

# COMPARISON OF THE QUALITY OF MECHANICALLY DEBONED POULTRY MEAT AFTER DIFFERENT METHODS OF SEPARATION

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## SUMMARY

*Selected parameters of quality (hydroxyproline, calcium, bone particles content, and histological determination of bone particles) of mechanically deboned poultry meat (MDPM – „firm separation“ and soft separation „Baader meat“) were compared. Comparison of results with composition (except bone particles) of fresh poultry meat (breast and thigh muscles) was performed. Hydroxyproline content was significantly different and the mean value of hydroxyproline content was in mechanically deboned meat more than two-fold higher in comparison with Baader meat (333.17 mg.100g<sup>-1</sup>, 152.90 mg.100g<sup>-1</sup> respectively). Similar results were achieved in calcium content (1.94g.kg<sup>-1</sup>, 1.05 g.kg<sup>-1</sup> respectively). The mean content of bone particles was 0.27 % (MDPM) and 0.034 % (Baader). Finally, histological determination of bone particles in MDPM and Baader meat was carried out.*

## INTRODUCTION

The current trend in poultry industry is to increase the consumption of poultry meat by producing not only traditional products (chilled and frozen poultry meat, giblets) but also a variety of meat products. In the production of meat products mechanically separated meat is widely used. Mechanically separated poultry meat is derived from carcasses after deboning and division of breast and thigh muscles, and wings.

According to Regulation (EC) No 853/2004, 'Mechanically separated meat' or 'MSM' means the product obtained by removing meat from flesh-bearing bones after deboning or from poultry carcasses, using mechanical means resulting in the

loss or modification of the muscle fibre structure. Mechanically separated meat (MSM) produced by techniques that do not alter the structure of bones used in the production of MSM should be treated as different from MSM produced by techniques that alter the bone structure (Commission Regulation (EC) No 2074/2005).

Finally, mechanically recovered meat is considered as a relatively non-standard raw material. Nowadays, milder production technologies are used, and the product obtained usually has a low calcium (bone) content and its structure is similar to that of minced meat (Tremlová et al., 2006). In practice, mainly two types of separation machines are used. There are continuous separators that destroy flesh-bearing bones, thus producing pulp. First, the pulp is forced out by an auger into the separator head through a sieve with different mesh sizes, leaving behind a slurry containing bone fragments and other non-processed parts that are ejected into the specific part of the separator head (Beehive type). Other machines are discontinued separators, with a hydraulic piston forcing flesh-bearing bones to the separation chamber while crushing them and squeezing meat puree through thin slits between the concentric rings (Protecon type). The efficiency and yield of separation depends on the pressure used for forcing the flesh-bearing bones. Another way of separation, reported by Stiebing (1998), is based on forcing the material to a rotating cylinder by the pressure of a running conveyor belt. This method of

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removing fascia and tendons from meat is the so-called soft separation.

According to Food Codex of the Slovak Republic (2005), the mechanically separated poultry meat can be used only for the production of soft meat products, cooked meat products, roasted meat products, semi-preserves, and canned meat products or for production of semi-products. The maximum permitted amount of MSPM is 70 % (in salami emulsion). Mechanically separated meat must not be used for the production of durable meat products. The size of bone particles in mechanically separated poultry meat can be maximum 1.3 mm, and the maximum accepted amount of bone particles is 1.5 % (Food Codex of the Slovak Republic, 2005). The calcium content of MSM as referred to in Regulation (EC) No 853/2004 should not exceed 0.1 % (100 mg/100 g or 1 000 ppm) of fresh product (Commission Regulation No 2074/2005, Annex IV).

## MATERIAL AND METHODS

Forty-six samples of mechanically deboned poultry meat (MDPM) were used for the analysis of chemical composition. Eleven samples were received after „hard separation“ (Protecon MRS 30 E; MDPM), and fifteen samples were received after „soft separation“ (Baader). Ten samples of breast muscle and ten samples of thigh muscle were used as control.

The samples were analysed for hydroxyproline (spectrophotometric method), calcium content (atomic absorption spectrophotometry), amount of bone particles (hydrolyse), and presence of bone particles by histological analysis (Alizarine Red stain).

