# The use of extract from blue grapes in the manufacturing of dry sausages

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**Abstract**

The objective of this study was to evaluate the effect of adding a powdered extract of grapes on the quality of Poličan dry fermented sausages, and Vysočina dry non-fermented sausages. Samples of these meat products were prepared by the Department of Meat Hygiene and Technology, University of Veterinary and Pharmaceutical Sciences in Brno. The following parameters were monitored: pH value, water activity, chemical composition (amount of dry matter, fat, collagen, protein, and malondialdehyde – TBARs scores), colour properties (L* – lightness, a* – redness, b* – yellowness), and the sensory properties. The extract had no effect on the composition or the main quality parameters. The samples of Poličan enriched with the extract were found to have lower TBARs scores in the curing period and better sensory properties as well.

*Lipid oxidation, colour, grape extract, dry non-fermented sausages, dry fermented sausages*

## Introduction

The consumers like dry meat products for their characteristic sensory properties, while some prefer them for their durability and minimal storage requirements. Microbially, these are highly stable products. However, after an extended storage, another factor comes into play that ultimately causes spoilage of these products, and that is the oxidation of fats. This undesirable tendency in dry meat products is typically protected by the addition of antioxidants.

Grapevine (*Vitis vinifera*) is a very common type of fruit in the world. The remains of grapes used in making wine (residue from the pressing) are rich in phenols, and although essentially a waste, they could be of some use, given the favourable influence of phenols on human health (Spigno and De Faveri 2007). The amount of residue generated in the process of wine-making is about 30% of the total volume of processed grapes (Contreras-Castillo et al. 2010).

The ability of grape seed extract to slow lipid oxidation in meat undergoing storage is increasingly evident. It is most likely due to the fact that such an extract is a rich source of polyphenolic compounds. It has been shown that grape seed extract is effective in reducing both the primary products of lipid oxidation in raw meat (for example hydroperoxides and hexanal) and the secondary ones (for example the content of malondialdehyde) (Lau and King 2003; Pazos et al. 2005; Bannon et al. 2007; Carpenter et al. 2007). These effects have been observed in raw beef, pork, chicken meat and fish, as well as in cooked meat. Red colour of exctracts may affect the sensory properties of the finished product (Brannan 2009).

The objective of this work was to evaluate the effect of an additive extracted from blue grapes on the quality of dry meat products.

### Materials and Methods

The laboratory of Department of Meat Hygiene and Technology at University of Veterinary and Pharmaceutical Sciences Brno prepared two types of meat products according to their classical recipes: a dry non fermented

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sausage called Vysočina, and a dry fermented sausage named Poličan. This consisted of a control group (control), and an experimental group treated by the addition (2 $g.kg^{-1}$) of an extract from blue grapes supplied by Chr. Hansen Czech Republic, s.r.o. (experimental). The extract is free-flowing powder of brown-reddish appearance, made from blue grapes chosen for their taste. It is alcohol-free. The quality parameters were checked when the samples were prepared (0), 21 days after preparation (21), and after having been stored in vacuum-packed and strored for 28 days (49).

The pH value was measured with pH meter WTW pH 340i (WTW GmBH, Weilheim, Germany) with a Double Pore puncture-type electrode (Hamilton, Switzerland). Water activity $a_w$ was measured on instruments Novasina LabMaster (Novasina, Switzerland) at the temperature of 25 °C.

The fat content was determined on SOXTEC (Tecator, Denmark), with diethylether as an extraction reagent. Dry matter content was determined by the method of drying (ČSN ISO 57 6021), gravimetric determination, drying at a temperature of 103 ± 2 °C for 24 hours. The collagen content was determined spectrophotometrically at 550 nm wavelength on GENESYS™ 6 spectrophotometer (Thermo Electron Corporation, USA) as a content of 4-hydroxyproline. The hydroxyproline content was obtained from the calibration curve and converted into collagen content. The contents of pure muscle protein were determined as the difference between the contents of pure protein and collagen. Pure proteins were determined after precipitation of non-protein N-substances by hot tannin solution and a subsequent conversion of organic into inorganic nitrogen on KJEHLTEC apparatus (Foss Tecator, Denmark). The nitrogen content was converted to the protein content using the factor 6.25. The thiobarbituric number for malondialdehyde content was determined by a reaction with 2-thiobarbituric acid using the distillation method (Castellini et al. 2002). The sensory evaluation was conducted with the participation of the staff and students of Department of Meat Hygiene and Technology, University of Veterinary and Pharmaceutical Sciences Brno (6 trained and 6 untrained assessors). The evaluation took place in a sensory lab within the Department of Meat Hygiene and Technology, which meets the requirements of ČSN ISO Standard 8589. The rating of meat products was recorded in unstructured graphic scales 100 mm long, with a verbal description at both ends. The left edge of the scale indicated a fully satisfactory condition of a parameter, the right end a completely unsatisfactory condition of that parameter. The evaluated parameters were: cut surface appearance, colour, matrix, occurrence of ring, odour, consistency, texture, taste, and overall notion.

