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Traditional Food Network to improve the transfer of knowledge for innovation

WP2: Products of Grains

Buckwheat as a functional ingredient in bakery products

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Training Workshop, 29.06.2016, Warsaw

WP2: Products of Grains

Overview of Polish grain-related national projects

Małgorzata Wronkowska

Multistakeholder Workshop, 1-2.10.2014, Wageningen

Innovative Bakery Products with health-promoting properties for Warmia-Masuria Province

The goal of project - creating a stable system of knowledge transfer between a research institution and a group of enterprises in the bakery products sector, following the model **“from the laboratory to the consumer”**.



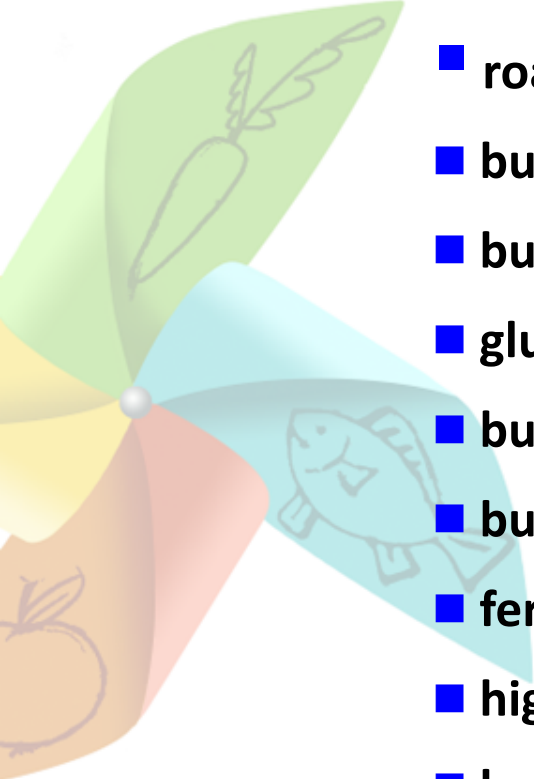
Leader of the project: company Agro-Coop Sp. z o.o. which unites 19 private enterprises – cooperatives from Warmia-Masuria and Podlaskie Provinces. The cooperatives run both manufacturing and trading, 132 shops and 14 bakeries operate as part of the company.

Department of Chemistry and Biodynamics of Food

Our research is focused on biologically-active compounds of plant origin:

- ✓ changes in the total antioxidative capacity of food in technological processes,
- ✓ the potential in human prophylaxis and modeling food qualities,
- ✓ studies on animals and in non-clinical medical trials on volunteers that address the bioavailability of biologically-active compounds in respect of changes proceeding in the food matrix upon technological processing.

Traditional food processing: focus on buckwheat-based food products

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- roasted groat
 - buckwheat enriched wheat bread
 - buckwheat enriched ginger cakes
 - gluten-free bread with buckwheat flour
 - buckwheat sprouts as a functional additive to food
 - buckwheat hull tea infusion
 - fermented buckwheat groat by fungi (*Rhizopus oligosporus*)
 - high pressured buckwheat raw and roasted groat (200 MPa)
 - buckwheat wet-milling products

MILLED

hull from raw buckwheat



hull from roasted buckwheat



flour from **roasted buckwheat**





	whole grain	hull	groat
Ash [%]	1.8	2.0	1.7
Proteins [%]	11.0	2.9	12.6
Dietary fibre [%]	11.0	49.4	0.8
TPC [mg GAE/g sample]	1.9	2.1	1.7
TFC [mg RE/g sample]	0.1	0.2	0.1
Rutin [ug/g]	146	225	116
Tocopherol total [mmol/g]	47.1	23.3	61.8

Sedej et al., Journal of Food Science, 77, 2012, 954-959



wheat roll named „Grahamka”



wholemeal rye-wheat bread,
sourdough fermented bread
formulated on rye and wheat
flours

