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LEAF EXTRACT OF *BRYOPHYLLUM PINNATUM*: A POTENTIAL TENDERIZER FOR GOAT MEAT

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Abstract

Tenderness of the cooked goat (*Capra aegagrus hircus*) meat is one of the significant sensory attributes highly expected by the goat meat lovers in Sri Lanka. The leaf of *Bryophyllum pinnatum* is traditionally used as a meat tenderizer in Northern Province. The research objective was to determine the optimum concentration of *Bryophyllum pinnatum* leaf extract as a tenderizer for goat meat chunks. Aqueous extraction of *Bryophyllum pinnatum* leaves was obtained by boiling chopped leaves in distilled water at 40 ^{O}C for 24 hours. Goat meat chunks (50g) were treated with four levels of leaf concentrations (0.2, 0.4, 0.6 and 0.8 % w/v) and distilled water (control). The chunks were marinated at 4 ^{O}C for 24 hours and treated with salt (2% w/w) followed by thermal treatment at 121 ^{O}C for 15 minutes. pH and weight difference of the meat chucks were measured after thermal treatment. Sensory attributes of heat treated chunks were evaluated using Hedonic Scale (9 points) with 30 semi-trained panelists. pH value of meat chunks was significantly decreased with increasing concentration of leaf extract. While thermal yield of meat chunks increased significantly with increasing concentration. . Mean scores of sensory attributes, colour, flavor and juiciness of meat chunks did not show significant difference ($n>0.05$) compared to the control and increasing concentration of extract did not influence on them, but mean scores for overall acceptability and tenderness were higher than the control. Significantly highest mean scores for the overall acceptability values and tenderness were observed in 0.6 % and 0.8 % leaf extraction concentration than other treatments and both concentrations showed similar result in all the sensory attributes and thermal yield. In conclusion, 0.6 % (w/v) *Bryophyllum pinnatum* leaf extract was the optimum concentration for goat meat tenderization.

Introduction

The annual per capita consumption of goat meat in Sri Lanka in 2015 was about 0.09 kg (Department of Animal Production and Health, 2015). The total annual domestic production of mutton was 1350 MT in the year 2015 the balance requirement (350.33 MT) is imported (Department of Animal Production and Health, 2015). The annual per capita consumption of goat meat in Sri Lanka in 2015 was about 0.09 kg (Department of Animal Production and Health, 2015). The total annual domestic production of mutton was 1350 MT in the year 2015 the balance requirement (350.33 MT) is imported (Department of Animal Production and
Health, 2015).Goat meat is one of the most popular meat among the consumers in Sri Lanka. The statistics showed that annual per capita consumption of goat meat in Sri Lanka was about 0.09 kg in 2015 [1], while the total annual domestic production of mutton was 1350 mt in the year 2015 and the balance requirement (350.33 mt) is imported [1]. Consumer satisfaction is highly depends on meat quality. Among the various components of meat quality, the technological, nutritional, and sensory dimensions are much considered. The most crucial factor is tenderness and its variability. Improvement of tenderness has been done

by physical or chemical methods [2]. Blade tenderizer, hydrodynamic shockwave treatment are some examples for physical methods [3], whereas the chemical method employs addition of photolytic enzymes of plant or fungal origin. Papain, ficin, trypsin, bromalean, rhozyme are some examples for chemical tenderizers. Papain is the well-established tenderizer commonly used in industrial level. However Papain treated meat received higher tenderness with higher score for bitterness [4]. Abnormal flavor and bitter taste due to calcium chloride had been reported by Perez et al. (1998)[5].The leaf of *Bryophyllum pinnatum* is traditionally used as a meat tenderizer in Northern province. It has been an age old tradition. Even though traditionally used as a meat tenderizer, scientific proofs lack to support the fact. This study was to analyze the fact scientifically and tries to compare it with commercially available tenderizer. Since the leaf has numerous medicinal properties this will add value to the meat.

