

Beefalin: Meat Tenderizer from non-edible parts of pineapple



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Product background

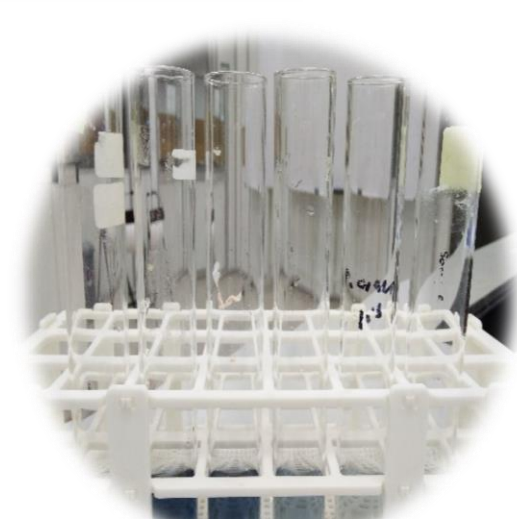


- ❑ Several strategies have been implemented to improve tenderness quality of meat
- ❑ Meat tenderization using plant proteolytic enzymes are preferable.
- ❑ Pineapple by-products (non edible parts) – source of proteolytic enzyme (bromelain).
- ❑ higher demand in pineapple processed items - huge pineapple 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

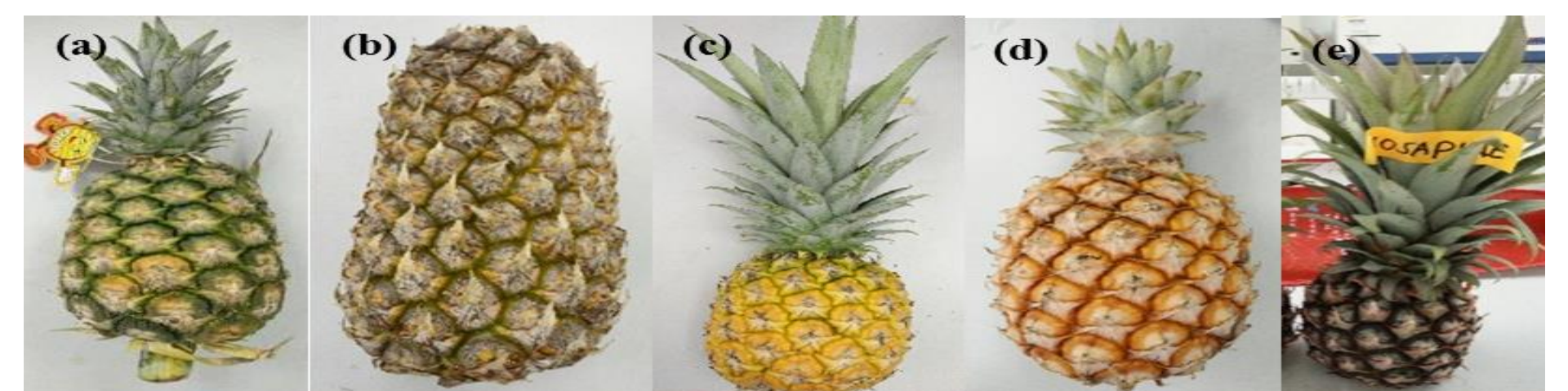
- ❑ Beef tenderizer produced from the local pineapple waste
- ❑ Bromelain is Generally Recognized As Safe (GRAS) for human consumption
- ❑ Suitable to tenderize beef and any other meat.
- ❑ Cooking time can be reduced to 1/3 of normal time.
- ❑ Meat palatability can be increased without affecting other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

Achievement and Publication

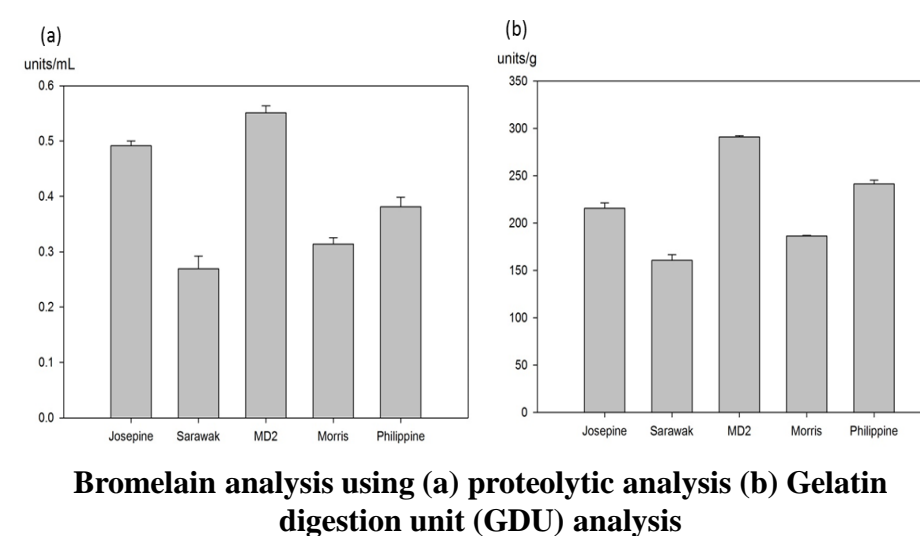
- ❑ GOLD MEDAL, CREATION, INNOVATION, TECHNOLOGY & RESEARCH EXPOSITION, 2018, UMP
- ❑ Aizi Nor Mazila Ramli, Tuan Norsyalieza Tuan Aznan, Rosli Md. Illias (2017). Bromelain: From Production to Commercialisation. *Journal of the Science of Food and Agriculture*. 97(5): 1386–1395

