Antioxidant effect of Litchi fruit pericarp extract in sheep meat nuggets

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Introduction

- Oxidation of lipid and auto-oxidation -major causes of quality deterioration and reduced shelf life of meat products.
- Changes in meat quality parameters such as colour, flavour, odour, texture and even nutritional value
- Meat mincing, cooking and other processing prior to refrigerated storage disrupt muscle cell membranes facilitating the interaction of unsaturated lipids with pro-oxidant substances such as non-haem iron, accelerating lipid oxidation leading to rapid quality deterioration and development of rancidity.
- Initially lipid oxidation in meat products results cardboard flavour and progresses with development of painty, rancid and oxidized flavour.
- Degree of lipid unsaturation, muscle type, animal diet, additives such as salt, cooking method, manner of storage and pH of the muscle

Introduction

- The rate and extent of oxidative deterioration can be reduced through various means like
  - **curing,**
  - **vacuum packaging,**
  - **modified atmosphere packaging**
  - **and most importantly adding synthetic or natural antioxidants.**
- Synthetic antioxidants such as butylated hydroxytoluene (BHT) and butylated hydroxy anisole (BHA) have been used extensively recent studies have implicated them to have toxic effects.
- An alternate to prevent lipid peroxidation in muscle foods during processing and storage- to use natural antioxidants
- Fruits and vegetables are rich sources of antioxidants and can serve as a source of natural antioxidants for meat products

Litchi fruit pericarp-a valuable agri-by-product

- Litchi (*Litchi chinensis Sonn.*) is a tropical and subtropical fruit native to China, and now widely cultivated throughout the World.
- Litchi or Lychee, a fruit with a rough brown shell and sweet white flesh around a large shining brown seed.
- Well received by consumers- due to its delicious taste and possible health benefits.

Litchi fruit pericarp-a valuable agri-by-product

- Litchi fruit pericarp (LFP) accounts for approximately 15% by weight of the whole fresh fruit and contains significant amounts of phenolics which are usually discarded as a waste in the process.
- The phenolics of LFP have been confirmed to have antioxidant, anticancer, immunomodulatory activities.
- LFP has been considered a new source of pharmaceuticals and food industry.
- No literature regarding its use as natural antioxidant in muscle food system.

Objective

- To assess the phenolic compounds and antioxidant potential of water extract of litchi fruit pericarp powder.
- To study its use in muscle food products as a source of natural antioxidants to prolong quality and stability.
- To compare its antioxidant potential with BHT in sheep meat nuggets.

Methodology

- Dressed and deboned sheep meat and stored frozen at – 18 °C till further use.
- Fresh Litchi fruit pericarp was collected and dried after fine chopping in an oven at 50°C.
- After drying, fine powder of Litchi fruit pericarp was prepared using home mixer.
- Ten grams of litchi pericarp powder was added in 100 ml boiled distilled water and left for 1 h followed by filtration through Whatmann No 1 filter paper to get extract

Analytical procedures

- Litchi pericarp powder analysis
  - Estimation of total phenolics
  - Radical Scavenging activity using DPPH assay
  - Ferric reducing antioxidant power assay
- Sheep meat nuggets for quality and acceptability
  - pH and cooking yield
  - TBARS number
  - Sensory analysis of goat meat patties

Formulation for sheep meat nuggets prepared with litchi pericarp extract and BHT

Ingredients (%)	Control	LPE (1%)	LPE (1.5%)	BHT (100)
Meat	71.1	70.1	69.5	70.0
Salt	1.8	1.8	1.8	1.8
Ice flakes	10	10	10	10
Refined oil	8	8	8	8
Condiments	4	4	4	4
Polyphosphate	0.3	0.3	0.3	0.3
Dry spice mix	1.8	1.8	1.8	1.8
Na nitrite (ppm)	150	150	150	150
Wheat flour	3	3	3	3
LPE (1%)	**0.00**	**1.00**	**1.5**	**-**
BHT (100ppm)	**-**	**-**	**-**	**100**

