Potato by-products as second-generation feedstuff for pig feed





Food Waste Management & Waste Management in island & Isolated areas

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Potato by-products

Potato by-products → **whole and broken potatoes** from processing industry **discarded from human consumption due to commercial criteria** (presence and size).

- Currently is **direct supply to animals** without stablishing great hygienic controls or any treatment → **verbal agreements with farmers** at low cost or assuming the logistics.
- However, the high moisture content of these by-products leads to a **rapid microbial spoilage** which can make this application unsustainable.
- They are very energetic due to its **starch content** (between 60-80%) and its interesting content in **protein, fibre and potassium**

→ Raw material that fits perfectly with the requirements of pigs (Ncobela et al, 2017).

Pig culture

Pig sector is interested in **replacing current raw materials such as soybean meal** with other more sustainable ingredients locally sourced with the aim of betting on local products.

This is aligned with the opportunity to obtain new feed ingredients from agri-food by-products

→ **Potatoes by-products** are considered a raw material that fits perfectly with the requirements of pigs, considering the requirements of pigs feeding (Ncobela et al, 2017).

Innovative process

A sustainable technological solution for reusing potatoes by-products as an alternative raw material to soybean meal for fattening pigs after applying an **innovative stabilization process** which ensures food security and the minimum hygienic conditions:

1. Step 1 – **Filter Centrifuge**

   A previous dehydration step by mechanical dehydration technologies (low energy consumption) to reduce the water content to 55%.

2. Step 2- **Flash Drying**

   A final dehydration step by thermal drying (with high efficiency energy use) to achieve the desired moisture content (less than 10%).

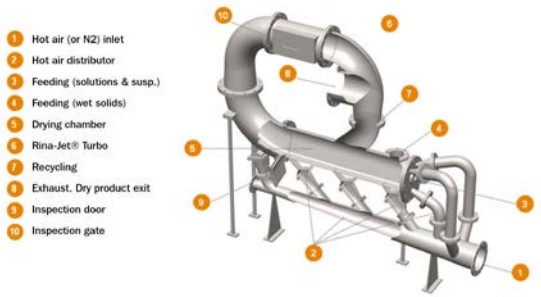
Step 1 Filter centrifuge

Initial moisture content of the potato rest was 85 %
Intermediate moisture after centrifuge was 56 %

Filter centrifuge → the most appropriate technology because it less energy demanding than thermal technologies.

1. The solid particles are trapped in a separation mesh that can have different pore size due to the centrifugal force and the liquid flows out from the upper side of the separator → 100 µm mesh.

Step 2 Flash Drying



Intermediate moisture after centrifuge was 56 %
Final target moisture content was < 10 %

Flash dryer technology → the most appropriate technology because it allows instant, self-regulating and continuous drying of wet solids.

1. Low operating cost associated to this high thermal efficiency:
   The combination of the turbulence effect and reduced pressure with the high-speed movement of particles results in disintegrating and drying solid instantly. The target product is very rapidly broken in the drying chamber, its surface area increases significantly and, therefore, the required energy decreases considerably.

2. Suitable for temperature-sensitive products:
   Minimum heating of the solid during a short time of residence inside the dryer - fractions of a second - to maintain their nutritional value and safely (food security).

Ingredient value

Parameters	Unit	Value
Moisture	%	10.0
Ashes	%	2.7
Protein	%	7.2
Carbohydrates	%	79.7
Fiber	%	2.3
Crude fat	%	0.4
Starch	%	63.5

Experimental diet

Iso-protein and isoenergetic diet was compared to commercial diet, used as a control.

Ingredients	Control diet (%)	Experimental diet (%)
Wheat	40.10	38.00
Corn	24.10	18.50
Green peas	10.00	10.00
Rapeseed flour	9.40	9.40
Corn germ	7.70	7.80
Barley	4.00	6.20
Soybean flour	1.80	1.80
Molasses	1.00	1.00
Calcium carbonate	0.83	0.73
Salt	0.36	0.40
Dicalcium phosphate	0.31	0.36
Ingaso ingredient	0.30	0.30
L-lysine	0.15	0.13
Potato by-products flour	0.00	5.00

Growth trial

Feed efficiency trial was carried out with **106 pigs** that were **randomly distributed in two groups** of 53 animals each. The two lots were distributed **balanced according to their live weight**.

