Instituto Nacional de Investigação Agrária e Veterinária, I.P.

ENTOVALOR

Effects of replacing soybean with Black Soldier Fly (*Hermetia illucens)* larvae in broiler feeding programs

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GOVERNO DE PORTUGAL
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Introduction

ENTOVALOR - Insects as an opportunity in by-products valorisation

Objectives:

- ✓ **Reuse food by-products**
- ✓ **Reintroduce the nutrients present in organic by-products in the value chain**
- ✓ **Contribute to the establishment of quality standards and biosafety**
- ✓ **Perform a proof of concept for industrial and commercial application**
- ✓ **Develop new products**

Coordination: Ingredient Odyssey/Entogreen

- **1 Research Entity**(INIAV)
- 4 **Agro/Feed Enterprises** (ENTOGREEN,AGROMAIS, Rações Zêzere, CONSULAI)

Introduction

- Chemical evaluation of substrates and larvae
- In vitro digestibility of larvae
- ***In vivo studies with broiler***
- Egg sensory analysis
- Agronomic valorization

Objectives

- To evaluate the effect of the partial replacement of soybean meal and soybean oil by insect meal (BSF larvae), in broiler diets, on the digestibility and productive performance.

Methodology

Experimental diets

4 dietary treatments:

Control (**BSF0**) and partial replacement of soybean meal and soybean oil by BSF larvae meal (**BSF25**, **BSF50**, **BSF75**)

Isoenergetic, Isoproteic

Digestibility Trial

48 Broilers ROSS 308 (0-28 days old)

Randomly distributed by experimental diets

Individually allocated in metabolic cages

- Daily control of feed and water intake
- Daily excreta sampling
- Week weight record

Chemical Characterization: Proximal analyses (feed and excreta)

Calculations: FCR, Apparent Digestibility (DM, N , GE, NDF)

Statistical analysis: Repeated measurement analysis using the proc mixed of SAS

Results

Ingredient composition of experimental diets (%)				
Ingredient	**BSF0** *Control*	**BSF25**	**BSF50**	**BSF75**
Corn	46,8	48,9	51,1	45,5
Wheat	10,0	10,0	10,0	10,0
Soybean meal	35,3	27,3	19,3	8,5
Soybean oil	4,1	2,2	0,2	--
BSF larvae meal	**0**	**7,8**	**15,6**	**23,4**
Sunflower meal	--	--	--	4,0
Wheat bran	--	--	--	4,5
Minerals & Vitamins	3,1%	3,1%	3,0%	3,0
AA Meth Lys Tre	0,7%	0,8%	0,9%	1,1

Results

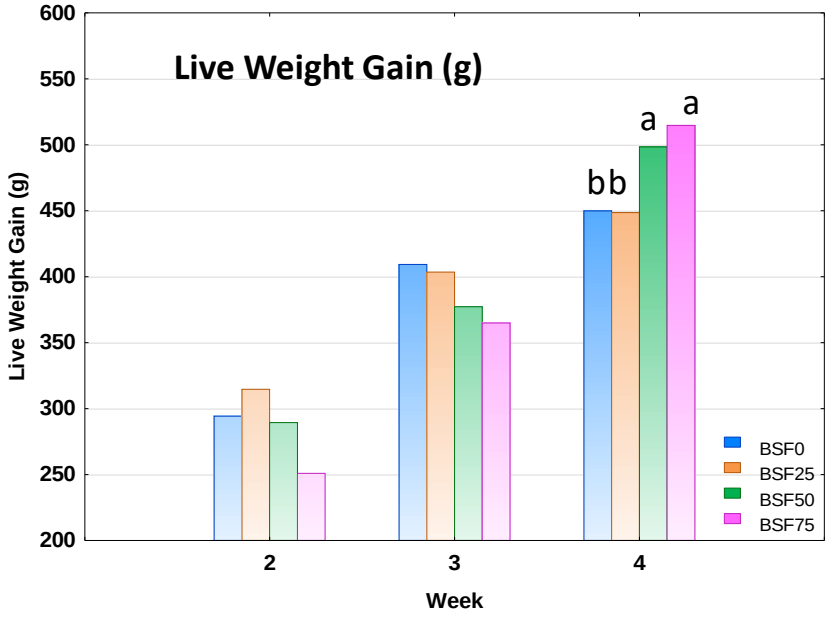
Chemical composition of experimental diets (g/kg DM)

