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PLANTS - ANTIOXIDANTS OR ANTIBACTERIALS OR BOTH IN MEAT

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I. INTRODUCTION

The use of plant powders as natural preservatives in the composition of meat can be an alternative to traditional products, because by adding plant materials, we can not only extend the shelf life, but also increase the content of fiber and bioactive compounds in meat products. In the present study, selected plant materials were used to test their antimicrobial and antioxidative properties in minced pork. Plant materials were powders of berry pomaces of blackcurrant, aronia, and tomato fruits, and pomace of petioles of rhubarb. Powders of garlic cloves and apples were also used.

II. MATERIALS AND METHODS

Plant materials were dried at 50 °C, milled to a fine powder and sieved to obtain a fraction of ≤1 mm. Powders were mixed (2% w/w) with raw minced pork (fat content 22%; linoleic acid (18:2 (n-6)) content 2.3%) one by one and the samples were packaged into sterile screw-on lid cups and stored at 4°C for up to 14 days. On days 1, 4, 6, 8, 11 and 14 the samples were analyzed for malondialdehyde (MDA) content by an in-house HPLC method based on the concentration of thiobarbituric acid reactive substances (TBARS). Enumeration of aerobic mesophilic microorganisms, yeasts and moulds and presumptive *Pseudomonas* spp. were performed according to the valid ISO standards.

III. RESULTS AND DISCUSSION

At the figure (Figure 1) the dynamics of relationship of MDA and aerobic microorganisms on the days 6-th to 14-th of the experiment is shown. Similar relationships were obtained with MDA and total oxylipins, yeasts and moulds and *Pseudomonas* spp. Until the 6-th day both count of aerobic microbes and the content of MDA in all studied meats with plant supplements were below the official limit $5x10^6$ cfu/g for recommended maximum colony count [1] and indicative limit 1.0 (2.0) mg/kg for MDA [2]. The most effective antimicrobial materials were rhubarb and garlic. The reasons are: 1. Due to relatively low content of antioxidants, a large number of primary (oxylipins) and secondary oxidation products (aldehydes, ketones, *etc.*) of unconjugated linoleic acid are formed in these mixtures. MDA is particularly important as a cross-linking and mutagenic agent also in procaryotic systems [3]. Other aldehydes and free oxygen radicals formed may also contribute to the effect. 2. In addition to lowering the pH, citric and oxalic acids are toxic to microbes due to chelating of metals essential for microbial growth and destabilizing the outer membrane [4,5]. In the case of garlic water-soluble organosulfur compounds such as allicin, ajoene *etc.* have a definite role in the strong antimicrobial effect [6] additionally to the high MDA content. The powders of pomaces of blackcurrant and aronia kept both microbial growth and oxidation at low level (Figure 1).

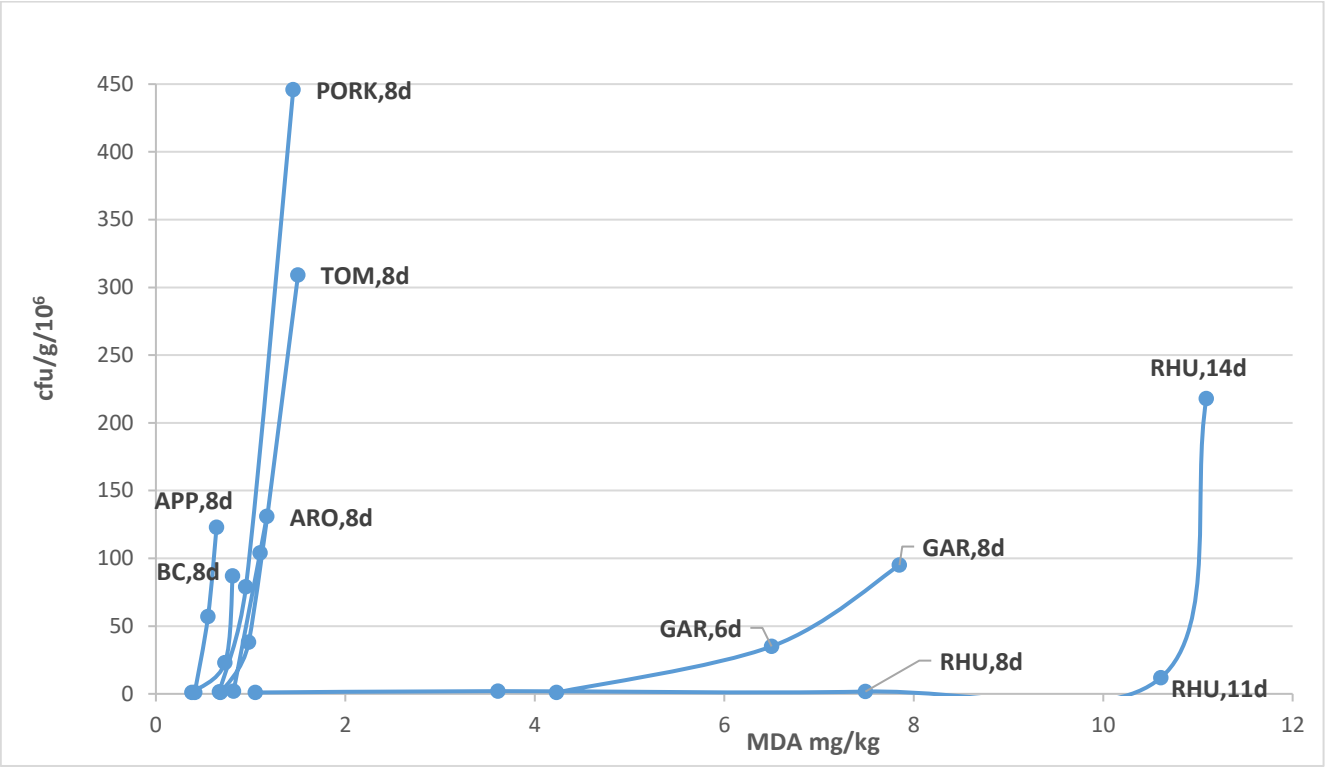


Figure 1. Dynamics of the relationship between aerobic mesophilic microorganisms (cfu/g/10^6) and malondialdehyde (MDA) in minced pork from 6 to 14 days. BC-blackcurrant, APP-apple, TOM-tomato, ARO-aronia, GAR-garlic, RHU-rhubarb, PORK- the minced meat without plant addition.

IV. CONCLUSION

Rhubarb (until day 8) and garlic (until day 4) powders were the most powerful antimicrobials. Blackcurrant pomace, apple and aronia pomace powders were the most effective antioxidants in minced pork. Therefore, in order to obtain both antibacterial and antioxidative effect in meat, it may be necessary to use different plant materials in combination.

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