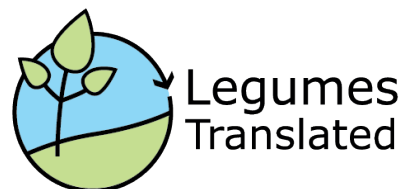


Feeding extruded soybean to pigs

A case study in Bulgaria

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Imported defatted soybean meal is the most common supplemental protein source used for feeding pigs. It is available as a commodity world-wide. Most soybean meal used in Europe is imported from South America. Partially replacing imported soybean meal with extruded full-fat soybeans in pigs' diet could be an attractive and financially beneficial alternative in a country like Bulgaria where the facilities for production of soybean meal is not widely available. It is especially attractive in mixed-farming systems where soybean production and use (in feed) are closely connected.

We investigated the inclusion of extruded full-fat soybeans in a diet of pigs to identify feed formulations for mixed farming systems based on scientific evidence. Local soybean production and processing can have a positive economic effect on livestock enterprises. Extruded full-fat soybean contains less protein and lysine than soybean meal, but is richer in fatty acids. The high fat content provides a

Applicability

Topic: Extruded full-fat soybean

For: Pig diet

Where: All pig growers

Duration: Pig live time

Impact: Diet with included extruded full-fat soybean for pigs benefit animal health and caused less oxidative stress.

convenient source of adding fat to pig diets. The addition of extruded full-fat soybeans had a positive effect on animal nutrition and caused less oxidative stress, as indicated by the lowest levels of malondialdehyde (MDA) in the blood plasma. This indicates that the full-fat soybean reduced lipid peroxidation. Further, Đorđević et al. (2016) found that the addition of oilseeds or full-fat soybeans to pig diets resulted in pork meat with higher content of polyunsaturated fatty acids.



Pigs from experimental group II of second experiment. Photograph: Radka Nedeva

Table 1. The formulation of the feeds used in Experiment 1 to examine the effect of replacing soybean meal with extruded full-fat soybean from cv. Srebrina for the control treatment (I) and the two experimental treatments (II and III).

Feed components	Subperiod I 20 kg – 60 kg live weight			Subperiod II 60 kg – 100 kg live weight		
	I (Control)	II	III	I (Control)	II	III
Maize	25.00	25.00	25.00	-	-	-
Wheat	27.17	25.69	24.97	40.30	39.60	39.16
Barley	20.00	20.00	20.00	40.00	40.00	40.00
Wheat bran	10.00	10.00	10.00	10.00	10.00	10.00
Soybean meal	16.00	8.00	4.00	8.00	4.00	2.00
Extruded soybean Srebrina	-	9.27	13.90	-	4.60	7.00
Chalk	1.35	1.30	1.30	1.10	1.05	1.05
Dicalcium phosphate	-	0.10	0.10	-	0.07	0.07
Salt	0.20	0.20	0.20	0.20	0.20	0.20
Lysine	0.08	0.24	0.33	0.20	0.28	0.32
Threonine	0.20	0.20	0.20	-	-	-
Premix	-	-	-	0.20	0.20	0.20
Total %	100.00	100.00	100.00	100.00	100.00	100.00
1 kg of feed contains:						
Total energy (kcal)	3,012	3,093	3,134	3,070	3,111	3,131
Crude protein %	17.11	17.10	17.00	15.9	15.9	15.9
Lysine %	0.80	0.80	0.80	0.76	0.76	0.75
Methionine + cysteine %	0.37	0.37	0.37	-	-	-
Threonine %	0.44	0.44	0.43	-	-	-
Tryptophan %	0.23	0.19	0.17	-	-	-
Ca %	0.70	0.71	0.71	0.60	0.60	0.60
P %	0.53	0.54	0.54	0.52	0.53	0.52
Fibre %	4.13	4.37	4.49	-	-	-
Fat %	2.10	3.87	4.78	1.21	2.17	2.64

Case study data

Two experiments were conducted. The Danube White breed was used in the first, and a Danube White x Pietren cross was used in the second.

The first experiment was performed using three treatments (I (Control), II and III). The Treatment II group were fed a compound feed in which 50% of the soybean meal was replaced on a protein basis by extruded full-fat soybean from the Bulgarian cultivar Srebrina. In Group III, 75% of the soybean meal was replaced by protein extruded full-fat soybean (Table 1).

