

**EVALUATION OF COMMERCIAL POTATO CRISPS PROCESSING IN KENYA:  
CHARACTERISTICS OF THE MARKET AND INDUSTRY, AND SUITABILITY OF  
THE LOCAL CULTIVARS FOR PROCESSING**

By

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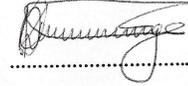
**Department of Food Science, Nutrition and Technology**

**2011**

**DECLARATION**

This thesis is my original work and has not been presented for a degree award in any other University.

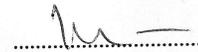
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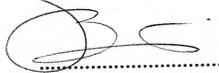
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## ABSTRACT

Potato crisps are increasingly becoming important as a snack food in Kenya. However the processing industry is faced with several constraints, the main one of which is lack of adequate quality raw potatoes. The objective of this study was to evaluate the performance of locally produced potato cultivars for processing into crisps, a major snack food in Kenya. A survey was conducted in the year 2009-2010 to obtain baseline information on the status of processing industry, consumption patterns, diversity and characteristics of potato crisps. Available potato varieties and cultivars undergoing National Performance Trials were evaluated for processing into crisps and the best performing tubers were selected for further assessment. Losses of reduced ascorbic acid (RAA) during frying, packaging and storage of potato crisps from the selected cultivars were determined. The performance of the selected potato cultivars in terms of oil uptake, color, texture and organoleptic properties of crisps was evaluated, at varying slice thickness and frying temperature. The effect of packaging and storage temperature on the shelf life of crisps made from the selected potato cultivars was also determined.

The results of the survey indicated that a total of 24 brands of crisps were available in the market. All the outlets surveyed stocked local, while 15% of the outlets also stocked imported brands of crisps in addition. The frequency of crisps purchased was influenced by factors such as festive occasions, seasons and purchasing power. Characteristics of the brands evaluated which included color, size, thickness, moisture, salt and oil content varied significantly ( $P \leq 0.05$ ) among the brands. About 90% of crisps processors were small and medium enterprises. About 4% of the processing firms identified the main constraints as lack of proper equipment and market, 43% indicated lack of finances to increase volume of production, while 64% as lack

of suitable potatoes and due to poor quality. Dutch Robjin was the potato variety used by most processors (76%).

The specific gravity of the cultivars evaluated for crisps processing varied from 1.074 to 1.098 and dry matter content from 19.50% to 24.20%. Reducing sugar levels significantly ( $P \leq 0.05$ ) varied among the cultivars and ranged between 0.07 and 0.4%. The varieties Dutch Robjin, Tigoni and Kenya Baraka and the clones 393371.58, 392657.8, 391691.96 and 393385.39 were identified as suitable for processing. They had desired physical characteristics with low levels of reducing sugars ( $\leq 0.25\%$ ), and were highly rated by sensory panelists. There was significant ( $P \leq 0.05$ ) reduction in the level of ascorbic acid, 45% in the average, in all the cultivars when tubers were fried into crisps. Package type and storage temperature significantly ( $P \leq 0.05$ ) influenced the retention of ascorbic acid in crisps during storage.

Crisps made from the selected four cultivars differed significantly ( $P \leq 0.05$ ) in oil absorption which ranged from 35.12% in Dutch Robjin to 36.52% in clone 391691.96. For each cultivar, the oil content of crisps differed significantly ( $P \leq 0.05$ ) with temperature and was highest (38.42%) at frying temperature of 160 °C and lowest (33.08%) at 180 °C. The oil content was significantly ( $P \leq 0.05$ ) higher (48.54%) in slices of 1.0 mm thick than in slices of 1.5 mm (35.12%) and 2.0 mm (29.80%). Texture significantly ( $P \leq 0.05$ ) increased with increase in frying temperature and slice thickness. Potato cultivar and slice thickness significantly ( $P \leq 0.05$ ) influenced the lightness ( $L^*$ ), redness ( $a^*$ ) and yellowness ( $b^*$ ) color parameters. Redness and yellowness parameters significantly ( $P \leq 0.05$ ) decreased with increase in frying temperature.

Results of shelf life evaluation indicated that aluminium foil pack was the most effective material in controlling moisture, and reducing lipid deterioration. Cultivar significantly ( $P \leq 0.05$ ) influenced the formation of peroxides. Crisps from Cv. 391691.96 had the lowest (0.38%)

peroxide values while it was highest (7.44%) in Tigoni crisps after 24 weeks of storage. The products stored at 35 °C had significantly ( $P \leq 0.05$ ) shorter shelf life compared to those stored at 25 and 30 °C. Crisps flavor, aroma and acceptability significantly ( $P \leq 0.05$ ) varied with cultivar and storage temperature.

Variety Tigoni that is known to be high yielding can produce equally good quality crisps should be promoted alongside Dutch Robjin that is currently used by many crisps processors in Kenya. The advanced clones 391691.96 and 393385.39 were comparable to Dutch Robjin. The National Potato Research Centre (KARI) should therefore ensure adequate production and distribution of seeds of these cultivars to farmers for supply to processors. Variety, frying temperature and slice thickness are important factors influencing oil uptake, color, texture and sensory properties of crisps processed from local potato cultivars and should therefore be considered by processors.