The test was extended **during a complete productive cycle** (with a duration of 161 days)

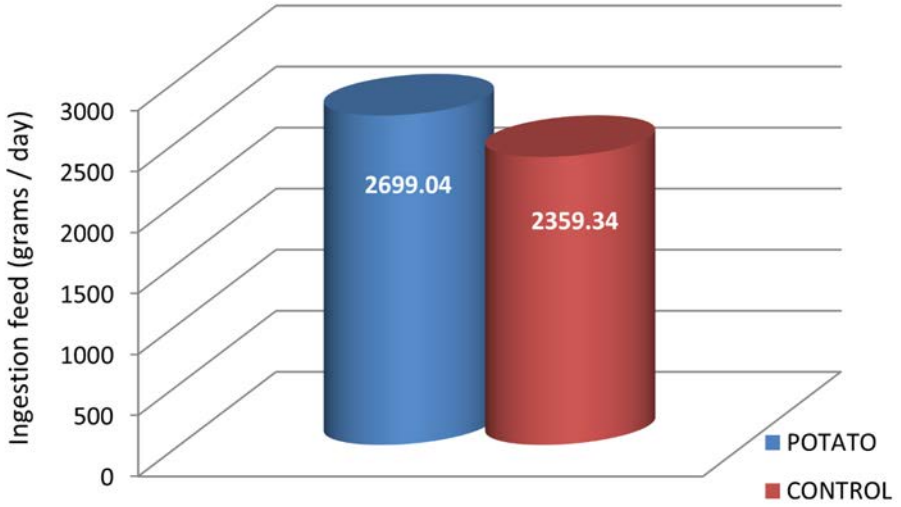
One lot received a **commercial control diet** and the other received **the innovative diet with 5% of potatoes by-products** in its composition.

The animals were **weighed at the beginning of the trial and at sacrifice**. Likewise, a biweekly record of the quantities of feed offered and rejected for each batch of animals has been kept.

At slaughter, the **classification of the channel assigned in slaughterhouse** was recorded.

Growth trial

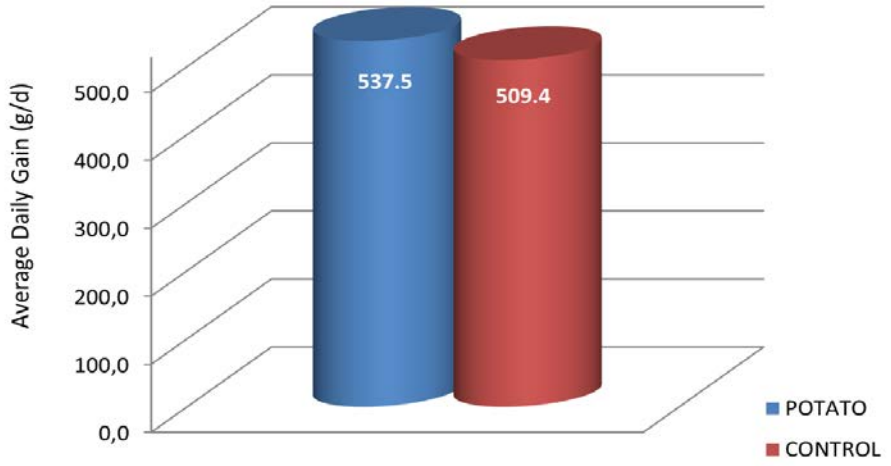
Daily ingestion of feed



The animals of the group with 5 % of potato flour consumed more average feed than the pigs of the control feed group (2699 g / d vs. 2359 g / d, respectively)

