

Insect Meal in Broiler Diets during subclinical Necrotic Enteritis



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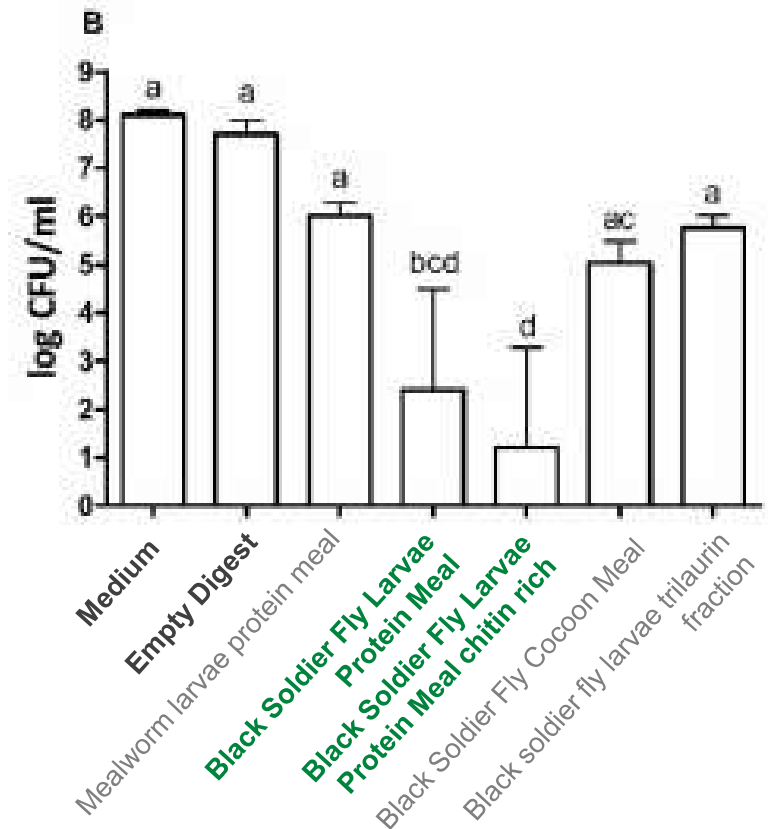
Antimicrobial effects of Insect Meal *in vitro*

Clostridium Perfringens

- Clostridium Perfringens is an intestinal microbiota present in humans and poultry
- Overgrowth can result in (subclinical) **necrotic enteritis**, with an annual worldwide impact of 15 billion birds*
 - Damaged epithelium cells and disturbed tight junctions
 - Protein synthesis shift from muscle to immunity
 - Higher heat production for maintenance

Black Soldier Fly Larvae Meal

In vitro research shows potential *C. Perfringens* growth suppressing of BSFL meal components (Dong et al., 2021)



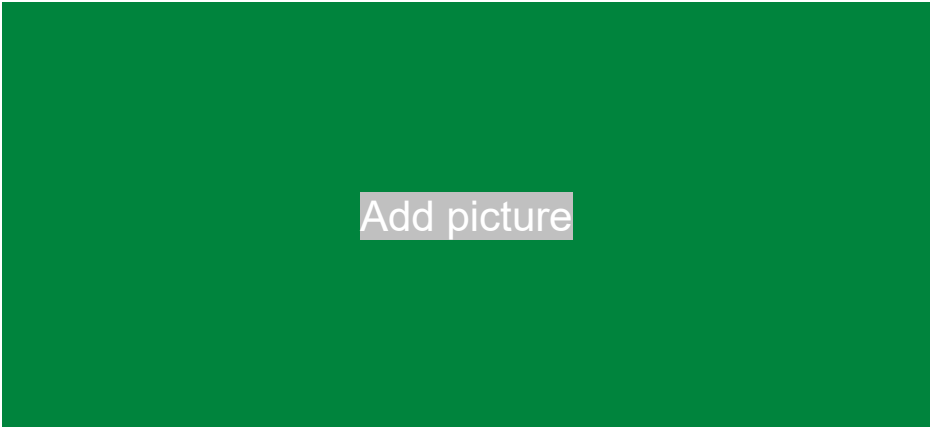
*Emami et al., 2019; Timbermont et al., 2011



Can black soldier fly larvae meal replace soybean meal, and does it influence disease symptoms of necrotic enteritis?

