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EVALUATION OF SWEET POTATO PROCESSED PRODUCTS

F. L. Mkandawire*, J. Onyango, N. Angwenyi and J. Ogot

Department of Agriculture, University of Eastern Africa Baraton, P.O. Box 2500, Eldoret-30100, Kenya.
Email: jarantowa@yahoo.com

Abstract

A study was carried out to assess the taste, texture, acceptance and demand for cookies, mandazi, cakes and bread made from varying proportions of sweet potato (SP) to wheat flour with the objective of adding value to sweet potatoes and reducing their bulkiness. Sweet potato flour was made from freshly dug sweet potato tubers. The tubers were cleaned in fresh water, peeled and placed in a basin of water. They were then grated with a kitchen grater and left in water to avoid oxidation. The grates were removed from water and sun-dried for two to three days. Dried grated sweet potatoes were ground into flour which was used in the study. Sweet potato flour was mixed into three ratios (25:75, 50:50, 75:25) with wheat flour. Each of these ratios was incorporated into a standard recipe for bread, cakes and cookies and baked in an oven at 180°C for one hour, 160°C for 40 minutes and 180°C for 15 minutes, respectively. Mandazi balls were deep fried in oil. The products were presented to a panel of randomly selected respondents for evaluation on a 5-point scale as follows: taste (1 = very poor, 2 = poor, 3 = average, 4 = good, 5 = very good) and texture (1 = very coarse, 2 = mildly coarse, 3 = average, 4 = soft, 5 = very soft). Consumer preference was determined in the form of a questionnaire. Respondents were also asked to determine possible market price of the various products. In general, the test products were accepted by the respondents at varying degrees. Cookies with SP flour ratios of up to 50% had highest preference rating. Increasing SP flour to 75% produced coarse cookies. Mandazi, on the other hand, were preferred at SP flour ratio of 75%, which was also the most expensive to make because of the amount of oil used. Preference for cakes and bread increased with decreases in SP flour. The most profitable sweet potato products according to the economic analysis were cakes and cookies. Demand for the products was also influenced by the availability of similar products made from wheat flour. Chi-square test of goodness of fit showed that acceptance of the products was influenced by taste and texture as a result of the various proportion of sweet potato flour to wheat.

Key words: Sweet potato, sweet potato (SP) flour, processing, product, market.

Introduction

Sweet potato (*Ipomoea batatas*) is an important crop in both staple and grain based food systems within Eastern and Southern Africa (Mutuura et al., 1990). The development of food products from sweet potatoes (SP) has been considered as a new approach to increasing value and upgrading the status of the crop. Sweet potato processing has diversified the range of products which can be made from sweet potatoes other than in the fresh form only. Secondary products like modified starch noodles, glucose and candy can be made from sweet potatoe flour.

Dehydration or drying of sweet potato roots with few physiological and biochemical changes is one way to reduce transportation costs and bulkiness in storage. Sweet potato processing at the village level has considerable potential to reduce post-harvest losses and to generate income through the production of value added products (Woolfe, 1990). Sweet potato flour is highly versatile and can be used to manufacture different types of snacks. The major drawback of sweet potato flour, however, is its undesirable discoloration and odour that it imparts onto its products following use of unsuitable varieties and poor processing techniques. A consumer survey that was carried out on SP products indicated a high acceptability (82.8%) but with low frequency in their purchasing (Wayne & Keys, 1992).

There are three kinds of sweet potato flours that can be used in product processing, there are those that are made from raw sweet potato, cooked potatoes, and from pulp or starch making process (Martin, 1984). Most current agricultural marketing research interventions have been based on improving the quality of flour which is expected to match that of wheat (Woolfe, 1992). Furthermore, a comparison of prices of sweet potato flour and wheat flour in Kisumu from 1989 to 1992 showed that the trend in fresh root prices relative to flour prices favors sweet potato (Hardy & Keyser, 1995). Further research may be necessary to popularize sweet potato usage.

According to Wollo & Rufus (1996), demand for SP products is influenced by income of consumers, number of meals eaten at home, family size and availability of money to be spent on substitutes. In another consumer survey carried out in Kisumu and Nairobi on sweet potato products, bread, cakes and biscuits, recorded a high level of acceptability, but their consumption was limited to special meals (celebrations) by most consumers except high income groups (Hardy & Keyser, 1995). Cookies had a favorable market advantage over bread, mandazi and cakes as evidenced by the numbers sold.