INNOVATIVE PRODUCT

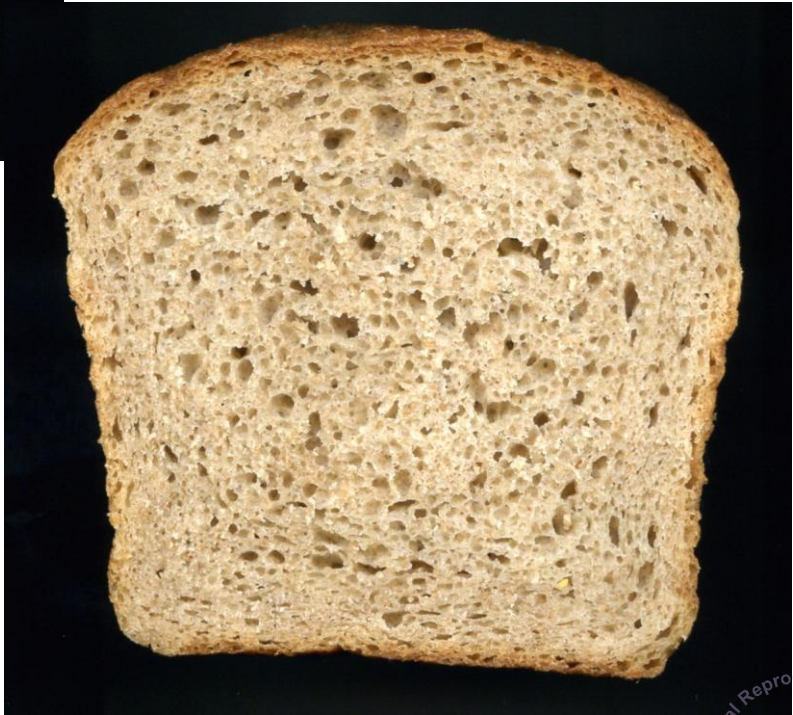


roll with **3% of milled hull from raw buckwheat**

INNOVATIVE PRODUCTS



wholemeal bread supplemented by **4% of milled hull from roasted buckwheat**, sourdough fermented bread formulated on rye and wheat flours



wholemeal bread supplemented by **13% of roasted buckwheat flour**, sourdough fermented bread formulated on rye and wheat flours



	Total phenolic [mg ferulic acid/kg d.m.]	Tocopherols [µg/g]	Available lysine [mg/g d.m.]
control wholemeal rye-wheat bread	1.81 ± 0.01	38.5 ± 9.9	2.68 ± 0.34
bread supplemented by milled hull from roasted buckwheat (4%)	20.88 ± 1.11	181.5 ± 10.4	3.20 ± 0.12
bread supplemented by roasted buckwheat flour (13%)	11.46 ± 1.20	568.1 ± 15.8	2.84 ± 0.06
control wheat roll	1.96 ± 0.04	203.9 ± 22.2	2.05 ± 0.28
roll with milled hull from raw buckwheat (3%)	25.65 ± 0.23	561.3 ± 20.7	2.27 ± 0.02

	Maillard		
	FIC [FI/mg d.m.]	FAST [%]	Browning index [AU]
control wholemeal rye-wheat bread	505.3 ± 67.2	94.4 ± 21.1	0.75 ± 0.12
bread supplemented by milled hull from roasted buckwheat (4%)	596.9 ± 15.3	281.3 ± 10.6	0.99 ± 0.03
bread supplemented by roasted buckwheat flour (13%)	533.2 ± 7.4	194.3 ± 4.2	0.68 ± 0.02
control wheat roll	426.6 ± 34.1	72.4 ± 12.3	0.49 ± 0.06
roll with milled hull from raw buckwheat (3%)	383.8 ± 15.5	108.8 ± 4.7	0.59 ± 0.01

