SUITABILITY OF DIFFERENT FRYING OILS FOR THE STORAGE OF ELEPHANT FOOT YAM CHIPS

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INTRODUCTION

Root and tuber crops form an important of dietary habits of people living in Batticaloa region. Due to the rainfall pattern and the sandy regosol soil of Batticaloa region, these crops are cultivated 934.75 Ha and 205.5Ha in Maha and Yala respectively. Sweet potato, cassava, king yam, aerial potato, arrowroot, sirukilungu, taro, tanthikilangu, white gunya yam, ulakaivalli, ankilivalli and elephant foot yam are the extensively grown root and tuber crops in Batticaloa region. Excluding cassava, other root and tuber crops are used only as vegetable or as fresh consumption purpose, the rest were wasted. In this context, Innovations in post-harvest management and agro-processing are necessary in order to derive maximum benefits from crop production outputs and to safe Q:uard the local farmers from losses.

The finding of a previous study conducted at faculty of Agriculture by Noroshini. Y et.al revealed that the thin fried chips of eleph~nt foot yam were superior in both organoleptically and chemically than the rectangular fried chips prepared from the locally available roots and tubers in Batticaloa region. In the present study, numerous types of vegetable oils, which differ in oil composition, are used for frying of chips. Thus oils from different sources could have different ratios of saturated vs. monounsaturated vs. polyunsaturated fatty acids. Fatty acid composition of the oil determines its use as an industrial or edible oil (Osorio et al. 1995)

OBJECTIVES OF THE STUDY:

This study attempted to select the best oil for chips making from Elephant foot yam through determining the nutritional quality, consumer acceptability and storability of the chips fried in three different commercially available oils in the Batticaloa region.

MATERIALS & METHODS:

Well matured, Elephant foot yam (Amorphophallus companulatus) tubers that are widely grown in Batticaloa region were collected, peeled and steeped in 2% salt solution and blanched for 5 minutes. After blanching, they were cut into thin squaire chips having 2mm thickness using chip slicer. They were soaked in 1 % potassium metabisulphite solution for 3 minutes and drained completely. These chips were deep fried in batches of 250g each in coconut oil at 177°C (350°F), the oil and the material ratio was kept as 4:1 while frying. Towards the end of frying, 20% aqueous salt solution was added to the frying oil at the ratio of 0.6: 1. Finally chips were subjected to organoleptic, chemical and microbial evaluation. Organoleptic evaluation was conducted using 9-points hedonic scale rating test, the chemical analyses were conducted using AOAC, 1998 recommendation and the microbial evaluation was under taken using potato dextrose agar media to study the fungal attack. Data were subjected to Analysis of Variance (ANOV A). Means of treatment were compared using Duncan Multiple Range Test (DMRT). (Gomez and Gomez, 1984).

Results and Discussion: -

Proximate composition: The fluctuations in the protein content of the chips between three different oils were found to be insignificant according to the DMRT results (Fig I).

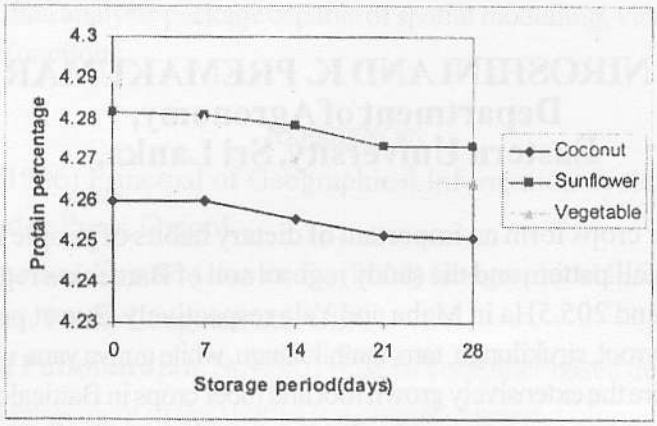

Fig.1 Changes in crude protein percentage of chips fried in different frying oil.

The moisture content of the chips fluctuated slightly during the storage period (R. Ni, A. K. Data, 1999). This fluctuation was high in chips fried in coconut and vegetable oils. The moisture gain of the chips occurred due to water vapour transmission through the lid of the glass container (Fig 2).