## RESULTS AND DISCUSSION

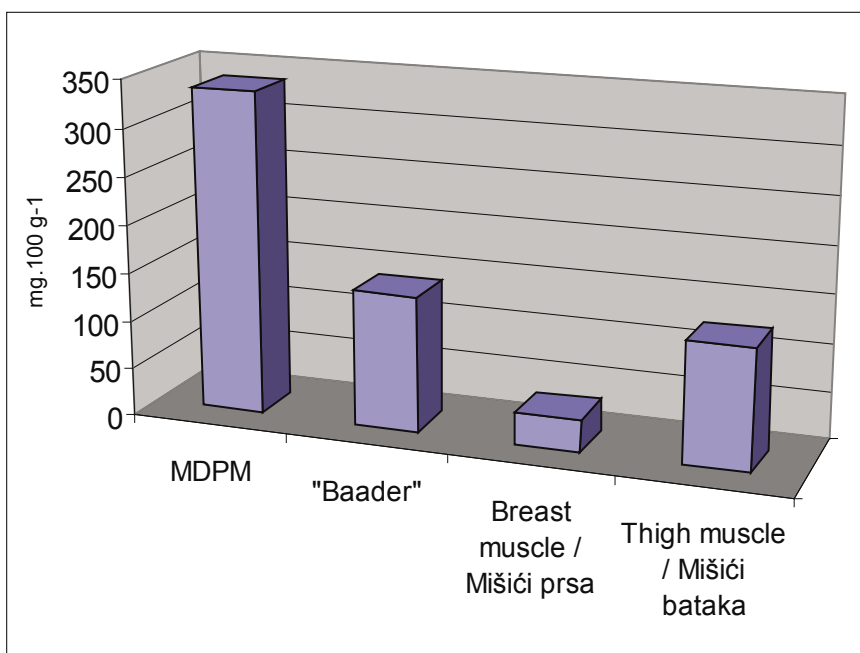
Hydroxyproline is an amino acid, which is typical for the so-called stromatic proteins

(tissue proteins). These proteins occur mainly in collagen tissues, tendons, joint cases, skin, cartilage, bones, but also in muscles as membranes and extracellular connective tissues. Hydroxyproline is a relatively constant compound included in collagen (13 – 14 %). On the other hand, in other proteins this amino acid is not present in high amounts. Therefore, the hydroxyproline estimation is usually used for determination of collagen tissue amount in meat and meat products (Steinhauserová and Steinhauser, 2000). Hydroxyproline content was significantly different in estimated samples (Fig. 1). The mean values of hydroxyproline content in „MDPM“ (335.44 mg.100 g<sup>-1</sup>) were more than two-fold higher in comparison with „Baader“ meat (140.73 mg.100 g<sup>-1</sup>). More expressive difference was found between values of mechanically separated products in comparison with poultry meat, mainly in breast muscle (breast muscle 32.62 mg.100 g<sup>-1</sup> and thigh muscle 124.90 mg.100 g<sup>-1</sup>).

Likewise, the mean values of calcium (Ca) content were also significantly different (Fig. 2). The mean

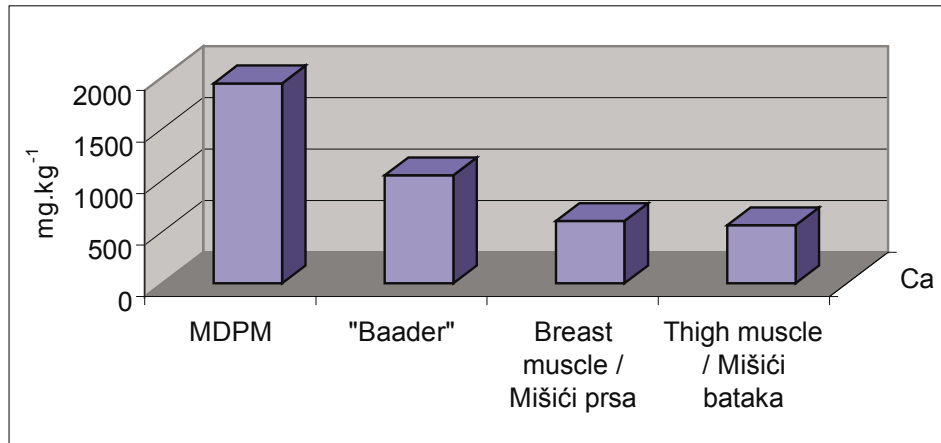
▼ Fig. 1. Comparison of the mean values of hydroxyproline content in „MDPM“, „Baader“ meat, and control breast and thigh muscles

