UNIVERSITY OF LIFE SCIENCES
"KING MIHAI I" FROM Timisoara
Multidisciplinary Conference on Sustainable Development
25-26 May 2023

THE CONTENT IN BIOACTIVE COMPOUNDS OF OIL BY-PRODUCTS

Gina Cecilia PISTOL, Valeria Cristina BULGARU, Daniela Eliza MARIN, Andrei Cristian ANGHEL, Ionelia ȚĂRANU

Laboratory of Animal Biology, National Institute for Research and Development for Animal Biology and Nutrition – IBNA Balotesti

e-mail: *gina.pistol@ibna.ro*

INTRODUCTION

- weaning is a very difficult period for piglets, in which the nature and quality of feed have a great influence on the development of the digestive and immune systems; is correlated with a transient increase in the local (intestinal) inflammatory responses, associated with digestive disorders, weakening of the body, increased susceptibility to infections that lead to economic losses.
- European Union banned the use of antibiotics as growth promoters in farm animals nutrition (2006).
- research topic: finding of nutritional solutions (rich in bioactive compounds, cheap) to prevent or reduce intestinal diseases and mortality in post-weaning piglets and to replace the in-feed antibiotics.

AIM: to investigate some agro-industrial by-products resulted from oil industry (grape seed meal and camelina meal), which could be used as alternatives to antibiotics in weaning piglets.

MATERIALS AND METHODS

-camelina meal (C1) and camelina seeds (C2) were provieded by Savoarea Soarelui, Oradea, Romania; grape seed meal (GSM) was obtained from Oleomet SRL; after oil extraction from camelina seeds, the camelina meal was air-dried and was grinded with Cyclone Mill -MC5 mill; mixtures with different inclusion rates of meals (GSM, C1 and C2) were obtained;

-the basic chemical composition of meals (crude protein, crude fat, crude fibers, and ash) was analysed by Weende method; the macro- and micro-mineral composition was determined by atomic absorbtion spectrometry

-the concentration of total polyphenols was determined by Folin-Ciocalteu method; the polyunsaturated fatty acids (PUFAs) were analysed by gas chromatography; the antioxidant capacity was determined using DPPH method.

RESULTS

The basic chemical composition of meals

- the amount of crude protein was ranged between 10.5g/100g sample (grape seed meal) and 38.7g/100g sample (camelina C1 meal).
- the percentage of fat was high in camelina C2 meal (16.1%)
- grape seed meal is rich in fiber (34.7%)

Sample no. *	Analyzed parameter (%) **				
	DM	CP	CF	CEL	Ash
1	92.9	38.7	8.5	13.5	4.2
2	91.9	10.5	6.1	34.7	2.9
3	92.1	32.6	16.1	14.4	4.2
4	92.7	32.4	7.9	18.8	3.9
5	92.6	25.1	7.4	26.4	3.7
6	92.3	18.8	6.4	30.8	3.2
7	92.3	27.3	13.7	20.7	4.0
8	92.2	21.7	11.0	25.4	3.6
9	92.2	16.7	8.6	33.6	3.3

*samples: 1: C1; 2: GSM; 3: C2; 4: C1+GSM (3:1) mix; 5: C1+GSM (1:1) mix; 6: C1+GSM (1:3) mix; 7: C2+GSM (3:1) mix; 8: C2 + GSM (1:1) mix; 9: C2 + GSM (1:3) mix
**DM = dry matter; CP = crude protein; CF = crude fat; CEL = cellulose

The composition in fatty acids of meals

-all analysed samples have a very high percentage (> 50%) of PUFAs;
-meals and mixtures with a high camelina content are richer in omega-3 PUFAs
-grape seed meal and mixtures based on a large amount of grape seed meal have a high content of omega-6 PUFAs

Sample no. *	Type of fatty acid **					Type of PUFA		
	SFA	MUFA	PUFA	SFA /UFA	PUFA /MUFA	Ω3	Ω6	Ω6/Ω3
1	16.8	29.5	52.6	0.21	1.78	30.5	22.1	0.7
2	14.8	15.8	68.5	0.18	4.33	1.6	66.9	40.5
3	12.9	30.1	56.5	0.15	1.88	31.9	24.6	0.8
4	12.6	27.3	59.0	0.15	2.16	27.2	31.8	1.2
5	12.8	22.5	63.9	0.15	2.83	19.8	44.2	2.2
6	13.9	19.1	66.2	0.16	3.45	11.7	54.4	4.6
7	12.4	28.6	58.3	0.14	2.04	28.4	29.9	1.1
8	12.9	25.4	61.0	0.15	2.40	23.2	37.7	1.6
9	13.0	22.1	64.3	0.15	2.91	15.7	48.7	3.1

*samples: 1: C1; 2: GSM; 3: C2; 4: C1+GSM (3:1) mix; 5: C1+GSM (1:1) mix; 6: C1+GSM (1:3) mix; 7: C2+GSM (3:1) mix; 8: C2+GSM (1:1) mix; 9: C2+GSM (1:3) mix
** SFA-saturated fatty acids; MUFA-monounsaturated fatty acids; PUFA- polyunsaturated fatty acids)