Trial Design

Factorial design	2	x 2	x 3
Treatment	Necrotic Enteritis Challenge	Insect Meal	Inclusion level
1	Yes	BSFL	0%
2			5%
3			10%
4		BSFLchitin	0%
5			5%
6			10%
7	No	BSFL	0%
8			5%
9			10%
10		BSFLchitin	0%
11			5%
12			10%



Trial Design



**936 birds, 72 Experimental Units,
Ross 308 male chicks**



Day 0 to day 35

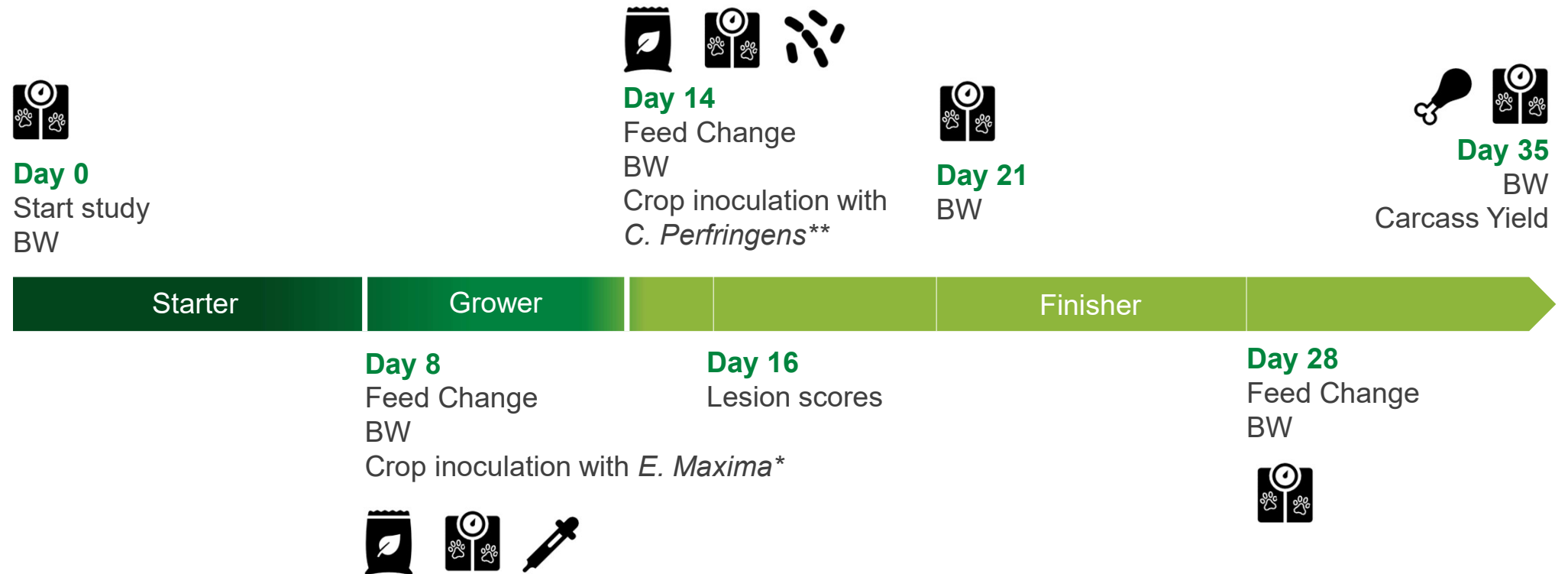


**Cargill Innovation Center Velddriel,
The Netherlands**

Add picture



Trial timeline



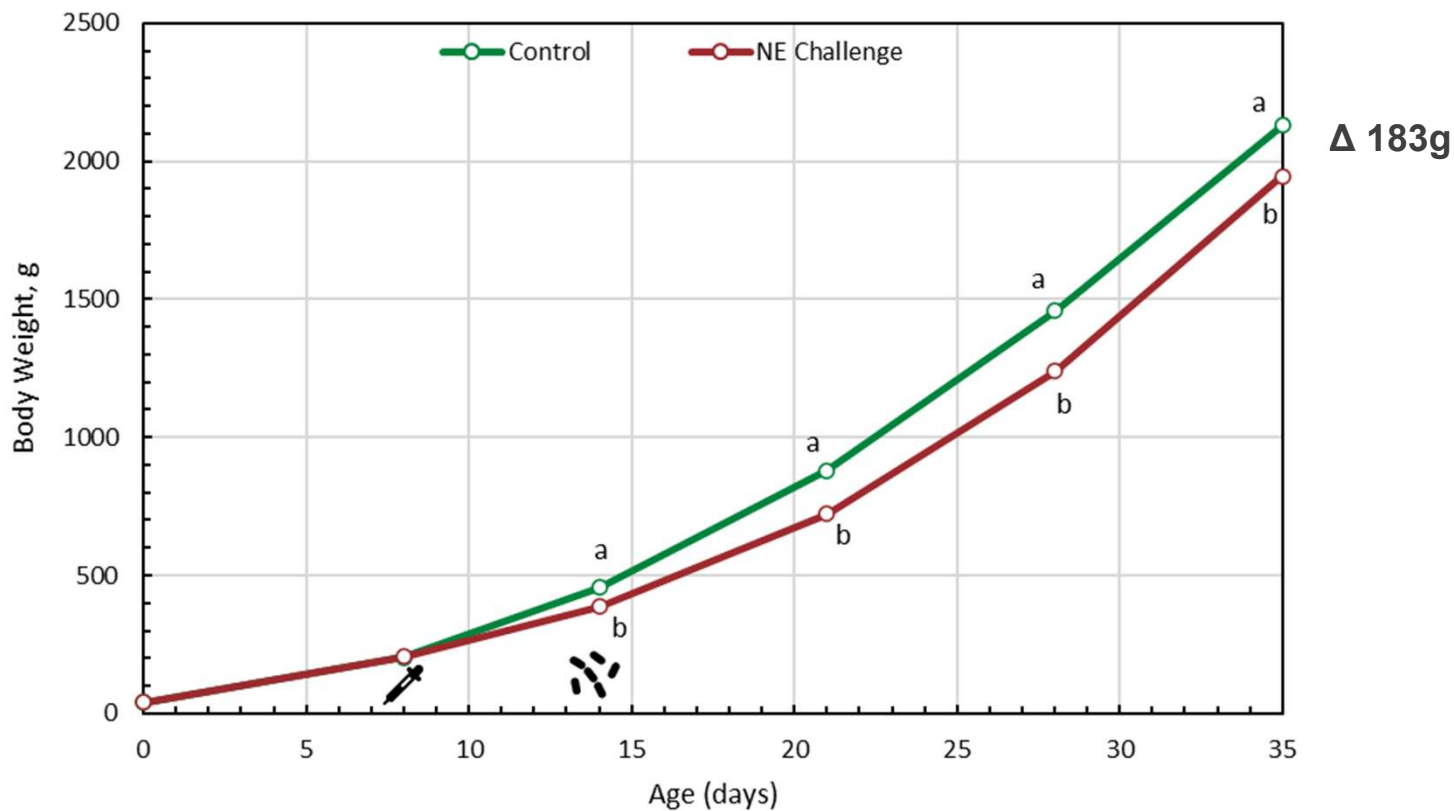
*4500 sporulated oocysts per mL; Royal GD
**Royal GD, 108 CFU/mL in liver broth

Starter Diets

Ingredients		A - D - G - J	B - H	C - I	E - K	F - L
Soybean meal		36.23	30.08	23.94	29.77	23.32
Maize		36.12	36.49	36.86	36.45	36.77
Wheat		20.00	20.00	20.00	20.00	20.00
Sunflowerseed meal		0.20	2.06	3.92	2.42	4.64
Insect Meal Protix			5.00	10.00		
Insect Meal Protix chitin					5.00	10.00
Fat - Sunflower Oil		3.68	2.71	1.75	2.69	1.70
Limestone		1.634	1.498	1.361	1.497	1.359
Monocalciumphosphate		0.720	0.763	0.805	0.763	0.805
