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Reconditioning of cold –stored Potato Varieties (*solanum tuberosum*) Kondor and Markies

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ABSTRACT

Reducing sugars diminishing during reconditioning of cold- stored (3-4°C) Kondor and Markies processing potato cultivars were investigated. Temperature of 18 °C (73-78% RH) has significantly ($P \leq 0.05$) reduced the sugar accumulation during 25 days storage in both potato cultivars from 1.82 to 0.09(%) and from 3.3 to 0.25(%) in Markies and Kondor respectively. The reduction in reducing sugars accumulation reached the recommended level for potato processing (0.25-0.50 %). No adverse effects were recorded during the reconditioning period on the potato quality parameters such as tubers fresh weight loss, dry matter content and potato chips yield

Keywords: *Potato; varieties; sugars; processing; reconditioning.*

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INTRODUCTION

Potato is one of the most important vegetable crops in the world. The potato cultivated area in Sudan ranges between 10–12000 ha. In Sudan, the ware potatoes are usually stored at 3-4°C to inhibit potato sprouting during off season. Depending on cultivar, potatoes start accumulating reducing sugars during storage, which impart sweet taste in their end products as well as making them unfit for chip processing, because of the undesirable brown color of chips and fries. (Schimmer, 1957).

High reducing sugar concentrations are related to the browning of potato chips during frying and therefore lower concentrations result in high quality product (Mazza, 1983).

It is well known since the experiments of MiJller-Thurgau (1882) that temperatures above 10~ change biochemical processes in the potato tuber tissue towards resynthesis of starch from free sugars. This phenomenon is nowadays known in industrial practice as 'reconditioning' and is a necessary treatment of cold-stored potatoes, especially in those cases, where frying is one of the steps in the processing of the potatoes. The length of reconditioning depends on the the level of sugars accumulated during cold storage and on the susceptibility of different potato varieties to lose sugar during this treatment (Samotus, 1974). The act of reconditioning consisted of subjecting potatoes to high temperature (20-22 °C) for 2-5 week's to interconvert sugars to starch and to respire off residual sugars. The application of such procedure improved recovery in the quality of potato chips (Dospikhov, 1983). This step is not always successful raising issues of sprouting development and rot potential (Olsen, 2005).

The aim of the study was to investigate the effect of reconditioning at (18°C) on chemical composition, physical properties and processing quality of two potato varieties Markies and Kondor (NIVAA, 2003) which have been stored at 4°C for 3 months.

MATERIALS AND METHODS

Materials

Kondor and Markies potato varieties were grown in a farmer's field at Elshek Eltayb (75 kilometers North Omdurman) in the western bank of the River Nile. Agronomic practices including regular weeding, earthing up, fertilizer applications, irrigation and pest control were done as recommended (Khalfalla, 2004). Fully cured, mature, medium-sized harvested tubers of Kondor and Markies varieties were packed in jute sacks and stored at 4°C for 3 months in a commercial cold store located in Omdurman. About 200kg from each potato varieties were selected randomly after 3 months cold-storage and kept at 18°C (73-78% RH) in a cold store at Food Research Center for reconditioning.

Methods

Fresh weight loss (%) of potato tubers was recorded on initial weight basis and recorded every 5 days throughout the reconditioning period. Dry matter (DM) content of all tubers was measured of using potato Hydrometer (APH Group, Holland) according to the method of Smith (1975). The reducing sugar of tubers extract was determined according to the technique described by Nelson (1944) as modified by Somogyi (1952). Chips yield (%) was recorded during the reconditioning period where about 300 g slices of potato were fried in sunflower seed oil at 170°C in a deep fryer till the bubbling stopped (about 6 min). The fried chips were drained off to remove excess oil and then weighed to determine the chips yield (Sandhu, 2002).

Data generated was subjected to Statistical Analysis System (SAS), using one factor analysis of variance (CRD); and then means were tested and separated using Duncan's Multiple Range Test (Steel, 1997).

RESULTS AND DISCUSSION

Fresh weight loss

The effect of reconditioning for 25 days at 18 °C (73-78 RH) on weight loss (%) in Kondor and Markies potato cultivars, were illustrated in Fig.1. Markies recorded the highest fresh weight loss compared with Kondor potato cultivar. The weight losses of potato tubers during the reconditioning process, the change from a low temperature storage to a high temperature reconditioning, generally leads to a respiratory burst and consequently to losses of reducing sugars, starch and water (Sasak ., 2004).

Reducing sugars content

Fig. 2 illustrates changes in content of reducing sugars (mg/100g) in Kondor and Markies potato cultivars during 25 days reconditioning at 18°C (73-78 % RH). There was a sharp decrease in reducing sugars content after 5 days in both potato varieties. After 25 days of reconditioning, all tubers showed a considerable decrease in the content of reducing sugars to the desirable level of 0.25% (Smith, 1955; 1956). The significant ($P \leq 0.05$) decrease in concentration of reducing sugars resulted in reduction of color darkening during chips frying specially at the end of the reconditioning period (Figure 5 and 6 for Kondor and Markies, respectively). The potato chips color remained golden yellow up to the day 25th and the product was acceptable for commercial purpose. Markies potato variety had lower content of reducing sugar (0.25 %) compared to Kondor potatoes. Starch degradation is catalyzed by enzymes such as α -amylase, which is capable of dissociating polymers at the surfaces of the semicrystalline granules (Smith ., 2005). The rate of starch depletion and sugar accumulation depends largely on the cultivar and temperature of storage, possibly owing to variation in enzyme activities (Kazami , 2000).

