

6:14 Investigation of the influence of a bacterial proteolytic enzyme preparation 'Mesenterin 11-11' on the hydrophilic properties of cattle meat

S. DANCHEV, D. DIMITROV AND B. KUPENOVA

Higher Institute of Food Industry, Plovdiv, Bulgaria

Introduction

The intensification of the processes relevant to ageing of meat is of essential interest to the practice. Good results along these lines were obtained using proteolytic enzyme preparations. In addition to the relatively widespread enzyme preparations of vegetable origin (1, 2, 3), a tendency to introducing microbial enzymes in the practice of meat processing was recently exhibited (4, 5). Our previous papers revealed good results obtained from studies of the effect of a bacterial enzyme preparation on mutton (6, 7, 8). The present investigation deals with the effect of a proteolytic enzyme preparation isolated from *Bacillus mesentericus* 11-11 on the hydrophilic properties of veal.

Material and Methods

The present studies were carried out on *m. longissimus dorsi* from calf carcasses taken two hours after slaughter for trials with unchilled meat, and twenty four hours post-mortem for trials with chilled meat. The two parts of *m. longissimus dorsi* were separated from both halves of the calf carcass. The right-hand half used as test sample was injected with an enzyme preparation dissolved in 2% solution of sodium chloride in ratio of 10% to the sample weight. The left-hand part of the muscle, used as control sample, was injected only with 2% solution of sodium chloride in the same amount to the sample weight. The test and control samples packed in polyethylene bags were stored at a temperature of 2 - 4°C. The experiments were conducted with our enzyme preparation of proteolytic activity of 600 PU/g, salted out from a culture medium of *Bacillus mesentericus* 11-11 (9), called 'Mesenterin 11-11'.

According to the medical and sanitary examinations, the strain *Bacillus mesentericus* 11-11 is apathogenic and produces no toxins. In order to establish the optimum amount of enzyme preparation, the samples were injected with various enzyme concentrations (0.1, 0.2, 0.3 and 0.5% solution) expressed in terms of proteolytic units of 78, 156, 230 and 390 PU/kg meat, respectively.

Samples were taken for studies within 2, 24 and 48 hours after the death of the animals, and the water-retaining power in terms of % was determined (10).

Two series of experiments with chilled and unchilled meat were completed. In case of chilled veal, 0.3% enzyme preparation concentration, corresponding to 230 proteolytic units/kg of meat, was tested only.

Results and Discussion

The results obtained from the studies of unchilled veal treated with various amounts of enzyme preparation are presented in Fig. 1, 2, 3 and 4.

Variation of water-retaining power in % of unchilled veal treated with a proteolytic enzyme preparation

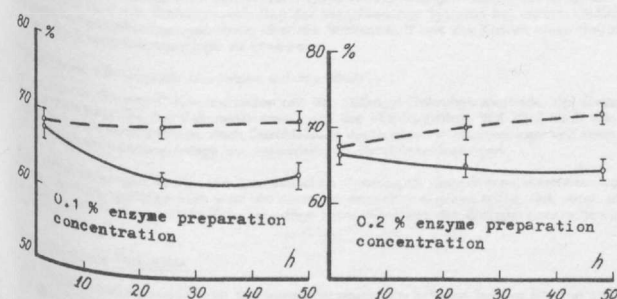


Fig. 1

Fig. 2

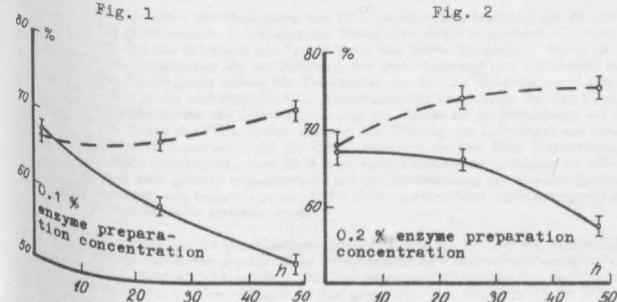


Fig. 3

Fig. 4

— control sample; - - - test sample

The Figures reveal the effect of various concentrations of Mesenterin 11-11 on the test samples for different time intervals.

It is seen that the water-retaining power of the control samples decreased to the 48th hour ranging within the limits of 2 - 10% compared to the mass of meat. The test samples exhibited the contrary phenomena - increasing the water-retaining power in proportion to the amount of enzyme preparation introduced. The increase was the lowest in the samples treated with 0.1% enzyme solution - 2.1%, and the highest in the samples treated with 0.5% enzyme solution - 9% (from 67.5% on the 2nd hour to 75.5% on the 48th hour).

Experiments with chilled veal (24 hours post-mortem) treated with 0.3% enzyme preparation solution, which showed the most appropriate effect in the tests with unchilled veal, were also conducted.

The results obtained from the studies of the water-retaining power of chilled veal are given in Fig. 5.