Growth trial

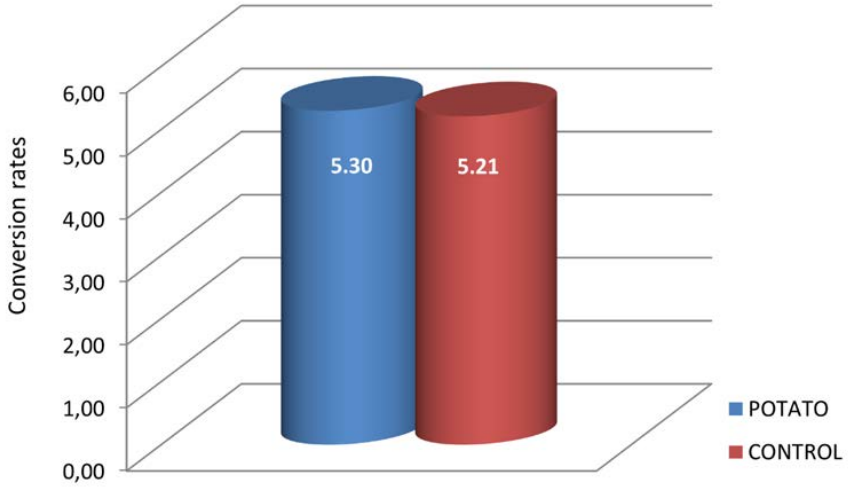
Average daily gain



A higher average daily gain was observed in the animals of the group with 5 % of potato flour than in those of the control group (537 g / d vs. 509 g / d, respectively)

Growth trial

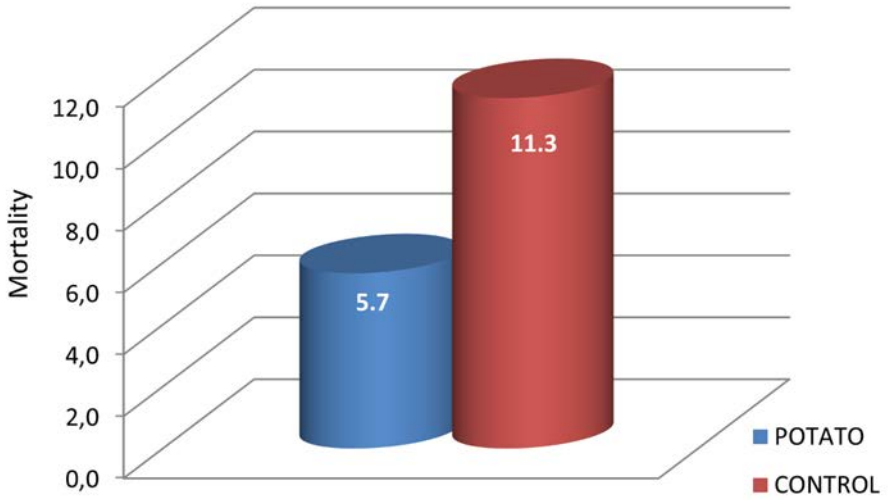
Conversion rate



The conversion rates in both groups were very similar (5.30 vs. 5.21 for the 5 % of potato flour group and the control group respectively)

Growth trial

Mortality



A higher mortality was observed in the bait period in the control group with respect to the group with 5 % of potato flour (11.3% vs. 5.7%, respectively).

Sensory test

A trend towards a small accumulation of liquid in the fillet, a greater presence of marbled meat and more resistance to biting was detected in the product fed with the experimental diet, but **without significant differences between both groups**.

Growth trial

Conclusions

Based on the data of the daily feed intake, the **palatability** of the experimental diet is adequate and does not affect feed intake.

The average daily gain data and the conversion rates show better results in animals fed with the experimental diet than with the commercial diet, so it can be concluded that, in terms of nutritional efficiency, the **inclusion of 5% of potato by-products in the diets do not involve differences in the nutritional value of the diets** and **does not significantly affect the fattening of pigs**.

Mortality is higher in animals fed with the commercial diet; therefore, **immunosuppression cannot be associated with the experimental diet**.

Finally, the sensory results do **not** show **significant differences between final products**, so the final products should be accepted by the consumer.

Conclusions

Potatoes by-products stand up as an alternative ingredient for pigs due to:

1. Their **availability in Europe**

2. Their **nutritional characteristics** and the **results obtained in the growing trials**.

3. Contribution to increase the **competitiveness of pig farm sector** by:

    - Replacing current raw materials such as soybean with a more sustainable ingredient based on potatoes by-products

    - Reducing the high dependence on current raw materials

4. Their recovery would **reduce the environmental footprint** of the potato sector, while generating a new economic activity based on circular economy

Thank you!

Any question?

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