The colour was measured in a CIEL*a*b* system by CM Konica Minolta 2600d spectrophotometer (Konica Minolta, Japan). The instrument settings were: light source D65, standard observer angle 10°, and measuring plate 3 mm. The instrument was calibrated on black and white colour. L*– lightness, a*– redness, b*– yellowness, with the colour measured at the fat parts and meat parts of the sausages.

## Results and Discussion

Our experiment monitored the influence of a blue grape extract on the quality parameters of dry sausages. As shown in Tables 1 and 2, no influence of extract addition was detected in terms of quality parameters, pH value and water activity, which is true for both Poličan and Vysočina sausages. Brannan (2009) had made the same observation with regard to poultry products. The chemical parameters of meat products were likewise unaffected by the addition of the blue grape extract.

In the sensory evaluation (Figure 1), the assessors rated the Poličan sausages at the end of ripening (day 21) and the Vysočina sausages at the end of the drying process (day 21). The Poličan dry fermented sausage treated by the extract was rated better in the following parameters: taste, colour, texture, matrix, overall notion, and occurrence of ring. Therefore, the addition of the extract seems to have a positive effect on the sensory properties of this

Table 1. Quality parameters of Poličan dry fermented sausages

| Sample | pH | $a_w$ | dry matter (%) | fat (%) | collagen (%) | PMP (%) |
|---|---|---|---|---|---|---|
| Test 0 | 5.549 ± 0.007 | 0.970 ± 0.002 | 47.445 ± 0.545 | 27.205 ± 2.745 | 1.541 ± 0.127 | 11.669 ± 0.540 |
| Control 0 | 5.455 ± 0.028 | 0.966 ± 0.002 | 46.885 ± 0.115 | 26.085 ± 2.865 | 0.961 ± 0.167 | 11.767 ± 0.333 |
| Test 21 | 4.522 ± 0.009 | 0.881 ± 0.003 | 71.935 ± 0.085 | 42.010 ± 0.710 | 2.100 ± 0.191 | 17.326 ± 0.092 |
| Control 21 | 4.600 ± 0.005 | 0.895 ± 0.002 | 71.400 ± 0.290 | 43.560 ± 2.400 | 1.649 ± 0.091 | 18.593 ± 0.581 |
| Test 49 | 4.661 ± 0.008 | 0.877 ± 0.003 | 71.345 ± 0.215 | 42.185 ± 0.025 | 1.333 ± 0.079 | 17.953 ± 1.827 |
| Control 49 | 4.788 ± 0.022 | 0.868 ± 0.002 | 71.190 ± 0.010 | 41.775 ± 0.495 | 1.631 ± 0.070 | 16.518 ± 0.358 |