Variation of water-retaining power (%) of chilled veal treated with a proteolytic enzyme preparation

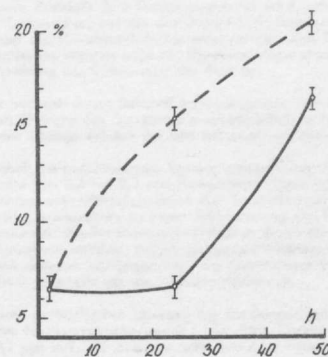


Fig. 5

— control sample
- - - test sample

The data given in Fig. 5 show that the percentage of water retaining increased in both the control and the test samples. The increase occurred quite earlier and to a greater extent in

the test samples. The increase in the water-retaining power on the 48th hour was 2.5% and 137% in the control sample and the meat treated with a proteolytic enzyme preparation, respectively.

After the 48th hour the test and the control samples were subjected to thermal treatment at the same temperature and time for 30 min at 180-200°C. The organoleptic estimation of the heat treated meat (Table 1) showed that the test samples had more tender consistency and better juiciness compared to the control samples. The highest organoleptic score was observed with 0.2% and 0.3% Mesenterin solution concentration. No difference of taste and flavour between the test and the control samples was reported. At 0.5% concentration the muscle tissue lost its structure during roasting and the meat became tasteless.

Table 1. Organoleptic estimation of heat treated veal injected with various Mesenterin 11-11 enzyme preparation concentrations

Indices	Kind of sample				
	Exp. 1	Exp. 2	Exp. 3	Exp. 4	Control
consistency	6.82±0.48	8.52±0.53	8.74±0.47	5.10±0.19	6.47±0.33
juiciness	7.22±0.33	8.22±0.39	8.35±0.31	6.04±0.27	6.79±0.28
flavour	7.46±0.29	7.76±0.37	7.57±0.29	6.12±0.32	7.60±0.31
taste	6.90±0.40	7.90±0.31	7.84±0.35	5.12±0.21	6.20±0.15
appearance	8.00±0.37	8.11±0.41	7.90±0.40	7.00±0.17	8.20±0.29
colour	7.10±0.34	7.40±0.24	7.65±0.29	6.90±0.22	7.25±0.32
total score	6.98±0.25	7.98±0.35	8.02±0.32	5.20±0.18	6.80±0.31

experiment 1 - 0.1% enzyme preparation concentration
experiment 2 - 0.2% enzyme preparation concentration
experiment 3 - 0.3% enzyme preparation concentration
experiment 4 - 0.5% enzyme preparation concentration

Conclusions

1. The proteolytic enzyme preparation 'Mesenterin 11-11' improved the hydrophilic properties of unchilled veal and resulted in increasing the amount of bound water and bettering the juiciness of meat.
2. The most effective concentration of Mesenterin 11-11, according to the complex indices - consistency, water-retaining power and organoleptic score, proved to be 0.2 - 0.3% enzyme solution, corresponding to 156 - 330 PU/kg of meat.

References

1. Grozdanov A., Velinov P., Nestorov N., Lilov L., Mesopro-

1. mishlenost (Meat Industry), 1973, 1.
2. Solovov V.I., Gashimova L.G., Prikl. biokh. i mikrob., 1970, 2, 190.
3. Solovov V.I., Dubinskaya A.P., Prikl. biokh. i mikrob., 1972, 2, 144.
4. Sh. Sinha, S. Danchev, D. Dimitrov, Nauchni trudove na VIHVP (Tr. scient. de l'ISTIA), Plovdiv, 1981, t. 28, fasc. 2, 237-244.
5. Dimitrov D., Kopenova B., Nauchni trudove na VIHVP (Tr. scient. de l'ISTIA), Plovdiv, 1973, t. 20, fasc. 1, 72-75.
6. Grau T., Myaso i myasoprodukty, Moskva, Pishtepromizdat, 1964.
7. Sosebee M.E., May K.N., Powers J.J., Food Technology, 1964, 18, 551.
8. Anon, Food Technology, 1980, 34, 10, 46.
9. E. Hristov, P. Velinov, S. Danchev, D. Dimitrov and Sh. Sinha, 27 Europäischer Fleischforscher Kongress in Wien, Austria 81.
10. Sh. Sinha, E. Hristov, S. Danchev and D. Dimitrov, 27 Europäischer Fleischforscher Kongress in Wien, Austria 81.

The purpose of the present investigation was to study the effect of the concentration of the solution on the rate of the reaction. The results are given in Table 1. It is seen from the table that the rate of the reaction increases with the increase of the concentration of the solution. The rate of the reaction is also affected by the temperature. The rate of the reaction increases with the increase of the temperature.

The results of the investigation show that the rate of the reaction is affected by the concentration of the solution and the temperature. The rate of the reaction increases with the increase of the concentration of the solution and the temperature. The rate of the reaction is also affected by the pH of the solution. The rate of the reaction increases with the increase of the pH of the solution.

The results of the investigation show that the rate of the reaction is affected by the concentration of the solution and the temperature. The rate of the reaction increases with the increase of the concentration of the solution and the temperature.

The results of the investigation show that the rate of the reaction is affected by the concentration of the solution and the temperature. The rate of the reaction increases with the increase of the concentration of the solution and the temperature.

The results of the investigation show that the rate of the reaction is affected by the concentration of the solution and the temperature. The rate of the reaction increases with the increase of the concentration of the solution and the temperature.