Although, there are numerous examples of different varieties of products that can be made from sweet potatoes, there have been very few cases of commercialization of these products (Woolfe, 1992).

Little has been done to examine the demand and economic aspects of using sweet potatoes in bread, cakes, biscuits and other potential snack foods, in terms of cost of raw material compared with existing flours. Consumer oriented surveys to determine potential markets for proposed products and economics of processing have rarely been carried out. Therefore, this study was conducted to evaluate the market potential and establish the feasibility of producing SP flour, blend this flour with wheat, produce various baked products and further look into the potential demand of such products.

Materials and Methods

Flour Production

Flour was made from sweet potato varieties selected and harvested from Research and Demonstration Farm at the University of Eastern Africa Baraton. Other materials required for preparation were purchased from the local market. Sweet potato flour was processed from tubers dug from the farm. The tubers were washed in water, then hand peeled using a stainless steel knife, and grated using a hand held grater. The slices were immersed in water to prevent enzymatic browning of the surface. The soaked slices were drained and dehydrated by spreading them over a clean surface and left to sun-dry. The drying duration depended on the relative humidity and intensity of solar radiation. It took approximately 2 - 3 days to completely dry the sweet potato slices. Once the grated sweet potatoes were dry they were milled into flour. The flour was packed in paper bags and stored in a cool dry place. As a precaution against moulds, the flour was occasionally exposed to the sun.

Sweet Potato Flour Usage

The SP flour mixing ratios with wheat flour are shown in Table 1. Bread, cakes, mandazi and cookies were prepared using conventional procedures as outlined in Tables 2,3,4,5. Bread was made by mixing the SP flour and whole wheat flour in the suggested ratios together with salt, brown sugar and butter in a bowl containing warm water (Table 2 – Table 5). The mixture was placed into oiled bread pans, allowed to rise at 140°C, baked in an oven for one hour at 180°C. Preheating of the oven was done at 220°C.

Table 1
Ratios of Sweet Potato Flour to Wheat Flour

Mixture	Sweet Potato Flour	Wheat Flour
1	25	75
2	50	50
3	75	25

Table 2
Recipe for Bread

Bread	Sweet Potato Flour 25%	Sweet Potato Flour 50%	Sweet Potato Flour 70%
Wheat Flour	6.5 cups	3.5 cups	1.5 cups
Sweet Potato Flour	1.5 cups	3.5 cups	6.5 cups
Sugar	0.75 cups	0.5 cups	0.5 cups
Salt	2 tsp	2 tsp	2tsp
Yeast	3 tsp	2 tsp	2.5 tsp
Warm water	3 cups	3 cups	4 cups
Oil	1 cup	1.25 cups	1.5 cups

Table 3
Recipe for Cookies

Cookies	Sweet Potato Flour 25%	Sweet Potato Flour 50%	Sweet Potato Flour 70%
Wheat Flour	4 cups	2 ½ cups	1 cup
Sweet Potato Flour	1 cup	2 ½ cups	4 cups
Sugar	2 ½ cups	1 ½ cups	1 cups
Oil	2 cups	2 cups	2 cups
Eggs	3	3	3
Baking Powder	2 tsp	1 tsp	½ tsp
Baking Soda	1/4 tsp	1 ½ tsp	2 tsp
Milk	2 cups	2 cups	2 cups

Table 4
Recipe for 'Mandazi'

Mandazi	Sweet Potato Flour 25%	Sweet Potato Flour 50%	Sweet Potato Flour 70%
Wheat Flour	4 cups	2 ½ cups	1 cup
Sweet Potato Flour	1 cup	2 ½ cups	4 cups
Sugar	1 cup	3/4 cup	½ cup
Water	1 cup	1 1/4 cup	1 ½ cup
Milk	1 ½ cup	1 ½ cup	2 cups
Oil	3 tsp	3 tsp	4 tsp
Baking Powder	2 tsp	2 tsp	2 tsp
Baking Soda	½ tsp	1 tsp	1 ½ tsp