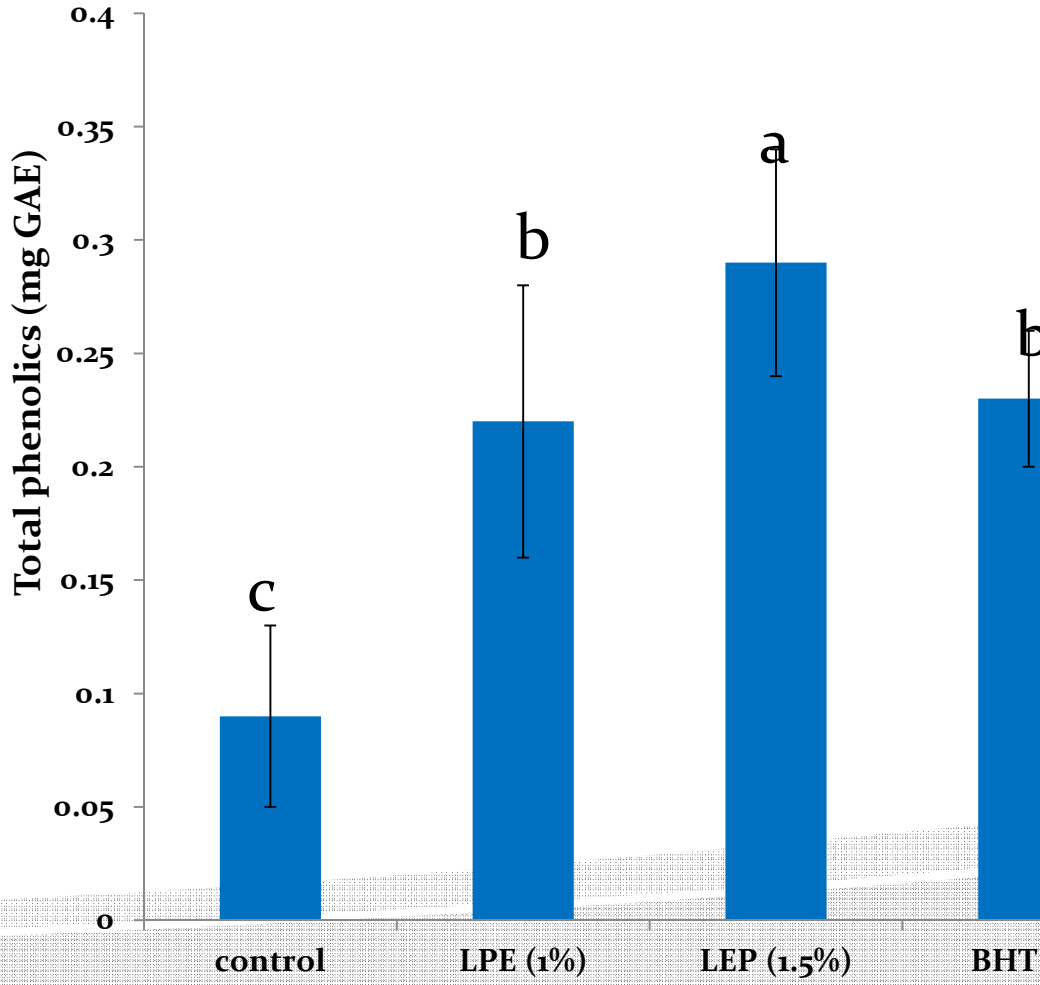
Control: Sheep meat nuggets; LEP (1%)-Sheep meat nuggets with 1% LPE; LEP (1.5%): Sheep meat nuggets with 1.5% LPE; BHT100: Sheep meat nuggets with 100ppm BHT

Total phenolics (mg gallic acid equivalent) in different concentrations of litchi pericarp powder and BHT

