CROPENTA

Full-Fat Toasted & Extruded Soybeans
Premium Protein & Energy Ingredient for Modern Animal Nutrition

Full-Fat Toasted & Extruded Soybeans are produced using an advanced combination of **complete toasting and high-performance extrusion technology**. This modern processing method transforms pre-cleaned, finely granulated full-fat soybeans into a highly digestible and energy-rich feed ingredient.

During extrusion, controlled levels of **temperature, friction and pressure** intensively modify the soybean's cell structure. This results in **maximum nutrient accessibility**, making both protein and natural oil highly available for animal uptake.
Unlike conventional soybean meal products, this ingredient delivers a unique combination of **high-grade protein and naturally embedded oil energy** within one stable nutritional matrix.

Key Nutritional & Functional Advantages
Full-Fat Toasted & Extruded Soybeans offer multiple performance benefits:

- **Maximum protein availability** with excellent digestibility
- **Superior oil release and absorption**, with oil availability reaching **up to 91%**
- Effective elimination of **anti-nutritional factors (ANFs)**
- Strong reduction of bitter substances, significantly improving palatability
- High moisture extrusion ensures optimal cooking without protein damage
- Functional water-binding properties supporting gut stability in piglet diets
- Suitable for sensitive young animals as well as premium petfood formulations

This makes the product highly valuable in feed concepts focused on **growth, efficiency and animal health**.

Superior Oil Utilisation – More Efficient Than Soy Meal + Added Oil
A key differentiator of this ingredient is the exceptional utilisation of the natural soybean oil.
Extrusion fully opens the cell structure, allowing the oil to be released and absorbed far more efficiently than in diets where soybean meal is combined with separately added vegetable oils.
As a result, Full-Fat Toasted & Extruded Soybeans provide:

- More stable fat inclusion
- Better energy consistency
- Higher overall oil availability (**up to 91%**)
- Improved feed performance in high-energy rations

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Applications in Animal Nutrition
This ingredient is widely used across multiple species:

Piglets & Young Pigs
Thanks to high digestibility, reduced ANFs and functional water absorption capacity, the product supports early gut development, smooth digestion and optimal starter performance.

Sows
In sow diets, the combination of protein and energy helps maintain body condition and supports milk production during lactation phases.

Poultry (Broilers & Layers)
The ingredient provides a balanced supply of amino acids and highly available oil energy, improving growth rates, feed conversion and production efficiency.

Petfood
With its neutral taste, excellent digestibility and consistent nutritional value, it is increasingly applied in premium dog and cat food formulations.

Recommended Inclusion Levels

Animal Category	Typical Inclusion Rate
Piglets	7–15% of the ration
Sows	10–15% of the ration
Poultry	5–20% depending on age and purpose

Composition

- **Full-fat soybeans**

Nutritional Values (Average per kg product)
These values represent typical average composition per kg of product:

Parameter	Value
Dry Matter	900 g/kg
Crude Protein	358 g/kg
Crude Fat	203 g/kg
Crude Fibre	61 g/kg

Parameter	Value
Crude Ash	46 g/kg
Starch	63 g/kg
Sugar	76 g/kg
Linoleic Acid	106 g/kg
Lysine	22.5 g/kg
Methionine	5.1 g/kg
Threonine	14.2 g/kg
Tryptophan	4.7 g/kg
Net Energy (Pigs)	12.7 MJ/kg

Benefits Summary (Highlight Block)

- Maximum protein availability
- Maximum oil availability
- Oil availability up to **91%**
- Significant reduction of bitter substances → improved taste
- Optimal reduction of anti-nutritional factors (ANFs)
- Excellent suitability for piglets, broilers, layers and petfood

Shelf Life & Storage

- Several months under dry storage conditions
- Store in a cool, dry and well-ventilated environment

Product Positioning

Full-Fat Toasted & Extruded Soybeans are the ideal choice for feed manufacturers seeking a premium soy ingredient that combines:

- Highly digestible protein
- Efficient natural oil energy
- Excellent palatability
- Broad application versatility

A powerful solution for high-performance pig, poultry and pet nutrition.