Table 5
Recipe for Cakes

Cakes	Sweet Potato Flour 25%	Sweet Potato Flour 50%	Sweet Potato Flour 70%
Wheat Flour	3 cups	2 ½ cups	1 cup
Sweet Potato Flour	1 cup	2 cups	3 cups
Margarine	1 cup	1 cup	1 cup
Eggs	4 eggs	4 eggs	4 eggs
Baking Powder	3 tsp	2 tsp	1 tsp
Baking Soda	½ tsp	1 ½ tsp	2 tsp
Milk	2 cups	2 ½ cups	2 ¾ cups
Sugar	1 ½ cups	1 cup	½ cup

Cookies were made by mixing flour, sugar and baking powder as shown in Table 3. Milk was added to make the dough soft. Butter and milk were added to recondition the dough before shaping it into 1 cm diameter balls. The balls were baked at 180°C for 15 minutes. Mandazi were made by beating eggs until light. Sugar, butter, milk, salt and baking soda were added and stirred into the egg mixture (Table 4). As the dough became soft, it was rolled, cut and deep fried. Cakes were made by mixing sugar and blue band (margarine) until soft (Table 5). The dough was mixed with beaten eggs. Flour mixture and baking powder were separately mixed in milk and added to the mixture. The mixture was transferred to a baking pan, and baked in the oven for 40 minutes at 160°C.

Sensory Attributes

A consumer panel comprising of 70 respondents was randomly selected from students, faculty members and staff to assess the products according to their flour ratios. The products were evaluated for taste and texture using a 5 -point scale as follows: (1 = very poor, 2 = poor, 3 = average, 4 = good, 5 = very good) and texture (1 = very coarse, 2 = mildly coarse, 3 = average, 4 = soft, 5 = very soft).

Table 6
Texture Ranking

Product	Ratios SP: Wheat	Soft -very soft Rating %	Rank order
Cakes	25: 75	51.0	2
	50:50	58.2	1
	75:25	47.5	3
Bread	25:75	60.0	1
	50:50	25.0	2
	75:25	22.8	3
Cookies	25:75	50.0	1
	50:50	15.8	3
	75:25	18.4	2
Mandazi	25:75	53.0	2
	50:50	34.0	3
	75:25	55.4	1

Price rating and consumer preference was determined by a questionnaire just to get respondent opinion. The final market price of the products was finally fixed by the researchers after carrying out a gross margin analysis. Then a test market at Baraton centre was selected as a market segment because of accessibility to most consumers. Baraton centre has a potential population of 3000 people composed of shop and restaurant owners, members of the local community, workers and students. The products were then displayed for purchase on a weekly basis for a month to assess the frequency of purchase and demand for each product. The values were compared statistically by χ^2 test of goodness of fit.

Results and Discussion

Sensory and Taste Evaluation

According to sensory evaluation, the texture of the products tended to be coarser with increasing proportion of SP flour in the mixture. The use of 50 - 75 % of SP flour for cakes, bread and cookies resulted into the majority of the products being rated soft and very soft (Table 6). Cakes and cookies with 75% SP flour were ranked as coarsest in texture and very soft by the majority of respondents. Bread and mandazi with 50 % SP flour were ranked as the most coarse according to majority of respondent (Table 7).

Table 7

Summary of Taste Preference

Product	Ratio of flour SP: Wheat	1. Very poor No.Respo	%	2. Poor No.Respo.	%	3. Average No.Respo.	%	4 Good No.Respo	%	5. VeryGood No. Respo.	%	Total No.Respo.	%
Cakes	25:75	0	0.00	1	1.50	14	20.9	25	37.31	27	40.30	76	100
Cakes	50:50	0	0.00	2	3.23	7	11.30	28	45.10	25	40.32	62	100
Cakes	75:25	0	0.00	9	14.1	19	29.70	27	42.20	9	14.10	64	100
Bread	25:75	1	1.60	8	12.7	23	36.5	19	30.20	12	19.0	63	100
Bread	50:50	1	1.70	22	37.3	18	30.50	15	25.40	15	5.10	59	100
Bread	75:25	4	24.1	18	31.1	14	24.10	9	15.50	9	5.20	58	100
Cookies	25:75	0	0.00	6	7.5	12	15.0	42	52.50	42	25.0	80	100
Cookies	50:50	0	0.00	1	1.31	11	14.50	30	39.50	30	44.70	76	100
Cookies	75:25	14	1.32	2	2.60	21	27.60	38	50.00	38	18.40	76	100
Mandazi	25:75	0	0.00	1	1.60	20	31.70	33	52.40	33	14.30	63	100
Mandazi	50:50	1	1.60	2	3.20	9	14.30	36	58.10	36	22.60	62	100
Mandazi	75:25	0	0.00	4	6.20	7	10.80	30	46.20	30	36.90	65	100