▼ Graf 1. Usporedba srednjih vrijednosti sadržaja hidroksiprolina u „MDPM“, „Baader“ mesu, i u kontrolnim mišićima prsa i bataka



▼ **Fig. 2.** Comparison of the mean values of calcium content in „MDPM“, „Baader“ meat, and control breast and thigh muscles

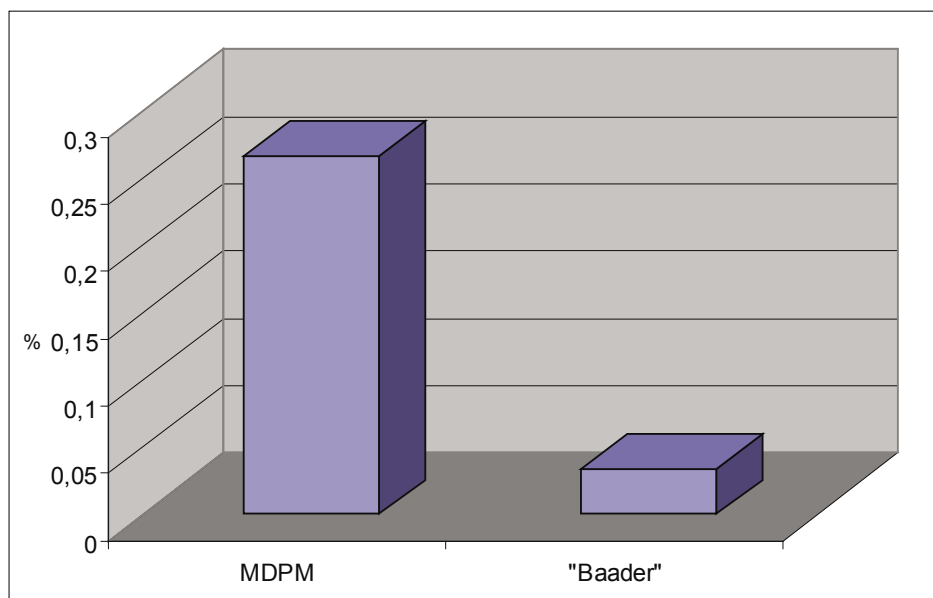
▼ **Graf 2.** Usporedba srednjih vrijednosti sadržaja kalcija u „MDPM“, „Baader“ mesu, u kontrolnim mišićima prsa i bataka



value of Ca content was almost two-fold in „MDPM“ (1.94 g.kg<sup>-1</sup>) in comparison with „Baader“ meat (1.05 g.kg<sup>-1</sup>). The calculation of calcium content indicates that in „MDPM“ it is 94 mg.100 g<sup>-1</sup>, and in „Baader“ meat 5 mg.100 g<sup>-1</sup> higher than the limit value (limit laid down in Commission Regulation 2074/2005 is 100 mg.100 g<sup>-1</sup>). Calcium content in control poultry meat was significantly lower (breast muscle – 0.61 g.kg<sup>-1</sup>, thigh muscle – 0.56 g.kg<sup>-1</sup>).

▼ **Fig. 3.** Comparison of the mean values of bone content (%) in MDPM and in „Baader“ meat

▼ **Graf 3.** Usporedba srednjih vrijednosti udjela kostiju u „MDPM“ i u „Baader“ mesu.



0.27 % in „MDPM“, and almost eight-fold lower in „Baader“ meat (0.034 %) (Fig. 3).

