

Preparation of Instant Tanier (*Xanthosoma Sagittifolium*) Flakes¹

E. J. Rodríguez-Sosa and M. A. González²

ABSTRACT

Tanier (*Xanthosoma* sp.) dehydrated instant flakes were prepared from the white-fleshed cultivar locally known as Rascana. The instant flakes prepared as meat pie (*pastelón*) and as forcemeat (*rellenos*) were taste evaluated and found acceptable by a panel. Pasting properties of slurries prepared from the instant flakes and from a flour prepared by sifting the flakes through a 0.840 mm screen in a Homoloid mill were examined using the Brabender Amylograph-Viscograph. Flour had higher viscosity. Cooking to 93 C produced no peak viscosity, indicating that tanier starch in flakes and flour is not fragile.

INTRODUCTION

Tanier (*Xanthosoma* sp.) is a starchy root crop indigenous to the West Indies (3). It is grown throughout the tropics for its edible tuber.

In Puerto Rico tanier is usually eaten boiled. Generally it is grown by small farmers in the highlands of the central part of the island. Its production totaled 265,000 cwt in 1973-74 with a farm value of \$4.31 million. In the same period 83,677 cwt were imported.

As with other tropical crops, no methods have been developed for storing tanier for extended periods. It can be stored satisfactorily for several weeks at ambient conditions. Lately, tanier has been sold frozen in wax velvet boxes, an expensive means of preservation.

Methods of preparing instant mashed white potatoes (4), sweet potatoes (2), and yams (*Dioscorea* spp.) (4) are reported in the literature.

Starch provides many desirable as well as undesirable properties to foods. The Brabender Amylograph-Viscograph³ has been the instrument used most extensively to measure the changes in viscosity or consistency which occur when heating, cooking, and cooling starch solutions as well as starchy flour slurries. The effect of flake size and precooking on pasting characteristics of yam instant flakes was studied by Rodríguez-Sosa and González (5), and by Rodríguez-Sosa et al. (6).

Purpose of this study was to prepare instant mashed tanier of good quality and acceptance, thus increasing throughout the year availabil-

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² Assistant Food Technologist and Technical Director, respectively, Food Technology Laboratory, Agricultural Experiment Station, Mayagüez Campus, University of Puerto Rico, Río Piedras, P.R.

³ Trade names are used in this publication solely for the purpose of providing specific information. Mention of trade names does not constitute a guarantee or warranty of equipment or materials by the Agricultural Experiment Station of the University of Puerto Rico or an endorsement over other equipment or materials not mentioned.

ity of tanier in a form which might be practical for consumers and industrial users, and possibly as an inexpensive means of storing tanier.

MATERIALS AND METHODS

The study used commercial samples of the white fleshed cultivar locally known as Rascana.

Instant flakes were prepared as follows: Tubers were washed, lye-peeled in a 15% NaOH solution at 200° F (93.3° C) for 6 min, brushed in a rotary washer provided with water jets, trimmed, sliced into about 1/2 in slabs, and soaked for 4 min in a 0.6% potassium metabisulfite solution to inhibit browning reactions. Slabs were steam cooked for 15, 20, 25, and 30 min. Samples were identified by cooking times. Cooked slabs were ground and mashed in a Hobart machine with addition of water to adjust total solids to about 20%. During mashing mono- and di-glycerides (Atmul 84) were added at a 0.5% level based on the total solids content.

The mashed tanier was dehydrated in a steam-heated double drum dryer with a steam pressure of 60 lbs/in². Drum speed was adjusted between 1.5 to 2.0 r/min with a clearance between drums of about 0.008 in. Antioxidants (BHA, BHT in 1:1 ratio) were added to the flakes at 50 p/m. Samples were packed in No. 303 tin cans and stored at ambient conditions.

Samples at different processing stages were analyzed for total solids. Transversal thin slices were cut from the center of the tuber and diced into small cubes to facilitate moisture evaporation. Around 2 g were weighed in an analytical balance and dehydrated in a vacuum oven at 50° C for 24 h. Total solids were obtained by subtracting moisture loss from total weight of sample.