Disclaimer

All values shown are average guideline figures. Product specifications may vary depending on raw material and processing conditions. Cropenta cannot be held liable for any inaccuracies, omissions or errors in this document.

Schothorst Feed Research

STUDY "Ileal and Total Tract Digestibility of Covax EXTRU in Growing-Finishing Pigs"

Experiment LVB-50, Project code VA10-40

SUMMARY

A digestibility experiment was carried out by Schothorst Feed Research to determine the faecal nutrient digestibilities, ileal nutrient and amino acid digestibilities and Net Energy (NE) for swine of Covax EXTRU. Dietary treatments used were a basal diet as such, a N-free diet and an experimental diet with the test ingredient (25% Covax EXTRU, 66.35% basal diet and 3.65% Diamol + premix + TiO_2). The basal diet was tested with 9 replicates (pigs fitted with a T-cannula in the ileum) and the N-free and experimental diet with Covax EXTRU were each tested in 8 replicates. Pigs were individually housed. Pigs were fed 3.2 times maintenance (310kJ NE/body weight$^{0.75}$) during the experimental period and weighed on average 60 to 85 kg. Fresh drinking water was available ad libitum via drinking nipples. Faecal nutrient digestibilities and NE were based on the method of faecal collection, using TiO_2 as a marker. Ileal nutrient digestibilities were based on the collection of ileal digesta, using the same marker. Ileal endogenous amino acid losses were determined in pigs fed the N-free diet. SID values were calculated by correcting the AID values for ileal endogenous amino acid losses.

The determined NE of Covax EXTRU is 13.05 MJ/Kg (according to CVB NE equation, 2005), which is higher than toasted soybeans listed in the CVB table (2005, 11.98 MJ/Kg). Faecal digestibility coefficients for protein, fat and NSP are given to be able to calculate the NE value. Covax EXTRU protein and NSP digestibilities are similar to toasted soybeans (CVB, 2005; 88 vs. 88% and 85 vs. 87% respectively), but the fat digestibility is higher in Covax EXTRU (91 vs. 85%).

Apparent Ileal and Standardised Ileal Digestibilities (AID and SID) of amino acids are given. Amino acid contents and SID values are similar to toasted soybeans (CVB, 2005), except for SID proline. Calculated SID proline value is high, due to a high measured endogenous proline loss in the N-free diet (2.95 g/kg DM intake compared to 1.14 g/kg DM intake listed by CVB, 2005).

Covax EXTRU is produced by COVACO B.V.. The examined product was supplied by Robi Droge Diervoeders B.V. to Schothorst Feed Research.

December 2016

Effect of processed soybeans on performance of piglets

feed innovation services

Effect of processed soybeans on performance of piglets

Trial code: FIS 201606FV

Research carried out by:

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This study was performed by Feed Innovation Services (FIS). This study was conducted in accordance with the study protocol

Signed by

Date: 06-12-2016

Dr. Ir. Willem Smink

1 Introduction

The performance of piglets following the weaning period is crucial for attainment of better results during the fattening period. Extruded full fat soy products have been shown to result in growth performance comparable to that achieved by highly refined soy products (e.g. soy protein concentrate) in early-weaned pigs (Friesen et al., 1993) and higher than soybean meal + oil diets (e.g. Li et al., 1991).

Covax Extru and Expanded soybean are soy products of extrusion and expansion processes. The inclusion of these products in piglet diets is expected to result in improvement of performance.

An experiment was performed to get more information on the effect of Covax Extru and Expanded soybean on piglet performance. The main goal was to compare these HP soybean meal + oil with extruded or expanded soybeans.

The experiment was carried out at 'De Aam" in Elst, The Netherlands.

The results of this experiment are described in this report.

2 Materials and methods

2.1 Piglets and housing

Piglets were used after weaning at an age period of approximately 25 days. Both female and male piglets were used. The piglets were distributed over the treatments on basis of sex, offspring and weaning weight. Before starting the trial, the suckling piglets were fed with the basal test diet as a liquid during one week.