In the second experiment with 2 groups (I (Control) and II (Experimental)), extruded full-fat soybean of the Bulgarian cultivar Richy was used. In the experimental group, 30% of the soybean meal (by was replaced by extruded full-fat soybean on a protein equivalent basis (Table 2).

Both experiments were performed over two rearing periods: the first from the weanling pigs 20 kg to 60 kg live weight, and the second from 60 kg to the end of fattening. Blood samples were taken at the end of Period 1 at 60 kg live weight to determine the values of MDA in blood plasma. This indicator was studied as a marker of oxidative stress.

Table 2. The formulation of the feeds used in Experiment 2 to examine the effect of replacing soybean meal with extruded full-fat soybean from cv. Richy.

Feed components	I Subperiod 30 kg – 60 kg live weight		II Subperiod 60 kg – 100 kg live weight	
	I Control	II Experimental	I Control	II Experimental
Maize	21.95	22.69	25.71	26.16
Wheat	25.00	25.00	25.00	25.00
Barley	20.00	20.00	20.00	20.00
Wheat bran	10.00	10.00	10.00	10.00
Biovit-14, bioconcentrate *	23.00	15.50	19.03	14.37
Extruded soybean Richy	-	6.00	-	3.73
Synthetic lysine	0.05	0.21	0.06	0.16
Dicalcium phosphate	-	0.30	-	0.21
Chalk	-	0.30	0.20	0.37
Total %	100.00	100.00	100.00	100.00
1 kg of feed contains:				
Total energy (kcal)	3,216	3,198	3,015	3,003
MJ	13.46	13.38	12.62	12.56
Crude protein %	17.13	17.15	16.00	16.00
Lysine %	0.81	0.81	0.75	0.75
Methionine + cysteine %	0.62	0.55	0.57	0.53
Ca %	0.77	0.77	0.73	0.73
P %	0.75	0.74	0.71	0.71
Tryptophan %	-	-	0.10	0.10
Threonine %	-	-	0.55	0.49
Fibers %	-	-	5.91	5.52
Fats %	-	-	2.06	2.93

*Component composition of Biovit-14-high protein sunflower meal, sunflower meal, soybean meal, rice bran, calcium carbonate, lysine, mono calcium phosphate, sodium chloride, sodium bicarbonate, vegetable oil, vitamin and microelements premix, L threonine, loxidan, hostasim, optiphos.

Data analyses

Feed intake, growth and feed conversion efficiency were measured. From the results of the first experiment we conclude that extruded full-fat soybean cv. Srebrina could be successfully included in the protein component of feed for growing pigs with a live weight of 30 to 60 kg, thereby replacing 50% of soybean meal on the basis of protein equivalent. In experiment 2, there was practically no difference between treatments for feed and nutrient intake and there were no significant differences in the average daily gain and feed conversion efficiency.



Pigs from experimental group II of first experiment. Photograph: Radka Nedeva

We conclude that extruded full-fat soybean can contribute up to 30% of the protein in the ration for fattening pigs without adverse effects.

Malondialdehyde (MDA) is an end product of lipid peroxidation and is widely used as an indicator for the determination of oxidative stress. Lower MDA blood plasma values indicate lower oxidative stress. The data from the first experiment showed that animals from the experimental Group III with a higher percentage of extruded soybeans included in the feed composition were found to have the lowest level of detected MDA in the blood plasma (0.0277 nmol/ μ L) followed by Group II (0.0310 nmol/ μ L) and the control (0.0337 nmol/ μ L). All differences between group means were significant. There were also differences in the amount of MDA in blood plasma of animals from two experimental groups in the second experiment. The level of MDA in experimental Group II was 0.0438 nmol/ μ L while that in the control group I was 0.0594 nmol/ μ L.

Sources

The information provided is the result of observations, discussion and experimental work of authors who are part of the Bulgarian Legumes network.

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About this practice note and Legumes Translated

Authors: Radka Nedeva, Apostol Apostolov and Anelia Iantcheva

Publisher: AgroBioInstitute, Bulgaria

Production: Donau Soja

Permalink: www.zenodo.org/record/6198686

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This practice note was prepared within the Legumes Translated project funded by the European Union through Horizon 2020, Project Grant Number 817634.

Citation: Nedeva, R., Apostolov, A. and Iantcheva, A., 2022. Feeding extruded soybean to pigs. AgroBioInstitute. Legumes Translated Practice Note 52. www.legumestranslated.eu

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This project is funded
by the European Union