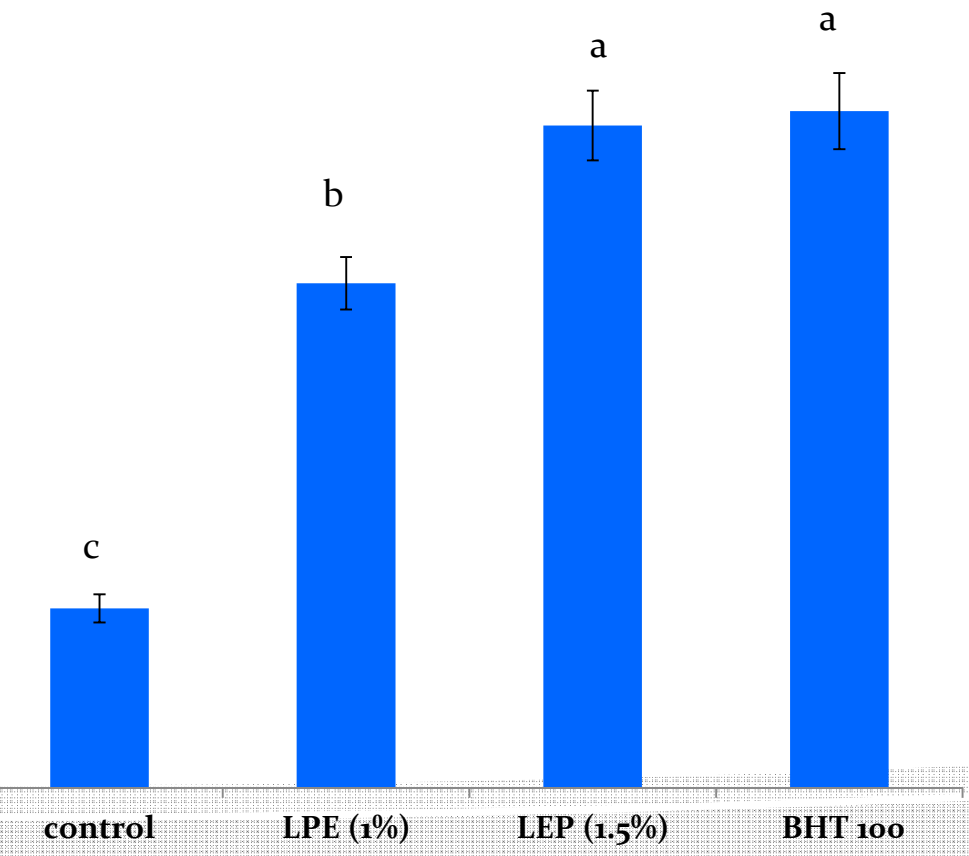
Phenolics constitutes - one of the major groups of compounds acting as primary antioxidants or free radical terminators.

Determination of total phenolics is one of important parameters to estimate the amount of antioxidants

Concentration dependent total phenolics in Litchi pericarb powder extract.



Radical scavenging activity (%) of litchi pericarb powder extract and BHT



- The DPPH radical has been widely us test the free radical scavenging abil various natural products and has accepted as a model compound fo radicals originating in lipids
- The percent radical scavenging activ LPE was increased significantly ($P <$ with the concentration
- DPPH radical scavenging activity of 1. was comparable to the activity of 100 BHT.
- The DPPH free radical scavengin antioxidants is due to their hyd donating ability; the more the numb hydroxyl groups, the higher the poss of free radical scavenging ability