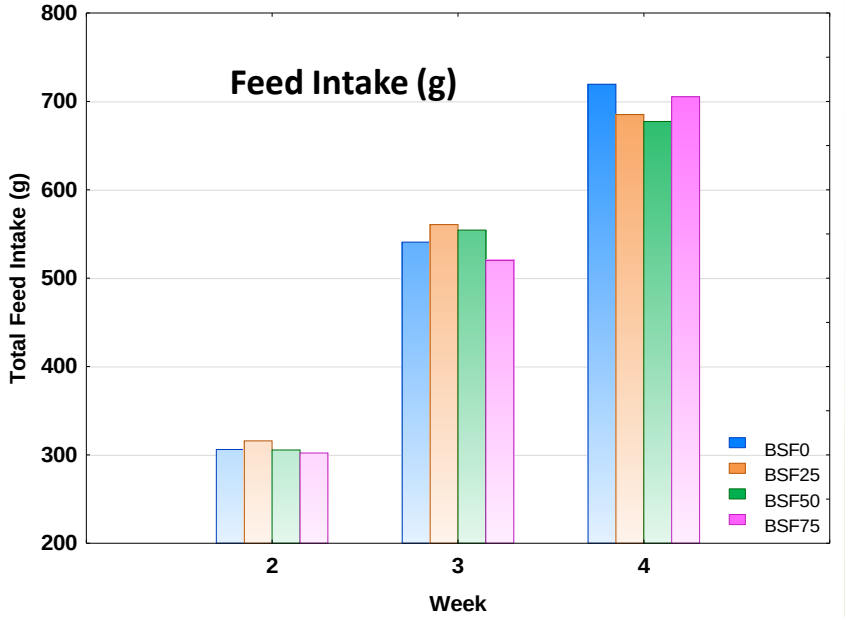
Parameter	BSF0	BSF25	BSF50	BSF75
Dry matter (g/kg)	878	880	875	881
Crude protein	235	242	234	228
Ether extract	68	66	68	69
NDF	116	121	129	164
ADF	48	49	55	67
Ash	60	66	68	77
Calcium	8.4	12.7	12.5	14.8
Phosphorus	6.7	7.7	7.6	8.5
Sodium	1.6	1.2	1.3	1.4
Potassium	6.6	6.5	6.0	5.3
Magnesium	1.7	1.4	1.5	1.6
Gross energy, Mj/kg DM	16.8	16.9	16.6	17.6

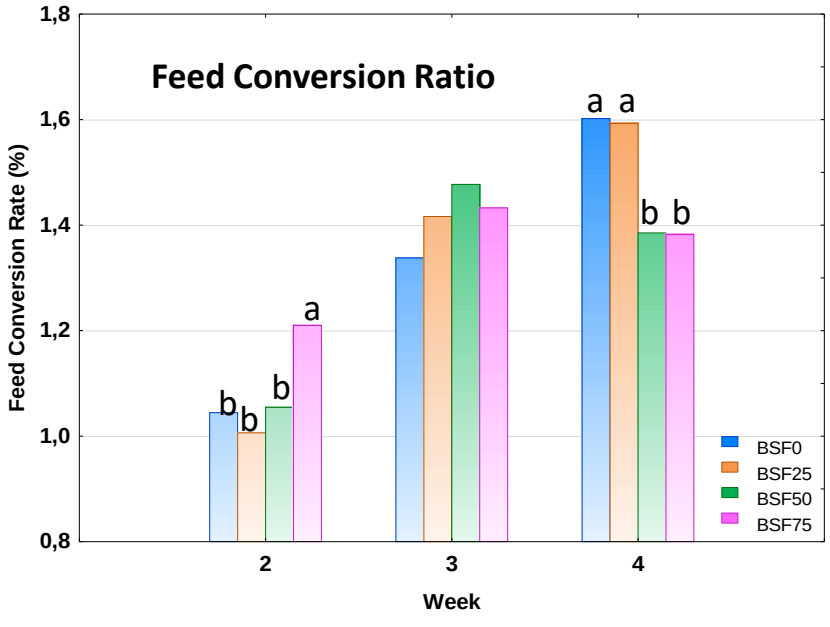
Results: Produtive performance

	Diet	Diet * Week
Live Weight Gain (g/day)	NS	***
Average Daily Gain (g/day)	NS	**
Total Feed Intake (g)	NS	NS
Daily Feed intake (g/day)	NS	NS
Feed conversion rate (%)	NS	***