The piglets were housed in pens of 12 piglets, with controlled ventilation and heating system at the pig station ''De Aam" in Elst, The Netherlands. Continuous lighting was provided in the first days, after which a day and night scheme was used.

2.2 Diets

The basal diets for the prestarter was formulated by FIS and produced for the experiment by Research Diet Services BV in Wijk bij Duurstede, The Netherlands. The diets were formulated based on the CVB. The main cereal was barley. The ingredient composition of the basal diets are presented in Tables 1 and 2. The calculated nutrient compositions are given in Tables 3 and 4.

2.3 Dietary treatments and replicates

The trial contained three treatments. The diets were pelleted (2.5 mm diameter). Diets and water were available *ad libitum*. The experimental diets are as follows:

1. Control diet
2. Control diet + 12.5 (prestarter) and 17.5 % (starter) extruded soybeans (Covax Extru)
3. Control diet + 12.5 (prestarter) and 17.5 % (starter) expanded soybeans (Expanded soybean)

Prestarter is fed from day 0 till day 14. Starter is fed from day 15 till day 28. Each treatment consisted of 8 replicates of 12 each. The diets were pelleted (2.5 mm diameter). Diets and water were available *ad libitum.*

Table 1. Ingredient composition (%) of prestarter diets (Control, Covax Extru and Expanded soybean)

Ingredient	Prestarter diets		
	Control	Covax Extru	Expanded soybean
Barley	43	43	38
Maize	-	-	4.3
Sugar	2.5	2.5	2.5
Soybean oil	2.53	0.14	-
Soja 44/7	10	-	-
Sojahulln RC <320	-	-	0.91
Corn, pre-gelatinised	25	25	25
Covax Extru	-	12.5	-
Expanded soybean	-	-	12.5
Potato protein	4.69	4.54	4.54
Wheypowder acid	7.11	7.11	7.11
Calcium formate	1.04	1.11	1.05
Dical	1.68	1.66	1.69
Fumaric acid	1.00	1.00	1.00
Salt	0.51	0.51	0.51
Vit.min. premix[1]	0.50	0.50	0.50
L-Lysine HCl 98.5%	0.38	0.40	0.40
DL-Methionine 99%	0.16	0.19	0.17
L-Threonine 98%	0.07	0.08	0.08
L-Tryptophan 98.5%	0.05	0.05	0.05

Table 2. Calculated nutrient composition (g/kg) of the prestarter diets

Nutrients, g/kg	Prestarter diets		
	Control	Covax Extru	Expanded soybean
Crude protein	160	161	161
Crude fat	47	47	50
Crude fibre	33	32	32
Starch	431	433	434
Sugars	100	101	100
Net energy (kCal/kg)	2363	2371	2371
EW*100	112	113	113
Linoleic acid (C18:2)	22	24	24
Ca	8.80	8.90	8.80
P	6.53	6.54	6.54
Lactose	50	50	50
Na	2.50	2.50	2.50
K	6.67	6.78	6.80
Cl	5.08	5.13	5.12
Lysine	11.43	11.58	11.60
Methion.	4.48	4.73	4.57
Meth+Cys	7.34	7.61	7.43
Trypt.	2.34	2.34	2.34
Threon.	7.35	7.42	7.43
P.dig. pigs	3.51	3.51	3.51
il dig Lys pigs app.	10	10	10
il dig Met pigs app.	4.02	4.27	4.11
il dig Met+C pigs app.	6.10	6.27	6.10
il dig Tryp pigs app.	1.90	1.90	1.90
il dig Threo pigs app.	5.90	5.90	5.90

Table 3. Ingredient composition (%) of starter diets (Control, Covax Extru and Expanded soybean)