PMP – pure muscle protein

Table 2. Quality parameters of Vysočina dry non-fermented sausages

| Sample | pH | $a_w$ | dry matter (%) | fat (%) | collagen (%) | PMP (%) |
|---|---|---|---|---|---|---|
| Test 0 | 5.571 ± 0.010 | 0.969 ± 0.002 | 47.675 ± 1.145 | 29.270 ± 0.610 | 2.092 ± 0.590 | 11.059 ± 0.876 |
| Control 0 | 5.615 ± 0.004 | 0.978 ± 0.000 | 47.490 ± 0.090 | 25.105 ± 1.035 | 1.055 ± 0.206 | 12.409 ± 0.296 |
| Test 21 | 5.319 ± 0.244 | 0.918 ± 0.002 | 69.405 ± 0.565 | 38.470 ± 1.450 | 1.614 ± 0.003 | 17.081 ± 0.211 |
| Control 21 | 5.390 ± 0.053 | 0.918 ± 0.001 | 68.255 ± 0.035 | 41.870 ± 0.200 | 1.427 ± 0.050 | 17.983 ± 0.400 |
| Test 49 | 5.406 ± 0.068 | 0.910 ± 0.000 | 68.905 ± 1.265 | 37.370 ± 0.280 | 2.104 ± 0.032 | 16.483 ± 0.337 |
| Control 49 | 5.711 ± 0.047 | 0.904 ± 0.003 | 68.215 ± 1.185 | 39.065 ± 0.995 | 2.125 ± 0.169 | 17.160 ± 0.249 |

PMP – pure muscle protein

product. In case of the Vysočina sausage the control group, which had no extract added, received higher ratings in some parameters. The higher rated parameters in the control group were: overall notion, matrix and occurrence of ring. In colour and taste, the two groups got a comparable rating.

Checking the samples for oxidation-induced changes in lipids included the determination of malondialdehyde, a secondary product in lipid oxidation. The experiment with the dry fermented meat product showed a lower malondialdehyde content during the process of rippening but reaching the same level at the end of storage. In the experiment with the Vysočina dry non fermented sausages, we detected a higher content of malondialdehyde during the drying period and at the end of storage in the sausages containing the grape extract, but the detected values were not statistically significant. The oxidation of lipids produces substances with undesirable sensory properties (Contreras-Castillo et al. 2010). The most common way of preventing lipid oxidation is to apply antioxidants and limit the oxygen exposure (Sáyago-Ayerdi et al. 2009).

The charts in Figure 3 show the changes in colour during storage. The colour is perceived critically by the consumers and often constitutes the reason why a product is selected or rejected. The visual colour assessment correlates closely with the consumer's impression

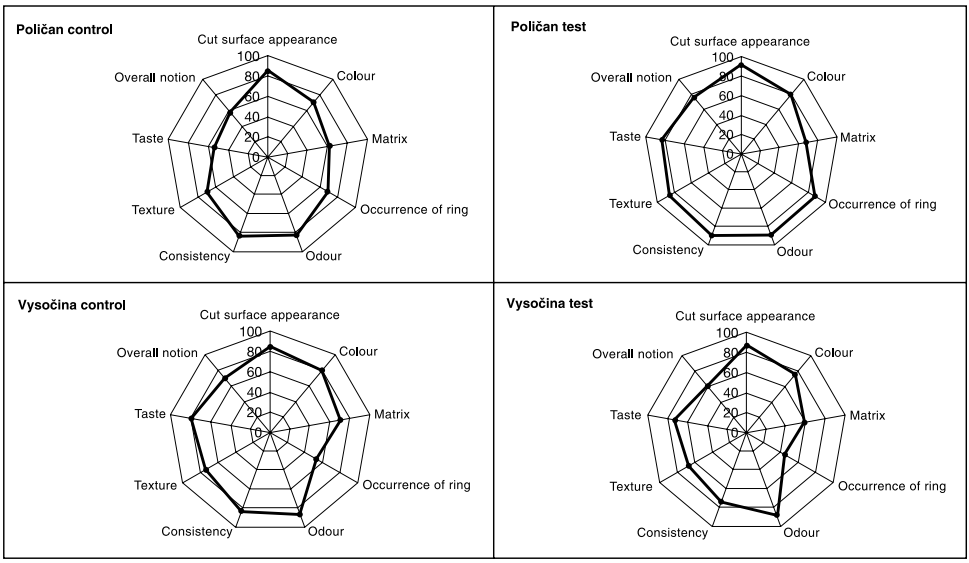


Fig. 1. Results of the sensory evaluation of meat products (21)