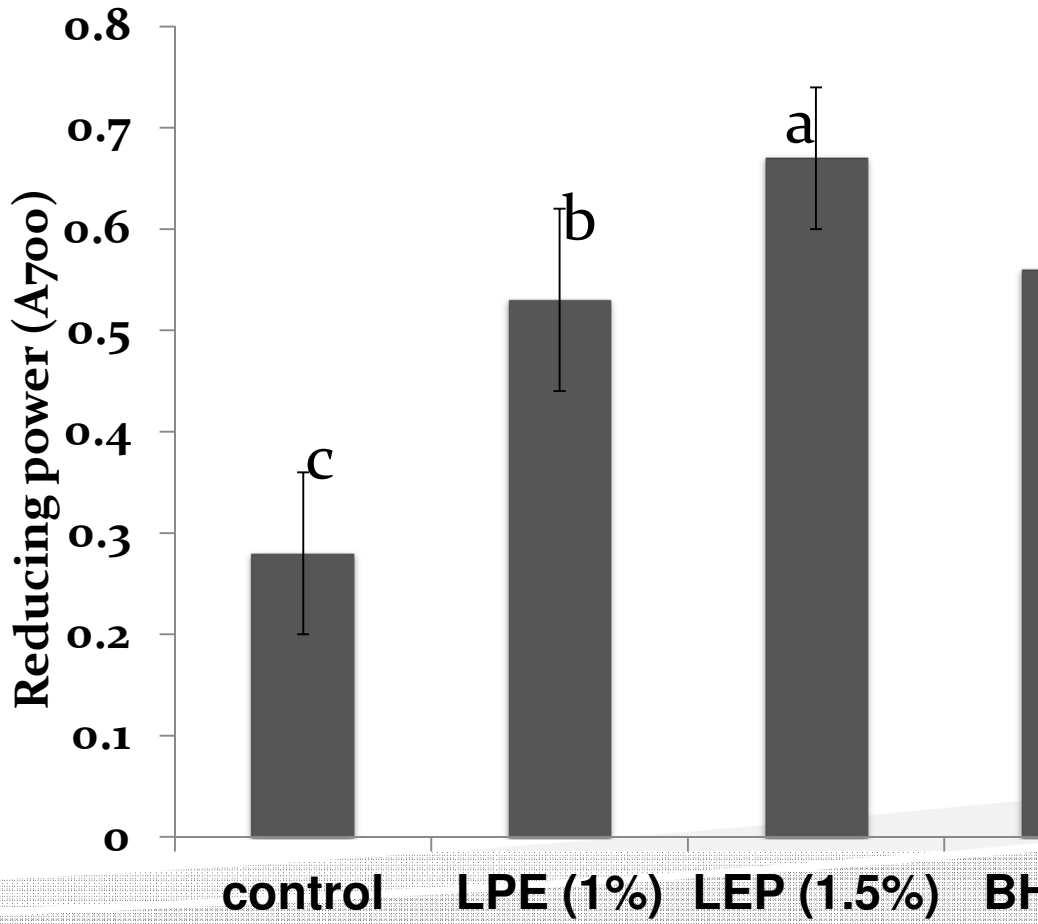
Ferric reducing antioxidant power (A700) of different concentrations of litchi pericarb powder and BHT

Reducing properties are generally associated with the presence of reductones.

The antioxidative action of reductones is based on the breaking of free radical chains by the donation of hydrogen atom

Reducing power of 1.5% LPE was even significantly higher ($P < 0.05$) as compared to 100 ppm BHT

The reducing power of a compound is related to its electron-transfer ability; therefore, the reducing capacity of a compound may serve as a significant indicator of its potential antioxidant activity



