

EFFECT OF DIFFERENT MARINADES ON
PHYSIO-CHEMICAL PROPERTIES OF BEEF

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ABSTRACT

Tenderness was found to be the most important factor in determining the eating quality of beef and the generally held view is that the beef produced in Sri Lanka is tougher than imported beef for use in the hotel industry. Hotels depending on Sri Lankan beef often employ tenderization techniques to develop tenderness on harder meat cuts like Chin, Rump, Topside and Silverside. A survey conducted to identify the tenderization practices adopted both in the hotel industry and in households in Sri Lanka has revealed quite a large variation among the practices. Common practices in the star grade hotels were, marinating with red wine, papaya milk, vinegar, curd, pineapple and vegetable oil. Hotels tend to marinate the larger or small meat cuts with the tenderizers at 4^oC for about 6-14 hrs, depending on the cut of meat. Among the conventional methods adopted at household level, incorporation of tamarind, vinegar, coconut shells, papaya, pineapple pieces, drumsticks barks, and ganja/ cannabis were outstanding.

But in households, marination seems to be restricted for 5-10 min at normal temperature and the addition of such tenderizers while cooking is popular. Based on the results of the survey thirteen marinades were been evaluated for their effectiveness and it was found that tamarind, oil, drumstick, curd, papaya, pineapple, ganja and vinegar were effective tenderizers. Six most promising marinades, namely papaya pineapple, vinegar, curd, red wine and cannabis were selected to investigate the shear values at different marination conditions. Laboratory analysis was also carried out to find the solubility of collagen and myofibrillar proteins after the marination.

TBA value of the marinated beef were examined during seven days frozen storage to detect rancidity.

All the beef samples subjected to the surface marination at 4⁰ C for 6 hrs showed a greater reduction in shear values than the control. Reduction of shear value in the meat treated with curd, vinegar, papaya and cannabis were outstanding and the respective shear values were 4.3, 4.6, 5.6, 5.5 kg. As the marination time increase to 14 hrs, tenderness had increased in all the samples. Increase in time had reduced the shear values in curd, vinegar and red wine treated meat considerably. After the injection of the same marinades into the tissues of meat samples and upon 14 hrs marination, all the marinades have proven to have greater tenderizing ability than surface marination.

Vinegar was the highest effective marinade. When injected marination was done, it had the ability to reduce the shear values by 42 %. Others were then, in order of effectiveness, papaya, pineapple, cannabis, curd and red wine. It was also found that, at the same concentration of the extracts, meat marinated with papaya developed more tenderness than with pineapple. Of the marinades included in the study, red wine and curd were shown to influence higher solubility of myofibrillar protein and the percentages were 18.9 and 18.2. It is reasonable to believe that acidity in red wine and curd affected the solubilization of M-line and Z-line proteins in the myofibrils in addition to the myosin. The next highest solubility of proteins was associated with meat marinated with papaya, pineapple and their protein solubility were not significantly different. Cannabis reached the third highest solubility but

the substance responsible is unknown. Vinegar has less effect on myofibrillar proteins, only solubilized 9.9%. On the other hand, vinegar was found to be the highest effective marinade on native collagen and solubility was 64.9%. The others were then, in order of curd, papaya, pineapple, cannabis and red wine. The highest solubility of collagen in vinegar treated meat may be primarily due to the presence of acetic acid and, in turn, the acceleration of cathepsin. In the same way lactic acid could have affected in the curd treated meat. The solubility of native collagen in papaya and pineapple treated meat were respectively 38.9% and 37.5%. This is presumably due to the action of papain and bromelain respectively. Slight acidity in red wine has resulted in 16.6% solubility of collagen and it was not significantly different with cannabis treated meat at $p < 0.05$. The effect of cannabis in this regard is unknown.

After 1 day frozen storage vinegar, curd and pineapple treated meat had higher TBA values than the control indicating that acidity favors the fat oxidation. Moreover, after 7 days of frozen storage vinegar (3.16) and curd (3.23) had resulted in higher TBA values than the control. The respective values for pineapple, cannabis and red wine were lower than the control, suggesting that the antioxidants in them slow down the fat oxidation.

The sensory test on the tenderness found that vinegar, curd, papaya and pineapple had been able to give the desired tenderness. Except in vinegar and curd treated meat which gave a dark brown colour, all the other marinades had not resulted in adverse effects on the appearance. The panel also recognized that flavour of the red

wine and curd treated meat had been detected to greater extent than that of others. Pineapple and vinegar treated meat were found to have next preference in response to flavour, showing that meat marinated with acidic marinades were more attractive than non acidic treatments.