DL-Methionine		0.276	0.267	0.258	0.265	0.253
Salt		0.229	0.233	0.236	0.226	0.223
Sodiumbicarbonate		0.213	0.213	0.212	0.222	0.230
L-Lysine HCL		0.134	0.126	0.118	0.143	0.152
L-Threonine		0.050	0.038	0.026	0.040	0.029
ENZ C Hostx D 100 P		0.010	0.010	0.010	0.010	0.010
Phyzyme XP 10000 TPT		0.006	0.006	0.006	0.006	0.006
Premix broilers starter		0.500	0.500	0.500	0.500	0.500
Nutrients						
Crude protein	%	23.00	23.00	23.00	23.00	23.00
Calcium	%	0.880	0.880	0.880	0.880	0.880
Chloride	%	0.200	0.200	0.200	0.200	0.200
Sodium	%	0.160	0.160	0.160	0.160	0.160
Av. P	%	0.400	0.400	0.400	0.400	0.400
ME broiler	kcal	2850	2850	2850	2850	2850
SID Lysine	%	1.200	1.200	1.200	1.200	1.200
SID Arginine	%	1.412	1.371	1.329	1.366	1.320
SID Isoleucine	%	0.874	0.885	0.895	0.886	0.897
SID Leucine	%	1.646	1.649	1.651	1.651	1.655
SID Meth.+Cyst.	%	0.880	0.880	0.880	0.880	0.880
SID Threonine	%	0.770	0.770	0.770	0.770	0.770
SID Tryptophan	%	0.247	0.218	0.189	0.218	0.188
SID Valine	%	0.948	0.997	1.045	1.007	1.065

