



SUSINCHAIN
SUSTAINABLE INSECT CHAIN



UNIVERSITÀ
DI TORINO



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1st-5th of September, 2024

MEAT QUALITY IN BROILER CHICKENS FED A MIXTURE OF *HERMETIA ILLUCENS* AND *TENEBRIO MOLITOR* MEALS

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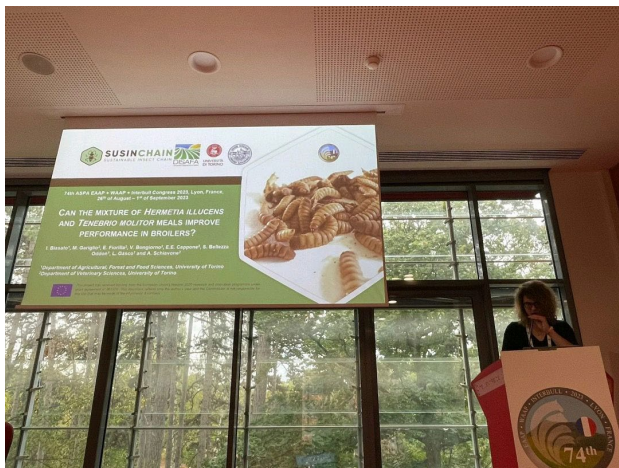
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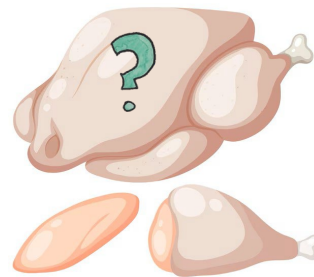
The journey..



One year ago in Lyon..

15:00 Fecal Metabolome of Chicken Fed Black Soldier Fly and Yellow Mealworm-Based Diets
A. Kenéz, I. Biasato, A. Schiavone, L. Gasco

..and here in Florence in a few minutes 😊



..few months ago in Potsdam..



INSECTA 2024 International Conference, Potsdam, Germany,
14th–16th of May, 2024

**CONSUMER PREFERENCE OF MEAT OBTAINED FROM
BROILER CHICKENS FED A MIXTURE OF *HERMETIA
ILLUCENS* AND *TENEBRIO MOLITOR* MEALS**

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Why?



Why using a mixture?



Promote insect industry
competitiveness

SYNERGY
 $1+1 > 2$

Potential synergy between
the two insect species

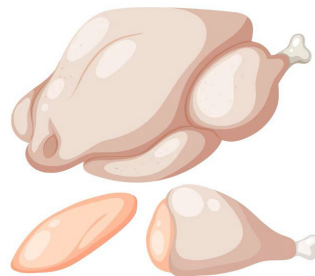


Reduce single species-
related potential issues

Aim



HI and TM meals (alone and as 1:1 mixture) in broiler chickens under commercial conditions



Meat quality

How?

Proximate composition (% , as is)	HI	TM	MIX
DM	95.99	96.38	96.25
CP	55.87	58.22	57.71
EE	4.35	8.81	6.41
Ash	9.90	3.60	6.70
Chitin	5.94	7.69	6.76
AMEn (kcal/Kg)	2794	4100	3473

Macrominerals and EAAs (% , as is)	HI	TM	MIX
Ca	2.20	0.09	0.99
P	1.20	0.87	1.00
Arginine	2.46	2.79	2.63
Isoleucine	2.24	2.84	2.54
Leucine	3.59	5.25	4.42
Lysine	0.20	0.24	0.27
Methionine	0.52	0.80	0.65
Phenylalanine	0.90	1.05	1.03
Threonine	1.51	2.17	1.86
Tryptophan	0.19	0.14	0.15
Valine	1.39	1.71	1.74

How?

	C	HI		TM		MIX	
		5%	10%	5%	10%	5%	10%
Starter phase (1-10 days)	Crumbled feed						
Grower phase (11-25 days)	Pelleted feed						
Finisher phase (26-37 days)							



- ✓ Partial replacement of soybean meal (till 72%)
- ✓ Isoenergetic and isonitrogenous diets
- ✓ Analogous AA ratios (to lysine)

How?



