



Evaluation and Safety Validation of Dehydrating Methods for Goat Meat in Rural Malawi

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Objectives

This study was conducted to evaluate the dehydration methods of goat meat based in Malawi and the effects on food safety.

Materials and Methods

Goat meat was prepared as ground, minced, and whole muscle strips. Samples were treated with 6% lemon juice marinade, 6% vinegar marinade, or salt rub. During phase 1, dehydration of the meat was performed with a solar dehydrator ($n = 108$), electric oven ($n = 108$) or drum oven ($n = 108$). Qualitative data on the three drying methods was collected from a panel of students from Mzuzu University, Malawi, on the practicality of each method in a local rural setting. Additionally, visual observations were conducted 30 d prior to drying for the presence of mold and insects to give an indication of shelf life. Phase 2 was performed at Texas Tech University in Lubbock, Texas where whole muscle strips of lamb were submerged in a five-strain *Escherichia coli* surrogate cocktail of *Escherichia coli* for 5 min, allowed 30 min for cell attachment, then dried using an electric and drum oven, replicating the dehydration procedure in Malawi. For each replicate ($n = 2$), attachment samples ($n = 10$), samples dried in the electric oven ($n = 10$) and samples dried in drum oven samples ($n = 10$) were aseptically plated on MacConkey agar with a TSA overlay and enumerated for *E. coli*.

Results

In phase 1, mold growth was observed on 15.7% (34/216) of samples dried in the solar dehydrator and

drum oven. Of those positive for mold, 32.4% ($n = 11$) were minced, and 67.6% ($n = 23$) were whole muscle strips. No samples dried using the electric oven displayed mold (0/108). No samples displayed insects. Based on qualitative data that was gathered, top reasons to dry goat meat using the drum oven include “not requiring electricity” and “drum ovens are a common piece of equipment in villages”. Top reasons against using a drum oven include “unequal distribution of heat” and “high level of oversight required during drying”. Top reasons to dry goat meat using electric oven include “fast drying time”, “uniform distribution of heat”, and “limited oversight required”. Top reasons against using electric oven to dry goat meat include “requiring electricity” and “low knowledge of electric oven operation in a community setting”. Top reasons to use the solar dehydrator to dry goat meat include “not requiring electricity or firewood” and “limited oversight required”. Top reasons against using the solar dehydrator to dry goat meat include “slow drying time” and “uneven heat distribution due to time of day and shadows”. In phase 2, a 5-log reduction was observed for all electric oven treatment replicates (100%, 2/2) and half drum oven (50%, 1/2) replicates. However, variation in the reduction of *E. coli* is a direct result of weather and fuel provided to the drum oven.

Conclusion

Electric drying oven displayed the most consistent results for shelf life and safety. However, in rural Malawi, dehydrating methods should be chosen on a case by case basis.