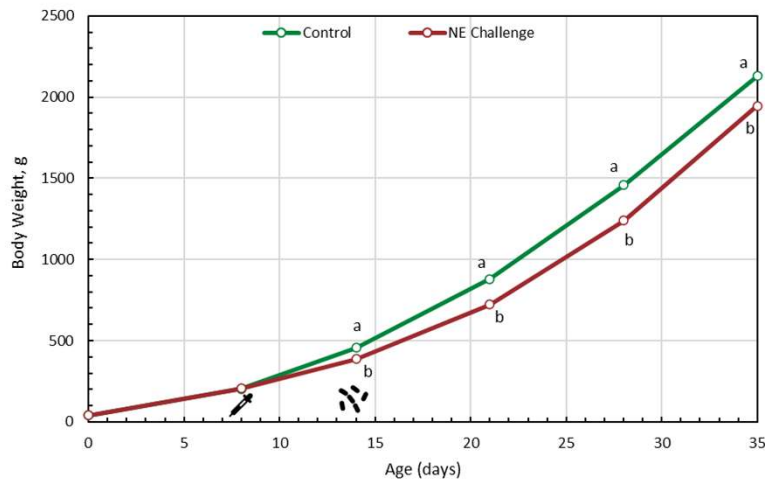
SID values of BSFL were calculated based on Mwaniki et al. (2019)