420 1-day-old male Ross 308 broiler chicks

**42 mobile pens (6 replicates/diet,
10 animals/replicate) in a
commercial farm (Piedmont, IT)**

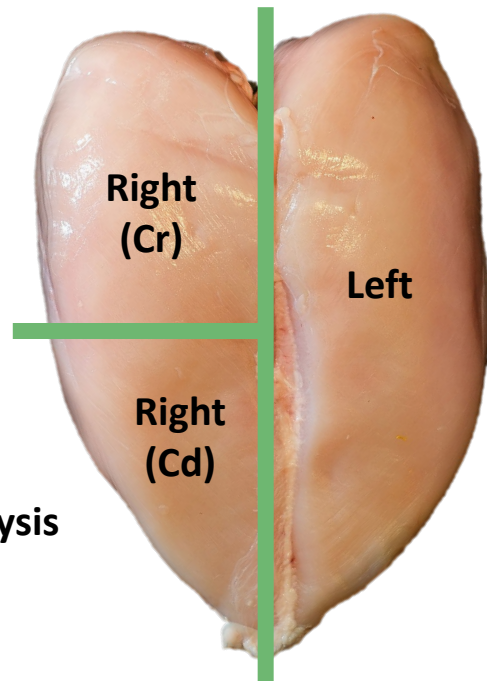




Bird slaughtering at 38 days of age (2/replicate, 12/diet)

- ✓ Thawing losses
- ✓ Cooking losses
- ✓ Shear force

- ✓ Sensory analysis



- ✓ pH and color
- ✓ DM
- ✓ CP
- ✓ EE
- ✓ Ash
- ✓ FA profile



How?



**One-way ANOVA
(P-values ≤ 0.05)**

Results



	C	HI5	HI10	TM5	TM10	MIX5	MIX10	SEM	P-value
Breast									
pH	5.60	5.63	5.63	5.72	5.70	5.72	5.65	0.01	0.155
L*	58.82	57.97	59.19	59.36	58.04	58.10	58.61	0.23	0.517
a*	0.40	0.39	-0.31	0.28	0.50	0.40	-0.26	0.09	0.052
b*	6.91	7.78	8.35	8.39	7.67	7.91	7.69	0.13	0.059
Thigh									
pH	5.88 ^a	5.81 ^{ab}	5.82 ^{ab}	5.80 ^{ab}	5.76 ^b	5.84 ^a	5.75 ^b	0.01	0.013
L*	57.79	57.26	57.95	58.07	57.24	57.89	58.02	0.22	0.905
a*	7.11 ^{bc}	6.67 ^c	8.44 ^a	6.91 ^c	8.13 ^{ab}	6.81 ^c	7.27 ^{bc}	0.15	0.006
b*	11.67	11.94	12.59	12.69	12.52	12.28	13.38	0.20	0.345

✓ pH changes difficult to be explained 😊

✓ ↑thigh redness in HI10 broilers = ↓growth

Results



	C	HI5	HI10	TM5	TM10	MIX5	MIX10	SEM	P-value
	Breast								
TL (%)	10.72	10.25	9.08	10.05	10.58	10.20	11.00	0.32	0.788
CL (%)	16.76 ^c	16.59 ^c	21.11 ^a	19.83 ^{ab}	19.13 ^{ab}	18.24 ^{bc}	19.49 ^{ab}	0.32	<0.001
SF (kgf/sec)	0.96	0.56	1.05	0.75	1.01	0.96	0.98	0.05	0.134

↓ash content = ↓WHC

Results



	C	HI5	HI10	TM5	TM10	MIX5	MIX10	SEM	P-value
Breast									
DM (%)	24.89 ^{ab}	25.12 ^a	23.97 ^c	23.98 ^c	24.49 ^{bc}	24.90 ^{ab}	24.57 ^{abc}	0.19	<0.001
CP (% as is)	21.89 ^{ab}	22.34 ^a	21.12 ^{cd}	20.90 ^d	21.37 ^{bcd}	21.69 ^{bc}	21.66 ^{bc}	0.20	<0.001
EE (% as is)	1.29	1.28	1.25	1.25	1.27	1.11	1.37	0.03	0.550
Ash (% as is)	1.36 ^a	1.37 ^a	1.26 ^b	1.26 ^b	1.29 ^{ab}	1.33 ^{ab}	1.32 ^{ab}	0.01	0.037
Thigh									
DM (%)	26.42	25.94	26.06	26.54	26.45	26.43	26.46	0.10	0.610
CP (% as is)	18.69 ^a	18.51 ^a	17.58 ^c	18.55 ^a	18.68 ^a	18.42 ^a	18.09 ^b	0.06	<0.001
EE (% as is)	6.34	6.00	6.93	6.73	6.56	6.60	6.88	0.11	0.301
Ash (% as is)	1.10	1.08	1.07	1.11	1.11	1.08	1.07	0.00	0.064

- ✓ ↓DM and CP in TM5 = ↑growth (potential wooden breast)
- ✓ ↓ash in TM5 = ↓Ca and P of TM meal
- ✓ ↓CP in HI10 = ↓growth