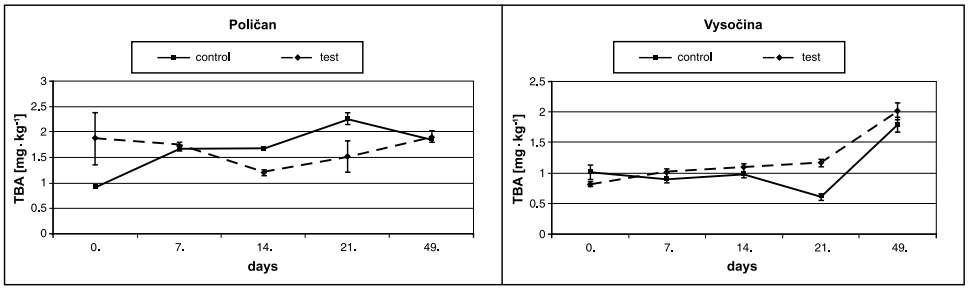


Fig. 2. Results of malondialdehyde content determination (TBA)

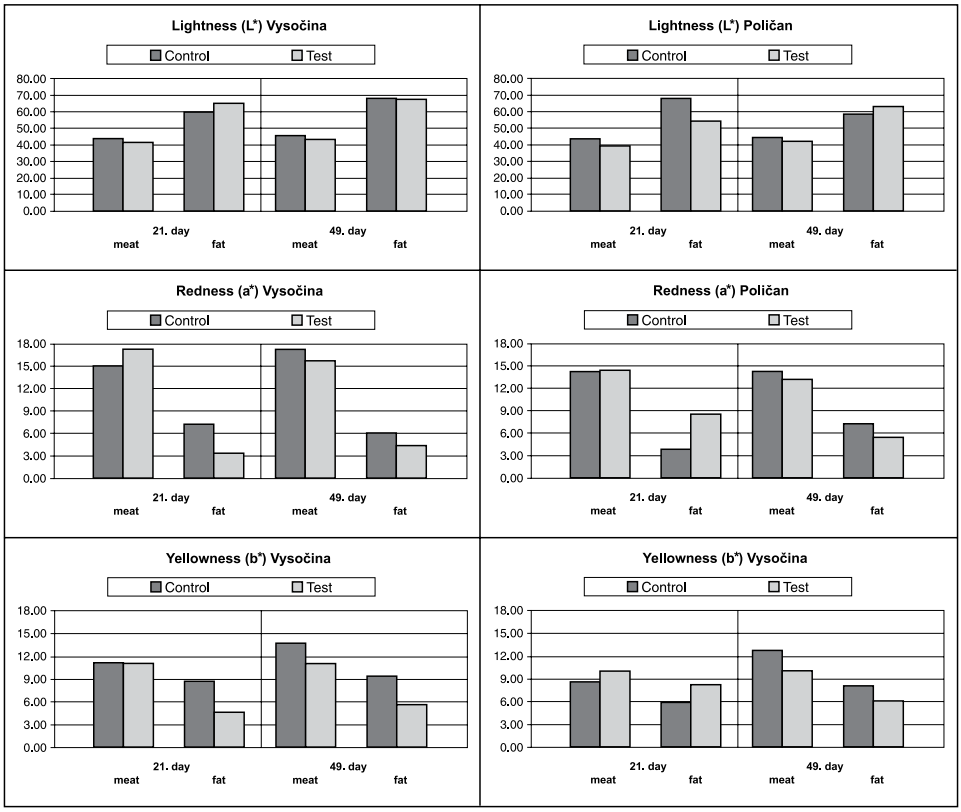


Fig. 3. Results of colour evaluation of fatty and meaty parts of the sausages

and represents a criterion for instrumental comparisons (Hunt et al. 1991). In the Vysočina sausage experimental group, the meat parts at the end of the drying period are redder, while the fat is lighter in colour, less red and less yellow. After packing and storage, the meat parts in the experimental group are less red and less yellow, the colour of fat in the experimental group being less yellow and less red. The colour of fat in the Poličan sausages

experimental group at the end of the ripening is redder, yellower, and darker. Finally, at the end of storage, the colour of both fat and meat parts become less red and less yellow in the experimental group.

## Conclusions

On the basis of the presented results, it can be concluded that it is possible to use the extract of blue grapes in the manufacturing of dry fermented meat products, as well as dry non fermented meat products. The addition of the extract has no effect on the product composition or technological parameters $a_w$ and pH value. The Poličan sausages exhibited a lower content of malondialdehyde, and this product, with the extract added, had also a better sensory rating.

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