

**EVALUATION OF THE PHYSICO-CHEMICAL PROPERTIES OF SELECTED  
POTATO VARIETIES AND CLONES AND THEIR POTENTIAL FOR PROCESSING  
INTO FROZEN FRENCH FRIES**

By

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**ABSTRACT**

The most important processed potato products in Kenya are French fries (chips), followed by crisps and frozen French fries (chips). The demands for these products have increased over the years and therefore require that more effort is made to develop varieties with appropriate qualities for the rapidly developing Industry. Ten advanced potato clones developed by the national breeding programme in collaboration with the International Potato Centre (CIP) and eight established varieties were evaluated for frozen French fry quality. The clones were coded 393385.47, 393385.39, 393380.57, 393380.58, 385524.9, 399746.2, 392657.8, 392617.54, 391691.96 and 392637.10. The potato varieties were Tigoni, Roslin Tana, Desiree, Kerr's Pink, Dutch Robyjn, Kenya Karibu, Kenya Sifa and Asante. Tubers were harvested at full maturity and cured under ambient air conditions for three weeks before evaluation. The tubers selected from a preliminary trial were harvested at maturity and subjected to further treatments and analysis after. Each cultivar was divided into three whereby one third was processed immediately after curing, a third was stored for 12 weeks at prevailing air conditions (15-19 °C/86-92 % rh) in a dark naturally ventilated store, and the other third was stored for 3 months in cold store (4 °C) before evaluation. Parameters evaluated include; physical and chemical characteristics for raw tubers processed fresh and frozen fries, and sensory quality characteristics for the fries.

Fries for the study were prepared by frying 12 mm X 12 mm potato sticks in vegetable oil at 170 °C for 2 min (par-fries) and finish fryied at 170 °C for 5 min. Blanched, partly fried or fully fried fries were frozen stored at -18 °C in a laboratory chest freezer one month in a preliminary evaluation trial and up to three months to test French fry quality of selected cultivars. Proximate and mineral compositions of raw tubers and fries were evaluated using AOAC methods.

Based on the preliminary trial, all the varieties and advanced clones except Asante, Kerr's Pink and 393380.57 were found to be suitable for processing into freshly prepared fries.

Frozen French fries from all the varieties except Asante and clones 393380.57, 393380.58, 385524.9, 399746.2, 392657.8, 392617.54 and 392637.10 were acceptable following one month of freeze storage at -18 °C. Eight cultivars were selected thereafter for further evaluation including five varieties (Tigoni, Desiree, Dutch Robyjn, Kenya Karibu, and Kenya Sifa) and three advanced clones (393385.47, 391696.96 and 393385.39).

Results indicated that all the 8 cultivars had acceptable physical tuber characteristics with acceptable levels of dry matter content ( $\geq 20\%$ ) and specific gravity ( $\geq 1.070$ ). Reducing sugar content differed significantly ( $P \leq 0.05$ ) with variety and storage condition. In freshly harvested tubers, reducing sugar levels ranged from 0.15 % to 0.37 %. No significant change ( $P > 0.05$ ) was found in the reducing sugar content when tubers were stored at ambient air conditions (15-19 °C/86-92 % rh) for 12 weeks. In cold storage (4 °C/95 % rh), tubers of all the varieties and advanced clones accumulated high amounts of reducing sugars and none was suitable for processing even after reconditioning for 3 weeks at  $\geq 15$  °C.

Ambient air storage had no significant ( $P > 0.05$ ) effect on proximate composition. Frying did not significantly ( $P > 0.05$ ) reduce any chemical constituent while freezing fries significantly ( $P \leq 0.05$ ) reduced total ash, crude protein and total carbohydrate contents. The retention levels were, however, substantial. Fat content increased on finish frying due to absorption of oil. The 'finish frying method' influenced significantly ( $P \leq 0.05$ ) the fat content in the fries, being higher in deep fat frying and lower in oven-fried samples.

Ambient air storage had no significant ( $P > 0.05$ ) effect on any of the sensory attributes evaluated. Freezing significantly ( $P \leq 0.05$ ) reduced flavour and texture scores of the tubers while the rest of attributes like colour, oiliness and overall acceptability were not affected. Frozen French fries made from the selected cultivars were acceptable even after 3 months of frozen storage at -18 °C.

The study established that five varieties (Tigoni, Desiree, Dutch Robyjn, Kenya Karibu, and Kenya Sifa) and three advanced clones (393385.47, 391696.96 and 393385.39) were the most suitable for processing into freshly prepared and frozen French fries.