Beefalin: Meat Tenderizer from non-edible parts of pineapple

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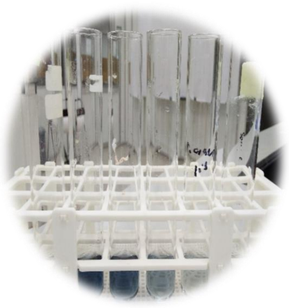
Product background

- ❑ Several strategies have been implemented to improve tenderness quality of meat
- ❑ Meat tenderization using plant proteolytic enzymes are preferable.
- ❑ Pineapple by-products (non edible parts) – source of proteolytic enzyme (bromelain).
- ❑ higher demand in pineapple processed items - huge pineapple by-products generations
- ❑ Pineapple by-products are typically easily exposed to microbial spoilage
- ❑ OBJECTIVE: to find out the added value of the pineapple byproducts, stem, from the Malaysian variant of *A. comosus* to be used as a meat tenderizer

State of the art

Bromelain extraction



Bromelain analysis

Beefalin formulation

Physico-chemical and antioxidant analysis on meat

Marketability and competitors

- ❑ Halal Food industries
- ❑ McCormick (USA) – no halal certification
- ❑ BEEFALIN will cost less than McCormick due to cheaper and available pineapple by-products

Environmental impact

- ❑ BEEFALIN is a natural product (enzyme) from agricultural by-products that is environment friendly and doesn't have any side effects
- ❑ BEEFALIN is an alternative to mechanical and chemical meat tenderization agents
- ❑ BEEFALIN is an added value to the pineapple by-products and at the same time can reduce agricultural waste

Novelty

- ❑ BEEFALIN is the first product from pineapple to be used in Malaysia food industries
- ❑ BEEFALIN will be the first local product of its kind to be commercialized and also halal
- ❑ BEEFALIN contain antioxidant properties that can improve the meat quality.
- ❑ Patent: In progress

Benefits

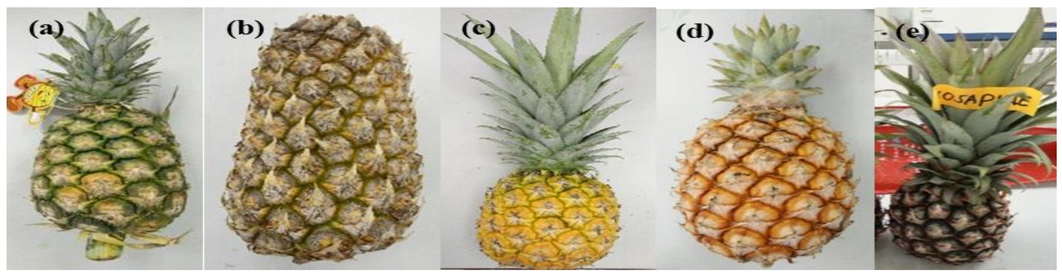
- ❑ Beef tenderizer produced from the local pineapple waste
- ❑ Bromelain is Generally Recognized As Safe (GRAS) for human consumption
- ❑ Suitable to tenderize beef and any other meat.
- ❑ Cooking time can be reduced to 1/3 of normal time.
- ❑ Meat palatability can be increased without affecting other meat quality

Achievement and Publication

- ❑ GOLD MEDAL, CREATION, INNOVATION, TECHNOLOGY & RESEARCH EXPOSITION, 2018, UMP
- ❑ Aizi Nor Mazila Ramli, Tuan Norsyalieza Tuan Aznan, Rosli Md. Illias (2017). Bromelain: From Production to Commercialisation. *Journal of the Science of Food and Agriculture*. 97(5): 1386–1395

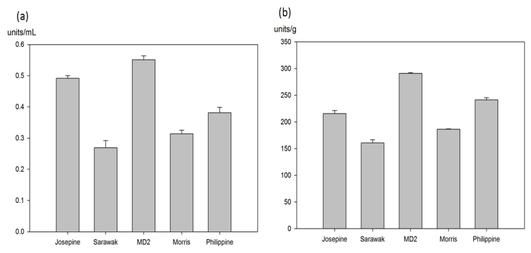
Product characteristics

Bromelain analysis from different A. Comosus variants

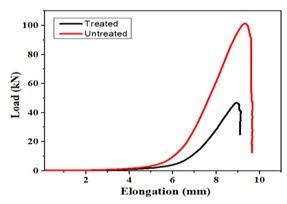


Different variants of *A. comosus* collected from different place in Malaysia with different properties: colour of skin, size and shape of body and amount and size of spines.