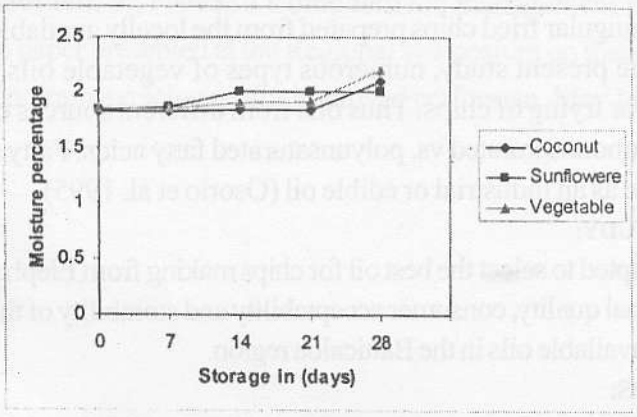

Fig. 2 Changes in Moisture percentage of chips fried in different frying oil

The Fluctuations in the ash content of the chips between three different oils were found to be insignificant according to the DMRT resultes (Fig 3)

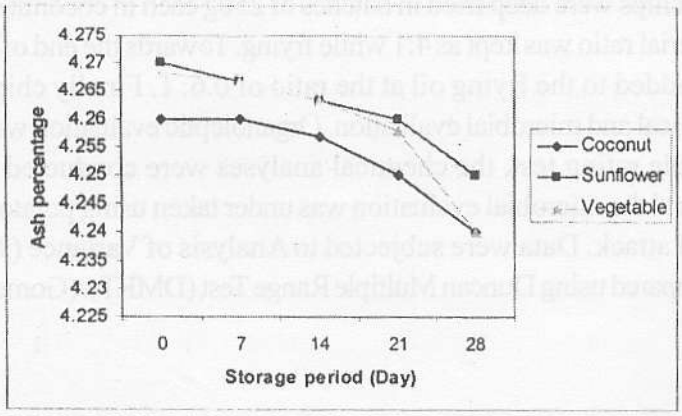

Fig. 3 Changes in Ash percentage of chips fried in different frying oil.

Fat percentage was initially higher in chips fried in sun flower oil. The decreasing trend was observed in the chips fried in all three frying oils (Fig 4). As Makinson, et.aL(1987) stated this decrease in fat percentage was due to the interaction of fatty acids with the atmospheric oxygen. The reduction was severely observed in the chips fried in sun flower oil with the rancid flavour, due to rapid oxidative rancidity of oil. Oxygen is eight times more soluble in fats than in water and it is the oxidation resulting from this exposure is the primary cause of rancidity. The more polyunsaturated oil is, the faster it will go rancid. Sunflower oil contains higher percentage of polyunsaturated fatty acid than the vegetable oil. Coconut oil contains very low polyunsaturated fatty acid content and high saturated fatty acid content.

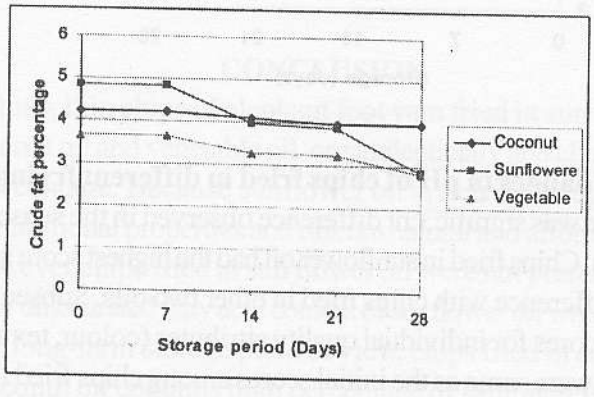

Fig.4 Changes in Crude fat percentage of chips fried in different frying oil

Chips fried in vegitable oil had the highest Vitamin C content initially, this was decreased with the increasing level of moisture content in chips, which might have increased the level of oxygen availabiliy in chips and this could have oxidized the vitamin C (Fig 5)

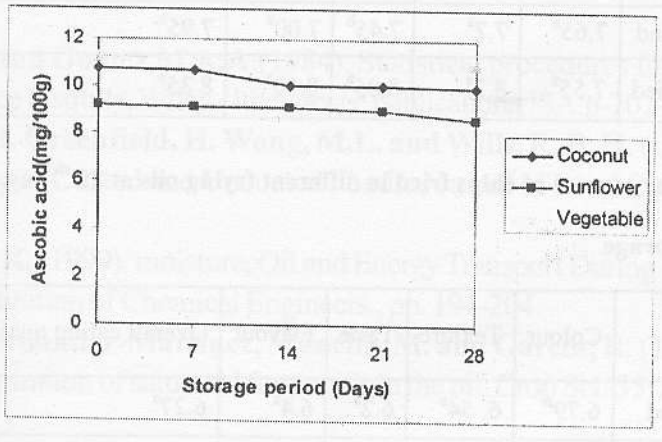

Fig.5 Changes in Ascorbic acid percentage of chips fried in different frying oil

The pH was increased with the storage periods in chips fried in all three frying oils and it was observed to be highset in chips fried in sunflower oil due to the reduction in acidity (Fig 6)