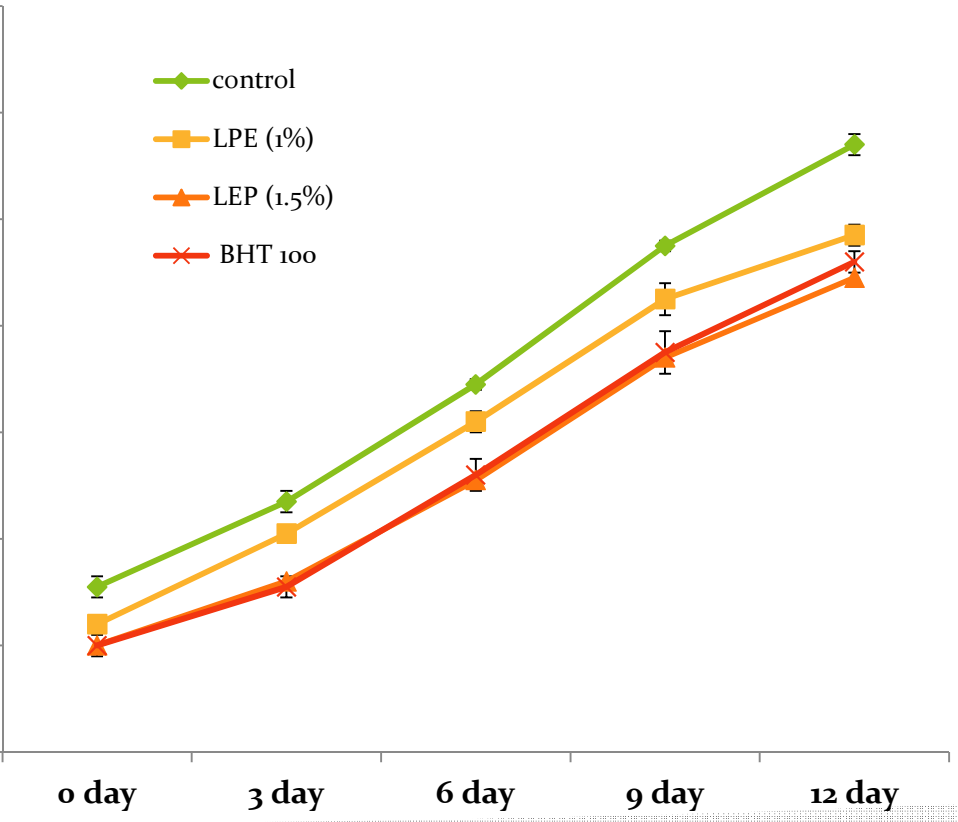
Effect of LPE and BHT on pH, product yield and total phenolics of sheep meat nuggets.

Parameters	Control	LPE (1%)	LPE (1.5%)	BHT (10
pH	6.21±0.03	6.20±0.02	6.22±0.02	6.19±0.02
Cooking yield (%)	93.62±0.48	93.29±0.36	94.12±0.43	93.75±0.3
Total phenolics (GAE)mg/g	0.05±0.01^{c}	0.13±0.01^{b}	0.17±0.01^{a}	0.16±0.01

Effect of LPE and BHT on sensory attributes of sheep meat nuggets.

Sensory attributes	Control	LPE (1%)	LPE (1.5%)	BHT (10
Appearance	7.23 ± 0.05	7.22 ± 0.06	7.18 ± 0.06	7.12 ± 0.0
Flavour	7.06 ± 0.6	7.05 ± 0.08	7.03 ± 0.06	6.94 ± 0.0
Texture	7.15 ± 0.08	7.03 ± 0.07	7.01 ± 0.06	7.02 ± 0.0
Juiciness	7.07 ± 0.07	7.13 ± 0.04	7.15 ± 0.05	7.17 ± 0.0
Overall acceptability	7.18 ± 0.05	7.08 ± 0.06	7.11 ± 0.06	7.05 ± 0.0

Effect of LPE and BHT on TBARS values of sheep meat nuggets during refrigerated storage



ARS number (mg malonaldehyde/kg)

- Total phenolics, radical scavenging a and reducing powder estimation in that LFP powder has good antiox potential.
- So its efficiency in controlling oxidation of sheep meat nuggets evaluated during refrigerated st against control nuggets and BHT nug
- TBARS values of all the products incr significantly with the advanceme storage period

Conclusion

- **Bestowed with phenolic compounds which have excellent free radical scavenging activity and reducing power.**
- **Extracts at 1 and 1.5% level significantly increases the phenolic contents in sheep meat nuggets and can act as a source of natural antioxidants.**
- **No adverse effect on sensory attributes of the final products.**
- **Extract significantly reduces the lipid peroxidation similar to the 100 ppm BHT thus improving the product quality and stability.**

Enjoy the delicious Litchi and benefits of pericarp as natural antioxidant