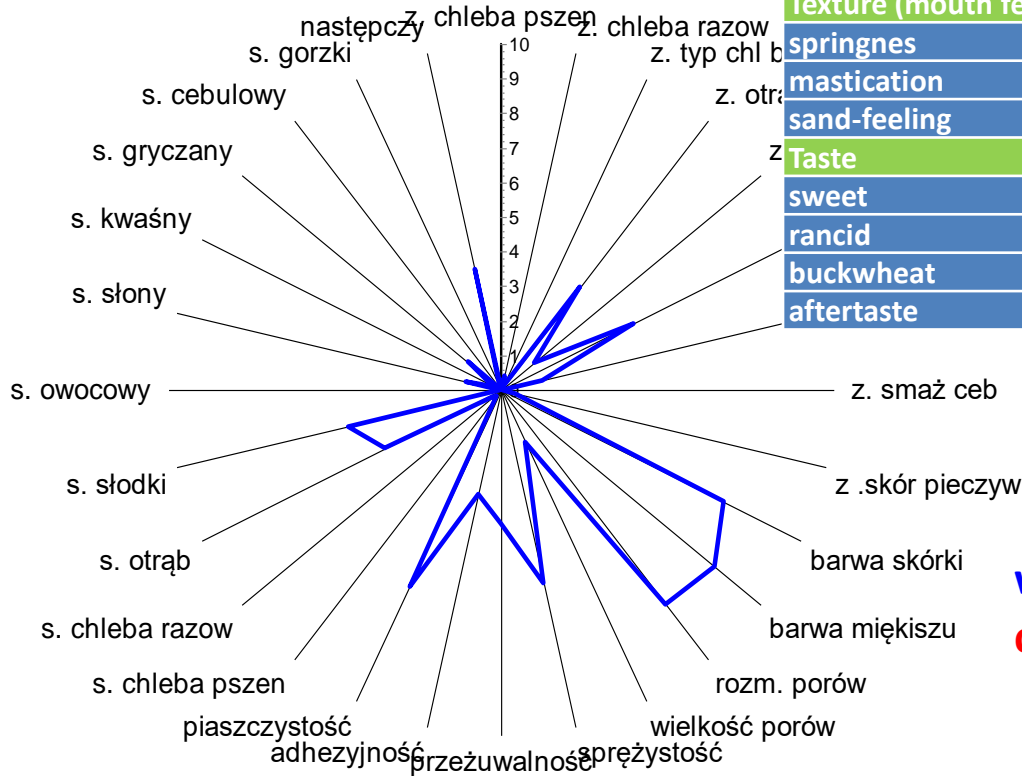
FIC – the free fluorescent intermediate compounds
 FAST- FIC/tryptophan



	Antioxidative potential [μmol Trolox/g d.m.]		
	ABTS	DPPH	PCL
control wholemeal rye-wheat bread	2.43 ± 0.50	1.62 ± 0.37	2.59 ± 1.78
bread supplemented by milled hull from roasted buckwheat (4%)	4.44 ± 0.05	4.09 ± 0.03	6.26 ± 0.52
bread supplemented by roasted buckwheat flour (13%)	3.60 ± 0.06	3.18 ± 0.09	4.85 ± 0.12
control wheat roll	2.33 ± 0.52	1.63 ± 0.37	1.71 ± 0.34
roll with milled hull from raw buckwheat (3%)	3.27 ± 0.12	2.21 ± 0.02	3.07 ± 0.87