The instant flakes were divided into two portions. One was ground in a Homoloid mill using a 0.840 mm screen; the other was sifted through an 8.00 mm screen and the flakes retained in a 2.38 mm screen were saved. Slurries of the instant flour and flakes were prepared to measure viscosity, using the Brabender Amylograph-Viscograph. Slurries were prepared by mixing 70 g of flakes or 50 g of flour with 450 ml distilled water in a Waring blender at moderate speed for 30 s. The Amylograph was set at 75 r/min and the 700 cm/g cartridge was used. The initial viscosity of the slurries was determined at room temperature ($\pm 27^\circ$ C). The instrument was then set at 30° C and the heating-cooling cycle initiated. Temperature was increased at 1.5°C/min up to 93° C and held constant for 1 h. Samples were then cooled at the same rate to 50° C and held at that temperature for another hour.

Instant tanier flakes prepared as meat pie (pastelón) using corned beef, and as forcemeat (rellenos) using ground beef were taste evalu-

ated. The flakes were reconstituted with water at 180° F. Beaten eggs were added to improve binding properties. The meat pie was baked at 375° F for 30 min and the forcemeat fried in vegetable oil. They were evaluated for appearance, flavor, texture, and overall acceptability. The meat pie overall acceptability was determined using a ± 2 scale ranging from very acceptable (+2) to not acceptable (-2). A 6-point hedonic scale ranging from "like very much" (6 points) to "dislike" (1 point) was used for all other evaluations.

TABLE 1.—*Pilot plant processing yields of prepared instant tanier flakes*

Processing stages	Weight of materials at given cooking time (min)—			
	15	20	25	30
	Lb	Lb	Lb	Lb
Fresh tanier	30	30	30	30
Peeled tanier	21	20.5	22	21.5
Cooked tanier	24.5	20	21.75	21.75
Trimnings	1	.75	.5	1
Peel	8	8.75	7.5	7.5
Water added during mashing	10	12	10	12
Instant flakes	6.75	6.5	7	6.5

TABLE 2.—*Total solids of tanier at various processing stages*

Processing stages	Total solids at given cooking time (min)—			
	15	20	25	30
	%	%	%	%
Fresh	37.95	38.56	35.49	35.12
Cooked	30.07	28.20	41.63	36.89
Before dehydration	22.37	21.74	22.86	22.44
Instant flakes	90.95	92.75	90.22	91.75

RESULTS AND DISCUSSION

Table 1 shows yields of instant tanier flakes after processing. The average batch weight after lye-peeling was 21.25 lb, a 30% weight loss, of which about 26% was peel. The average yield of instant flakes was 6.5 lb, or 21.7%.

Table 2 shows total solids of tanier taken at various processing stages. It is generally recognized that proximate composition and other properties of plant materials frequently vary with changes in growing conditions. Because commercial samples were used in these experiments, differences in analyses among samples might be attributed to differences in raw materials. Total solids of samples cooked for 15 and 20 min were lower than those of fresh tanier; in samples cooked for 25 and 30 min it was the opposite. Although results for samples cooked for 25 min were extremely high, the tendency could be due to some dehydration of

the slabs during cooling prior to the analysis. In longer steam cooking periods, slabs attained higher temperature; this might contribute to evaporation of surface and free water in cells.

A portion of flakes was ground to 0.840 mm mesh to study the effect of particle size on pasting properties. The flour used for the slurries was reduced from 70 g in flakes to 50 g in flour so that pasting measurements could be recorded on the chart. As expected, pasting temperatures were lower, while the other amylographic measurements were higher for instant flour (table 3).

Figure 1 shows typical amylograms of tanier instant flour and instant flakes. The ascending portion of the amylogram when heating to 93° C

TABLE 3.—Pasting characteristics of tanier instant flakes and flour using the Brabender Amylograph-Viscograph

Item	Pasting characteristics at given cooking times (min)—							
	Flakes				Flour			
	15	20	25	30	15	20	25	30
Initial viscosity ¹	48	55	40	58	117	65	92	77
Pasting temperature (° C)	71	74	74	78	59	54	57	53
Viscosity at 93° C	47	43	17	25	273	220	208	190
Viscosity after 1 h at 93° C	107	85	67	92	148	195	128	165
Viscosity at 50° C	292	238	182	265	403	380	327	377
Viscosity after 1 h at 50° C	267	218	172	247	392	370	328	360

¹ Viscosity is given in Brabender Units.

