

PE4.112 Influence of a Microbial Enzyme Preparation upon the Colour Characteristics and Organoleptic Properties of Meat Cans 406.00

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The colour of meat cans is one of the main factors guiding consumers in their perception of quality and expression of preferences. It is known that the colour of finished meat products is largely affected by post mortem biochemical processes in miofibrillar proteins, in particular the kind, state and pH of meat raw materials, and by the changes occurring in the sarcoplasmatic protein myoglobin. In this study, the aim we have set has been to establish the influence of a microbial enzyme preparation upon color characteristics of meat cans. The investigations have been carried out with a bacterial enzyme preparation with collagenase activity, obtained from *Streptomyces* sp.82. In order to establish the influence of enzyme preparation upon color characteristics of meat cans, the changes in the red color "a", yellow color "b" and brightness "L" have been determined. The results from the organoleptic investigation carried out have shown that there is a statistically significant difference between the experimental and the control samples, as regards the following indices: consistency, juiciness, flavor, taste and total assessment. The samples produced by using the enzyme preparation having an activity of 110 PU/kg have received considerably higher assessments as compared to the samples without enzyme preparation and those with enzyme preparation having an activity of 230 PU/kg. The assessments for consistency and juiciness of the control and the experimental samples are respectively: $6,24 \pm 0,38$ and $6,82 \pm 0,41$ in the control samples; $8,45 \pm 0,39$ and $8,26 \pm 0,41$ in the sample with an enzyme preparation having an activity of 110 PU/kg and $6,92 \pm 0,41$ and $6,63 \pm 0,35$ in the sample with an enzyme preparation having an activity of 230 PU/kg.

Index Terms — colour, enzyme preparation, meat cans, organoleptic properties.

I. INTRODUCTION

The colour of meat cans is one of the main factors guiding consumers in their perception of quality and expression of preferences. It is known that the colour of finished meat products is largely affected by post mortem biochemical processes in miofibrillar proteins, in particular the kind, state and pH of meat raw materials, and by the changes occurring in the sarcoplasmatic protein myoglobin. A fairly large

number of studies have been made on the application of enzyme preparations to the meat industry where they contribute to improving the quality of some traditional meat products and creating new varieties, including meat cans, to a wider use of low-functional meat raw materials, to intensified technological processes, etc. In addition, the use of proteolytic enzyme preparations enables the occurrence of certain desirable changes in the connective tissue of meat within a relatively shorter period of time. This study aimed to determine the effect of a microbial enzyme preparation on the colour characteristics of meat cans. With regard to the pre-set aim and operational tasks we conducted research using a bacterial enzyme preparation obtained from *Streptomyces* sp. 82 and having collagenase activity. The strain had the following characteristics: it produced an exocellular enzyme with elastolytic and collagenolytic activity: pH optimum 6 – 7.5; proteolytic activity up to 300 PU/g enzyme, temperature optimum 45 – 50 °C; inactivation temperature 70 °C. Complete inhibition of activity could be observed at pH 4.5 in the acidic region and pH 9.0 in the alkaline region. In order to characterize the changes occurring in the colour of finished meat cans under the effect of an enzyme preparation, the control and test samples were studied for changes in the red colour 'a', yellow colour 'b' and brightness 'L'.

II. MATERIALS AND METHODS

Samples were prepared by recipes shown at Table 1. Beef II grade was mined on a wolf-machine with grade apertures diameter 24 mm, then salted and gelatin, additives and enzyme preparation added to it. After a good mixing, the meat mass have been left in a refrigeration chamber at a temperature of 0 – 4 °C for 48 h. After that filling mass was filled into metal cans and then sterilized. The colour evaluation was made on a CHROMA METER CR – 410 (KONICA MINOLTA). The colour characteristic of colour L*, a*, and b* was determined. One way of determining the degree of freshness and the quality of meat is through organoleptic study (3). When meat is subjected to organoleptic study, the following indices are

investigated: appearance, colour, consistency, aroma, flavour, juiciness and overall rating. In our studies, we assessed the organoleptic characteristics of the samples according to a 9-grade scale.