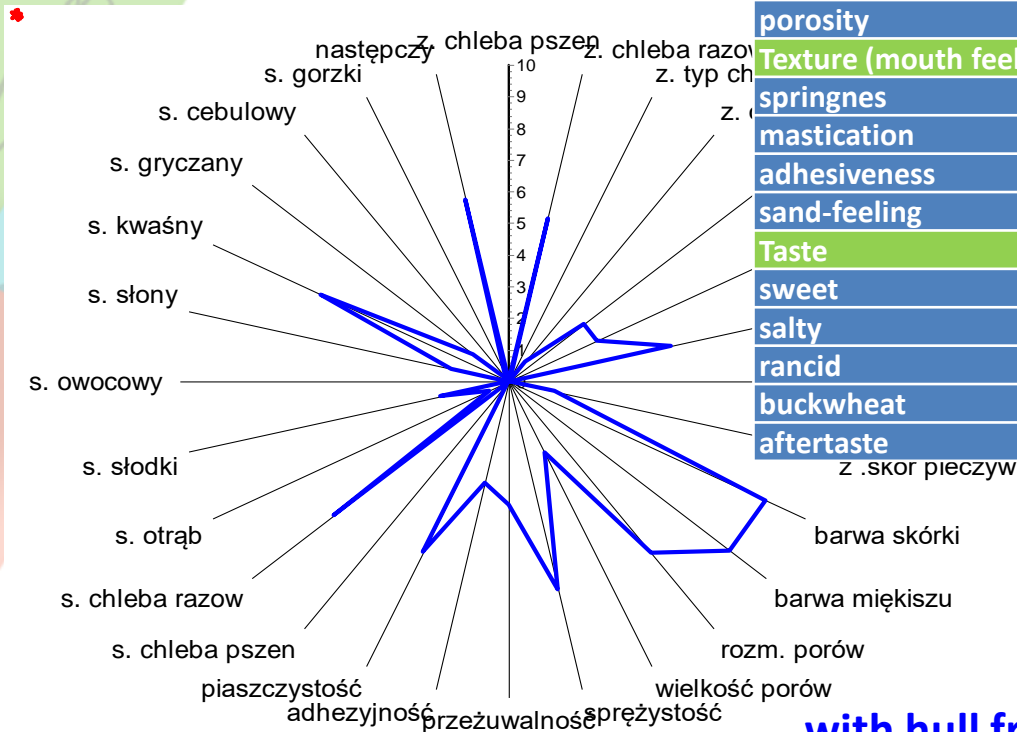
	with milled hull from raw buckwheat (3%)	control roll
Odour		
buckwheat	1.26	0.03
sweet	4.42	5.08
rancid	1.27	1.13
Appearance		
crust colour	7.42	5.02
crumb colour	8.17	4.46
porosity	1.68	1.82
Texture (mouth feel)		
springnes	5.73	5.85
mastication	3.88	3.61
sand-feeling	6.31	1.52
Taste		
sweet	4.71	4.76
rancid	0.26	0.23
buckwheat	1.29	0.03
aftertaste	3.6	3.58



