Effect of Drying air Temperature and Slice Thickness on the Colour, Texture and Rehydration Parameters of Dried Beef

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Introduction

There is an increasing demand for beef in sub-Saharan Africa; driven by an increase in population growth and disposable income. However, beef is highly perishable and its commercialization by the pastoral communities of Kenya is challenging due to high temperatures and the absence of cold chain. Sun drying has been done for many years to preserve meat during excess supply. However, with an increasing demand for high quality dried products, solar drying is gaining a lot of interest. Therefore, in order to optimize the drying process in tropical conditions, information on dried product quality in conditions close to those encountered in the real processes is needed. The objective of this work therefore, was to determine the effect of drying temperature and slice thickness on the physical quality of dried beef.

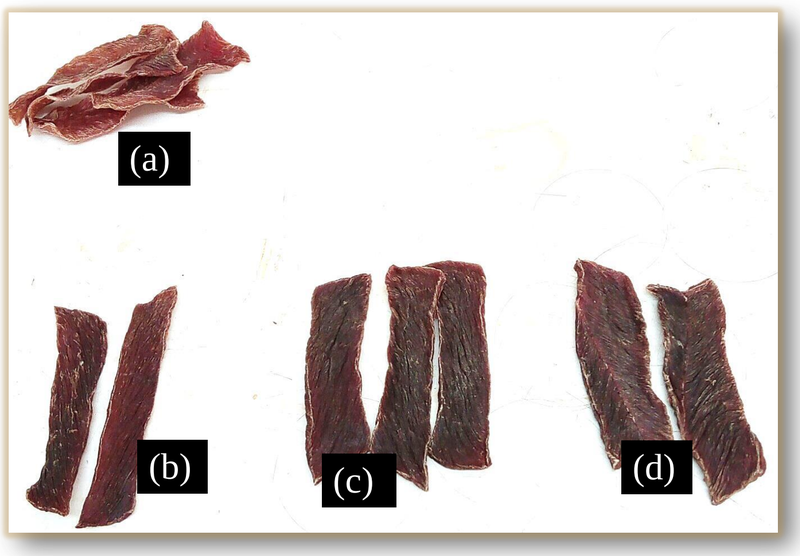
Methodology

Fresh beef was dried in a cabinet dryer "Hohenheim HT mini" at 30-60˚C air temperatures and 0.25-1.0 cm slice thickness. Air flow was generated by a fan operating at 24 V and thin layer drying done to 20% moisture content (dry basis). L*(lightness), a*(redness) and b*(yellowness/blueness) colour measurements were done using a colorimeter (Minolta Chroma Meter CR-200). The rehydration ratio (RR) was calculated as the ratio of weight after to weight before immersion in a hot water bath (100˚C for 10 min). Texture measurements were done using volodkevich bite jaws (HDP/VB*) fixture of a TA.XT.*plus* Texture Analyzer.

