinal immunity and barrier function of broilers, maintain the intestinal health status, and promote the growth of broilers.

THANKS FOR YOUR ATTENTION!

PROSOL

INSTITUTE OF FEED RESEARCH OF CHINESE ACADEMY OF AGRICULTURAL SCIENCES

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divas

DIPARTIMENTO DI MEDICINA VETERINARIA E SCIENZE ANIMALI