with hull from raw buckwheat (3%)
control roll



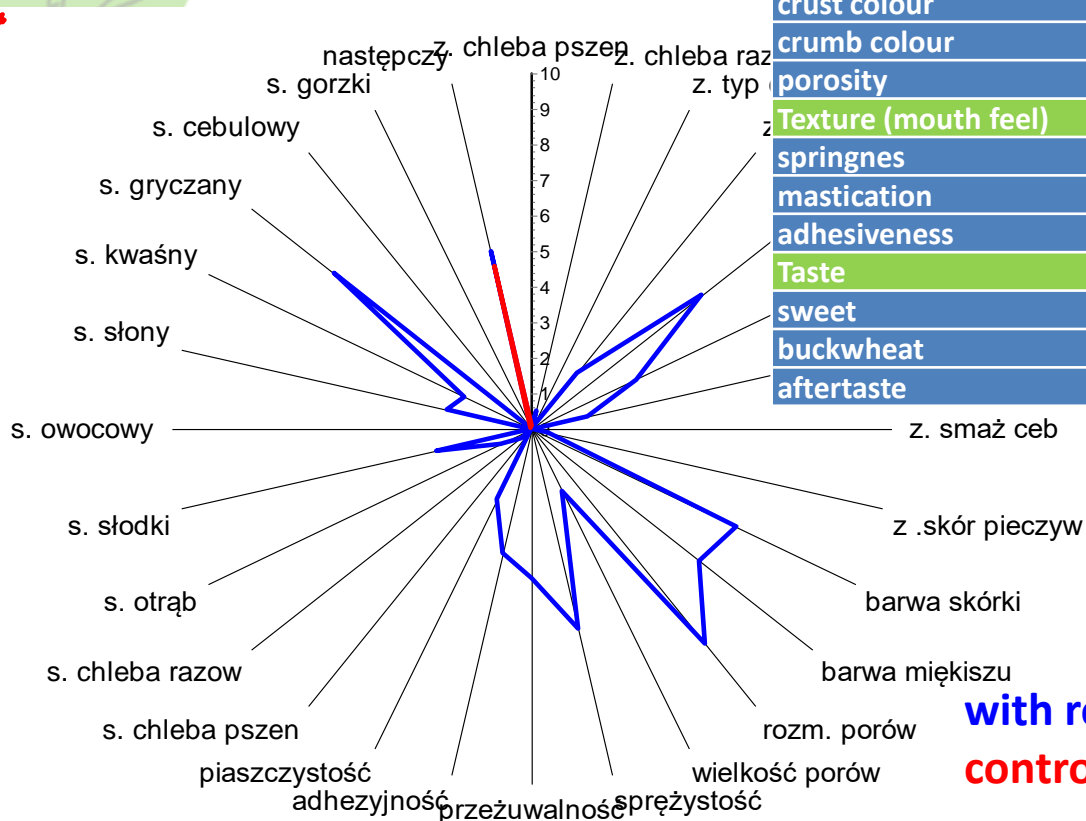
	with hull from roasted buckwheat (4%)	control bread
Odour		
sourdough bread	5.28	6.26
buckwheat	2.93	1.16
sweet	2.96	3.28
rancid	5.04	5.17
Appearance		
crust colour	8.66	6.66
crumb colour	8.55	4.12
porosity	2.49	2.88
Texture (mouth feel)		
springnes	6.73	6.92
mastication	3.89	3.42
adhesiveness	3.30	3.47
sand-feeling	5.98	0.16
Taste		
sweet	2.13	1.63
salty	1.78	1.82
rancid	6.33	6.68
buckwheat	1.40	0.03
aftertaste	5.88	5.56



with hull from roasted buckwheat flour (4%)
control bread




	with roasted buckwheat flour (13%)	control bread
Odour		
sourdough bread	0.53	0.44
buckwheat	6.03	5.31
sweet	3.22	2.25
rancid	1.6	2.08
Appearance		
crust colour	6.32	6.85
crumb colour	5.95	6.57
porosity	7.72	6.79
Texture (mouth feel)		
springnes	5.76	5.96
mastication	4.18	3.68
adhesiveness	3.58	3.28
Taste		
sweet	2.71	2.88
buckwheat	7.03	4.99
aftertaste	5.14	4.7



with roasted buckwheat flour (13%)
control bread

Number of yeasts and molds [cfu/g]

	Fresh	In 21°C		In 4°C	
		After 2 days	After 4 days	After 3 days	After 6 days
control wholemeal rye-wheat bread	<10	<10	<10	<10	<10
bread supplemented by milled hull from roasted buckwheat (4%)	<10	<10	<10	<10	<10
bread supplemented by roasted buckwheat flour (13%)	<10	<10	<10	<10	<10
control wheat roll	<10	<10	<10	<10	<10
roll with milled hull from raw buckwheat (3%)	<10	<10	<10	<10	<10



**Buckwheat flour and hulls used in the recipe
proved the positive influence
on antioxidative potential, sensory and storage
properties of bakery products.**



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Part of the results were presented during III International Symposium on Traditional Foods from Adriatic to Caucasus, Sarajevo/Bosnia and Herzegovina, 01-04.10.2015 as an poster presentation „Traditional bakery products with an enhanced antioxidative potential”; authors: Wronkowska M., Zieliński H., Szawara-Nowak D., Honke J., Topolska J., Bączek N., Wiczkowski W.



Thank you for your attention