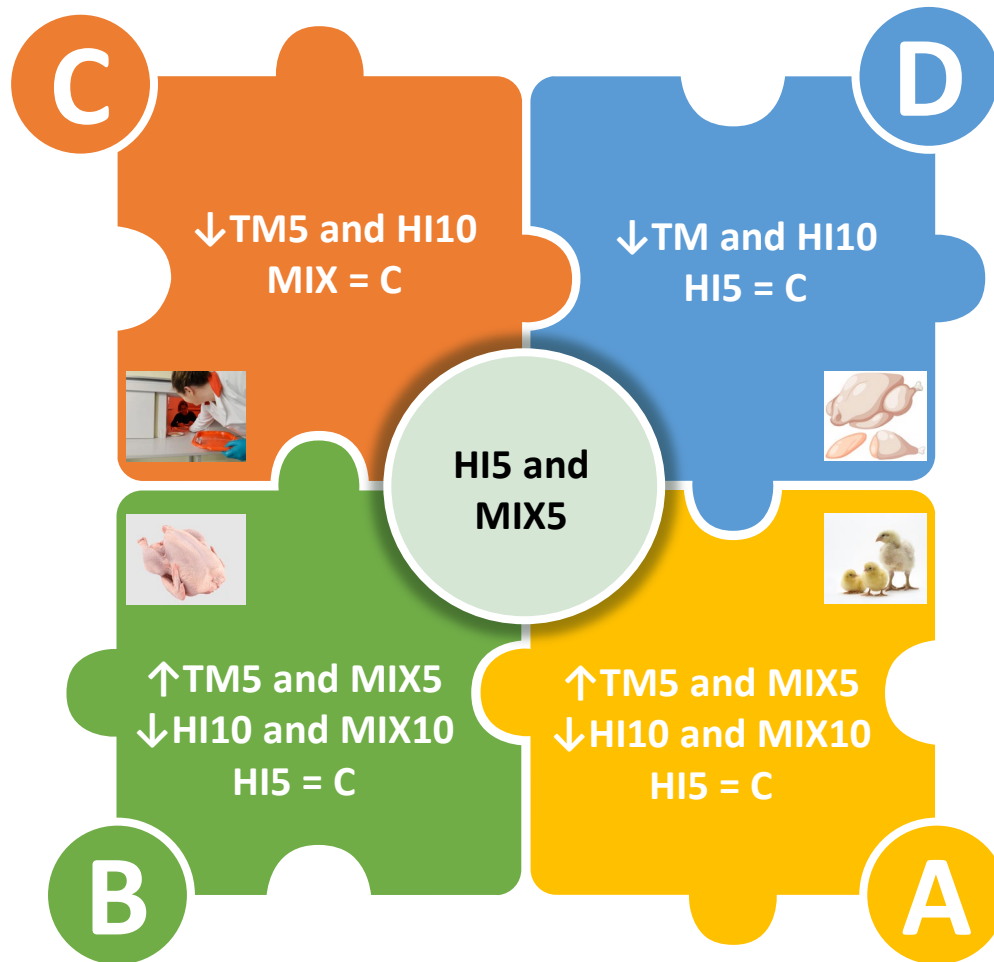
Results



	C	HI5	HI10	TM5	TM10	MIX5	MIX10	SEM	P-value
	Breast								
SFA (% TFA)	29.55 ^c	30.75 ^{bc}	31.49 ^{ab}	31.00 ^{bc}	32.88 ^a	31.39 ^{ab}	31.60 ^{ab}	0.25	0.017
MUFA (% TFA)	30.57 ^c	30.87 ^c	30.95 ^c	34.24 ^b	38.96 ^a	34.87 ^b	35.70 ^b	0.51	<0.001
PUFA (% TFA)	39.67 ^a	38.06 ^a	37.23 ^a	34.40 ^b	27.79 ^c	33.43 ^b	32.38 ^b	0.65	<0.001
PUFA/SFA	1.35 ^a	1.24 ^{ab}	1.19 ^{bc}	1.11 ^c	0.85 ^e	1.08 ^{cd}	1.03 ^d	0.03	<0.001
n-3 (% TFA)	2.11 ^a	1.80 ^a	1.64 ^a	1.80 ^a	1.17 ^b	1.94 ^a	1.62 ^a	0.07	0.004
n-6 (% TFA)	37.56 ^a	36.26 ^a	35.59 ^a	32.61 ^b	26.62 ^c	31.49 ^b	30.76 ^b	0.61	<0.001
n-6/n-3	18.94	20.71	23.75	18.62	24.06	16.61	19.36	0.87	0.190

↑SFA and ↓PUFA
and n-3 in TM10 =
rearing substrate FA
influence (HI can be
rich in PUFA ☺)

Conclusions



- ✓ Growth performance and meat quality outcomes may differ
- ✓ Dietary inclusion levels influence more than insect species
- ✓ HI and TM mixture is feasible, but not better than the single meals

THANK YOU FOR YOUR KIND ATTENTION 😊



“To be successful, the first thing to do is fall in love with your work” [cit.]



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