



Chemical changes in the quality of reused sunflower oil under deep frying cooking methods

Benard Nkole¹, Adolf Lungu¹, Evans Kaimoyo¹, Evelyn Funjika¹

¹The University of Zambia, School of Natural Sciences, Department of Chemistry, Lusaka, Zambia

Introduction

Deep-fried foods prepared using reused vegetable oils are among the most popular foods not only in Zambia but also in other parts of Sub-Saharan Africa. Deep-fat frying can produce undesirable flavor compounds as well as changes to the food quality, color, and texture.

The hydrolysis, oxidation, and polymerization of oil are common chemical reactions in frying oil and they produce both volatile and nonvolatile compounds which undergo further chemical changes (Choe and Min 2007).

High degrees of saturation, fatty acid and peroxy values as well as microbial contamination of vegetable oils may pose detrimental health risks as the toxic and reactive oxidation products formed accumulate and bind to the consumed foods (Jurid et al., 2020).

There is need to sensitize the general public on the risks associated with reused cooking oil which will help to ensure improved nutrition and wellbeing for all people at all ages.

Aim

The aim of this study was to investigate the physical and chemical changes in recycled sunflower oil under deep frying cooking methods and to determine the rate of toxic microbial contamination on the recycled sunflower oil.

Method

1. In this research, Samples of beef or potato chips were deep fried in sunflower cooking oil. This was repeated for 8 days using the same cooking oil.
2. The American Oil Chemists' Society (AOCS) Official Methods Cd 8–53 and Cd 3d-63 were used to determine the peroxide and Acid values (PV) whilst the hanus method was employed to determine the variations in the degree of saturation of the oil samples
3. Tests conducted were compared between fresh sunflower oil samples, and those reused to prepare potato chips and beef samples
4. Standard methods of preparing microbial culture media were carefully and strategically manipulated to prepare a unique kind of culture media(in % oil/40ml culture media) whose source of nutrition and water(moisture) was restricted to the oil samples used in this research.

Results



Figure 1: Changes in appearance of potato chips deep- fried with recycled sunflower oil for the same amount of time (8 min) and temperature (120 -130 °C)

Results

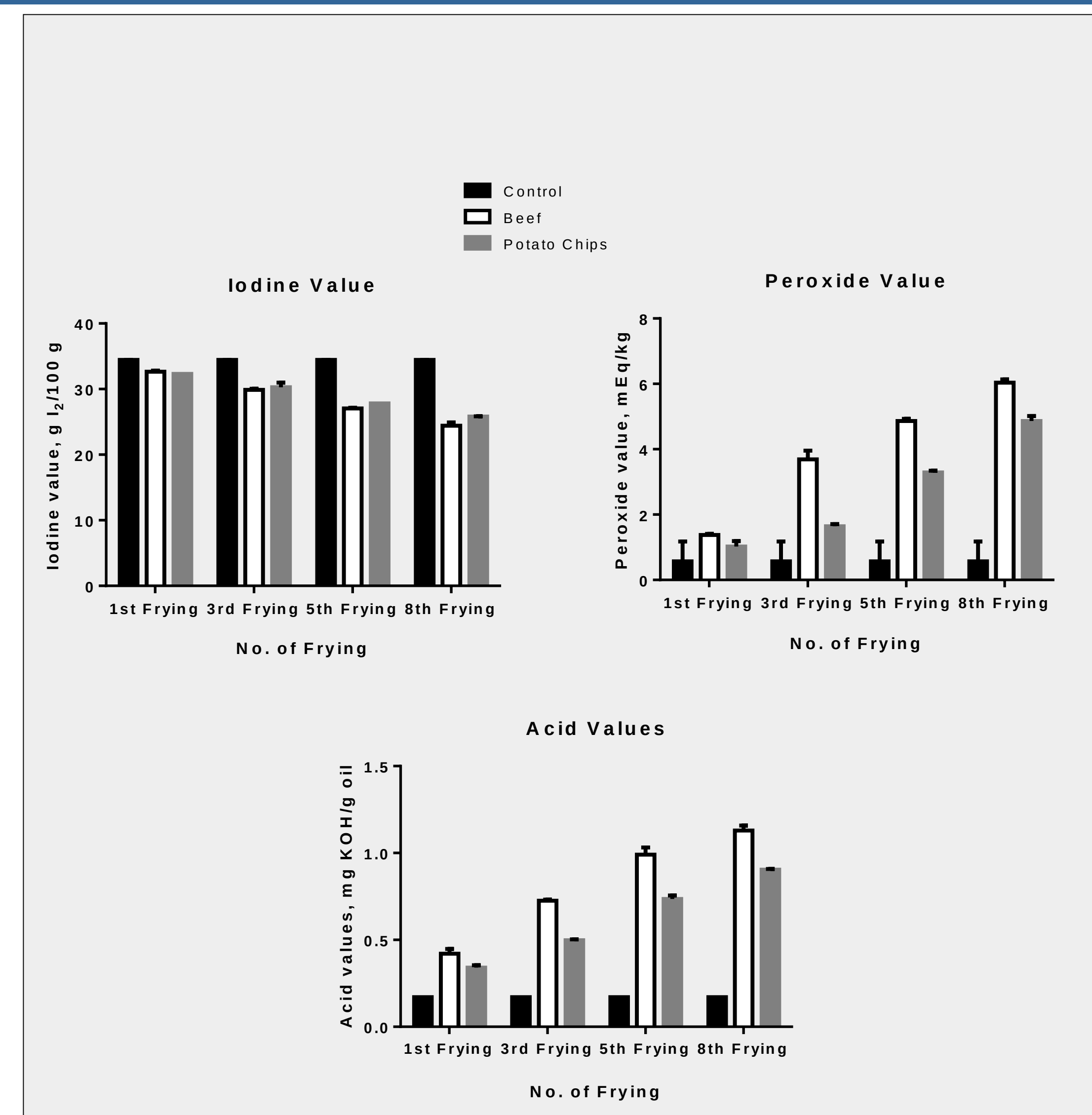


Figure 2: Chemical changes in the reused cooking oil: Iodine value, peroxide value, acid value. Results show mean +/- SD.