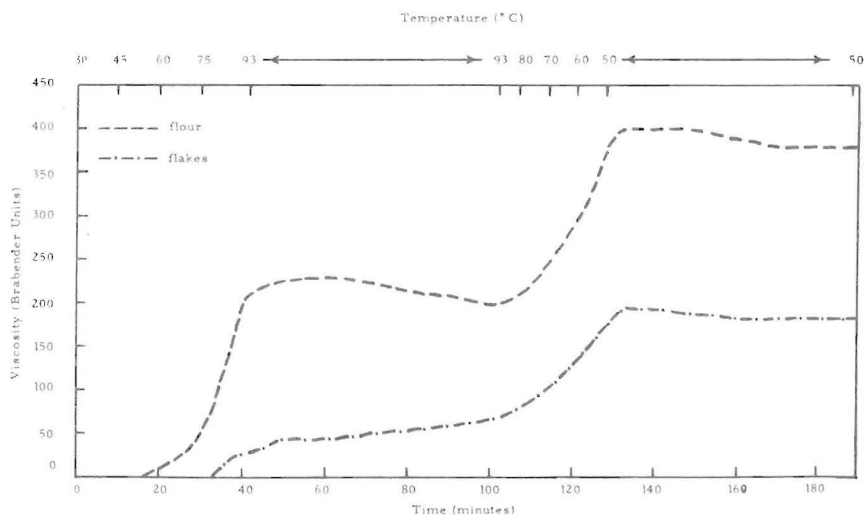


FIG. 1.—Typical amylograms of tanier instant flakes and flour of Rascana cultivar using the Brabender Amylograph-Viscograph.

was sharper in flour. This is attributed mainly to the resistance of the swollen starch granules to displacement. No peak viscosity was observed in either case, reflecting the strength of tanier starch. In flakes, pasting increased during the cooking period at 93° C, while in flour it decreased, that is, starch granules ruptured due both to overswelling and to mechanical disintegration caused by agitation of the starch paste. This probably occurred because more granule surface was exposed in the flour and consequently the opportunity to imbibe water and

TABLE 4.—Sensory evaluations of instant flakes prepared as meat pie (*pastelón*) and as forcemeat (*rellenos*)

Cooking time	Sensory scores ¹			
	Appearance	Flavor	Texture	Overall acceptability ²
<i>Min</i>				
		<i>Pastelón</i>		
15	4.7	5.0	5.1	1.0
20	4.8	4.2	5.1	1.1
25	4.8	4.8	5.0	1.1
30	4.7	4.6	4.6	.8
		<i>Rellenos</i>		
15	5.0	5.1	5.1	5.1
20	5.1	5.1	5.0	5.1
25	5.2	5.2	5.3	5.3

¹ Using a 6-point hedonic scale ranging from "like very much" (6 points) to "dislike" (1 point), except where indicated.

² Overall acceptability for *pastelón* was measured using a ± 2 scale ranging from "very acceptable" (+2) to "not acceptable" (-2).

swell was greater. In the flakes, starch granules are closer and possibly the swelling capacity was restricted. This probably explains why they continued to swell while cooking at 93° C for 1 hour.

The reaggregation of starch molecules after slurries were cooled from 93° C to 50° C was greater in flour. A small thinning process occurred in the last cooking period, indicating that the starch in both flour and flake was stable at 50° C.

Table 4 presents sensory scores of instant tanier flakes prepared as *pastelón* and as *rellenos*. All samples were found acceptable. The flour was not sensory-evaluated.

RESUMEN

Se prepararon hojuelas deshidratadas para restitución instantánea de yautía (*Xanthosoma* sp.) de la variedad de pulpa blanca conocida localmente por Rascana. Con las hojuelas se prepararon *pastelón* y *rellenos* de carne; ambos resultaron aceptables para un panel de catadores.

También se examinaron las propiedades reológicas de las hojuelas y de una harina (tamiz de 0.840 mm.) derivada de ellas. Se usó el amiloviscógrafo Brabender. La harina tuvo mayor viscosidad que las hojuelas instantáneas. Además se determinó que el almidón de yautía, tanto en la harina como en las hojuelas, no es frágil.

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