Results: Productive Performance







Overall experimental period

- No differences between dietary treatments

LWG: 380 g

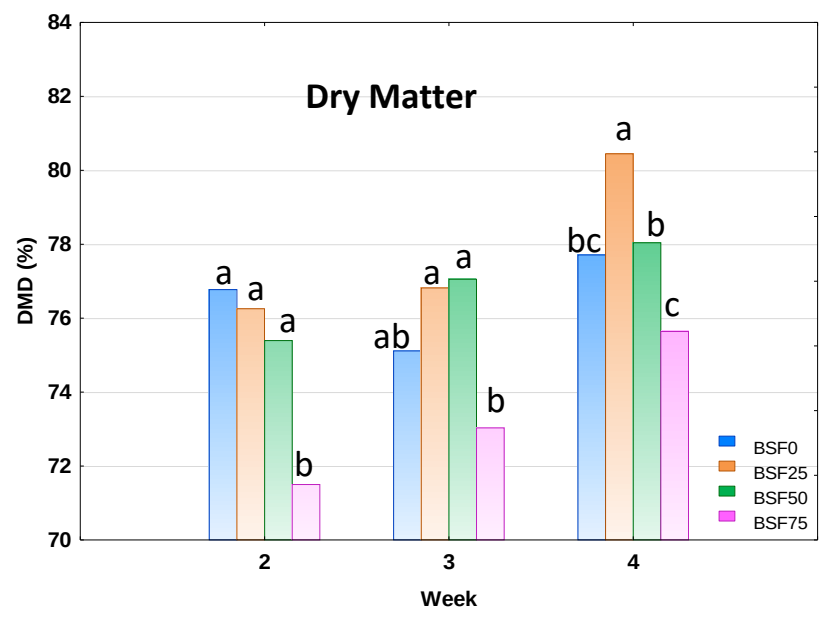
Feed intake: 515 g

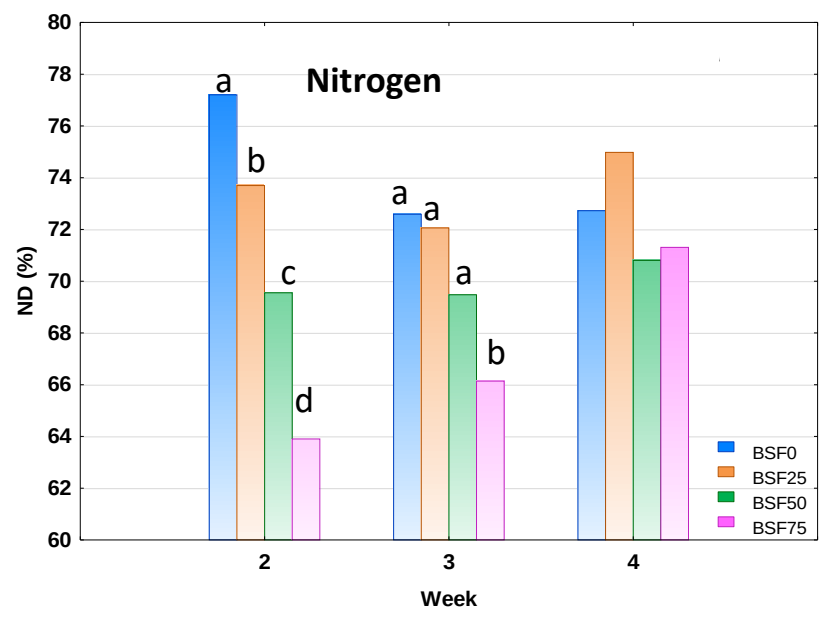
FCR: 1.35

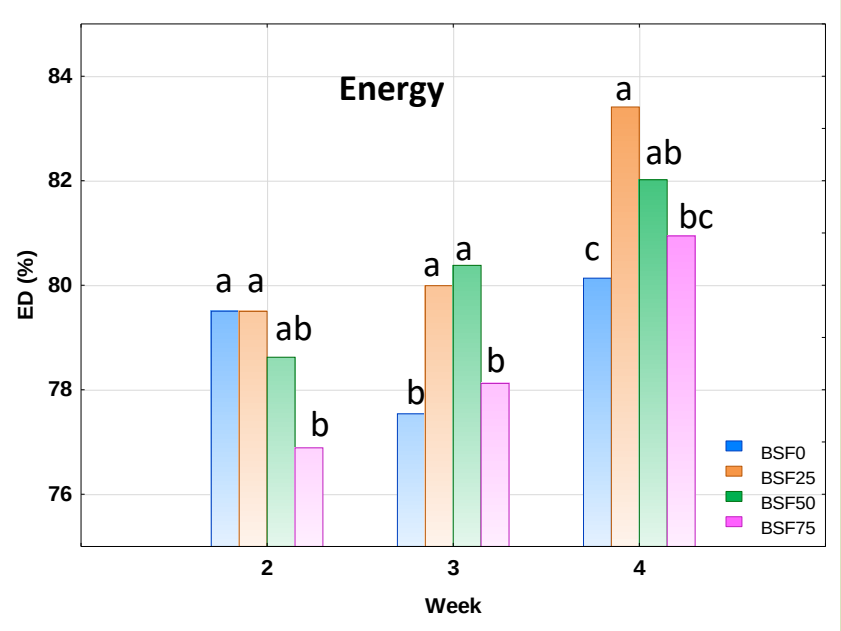
Results: Apparent Digestibility

	Diet	Diet * Week
Dry matter excreted (g/day)	***	**
Dry matter digestibility (%)	***	*
Nitrogen digestibility (%)	***	***
Energy digestibility (%)	***	*
NDF digestibility (%)	NS	NS

