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Impact of passive solar drying on secondary plant metabolites in African indigenous vegetables

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Abstract

The promotion of African indigenous vegetables (AIVs) has received increasing attention due to their rich composition of secondary plant metabolites with potential health benefits. However, due to their high perishability and seasonal availability, AIVs' significance has not been achieved. Nonetheless, drying technologies are crucial in reducing moisture contents of AIVs to optimum levels, thereby improving storability and quality preservation. Therefore, the effect of passive direct (PDSD) and passive indirect solar drying (PISD) on the secondary plant metabolite contents of amaranth, Abyssinian mustard and pumpkin leaves was evaluated. Leaf material of the selected AIVs was harvested 4 weeks after sowing under field conditions, subsequently followed by a passive solar drying experiment. Oven-dried leaves (40 °C, 24 h) served as the control, while the variants included PDSD (52 °C, 74 h), PISD (35 °C, 101 h), and a 30-days storage (25 °C) of the respective passive solar dried samples. Quality evaluations of the AIVs was based on the total carotenoid, total flavonoid and total phenolic acid contents using high-performance liquid chromatography. Results indicated that compared to the control (oven-dried leaves), the total carotenoid contents were retained across the AIVs following PDSD and PISD, except for Abyssinian mustard where a significant decrease (45 % PDSD, 33 % PISD) was observed. The total flavonoid contents were maintained irrespective of the drying treatment compared to the control, except for amaranth leaves where a significant decline (53 %, PISD) was observed. There was no significant difference in the total phenolic acid contents between the control and the variants with PDSD resulting to higher retentions (>100 %) compared to PISD (<85 %). Following a 30-days storage duration, the secondary plant metabolite contents did not significantly vary across the AIVs compared to the initial contents (solar dried samples). However, the only exception was found in pumpkin leaves where storage resulted to a significant decline (20 %, PDSD) of the total phenolic acid contents compared to the initial contents. The present study indicates that passive solar drying is effective in terms of quality preservation in vegetables, for at least 30 days of ambient temperature storage.

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