FRACTIONATION OF UGANDAN SHEA BUTTER INTO COMMERCIAL SHEA STEARIN AND SHEA OLEIN

Omujal Francis , Okullo John Bosco Lamoris , Agwaya Moses Solomon , Kirabo Irene , Natukunda Sheilla

Omujal Francis , Okullo John Bosco Lamoris , Agwaya Moses Solomon , Kirabo Irene , Natukunda Sheilla

IDRC GRANT / SUBVENTION DU CRDI : - STRENGTHENING PUBLIC-PRIVATE PARTNERSHIPS IN RESEARCH AND INNOVATION IN THE MANUFACTURING SECTOR IN UGANDA

FRACTIONATION OF UGANDAN SHEA BUTTER INTO COMMERCIAL SHEA STEARIN AND SHEA OLEIN

Omujal Francis[1], Okullo John Bosco Lamoris[2], Agwaya Moses Solomon[3], Kirabo Irene[1] and Natukunda Sheilla[2]
Natural Chemotherapeutics Research Institute[1] Makerere University, College of Agriculture and Environmental sciences[2] Nilo Beauty Products Ltd[3]

Project award No: UNCST/SGCI-11/2021/003

Corresponding Author's Email: fomujal@gmail.com

INTRODUCTION

- Shea butter is fat produced from the nuts of the shea tree (Vitellaria paradoxa, family Sapotaceae)
- There are at least one billion shea butter fruiting trees (**Fig1**) across 3-4 million km2 in 21 countries producing about 2.5 million tons of dry seed kernel (**Fig 2-4**) per annum which translates to over 1.2 million tons of shea butter fat.
- Shea butter fat is an important ingredient in foods, cosmetics and pharmaceutical products
- However, shea butter has been produced using traditional artisan method (TAM) (**Fig 5**) and cold pressing method (CPM) (**Fig 6**) with limited applications or no economic gain
- To open diverse uses of shea butter, there is need to subject it to fractionation, a a technique that separate the fats into liquid (olein) and solid (stearin) (**Fig 8**)
- The objective of this project was to develop a fractionation technology for producing shea olein and shea stearin as ingredient in food and cosmetic industries.

MATERIALS AND METHODS

- Shea butter extracted by TAM and CPM were sourced from small scale processors in Lira district.
- The shea butter was fractionated in the laboratory using dry and solvent techniques at crystallization temperatures of 15°C and 20°C.
- The shea olein and shea stearin fractions obtained were subjected to physico-chemical analyses for acid value (AV), iodine value (IV), refractive index (RI) and fatty acid profile (FAP)
- Based on lab experiment, a pilot production facility to fractionated shea butter was fabricated for industrial use (**Fig 13**)

Fig 1: Shea tree

Fig 3: Shea nuts

Fig 2: Shea fruits

Fig 4: shea kernels

Fig 5: shea butter processed by traditional method

Fig 6: Shea butter processed by cold pressed method

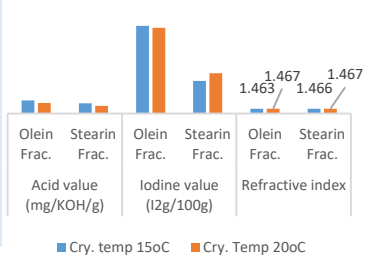

Fig 9: Physico-chemical characteristics of cold pressed shea butter olein and stearin fractions

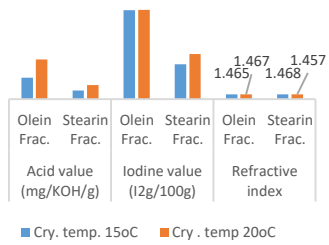

Fig 10: Physico-chemical characteristics of traditionally processed shea butter olein and stearin fractions

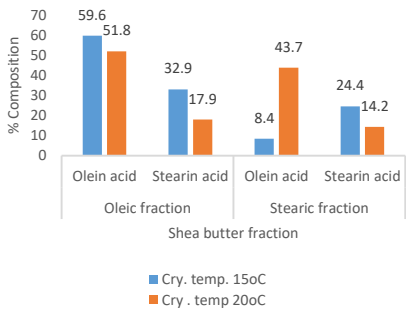

Fig 11: Oleic acid and stearic acid composition in cold pressed processed shea butter fractions

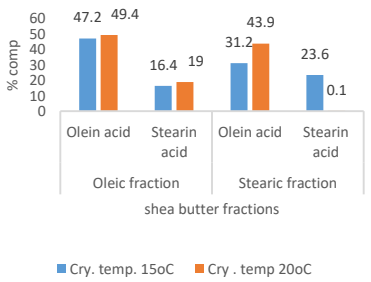

Fig 12: Oleic acid and stearic acid composition in traditional processed shea butter fractions

Fig 13: Pilot fractionation machine

Fig 14: Fractionated shea butter into olein and stearin with hexane

RESULTS

- The shea butter processed by TAM had yields of 59.4% (olein fraction) and 40.6% (stearin fraction) compared to 40% and 60% respectively for that of CPM (**Fig 7**).
- Although the physico-chemical parameters like AV and IV between olein and stearin fractions showed significant differences, this was not the case between crystallization temperatures of 15°C and 20°C (**Fig 9 and 10**).
- The FAP of the olein fraction and shea stearin had their oleic acid content at 45-60% and 30-43% respectively, and vice versa for their respective stearic fatty acid contents (**Fig 11 and 12**).
- Moreover, the oleic acid content at 20°C crystallization temperature was higher than at that 15°C crystallization temperatures (**Fig 11 and 12**)

Fig 15: Shea olein products (soap, lotion and cream)

Fig 16: Shea olein

CONCLUSION & RECOMMENDATION

- Fractionation of shea butter produced by TAM at a crystallization temperature of 20°C produced higher yield of shea olein.
- Therefore, there is need to maximize the use of shea olein and shea stearin ingredients for the manufacture of cosmetics and food products (**Fig 15 & 16)**

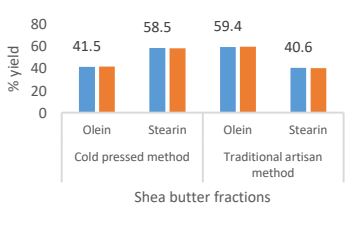

Fig 7: Fractionation yields for shea butter processed by cold pressing and traditional artisan method

Fig 8: Shea stearin and olein fractions

Acknowledgement: UNCST, SGCI IQSRS