Methodology

Bryophyllum pinnatum leaves were collected and subjected to aqueous extraction (size reduced cleaned leaves were mixed with distilled water and kept at 40^{O} C for 24 hours) and prepared in different concentrations (0.2 %, 0.4 %, 0.6 %, 0.8 % w/v%). 50g of goat meat chunks of same variety from same part were chosen and the pH and the initial weight of the meat chunks were measured. Then the chunks were allowed to marinate in different concentrations of *Bryophyllum* aqueous extraction at 4^{O} C for 24 hours. One sample was allowed to marinate in distilled water as a control. Marinated chunks were taken out and 2% (w/w %) salt was added and set to autoclave at 121^{O}C for 15 minutes. The pH and the final weight of the meat chunks were measured and sensory evaluation was conducted using Hedonic Scale (9 points) using 30 semi-trained panelists. All the data was analyzed by ONE – WAY ANOVA test using Minitab 17software.

Thermal processing yield

Thermal processing yield (YTP) was calculated according to equation:

$$YTP = mf / mi * 100$$

where: mf - final mass of the sample (after thermal treatment)
mi - initial mass of the sample (raw meat).

pH

pH was determined according to A.O.A.C. method (1980) [6], with a Trans bench top digital pH meter.

Results

Table 01: Thermal yield of the treated sample

Concentration (W/V %)	Raw weight (g)	cooked weight (g)	Thermal yield (%)
0.2	45.7	24.5	53.6^{b}
0.4	50.9	27	53.0^{d}
0.6	51.1	27.2	53.2^{c}
0.8	51.5	30.3	58.8^{a}
Control	53.2	27.3	51.3^{e}

Means sharing similar superscripts in a row are statistically non-significant ($p<0.05$)

Table 02. pH of the meat samples

Treatment Concentration	Initial pH of solution	meat pH after the treatment
0.2	6.85	6.59^{b}
0.4	6.61	6.43^{c}
0.6	6.15	6.34^{d}
0.8	5.67	6.28^{e}
Control	7.1	6.67^{a}

Means sharing similar superscripts in a row are statistically non-significant ($p<0.05$)

Table 03: Sensory analysis results of the treated meat chunks

Treatment Concentration % w/v	Juiciness	Tenderness	Flavor	Color	Overall acceptance
Control	6.60 ± 1.79 ^{a}	5.15 ± 1.84 ^{c}	6.65 ± 0.36 ^{a}	5.90 ± 1.51 ^{a}	4.70 ± 1.72 ^{c}
0.2	5.90 ± 0.45 ^{a}	5.10 ± 1.59 ^{c}	6.75 ± 0.91 ^{a}	6.60 ± 1.57 ^{a}	6.30 ± 1.17 ^{b}
0.4	6.00 ± 1.84 ^{a}	6.20 ± 1.19 ^{b}	6.60 ± 1.05 ^{a}	6.45 ± 1.70 ^{a}	5.65 ± 1.75 ^{c}
0.6	7.00 ± 0.78 ^{a}	7.00 ± 1.08 ^{a}	6.80 ± 0.41 ^{a}	6.15 ± 1.72 ^{a}	7.45 ± 0.76 ^{a}
0.8	6.90 ± 0.71 ^{a}	7.75 ± 0.63 ^{a}	6.75 ± 1.12 ^{a}	5.95 ± 1.50 ^{a}	7.50 ± 0.89 ^{a}

Means sharing similar superscripts in a row are statistically non-significant ($p<0.05$)

Conclusion

The highest mean values were observed in 0.6 % and 0.8 % concentration of *Bryophyllum* leaf extract and those two values were not significantly differ thus, the lowest *Bryophyllum pinnatum* leaf extract concentration 0.6 % was considered as an optimum concentration to tenderize the goat meat. *Bryophyllum pinnatum* leaf extract showed strong tenderizing activity whereas the overall acceptability of the control is 4.70±1.72 and the treatment 0.6 % shows 7.45±0.76.

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