Necrotic Enteritis challenge reduced growth

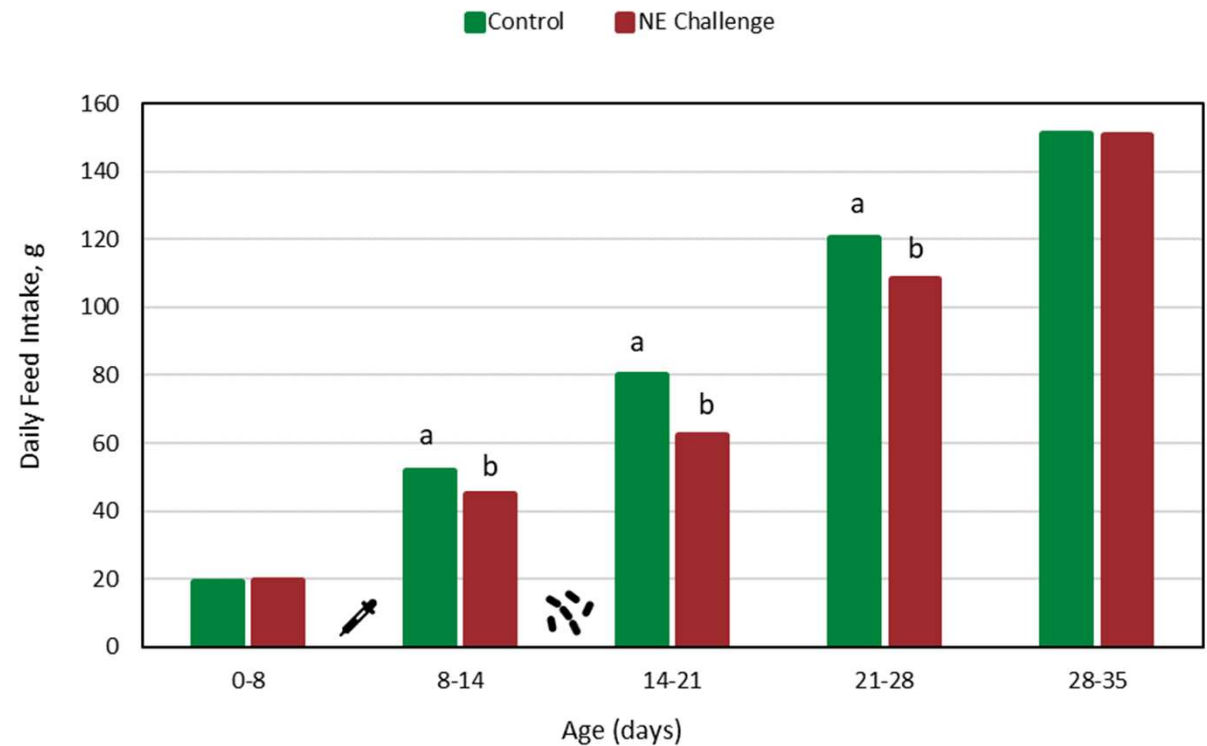


Different superscripts show significant difference $P < 0.05$

Necrotic Enteritis challenge reduced growth



	Control	NE Challenge	P Value
Gain to Feed Day 0 to 35	0.725	0.718	<0.05
Mortality	4%	9%	0.07
Lesion score Probability for a higher score	0	60	0.0995