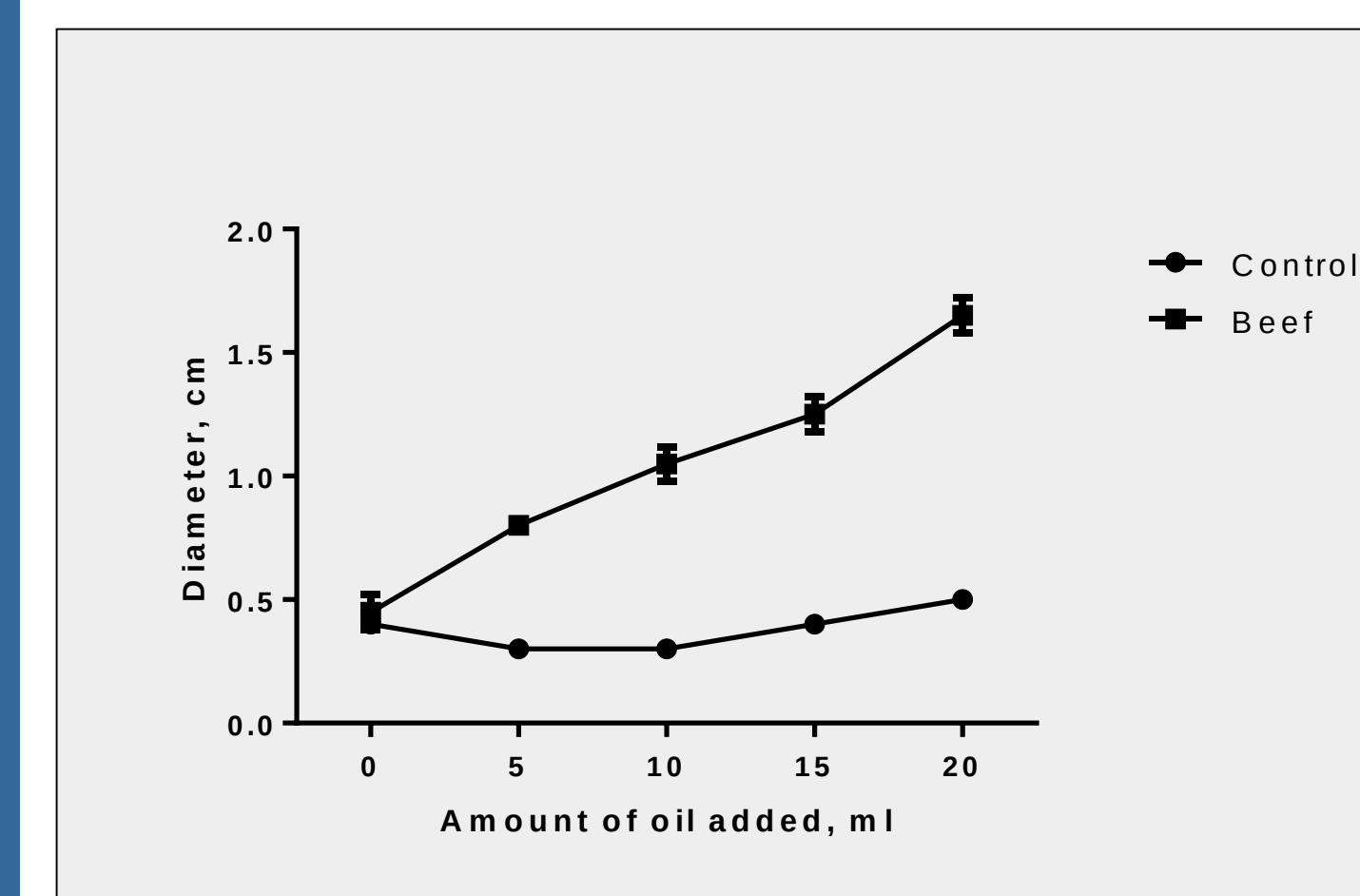


Figure 3: Diameter of *Aspergillus flavus* colonies grown on oatmeal agar containing different amounts of reused cooking oil. Results show mean +/- SD.

Discussion

Chemical analysis of the reused cooking oil showed that the iodine value (IV), peroxide value (PI) and acid values (AV) in both the beef and potato chip reused oil increased after each use.

The increase in diameter *A. flavus* colonies growing on Oatmeal enriched agar plates containing varying amounts of the reused oil showed that these chemical changes described above provided a more conducive environment for rapid toxic fungal growth on reused oil samples which may pose potential negative effects on human health

Conclusion

Reusing oils irreversibly alters its chemical state. Storing reused oil samples increases the risk of its exposure to toxic microbial contamination. Consuming such foods prepared using reused oil samples may increase your risk to coronary and gastrointestinal complications.

References

1. Choe, E. and D. B. Min (2007). "Chemistry of deep-fat frying oils." J Food Sci 72(5): 1750-3841.
2. Jurid, L. S., Zubairi, S. I., Kasim, Z. M., & Kadir, I. A. A. (2020). The effect of repetitive frying on physicochemical properties of refined, bleached and deodorized Malaysian tenera palm olein during deep-fat frying. Arabian Journal of Chemistry, 13(7), 6149–6160.