Product characteristics

Bromelain analysis from different *A. Comosus* variants

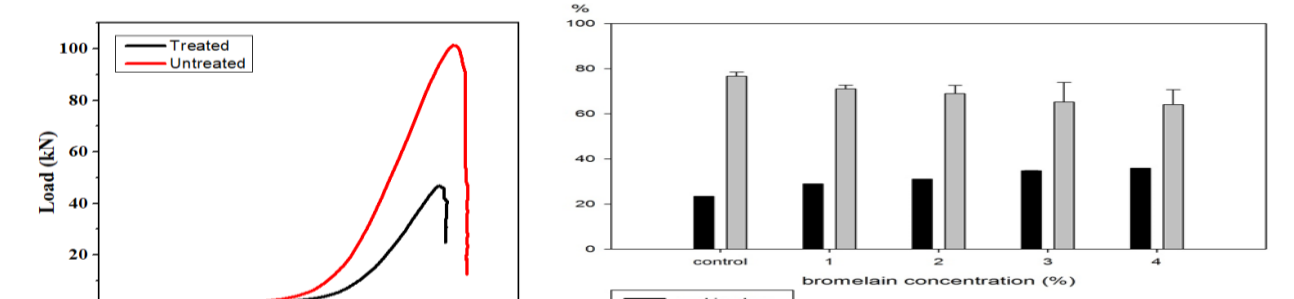


Different variants of *A. comosus* collected from different place in Malaysia with different properties: colour of skin, size and shape of body and amount and size of spines.



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

Physico-chemical properties determination



mechanical properties of treated and untreated beef samples

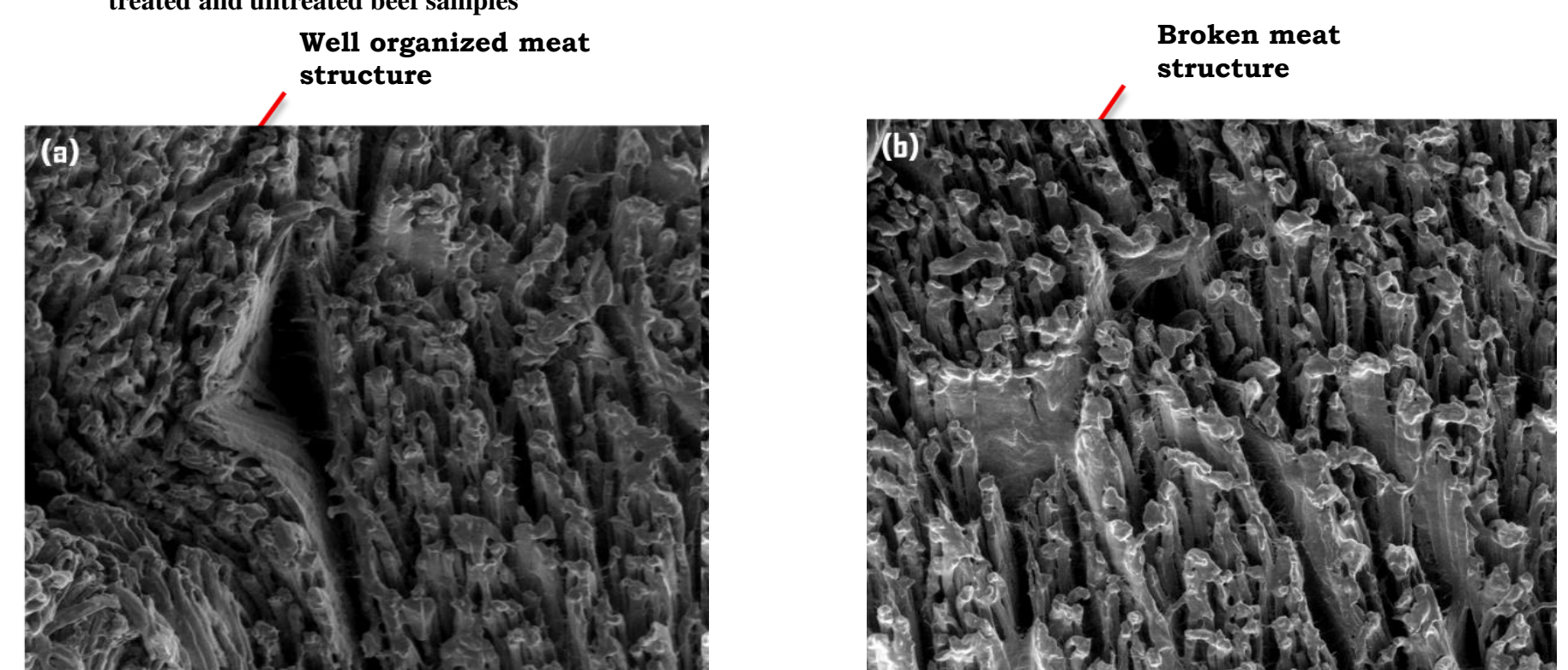
Cooking loss and cooking yield of treated and untreated beef samples

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

Properties	Cooked bovine		Raw bovine	
	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 (IC₅₀ 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