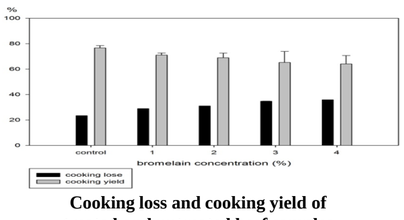
Physico-chemical properties determination



Bromelain analysis using (a) proteolytic analysis (b) Gelatin digestion unit (GDU) analysis



mechanical properties of treated and untreated beef samples



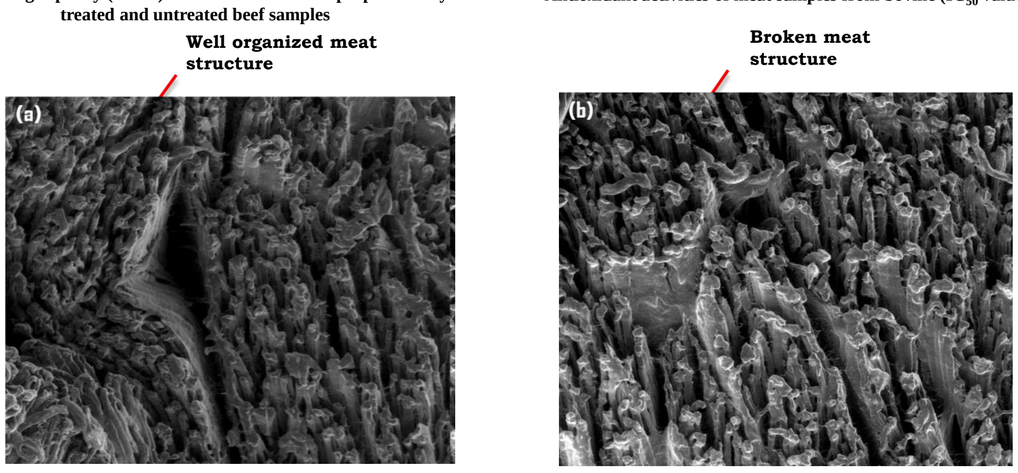
Cooking loss and cooking yield of treated and untreated beef samples

Properties	Concentration (%, v/v)				
	0%	1%	2%	3%	4%
pH	5.59 ± 0.02	5.32 ± 0.12	5.22 ± 0.02	5.12 ± 0.05	4.83 ± 0.08
WHC (%)	28.37 ± 0.01	26.95 ± 0.01	21.19 ± 0.01	21.07 ± 0.01	20.95 ± 0.01
Moisture	42.33 ± 0.01	42.04 ± 0.06	38.92 ± 0.07	33.15 ± 0.01	31.97 ± 0.01

pH, water holding capacity (WHC) and moisture content properties of yield of treated and untreated beef samples

	Cooked bovine		Raw bovine	
Properties	DPPH	CUPRAC	DPPH	CUPRAC
Ascorbic acid (Positive control)	37.011 ± 0.007	37.481 ± 0.044	40.218 ± 0.015	34.164 ± 0.025
Untreated (Negative control)	ND	ND	ND	ND
Treated	153.763 ± 0.046	115.983 ± 0.016	195.065 ± 0.021	91.080 ± 0.027

Antioxidant activities of meat samples from bovine (IC_{50} values, µg/mL)



Microstructure property of (a) untreated (b) treated beef samples using scanning electron microscope (SEM)

Research Collaboration

Lembaga Perindustrian Nenas Malaysia (LPNM)
Cawangan Negeri Pahang

Pekan Pina Sdn Bhd