Different superscripts show significant difference $P < 0.05$

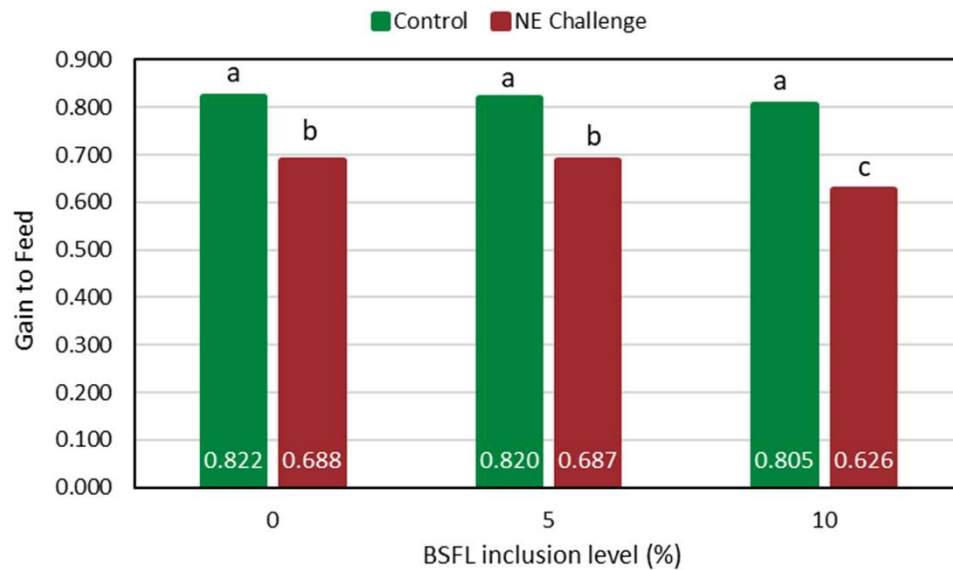
Influence of BSFM on Feed Efficiency



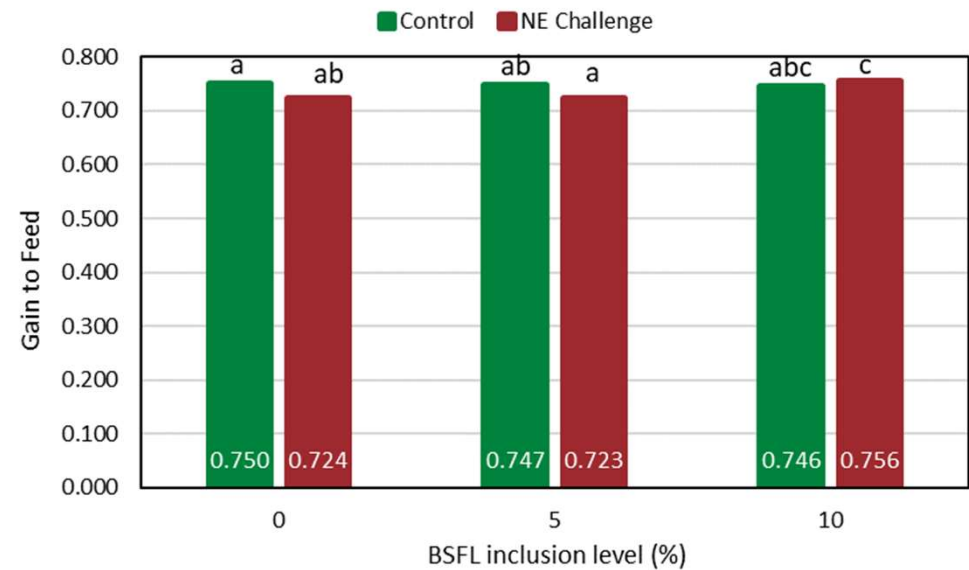
Day 8 to 14



Day 14 to 21

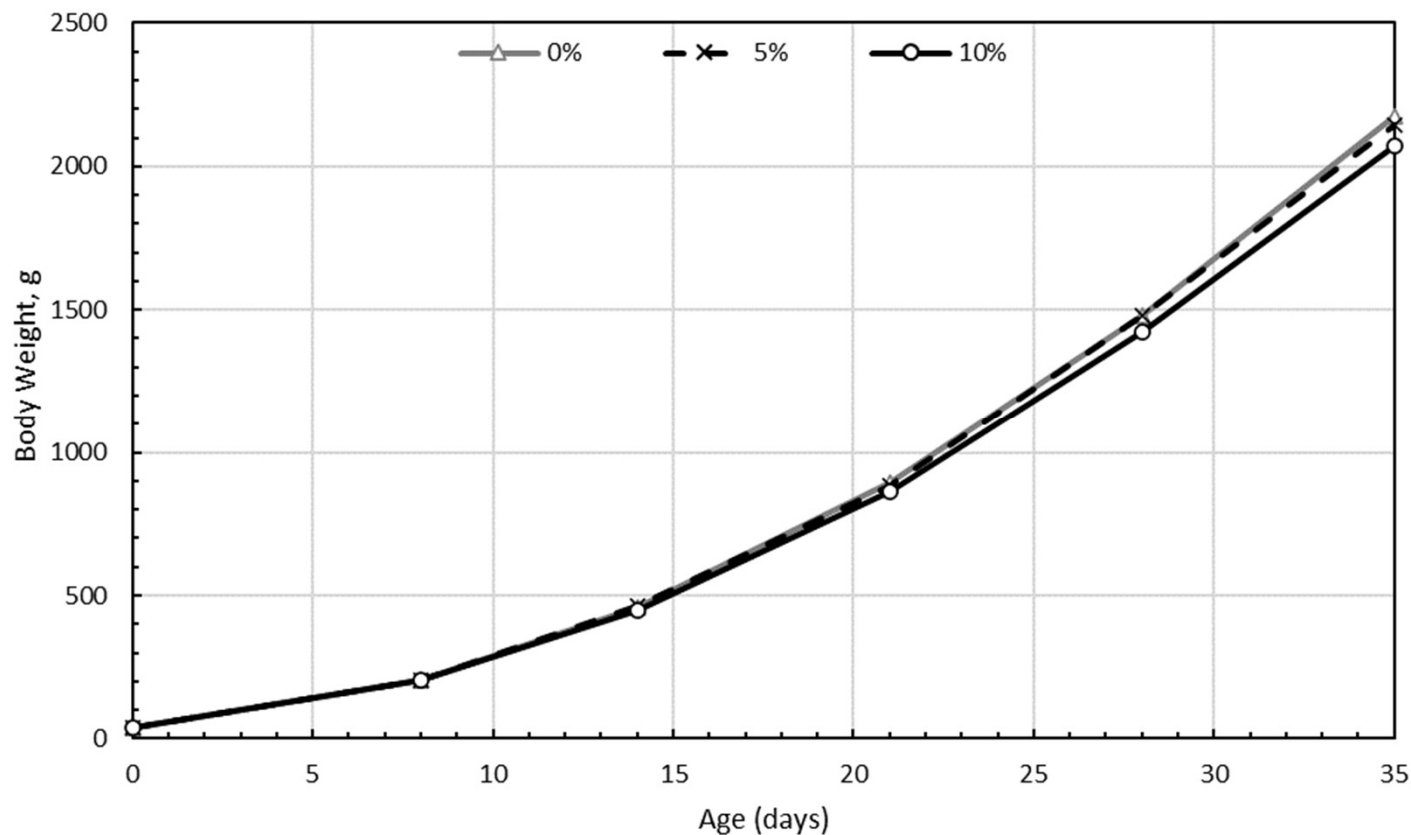


- NE challenge resulted in lower G:F
- 10% inclusion of BSFL showed the lowest G:F