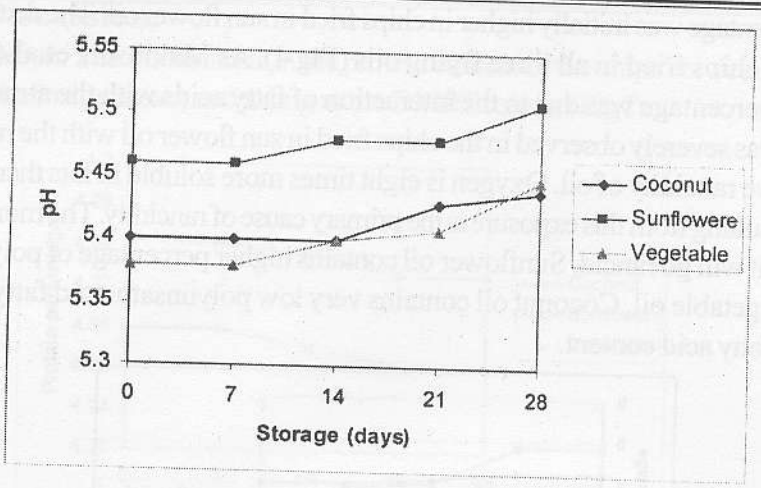

Fig. 6. Changes in pH of chips fried in different frying oil.

Sensory evaluation :There was signific3;nt difference observed in the sensory scores of the chips fried in different frying oils. Chips fried in sunflower oil had the highest score in overall eating quality and showed significant difference with chips fried in other two oils. Subsequently at 7th and 14th days of storage, sensory scores for individual quality attributes (colour, texture, taste and flavour) and overall eating quality were same as the initial scores among chips fried in different oils. On 21 st day of storage, scores did not show any significant differences among them (Table 1).

Chips	Colour	Texture	Taste	Flavour	Overall eating quality
Coconut oil fried	7.75^{a}	6.8^{b}	7.00^{c}	6.05^{c}	7.25^{c}
Vegetable oil fried	7.65^{a}	7.7^{a}	7.45^{b}	7.00^{b}	7.95^{b}
Sunflower oil fried	7.55^{a}	8.2^{a}	8.05^{a}	8.10^{a}	8.35^{a}

Table 2 – Sensory scores of chips fried in different frying oils at 28 th day Storage

Chips	Colour	Texture	Taste	Flavour	Overall eating quality
Coconut oil fried	6.79^{a}	6.54^{a}	6.2^{a}	6.4^{a}	6.27^{a}
Vegetable oil fried	6.57^{a}	6.01^{a}	5.00^{b}	4.87^{b}	5.47^{ab}
Sunflower oil fried	6.55^{a}	5.99^{a}	4.07^{c}	4.47^{b}	5.07^{b}

(Values are means of the 20 samples; Means with the some letters in each row are not significantly differ at 5% provability level)

Scale: 9=Like extremely, 1=Dislike extermely

However at 28 th day storage analysis showed a significant difference among chips fried in three frying oils. The overall eating quality of the chips fried in sun flower oil was significantly differed with other two chips and had the lowest value. In colour, there was no significant difference observed during the storage periods among three treatments. In flavour, texture and taste, there was significant differences were observed initially and at 28 th day storage(Table 2)

Microbial evaluation: There were no microbial colonies found during the storage periods (0,7th 14th, 21st day). However, at the end of the storage periods (28th day), a small amount of colonies of Fusarium spp.and Cuvularia spp. were found in chips fried in sunflower oil and, vegetable oil respectively.

CONCLUSION

Based on the above study, thin chips of elephant foot yam fried in sun flower oil were preferred than chips fried in coconut oil and vegetable oil, organoleptically and chemically, even though they contained high fat percentage. Because sunflower oil is rich in Omega fatty acids which have excellent healing and nutritional properties and offers a natural and affordable means for improving the quality of life. However chips fried in sun flower oil were not preferred for long term storage due to high level of poly unsaturated fatty acid content of sunflower oil which lead to the development of rapid rancidity. For long-term storage point of view, chips fried in coconut oil were preferred organleptically, as coconut oil contains high percentage of saturated fatty acid and low level of polyunsaturated fatty acids, which delay the development of rancidity in oil.

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