Dry matter content

Kondor dry matter content showed no significant difference ($P \leq 0.05$) till the end of reconditioning period while Markies showed a sudden decrease after the first week of reconditioning (Fig. 3). The dry matter content of treated tubers remained within the suitable range for processing (20-24%) as reported by Heslen . (1979).

Chips yield

The effect of reconditioning for 25 days at 18 °C (85-90% RH) on potato chips yield (%) is illustrated in Fig. 4. Potato chips yield (%) increased during the first ten days, and then showed a significant decrease in day 15. Potato chips yield increased gradually in the last ten days of storage in Kondor potato variety.

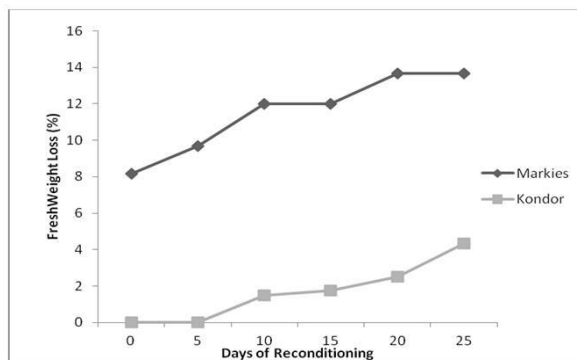


Figure 1. The effect of reconditioning on fresh weight loss (%) on Markies and Kondor potato varieties at 18°C (73-78 % RH) during 25 days storage

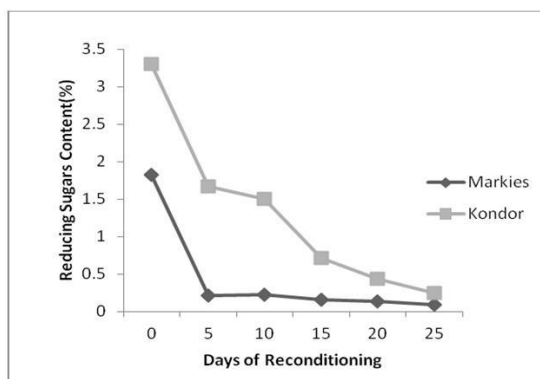


Figure 2. The effect of reconditioning on reducing sugars content (%) in Markies and Kondor potato varieties at 18°C (73-78 %RH) during 25 days storage

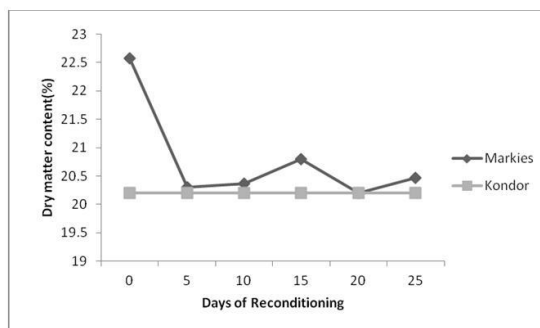


Figure 3. The effect of reconditioning on dry matter content (%) in Markies and Kondor potato varieties at 18°C (73-78 % RH) during 25 days storage

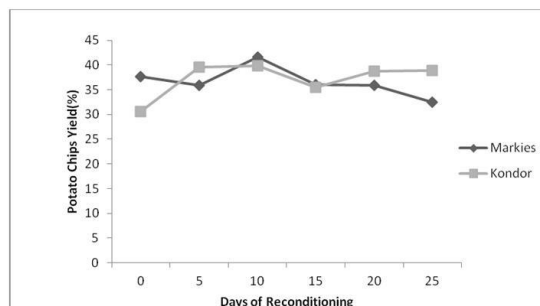


Figure 4. The effect of reconditioning on potato chips yield (%) in Markies and Kondor potato varieties at 18°C (73-78 % RH) during 25 days storage



Figure 5. Effect of reconditioning on Chips frying color in Kondor potato tubers at 18°C (73-78%RH) in day 0, 5, 10, 15, 20 and 25

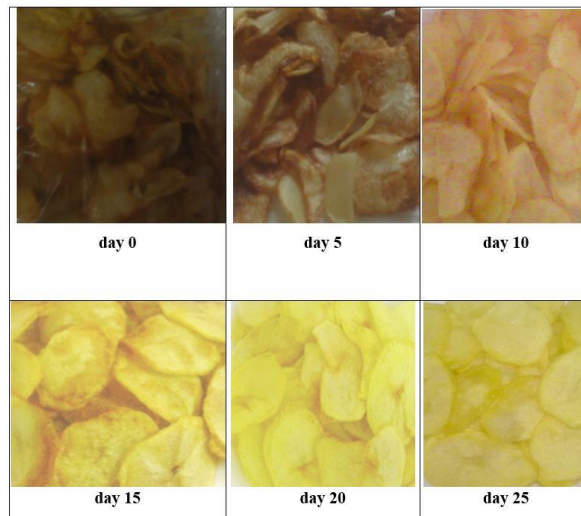


Figure 5. Effect of reconditioning on Chips frying color in Markies potato tubers at 18°C (73-78%RH) in day 0, 5, 10, 15, 20 and 25

CONCLUSION

The reconditioning of potato varieties Markies and Kondor at 18°C (73-78%RH) for 25 days reduced the accumulation of sugars in potato tubers to the desirable level without an adverse effect on dry matter content or quality and yield of potato chips. The chips color became lighter with time during the reconditioning period.

RECOMMENDATION

To reduce sugars accumulation in processing potato varieties stored at 3 ± 1 °C reconditioning at 18 °C up to 25 days is recommended

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