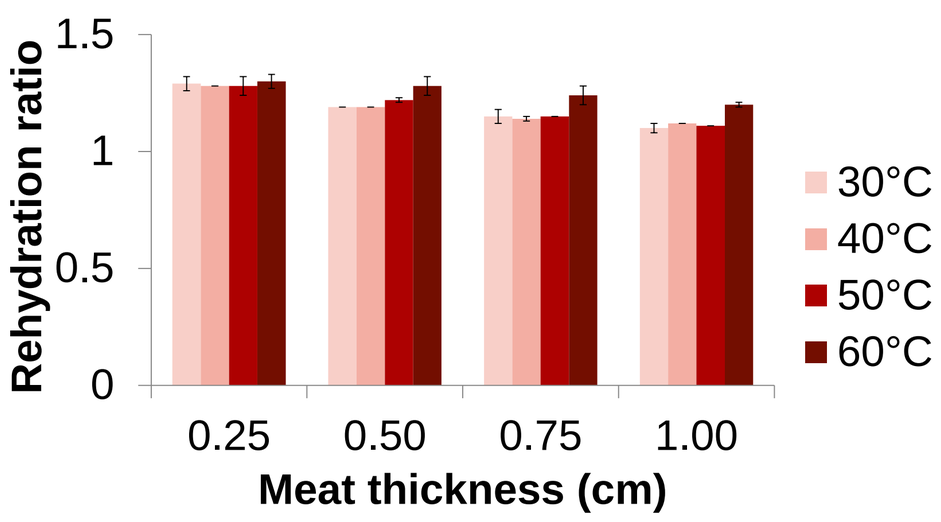
Results and Discussion

Colour

- A higher drying temperature and beef thickness deceased the L*, a* and b* colour parameters as a result of increased browning, reduced redness and yellowness of meat respectively.
- Surface discoloration in fresh meat is mostly due to metmyoglobin formation (an oxidized form of myoglobin).
- This is greatly accelerated by an increase in temperature and longer drying for thicker meat samples, causing a reduction in redness of meat.



Beef samples dried at 40˚C (a) 0.25 cm, (b) 0.5 cm, (c) 0.75 cm and (d) 1.0 cm thickness



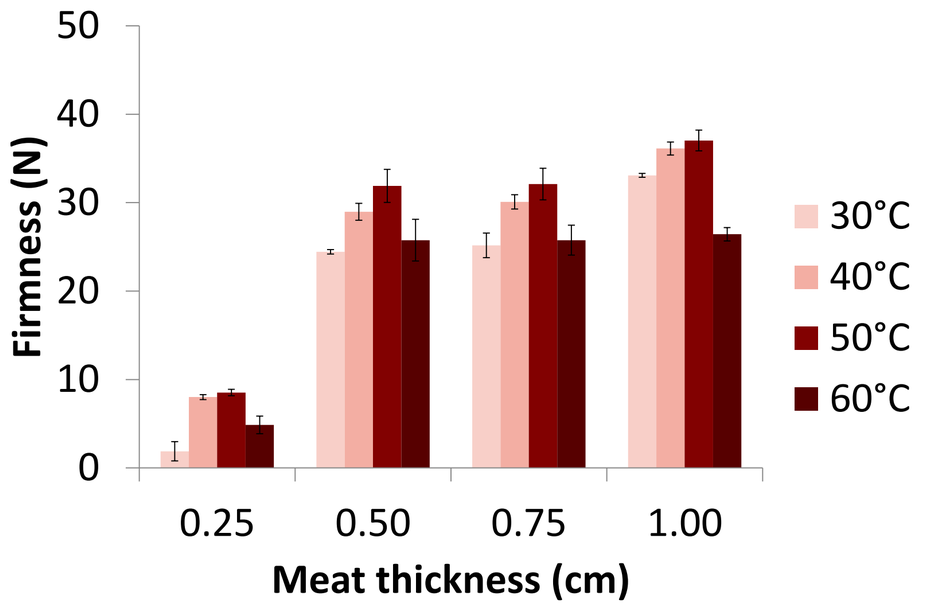
Rehydration Ratio for beef of different slice thicknesses dried at different temperatures

Rehydration Ratio/RR

- Rehydration ratio of dried beef was highest at 60˚C and decreased with increase in sample thickness .
- Beef samples heated at 60˚C had larger extracellular voids attributed to solubilization and longitudinal shrinkage of connective tissues.
- Long exposure of thicker samples to the drying medium enhanced denaturation of meat proteins, making them lose their water holding ability and resulting in loss of ability to reconstitute faster.

Beef firmness

- Firmness of dried beef increased with increase in temperature from 30 to 50˚C then decreased at 60˚C.
- Improved tenderness of meat at 60˚C is related to collagen denaturation, and increased proteolytic activity in beef muscles.
- Dried beef texture was significantly lower ($P \leq 0.05$) at beef thickness of 0.25 cm. Thicker muscle fibers were more shortened due to longer exposure to heat, giving a much denser material thus tougher meat.



Firmness values (N) for beef of different slice thicknesses dried at different temperatures

Conclusion

- With view of drying process optimization with respect to time and physical quality of beef, heating temperature zone of 60˚C and a lower meat thickness was recommended.

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