The above mentioned results were confirmed by histological determination of bone fragments (Abb. 1 and 2). Histological methods belong to the less used methods assessing the quality of raw foodstuff of animal origin. A characteristic feature of separated meat is the presence of bone fragments that usually do not occur in normal meat and their deter-

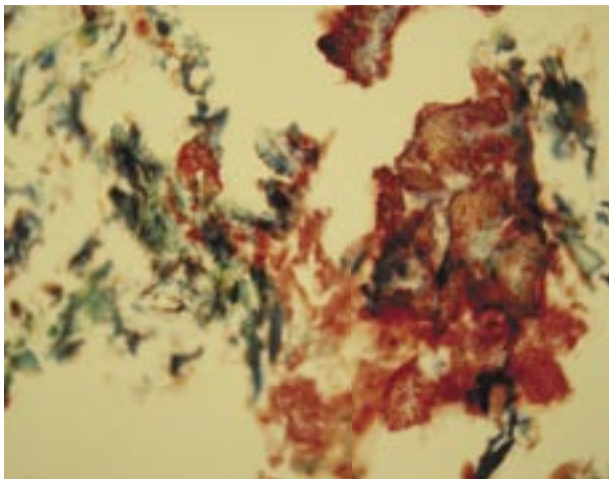
The bone particles content is an important criterion of hygienic quality, mainly their size and shape. Larger and sharp fragments can negatively influence sensor properties of final meat products (Horáková and Lukačka, 1984). The bone particles content ranged from 0.22 % to 0.32 % (MDPM), from 0.04 to 0.08 % respectively (Baader).

The mean values were

mination can be used when identifying this raw material in products (Schulte-Sutrum and Horn, 2003). The quality of food raw material is most often expressed by chemical composition, but in the case of raw material of animal origin, the chemical characteristics do not always cover all quality aspects. The evaluation of the structure and the degree of damage of different tissues contained in production raw materials is possible only by histological examination (Tremlová et al., 2006).

▼ **Abb. 1.** Histological Picture of the mechanically deboned poultry meat (Protecon) (Bone tissue – red)

▼ **Slika 1.** Histološki preparat mehanički otkošenog mesa peradi ( Protecon) (koštano tkivo-crvene boje)



## CONCLUSION

The results showed that „Baader“ meat has higher quality in comparison with „MDPM“ and its quality is in accordance with the requirements of the Slovak and EU legislation. This fact demonstrates that the properties of „Baader“ meat are similar to the properties of fresh meat.

## SAŽETAK

### USPOREDBA KAKVOĆE STROJNO OTKOŠTENOG MESA PERADI UPOTREBOM RAZLIČITIH POSTUPAKA SEPARACIJE

U radu su uspoređeni odabrani parametri kakvoće (hidroksiprolin, kalcij, sadržaj čestica kostiju i histološko određivanje čestica kostiju) strojno otkošteog mesa peradi (engl. mechanically deboned poultry meat; MDPM – „čvrsta separacija“ i „meko separacija“ „Baader meso“). Rezultati su uspoređeni sa sastavom (izuzev koštanih čestica) svježeg pilećeg mesa (mišići prsiju i bataka). Sadržaj hidroksiprolina pokazivao je značajne razlike, a srednja vrijednost sadržaja hidroksiprolina u strojno otkošenom mesu bila je dvostruko veća u odnosu na „Baader meso“ (333,17 mg.100g<sup>-1</sup>, odnosno 152,90 mg.100g<sup>-1</sup>). Analiza sadržaja kalcija dala je slične rezultate (1,94g.kg<sup>-1</sup>, odnosno 1,05 g.kg<sup>-1</sup>). Srednji sadržaj čestica kostiju iznosio je 0,27 % (MDPM) i 0,034 % („Baader“). Provedeno je histološko određivanje čestica kostiju u MDPM i „Baader“ mesu.

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\*Food Codex of the Slovak Republic. Third part, Fifth head, Meat products.

\*COMMISSION REGULATION (EC) No 2074/2005 of 5 December 2005 laying down implementing measures for certain products under Regulation (EC) No 853/2004 of the European Parliament and of the Council and for the organisation of official controls under Regulation (EC) No 854/2004 of the European Parliament and of the Council and Regulation (EC) No 882/2004 of the European Parliament and of the Council, derogating from Regulation (EC) No 852/2004 of the European Parliament and of the Council and amending Regulations (EC) No 853/2004 and (EC) No 854/2004

\*REGULATION (EC) No 853/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 29 April 2004 laying down specific hygiene rules for food of animal origin.

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▼ **Abb. 2.** Histological picture of mechanically deboned poultry meat („Baadar“) (Bone tissue – red)

▼ **Slika 2.** Histološki preparat mehanički otkošenog mesa peradi („Baadar“) (koštano tkivo-crvene boje)