III. RESULTS AND DISCUSSION

Assessment of the quantitative and qualitative characteristics of the colour of meat cans provides further information on the effect of enzyme preparations upon muscle pigments. The spectrophotometric studies showed that the values of the 'L' index characterizing the colour brightness of the incised surface of the control and test samples did not demonstrate any reliable differences (fig. 1). A similar tendency was observed with the 'a' and 'b' indices characterising the participation of the red and yellow component in the incised surface colour (fig. 2 and 3). The organoleptic evaluation of meat cans is of great importance to their quality profile.

The results of the organoleptic study made (tables 2) showed that there was a statistically significant difference between the control and test samples with regard to their consistency, juiciness, aroma, flavour and overall rating. In respect to consistency, which is a compound property determined by a combination of mechanical properties (structural strength, plastic strength, tenderness, etc.), reliable differences were established between the control samples and the test samples. The juiciness of the finished products had the best value with the meat cans where an enzyme preparation having an activity of 110 PU/kg had been used (tables 2).

A higher preparation activity made the product considerably moist, whereas the lack of enzyme preparation led to a finished product of dry consistency. There were reliable differences, though to a smaller extent, between the flavour and aroma of the test and control samples. Better aroma and flavour confirmed by higher ratings were observed with the products where an enzyme having an activity of 110 PU/kg had been used. Colour of the incised surface was the only index for which no significant differences between the control and test samples were established. The complex organoleptic evaluation showed that

consistency, juiciness (to a smaller extent), aroma and flavour had a decisive effect on quality evaluation.

IV. CONCLUSION

The organoleptic analysis results have provided evidence that the enzyme preparation used largely improves the quality of meat cans made from meat raw materials of low-functional properties obtained from large ruminants. The application of microbial enzyme preparations to meat canning technology showed that the enzyme preparation quantities used did not interfere with the colour formation process, therefore the test samples of meat cans had the same values of the colour-characterizing indices. The best results were obtained when an enzyme preparation having an activity of 110 PU/kg was used.

REFERENCES

- [1] Flores, M.; C. Alasnier; M.C. Aristoy; J.L. Navarro; G. Gandemer; F. Toldra (1996): Activity of aminopeptidase and lipolytic enzymes in five skeletal muscles with various oxidative patterns. *Journal of Science Food Agriculture*. 70(1), 127-130.
- [2] Hagen, B.F., J.L. Berdague; A.L. Holck; H. Naes; H. Blom (1996): Bacterial proteinase reduces maturation time of dry fermented sausages. *Journal of Food Science*. 61(5), 1024 - 1029.
- [3] Hagen, B.F.; J.L. Berdague; A.L. Holck; H. Naes; H. Blom (1996): Bacterial proteinase reduces maturation time of dry fermented sausages. *Journal of Food Science*. 61(5), 1024-1029.
- [4] Marggrander, K., (1995): Collagen proteins as aids to improve the technological and sensory characteristics of meat products and ready meals. *Fleischwirtschaft*, 75(11), 1286-1287.
- [5] Mendiratta, S.K., Panda P.C. (1995): Chemical and histological changes caused by pressure and enzyme treatment for tenderization of spent hen meat. *Journal of Food Science and Technology*, 32(4), 336-338.
- [6] Eilert, S.J.; R.W. Mandigo (1993): Meat batters manufactured with modified beef connective-tissue. *Journal of Food Science*, 58(4), 691-696.
- [7] Jeremiah L.E., Tong A.K.W., Gibson L.L., (1991). The usefulness of muscle color and segregating beef carcasses into tenderness groups. *Meat Sci.*, 30, 97 - 114.
- [8] Tunic, M.H., (1988): Changes in the denaturation characteristics of collagen induced by bacterial collagenase preparations. *Journal of Food Science*, 53, 662-665.