The composition in macro- and micro-elements

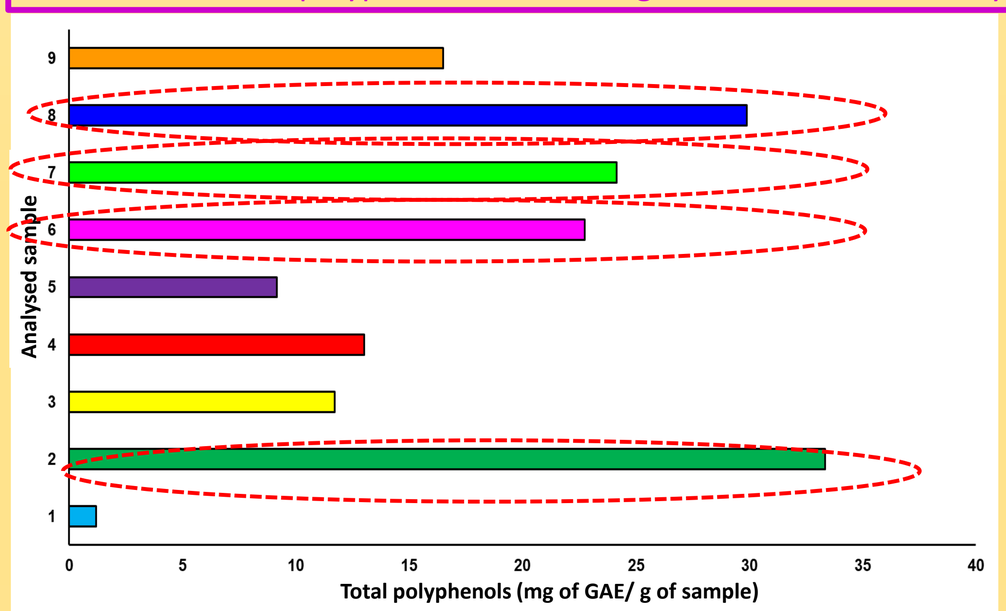
- GSM has the highest content of calcium and copper
- Both C1 and C2 camelina meals had a high content of phosphorus, potassium, iron, manganese and zinc

Sample no. *	Ca (%)	P (%)	K (%)	Mg (%)	Cu ppm	Fe ppm	Mn ppm	Zn ppm	Na ppm
1	0.4	0.6	1.3	0.4	3.8	229.0	30.2	58.7	34.9
2	0.6	0.3	0.6	0.2	5.7	70.7	12.5	16.7	34.0
3	0.3	0.6	1.0	0.4	2.4	196.1	26.5	67.1	20.9
4	0.4	0.5	1.0	0.3	3.8	194.6	25.6	48.6	50.1
5	0.5	0.4	0.8	0.2	4.5	160.1	21.5	39.8	46.9
6	0.6	0.4	0.6	0.2	5.7	117.3	17.4	28.7	43.5
7	0.3	0.6	0.9	0.4	2.9	171.2	22.5	55.1	45.2
8	0.4	0.5	0.6	0.3	4.1	137.3	19.9	43.5	31.4
9	0.6	0.4	0.5	0.2	4.2	103.7	17.1	31.8	26.3

* samples: 1: C1; 2: GSM; 3: C2; 4: C1+GSM (3:1) mix; 5: C1+GSM (1:1) mix; 6: C1+GSM (1:3) mix; 7: C2+GSM (3:1) mix; 8: C2 + GSM (1:1) mix; 9: C2 + GSM (1:3) mix

The composition in poyphenols and the antioxidant activity of meals

✓ GSM and mixes with high inclusion of GSM had the highest content in total polyphenols and the highest antioxidant activity



DPPH inhibition activity (%)	Sample no*								
	1	2	3	4	5	6	7	8	9
	75.6	27.4	71.4	71.2	62.4	52.4	68.3	59.1	49.2

* samples: 1: C1; 2: GSM; 3: C2; 4: C1+GSM (3:1) mix; 5: C1+GSM (1:1) mix; 6: C1+GSM (1:3) mix; 7: C2+GSM (3:1) mix; 8: C2 + GSM (1:1) mix; 9: C2 + GSM (1:3) mix

CONCLUSIONS: both camelina and grape seed meal had an increased content in polyphenols and PUFAs, compounds with anti-inflammatory and anti-oxidant activities; these by-products can be used as replacers of the in-feed antibiotics in the nutrition of piglets after weaning

ACKNOWLEDGEMENT: This research was supported by funds from the PN-III-P2-2_1-PED-2021-1989 - PED 660 project and from the National Research Development Project to Finance Excellence (PFE) - 8/2021 granted by the Romanian Ministry of Research, Innovation and Digitalization