Results: Apparent Digestibility (%)







Overall Experimental period

BSF50 and BSF75: lower digestibility

BSF25: 79% DMD; 74% ND; 81% ED

Conclusions

- Diets with larvae meal have higher content of NDF, ADF, Ca, P
- Produtive performance was not affected by dietary treatments
- The inclusion of BSF larvae meal in poultry diets to partially replace soya at 25 %, as alternative protein source, may be a sustainable solution in broiler diets.
- The level of replacement of 75 % compromises the apparent digestibility of nutrients.

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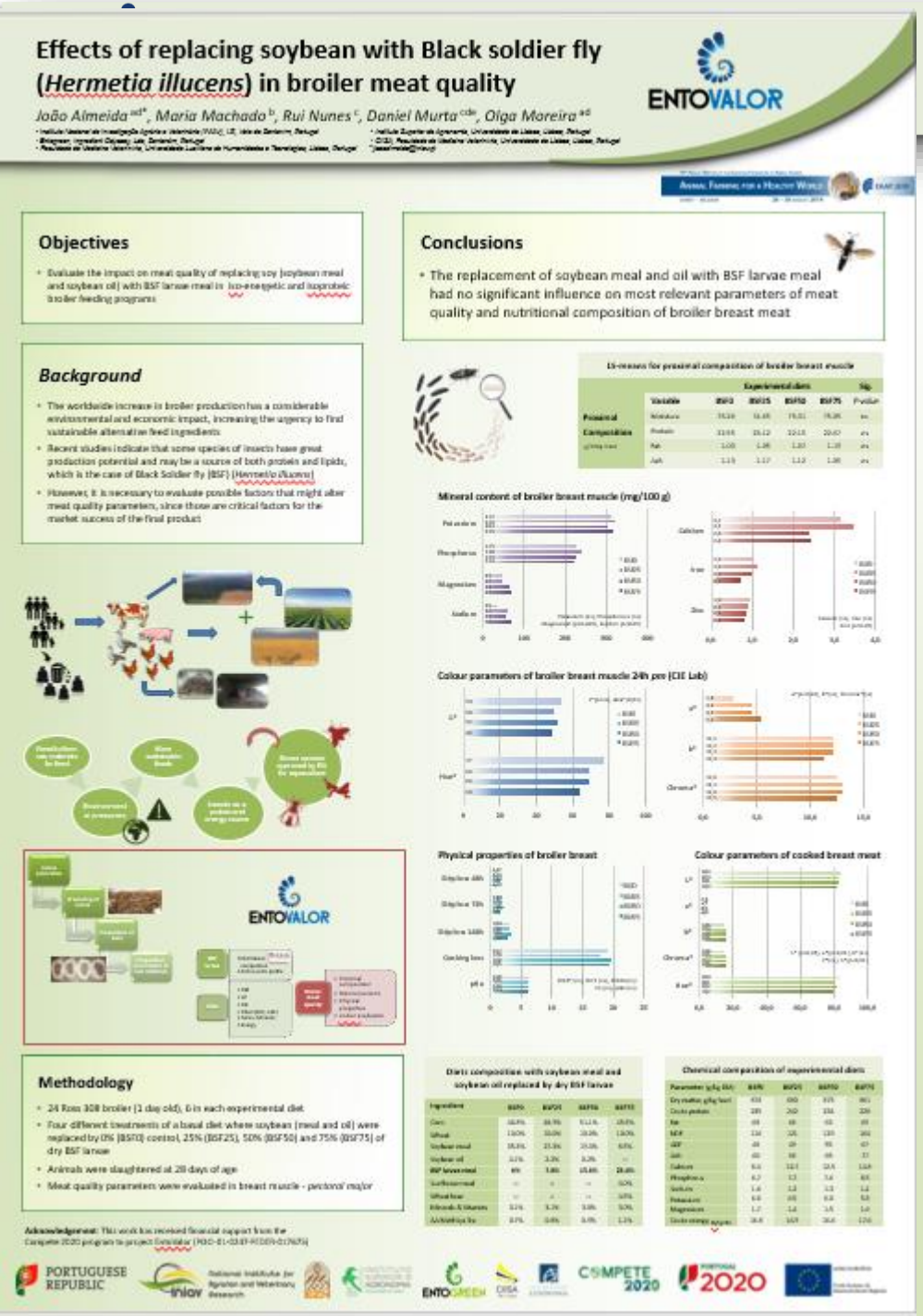

Broiler meat quality

- Proximal composition
- Mineral content
- Physical properties
- Colour evaluation

THANK YOU FOR YOUR ATTENTION

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