- NE challenge was no longer lowering G:F
- 10% inclusion of BSFL showed the highest G:F in challenged birds, compared to 0% and 5% inclusion
- No significant differences in feed intake and growth

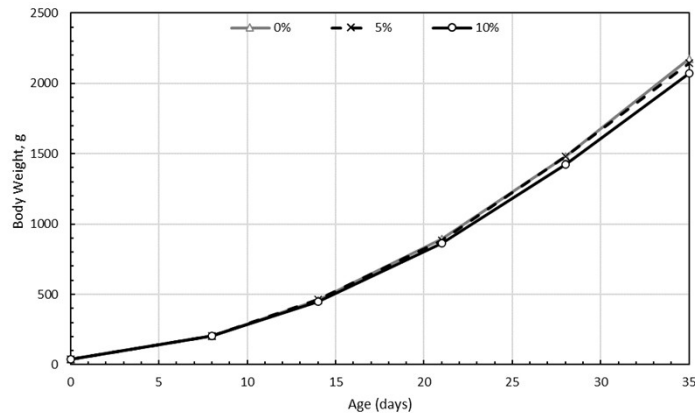
Influence of BSFL on growth curve



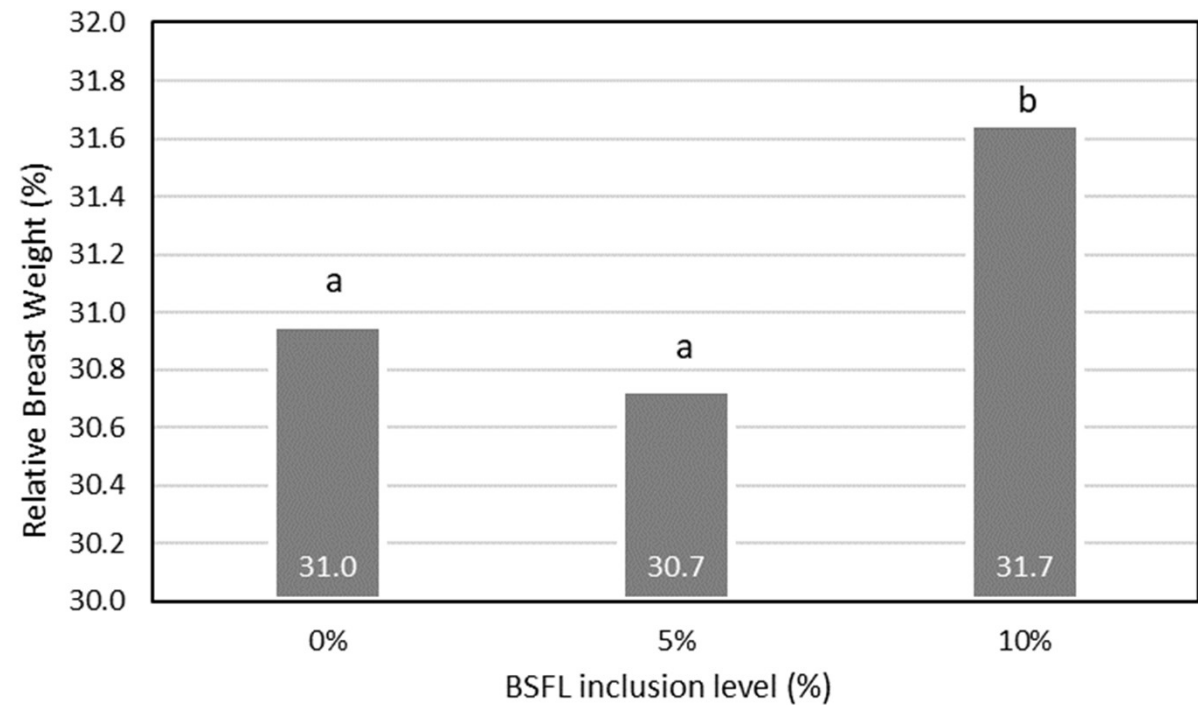
No significant impact of BSFL on body weight curves $P>0.05$