Ingredient	Starter diets		
	Control	Covax Extru	Expanded soybean
Barley	45	45	45
Wheat	16	15	14
Maize	-	-	1.3
Soybean oil	3.49	-	-
Soja 44/7	14	-	-
Sojahulln RC <320	-	-	0.46
Corn, pre-gelatinised	10	10	10
Covax Extru	-	17.5	-
Expanded soybean	-	-	17.5
Potato protein	4.28	4.38	4.38
Wheypowder acid	2.85	2.85	2.85
Monocal	0.91	0.89	0.90
Limestone	1.69	1.88	1.87
Fumaric acid	0.50	0.50	0.50
Salt	0.57	0.57	0.57
Vit.min. premix[1]	0.50	0.50	0.50
L-Lysine HCl 98.5%	0.30	0.30	0.30
DL-Methionine 99%	0.11	0.12	0.12
L-Threonine 98%	0.03	0.03	0.03
L-Tryptophan 98.5%	0.03	0.02	0.02
NATUPHOS 5000 FTU/g PIGS	0.01	0.01	0.01

Table 4. Calculated nutrient composition (g/kg) of the starter diets

Nutrients, g/kg	Starter diets		
	Control	Covax Extru	Expanded soybean
Crude protein	176	180	180
Crude fat	53	52	56
Crude fibre	37	36	36
Starch	413	414	412
Sugars	49	51	51
Net energy (kCal/kg)	2350	2350	2348
EW*100	112	112	112
Linoleic acid (C18:2)	25	27	27
Ca	10.4	11.0	11.0
P	5.52	5.54	5.54
Lactose	20	20	20
Na	2.50	2.50	2.50
K	6.76	6.91	6.93
Cl	4.85	4.87	4.87
P.dig. pigs	3.70	3.70	3.70
il dig Lys pigs app.	10	10	10
il dig Met pigs app.	3.65	3.73	3.75
il dig Met+C pigs app.	6.00	6.00	6.00
il dig Tryp pigs app.	1.90	1.90	1.90
il dig Threo pigs app.	5.80	5.80	5.80
Phytase FTU/kg	500	500	500

2.4 Performance measurements

The piglets were weighed on the day of weaning and divided over the pens. The treatments were based on weight, sex and litter. Piglets were weighed again after 14 days and after 28 days. Body weight, feed intake, growth and average feed conversion per pen were calculated. Mortality, health aspects and treatments were registered.

2.5 Statistical analysis

All data for each variable were subjected to an analysis of variance, in which dietary treatment and department were the independent factors, and starting weight was added as a covariable, using the statistical program SPSS 17.0. The level of statistical significance was set at $P<0.05$.

The statistical model was:

$Y_{ijk} = \mu + round_i + treatment_j + starter\ weight_{k+} error_{ijk}$

Whereby:

i = round 1, 2, 3

j = treatment 1, 2, 3

k = body weight at the start in kg as covariable

3 Results

3.1 General

The performance of the piglets for the whole period was good and there were no treatments. Throughout the experimental period a total of 6 piglets died, 2 from each treatment group. Of the 6 piglets which died, two were from the first round , three from second round and one from the third round. But generally the whole trial was conducted successfully. During the trial there was a visual observation of the faeces. Piglet fed with extruded en expanded showed a less loose faeces. However, diarrhoea was not observed in all groups. There was one pen removed from the dataset because and determined as an outlier.

3.2 Body weight, growth rate, feed intake and feed conversion

The results of the body weight, growth rate, feed intake and feed conversion ratio of the piglets are presented in subsequent sections to illustrate the effect of Covax Extru and Expanded soybean in the diet.

3.2.1 Body weight

The weight of the piglets at days 1, 14 and 28 are presented in Table 5 below. The average body weight at day 1 is also presented. During the prestarter, starter and the whole period, the body weight of the processed beans were higher than the control, although the differences were not statistically significant.

