QUALITY OF FRENCH FRIES AND CHIPS PREPARED FROM POTATOES STORED AT AMBIENT TEMPERATURE

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Four potato varieties namely Arka, Spunta, Multa and Desiree were stored at ambient temperature for 90 days and evaluated periodically for sugars (reducing and nonreducing), nitrogen fractions (total, amino and non-protein) and specific gravity. French fries and chips were prepared and evaluated. Potatoes could be stored for 60 days at ambient temperature without loss of their suitability for the preparation of fries and chips.

INTRODUCTION

Potato is a major crop of Pakistan. The annual production in 1968-69 was 194.06 thousand tons. Potatoes are available in abundance during January, May and October when Autum, Spring and Summer crops are harvested. Potatoes are usually stored at ambient temperature except those meant for seed purpose. Storage conditions exert profound effect on the processing quality of potatoes. Alexander et al (1949) reported high reducing sugars in potatoes stored at 1.5 to 4°C and that such potatoes produced poor French fries. Terman *et al.* (1950) observed that potatoes stored at 50 to 60°F for two to three months yielded French fries with better texture, flavour and colour as compared to those stored at temperature below 50°F. Similarly Wright *et al.* (1936) had reported the preparation of better quality chips from potatoes stored at 50 to 60°F than at lower temperature. Kirkpatrick *et al.* (1956) observed that colour scores of French fries prepared from potatoes stored at 55 to 60°F were significantly better than those stored at 45 to 50°F.

MATERIALS AND METHODS

Potatoes of four varieties viz., Arka, Spunta, Multa and Desiree, were obtained from Punjab Agricultural Research Institute, Risalewala, Lyallpur in February 1971. These were stored in gunny bags at ambient temperature for a period of three months. Samples were drawn at biweekly intervals for analysis and the preparation of French fries and chips.

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The procedures for the preparation of French fries and chips described by Talburt and Smith (1955) were followed. For preparation of chips, potatoes were washed, peeled, sliced to 1/15th inch thickness, washed to remove adhering starch and fried in hydrogenated fat at 385°F. Fried chips were drained to remove excess fat and were salted at the rate of 1.5 lbs. per 100 lbs. of chips.

Raw potatoes were analysed for specific gravity according to the method described by Smith (1950a and 1950b). Total nitrogen, amino nitrogen and non-protein nitrogen were determined according to methods of *A.O.A.C.* (1965). Reducing and non-reducing sugars were determined by colorimetric method described by Ting (1956). Chips and French fries prepared at different intervals were evaluated organoleptically according to the procedure described by Boyle, *et al.* (1955).

RESULTS AND DISCUSSION

Sugars : The reducing and non-reducing sugars content of different varieties during storage are shown in Table 1. The initial reducing sugars varied non-significantly from 0.5415 per cent in case of Arka to 0.3420 per cent in case of Desiree. The reducing sugars increased during the first 15 days of storage in all varieties and then decreased progressively and significantly upto the end of storage period of 90 days. The non-reducing sugars varied from 0.0285 per cent in case of varieties Arka and Desiree to 0.0550 per cent in case of variety Spunta. This constituent increased progressively during the first 45 days of storage in all varieties after which period it decreased. Lower ambient temperature (less than 60°F) during the first three weeks and higher temperatures during the rest of the storage period could have caused this effect on sugars (Schwimmer *et al.* 1954; Kirkpatrick *et al.* 1956).

Nitrogen : The total, amino and non-protein nitrogen contents of potatoes during storage are given in Table 2. Total nitrogen content ranged from 0.315 per cent in case of Spunta to 0.385 per cent in case of Desiree. Desiree also contained the highest amounts of amino nitrogen fraction and non-protein nitrogen fractions i.e. 0.154 per cent and 0.231 per cent respectively. The three nitrogen fractions decreased progressively in all varieties during the first 45 days of storage and then there was a sharp decrease in these fractions. This sharp decrease coincided with the appearance of sprouts on the tubers. Tagawa and Okazawa (1955) reported similar observations about the decrease in nitrogen fractions during sprouting.

Specific Gravity : The specific gravity of potatoes as shown in Table 3, ranged from 1.088 in case of Multa variety to 1.098 in case of Arka and it showed little change upto 45 days of storage after which period it decreased sharply towards the end of storage period of 90 days. This decrease also corresponded with the sprouting of potatoes.

Organoleptic Evaluation of Potato Chips and French Fries : The French fries and chips prepared from potatoes of different varieties varied non-significantly with respect of their colour, taste and texture. There was no change in these attributes of quality when the potatoes had been stored for 60 days. Both products (French fries and chips) showed significant deterioration in colour, taste and texture when prepared from potatoes stored for more than 60 days and the products were rated as unacceptable. The physical and chemical evaluation of potatoes and organoleptic evaluation of French fries and chips showed that potatoes of all the four varieties could be stored for approximately 60 days at ambient temperature without loss is their quality for the preparation of French fries and potato chips.

TABLE 1. *Reducing and non-reducing sugars (as per cent) of potato varieties during storage (calculated on the basis of fresh potatoes)*

Days	VARIETIES							
	Arka		Spunta		Multa		Desiree	
	Reducing Sugars	Non-reducing Sugars	Reducing Sugars	Non-reducing Sugars	Reducing Sugars	Non-reducing Sugars	Reducing Sugars	Non-reducing Sugars
0	.5415	.0285	.3705	.0550	.4275	.0425	.3420	.0285
15	.6270	.0855	.5130	.0855	.5700	.0855	.3960	.1740
30	.5415	.1995	.4560	.0710	.4845	.1995	.5130	.1425
45	.4275	.2280	.4560	.2565	.4845	.0855	.4275	.2850
60	.4275	.2280	.4560	.1995	.4560	.1140	.4275	.2565
75	.3175	.1710	.3420	.1710	.3420	.1140	.3135	.1140
90	.2280	.1426	.2565	.1428	.2585	.0850	.1995	.1140

TABLE 2. *Total, amino and non-protein nitrogen contents (as per cent) of potatoes during storage (calculated on the basis of fresh potatoes)*

Storage Days	VARIETIES											
	Arka			Spunta			Multa			Desiree		
	Total	Amino	Non-protein	Total	Amino	Non-protein	Total	Amino	Non-protein	Total	Amino	Non-protein
0	.350	.140	.175	.315	.147	.203	.350	.133	.217	.385	.154	.231
15	.322	.147	.175	.351	.147	.204	.342	.140	.203	.392	.154	.238
30	.301	.133	.168	.343	.126	.217	.329	.119	.210	.350	.126	.224
45	.315	.133	.182	.322	.126	.192	.352	.133	.214	.350	.126	.231
60	.290	.112	.170	.301	.102	.196	.308	.112	.196	.315	.105	.210
75	.254	.091	.154	.252	.084	.168	.273	.077	.156	.283	.091	.210
90	.224	.084	.140	.231	.070	.161	.238	.068	.175	.245	.077	.192

TABLE 3. *Specific gravity of potatoes of different varieties during storage (Calculated on the basis of fresh potatoes).*

Days	VARIETIES			
	Arka	Spunta	Multa	Desiree
0	1.098	1.089	1.088	1.097
15	1.099	1.088	1.089	1.099
30	1.098	1.089	1.088	1.098
45	1.096	1.085	1.084	1.098
60	1.085	1.072	1.068	1.082
75	1.025	1.018	1.017	1.023
90	0.928	0.867	0.859	0.919

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