Figure shows non-challenged birds

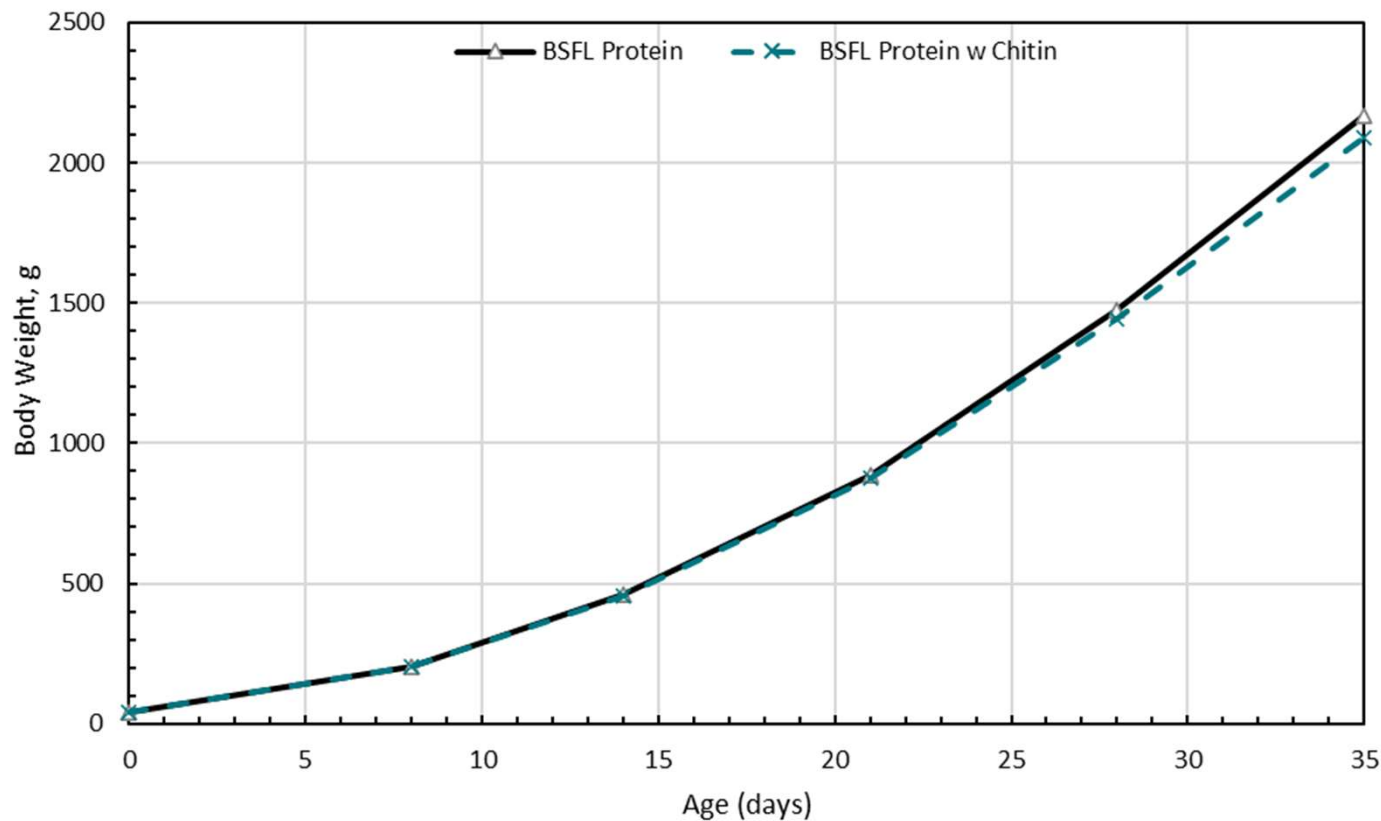
Influence of BSFL on carcass composition



Relative breast weight was higher in 10% BSFL group ($P < 0.05$)



Influence of insect source on growth



No significant impact of BSFL or BSFLchitin on body weight curves $P>0.05$

Figure shows non-challenged birds

Conclusion

- 01 The subclinical NE challenge significantly reduced growth
- 02 Overall, BSFL inclusion did not impact the negative effect of NE challenge
- 03 In d 8-14, the G:F was lower in the NE challenged, 10% BSFL group
- 04 In d 14-21, the G:F was higher in the NE challenged, 10% BSFL group
- 05 Neither BSFL replacement of SBM, nor BSFL source impacted growth, feed intake or efficiency.