Table 5. Body weight (kg) of the piglets of the three treatment groups at the start, at day 14 and day 28

Treatment	Body weight day 1	Body weight day 14	Body weight day 28
Control	7.4	10.6	17.5
Covax Extru	7.4	11.0	18.1
Expanded soybean	7.4	10.9	18.0
P-values			
Diet	-	0.134	0.450
Body weight start	-	0.000	0.000
Pairwise comparison			
Covax Extru vs Control	-	0.293	0.361
Covax Extru vs Expanded soybean	-	0.848	0.806

3.2.2 Growth rate

The results of the body weight gain are presented in Table 6 below. Numerical differences were observed between groups, however, the differences could not be statistically substantiated; the body weight gain of pigs for the prestarter, starter and for the whole experimental period showed higher body weight gain for both Covax Extru and Expanded soybean groups compared to the control diet. During the starter period, the growth increase for Covax Extru was 3% and for Expanded soybean 1% over the control. For the whole period, both pigs fed Covax Extru and Expanded soybean had a higher body weight gain of approximately 3%.

Table 6. Body weight gain (g/d) of the piglets of the three treatment groups during the prestarter, starter and total period

Treatment	Prestarter, day 1-14	Starter, day 14-28	Total, day 1-28
Control	235	497	366
Covax Extru	253	512	379
Expanded soybean	252	502	378
P-values			
Diet	0.135	0.827	0.457
Body weight start	0.003	0.013	0.001
Pairwise comparison			
Covax Extru vs Control	0.293	0.548	0.327
Covax Extru vs Expanded soybean	0.847	0.691	0.900

3.2.3 Feed intake

The results of the feed intake are shown in Table 7 below. The feed intake of pigs for the prestarter, starter and for the total period showed higher feed intake values for both Covax Extru and Expanded soybean groups compared to the control diet. However, the differences were not sufficient to bring a significant difference.

Table 7. Feed intake (g/d) of the piglets of the three treatment groups during the prestarter, starter and total period

Treatment	Prestarter, day 1-14	Starter, day 14-28	Total, day 1-28
Control	319	654	485
Covax Extru	328	676	501
Expanded soybean	335	686	509
P-values			
Diet	0.528	0.276	0.270
Body weight start	0.018	0.000	0.000
Pairwise comparison			
Covax Extru vs Control	0.687	0.486	0.438
Covax Extru vs Expanded soybean	0.500	0.384	0.419

3.2.4 Feed conversion

The findings of the experiment on feed conversion of the three dietary treatment groups are given in Table 8. During the prestarter and the total period, feed conversion was numerically better for the Covax Extru group compared to control and Expanded soybean groups. Though not significant, there was a statistical tendency (P=0.14) for an improvement of Covax Extru group over Expanded soybean group during the starter period. The body weight at the start of the experiment had no significant effect on feed conversion throughout the experimental period.

Table 8. Feed conversion (g/g) of the piglets of the three treatment groups during the prestarter, starter and total period

Treatment	Prestarter, day 1-14	Starter, day 14-28	Total, day 1-28
Control	1.359	1.317	1.327
Covax Extru	1.299	1.319	1.322
Expanded soybean	1.326	1.363	1.347
P-values			
Diet	0.808	0.228	0.547
Body weight start	0.850	0.115	0.229
Pairwise comparison			
Covax Extru vs Control	0.566	0.938	0.734
Covax Extru vs Expanded soybean	0.653	0.137	0.293

4 Conclusions

The conclusions that can be drawn from the whole trial are summarized as follows:

- Both growth rate and feed intake were numerically better for the Covax Extru and Expanded soybean supplemented groups compared to the control group. The growth rate was approximately 3% better for the Covax Extru and the expanded soybean group compared to control group. However, all the differences observed for the growth rate and feed intake were not statistically significant.
- Although not statistically significant, the FCR was 2% better for the Covax Extru group compared to the Expanded soybean group.
- There was, however, a statistical tendency for an FCR improvement of Covax Extru group over Expanded soybean group during the starter period.

A potential explanation of a higher weight gain for expanded or extruded soybeans in comparison with soybean meal plus soybean oil might be the surface enlargement which will give a higher water absorption with a better enzym operation together will bound oil instead of free flowing oil. On top of that the presence of lecithin in beans.

The better feed conversion efficiency of the extruded beans in comparison with the expanded beans might be a result of a better access to enzymes as a result of the more intensive extrusion process.

There was no diarrhoea observed, but the firmness of the faeces was seemed to be better for the groups fed with the processed beans.