EFFECT OF DIFFERENT BLACKCURRANT SEED INGREDIENTS IN MEATBALLS BY USING CONVENTIONAL QUALITY ASSESSMENT AND UNTARGETED METABOLOMICS

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INTRODUCTION. Testing the possibility of using plant origin ingredients in meat products has become very popular.

Blackcurrant (BC) pomace is rich in antioxidants and other bioactive compounds, which may inhibit the oxidative processes and increase health benefits of meat products.

The aim of the study was to evaluate the effect of BC seed powder and its biorefining products on the quality and untargeted metabolomics of pork meatballs.

Table 1. Total phenolic content and *in vitro* antioxidant activity of BC seeds and their residues after extractions

Sample	TPC (mg GA/g)	ABTS (TE mg Trolox/g)	ORAC (TE mg Trolox/g)
BC-RS	42.07 ± 0.53	74.12 ± 0.99	13.35 ± 0.52
BC-ASC	62.09 ± 1.16	141.31 ± 3.00	15.62 ± 0.46
BC-AE	31.54 ± 0.87	109.63 ± 1.60	2.73 ± 0.05

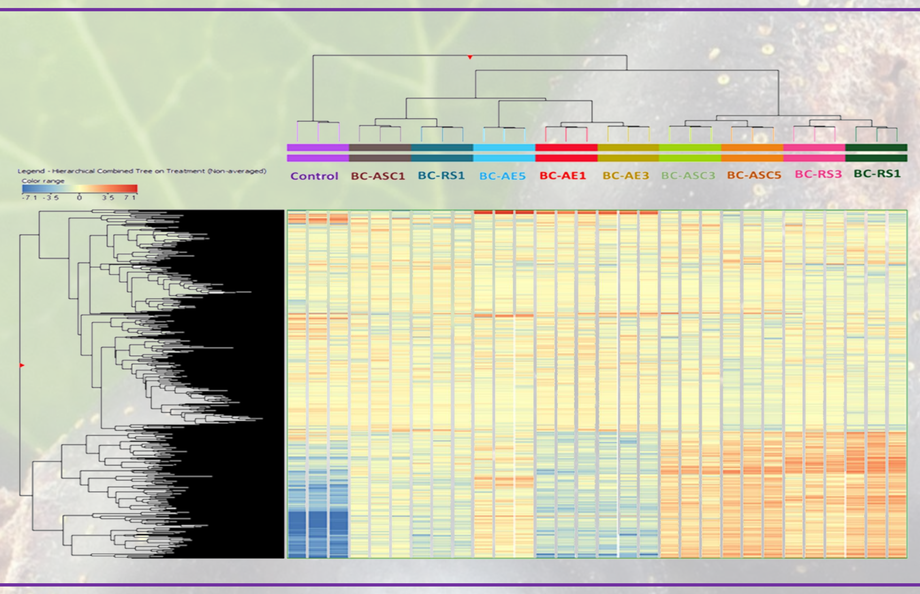

Figure 1. Unsupervised HCA built considering the compounds annotated by untargeted metabolomics in the different meatballs, according to the different inclusion levels of BC-based ingredients

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MATERIALS AND METHODS. The following BC seed ingredients were added to pork meatballs at **1, 3 and 5%** (w/w) doses: (1) blackcurrant seeds before CO_2 extraction (BC-RS); (2) after supercritical fluid CO_2 extraction (BC-ASC); (3) EtOH/water extraction (BC-AE). Pork meatballs were kept in modified atmosphere (70% N_2 and 30% CO_2) and stored 1, 3 and 6 days at 4 ± 1 ºC.

Their chemical composition, cooking loss, colour coordinates, lipid and protein-related compounds were assessed.

Table 2. Proximate chemical composition and cooking losses of pork meatballs (LSM ± se; a, b, c – $P < 0.05$ between means)

Sample	Moisture (%)	Protein (g/100 g)	Fat (g/100 g)	Ash (g/100 g)	Fibre (%)	Cooking loss (%)
Control	53.27 ± 1.79^{ab}	21.32 ± 0.47^{bc}	18.98 ± 0.60^{c}	2.06 ± 0.046^{a}	0.00 ± 0.00^{f}	26.79 ± 1.59^{a}
BC-RS1	53.82 ± 2.95^{ab}	21.77 ± 0.57^{ab}	18.73 ± 1.09^{bc}	2.13 ± 0.011^{a}	0.181 ± 0.004^{a}	27.30 ± 1.31^{a}
BC-RS3	53.80 ± 3.64^{ab}	21.71 ± 0.19^{abc}	16.73 ± 1.29^{abc}	2.03 ± 0.030^{a}	1.104 ± 0.028^{b}	23.96 ± 0.81^{ab}
BC-RS5	54.57 ± 2.12^{a}	20.29 ± 0.57^{c}	17.17 ± 0.43^{abc}	1.96 ± 0.019^{a}	1.608 ± 0.020^{c}	20.48 ± 2.22^{b}
BC-ASC1	51.67 ± 3.67^{b}	22.88 ± 0.41^{a}	15.97 ± 1.21^{ab}	2.00 ± 0.022^{a}	0.206 ± 0.009^{a}	25.23 ± 1.74^{ab}
BC-ASC3	54.80 ± 4.05^{a}	21.87 ± 0.46^{ab}	15.06 ± 1.45^{ad}	1.94 ± 0.086^{a}	1.327 ± 0.016^{d}	22.82 ± 1.83^{ab}
BC-ASC5	52.75 ± 0.03^{ab}	22.85 ± 0.75^{a}	12.54 ± 0.98^{d}	1.98 ± 0.007^{a}	2.128 ± 0.016^{e}	19.77 ± 2.18^{b}
BC-AE1	53.47 ± 3.91^{ab}	22.32 ± 0.6^{ab}	16.88 ± 1.12^{abc}	2.05 ± 0.053^{a}	0.191 ± 0.004^{a}	27.05 ± 1.86^{a}
BC-AE3	54.71 ± 2.56^{a}	21.85 ± 0.35^{ab}	16.36 ± 0.67^{abc}	1.92 ± 0.087^{a}	1.074 ± 0.047^{b}	24.45 ± 1.56^{ab}
BC-AE5	55.75 ± 2.91^{a}	21.56 ± 0.46^{abc}	14.54 ± 1.23^{ad}	1.48 ± 0.128^{b}	1.585 ± 0.034^{c}	20.64 ± 1.10^{b}

RESULTS & CONCLUSIONS.

- The higher the concentration of BC seed ingredients, the lower the cooking loss and the higher the fibre content.
- All BC seed ingredients decreased the lightness (*L**) and increased the redness (*a**) values of meatballs due to dark-red coloured anthocyanins.
- The most effective treatments providing significant differences in the chemical profile of meatballs were at the high levels (3-5%) of BC seeds before and after supercritical fluid CO_2 extractions.
- BC-ASC indicate the most effective ingredient in reducing the number of oxidation-related derivatives.
- BCS ingredients can be considered as promising natural antioxidants and fibre-rich ingredients for producing healthier meat products.