Tropentag, September 15-17, 2021, hybrid conference

"Towards shifting paradigms in agriculture
for a healthy and sustainable future"

Design and Performance Evaluation of a Solar Hybrid Dryer for Cassava Breadflour in Benin

Schadrac Don de Dieu Agossevi[1], Thierry Godjo[2], Joseph Dossou[1]

[1] *University of Abomey-Calavi, Faculty of Agricultural Sciences, Benin*
[2] *University of Science, Technology, Engineering and Mathematics, Doctoral School of Science, Technology, Engineering and Mathematics, Benin*

Abstract

Cassava is a well-known crop and a staple food in Benin. The cassava cossette derivative is used in addition to wheat flour in breadmaking. This research aims to design a hybrid solar dryer. A diagnostic survey was carried out by cassava processing cooperatives to identify the difficulties of producing good quality cossette and by the Ouidah Pain bakery (which incorporates 30 % cassava flour in the production of bread) to collect its needs in bread cossettes. Following the need analysis, a dryer meeting the expected functions was designed and tested. The dryer operating temperatures and relative humidity of the air in the drying chamber were respectively 65°C and 10 % during the day and 32°C and 88 % at night. A solar collector and a heat exchanger were used for air heating. The physico-chemical and food microbiological analyses of dried cassava chips samples were carried out. The cassava cossettes obtained from 1 mm, 3 mm and 5 mm thick flakes had a final moisture content of 9.65 ± 1.23 %, 12.05 ± 0.66 % and 14.52 ± 0.71 % respectively, compared to 14.10±0.31 % for those from the cooperatives in the wet period. In the dry period, the same cossettes have a final moisture content of 5.47±0.91 % and 9.10±4.96 % compared to 12.36 ± 0.65 % for the cooperatives cossettes. All the cossettes respect the normative values of the Beninese standard 03.06.006 of CEBENOR with water content (< 12 %), luminance ($L > 93$) and clarity ($\Delta E < 12$) except for 5mm which has water content higher than 12 %. On the other hand, the acidity level of the cossettes, between 0.06 and 0.09, is slightly higher than the normative value (0.05). The sanitary quality of the 1mm cossettes in terms of yeasts and moulds < 10 g CFU is in line with the standard. The high presence of total mesophilic aerobic germs ($2.5.106 CFUg^{-1}$) had a negative impact on the cossettes during the rainy season due to airborne contamination of the air entering the dryer. It is therefore imperative to focus on air filtration techniques and thermal regulation of the hybrid solar dryer.

Keywords: Benin, cassava, Cossettes, Flakes, Solar Hybrid Dryer

Contact Address: Thierry Godjo, University of Science, Technology, Engineering and Mathematics, Doctoral School of Science, Technology, Engineering and Mathematics, B.P. 2282 Goho, 01 Abomey, Benin, e-mail: thierrygodjo@hotmail.com