Table 8

Taste Ranking

Product	Ratio SP: Wheat	Good-Very Good Rating %	Rank Order
Cakes	25:75	77	2
	50:50	85	1
	75:25	56	3
Bread	25:75	49	1
	50:50	30	2
	75:25	20	3
Cookies	25:75	78	2
	50:50	84	1
	75:25	68	3
Mandazi	25:75	67	3
	50:50	80	2
	75:25	83	1

Table 9

Summary of Textural Preference

Product	Ratio of flour SP: wheat	1. Very coarse No. Respon	%	2. M i l d l y coarse No. Respon	%	3. Average No. Respon	%	4. Soft No. Respon	%	5. Very soft No. Respon.	%	Total No. Respon.	%
Cakes	25:75	0	0.00	8	12.00	25	37.50	25	37.30	9	13.40	67	100
Cakes	50:50	0	0.00	5	8.10	21	33.90	28	45.20	8	13.00	62	100
Cakes	75:25	0	0.00	16	25.40	17	27.00	23	36.30	7	11.10	63	100
Bread	25:75	3	4.80	5	7.90	17	27.00	34	54.00	4	6.30	63	100
Bread	50:50	16	10.00	25	41.70	14	23.30	13	21.70	3	3.30	60	100
Bread	75:25	14	24.60	10	17.50	20	35.10	10	17.50	2	5.30	57	100
Cookies	25:75	1	1.30	10	12.50	29	36.30	36	45.00	4	5.00	80	100
Cookies	50:50	5	6.60	30	39.50	29	38.20	12	15.80	0	0.00	76	100
Cookies	75:25	5	6.50	35	46.10	22	29.00	14	18.40	0	0.00	76	100
Mandazi	25:75	0	0.00	8	12.50	22	34.40	26	40.60	8	12.50	63	100
Mandazi	50:50	2	3.20	13	21.00	16	25.80	20	32.30	1	1.60	62	100
Mandazi	75:25	1	1.50	10	15.40	8	27.70	30	46.20	6	9.20	65	100

Evaluation of Sweet Potato Products

Table 10

Summary of Price Preference

Product	Price Specification	Yes by no.Respo	%	No expensive No. Respo	%	No cheap No. Respo	%	Total No.Respo	%
Cakes	10*	28	44.40	2	3.20	33	52.40	63	100
	15	36	61.00	13	22.0	10	17.00	59	100
	20	30	50.00	25	42.40	4	6.80	59	100
Bread	20	28	50.00	14	25.00	14	25.00	56	100
	25	26	47.30	23	41.80	6	10.90	55	100
	30	8	14.30	46	82.10	2	3.60	56	100
Cookies	5	26	33.30	5	6.40	47	60.30	78	100
	10	45	59.20	13	17.10	18	3.70	76	100
	15	31	41.30	31	41.30	13	17.30	75	100
Mandazi	*5	23	16.00	1	16.00	40	62.50	64	100
	10	49	10.90	7	10.90	8	12.50	64	100
	20	8	87.30	55	87.30	0	0.00	63	100

* Ksh

Table 11

Summary of Sale

	Cake No. Sold	%	Bread No.Sold	%	Cookies No. Sold	%	Mandazi No. sold	%	Total No. Sold	%
Week 1	7	20.00	4	11.43	20	57.14	4	11.43	35	100
Week 2	8	18.60	5	11.63	22	51.16	8	18.60	43	100
Week 3	7	17.50	3	7.50	25	62.50	5	12.50	40	100
Week 4	8	19.51	4	9.76	23	56.10	6	17.63	41	100

Selling Prices

@ 10, 15 Ksh

@ 18 Ksh

@ 5 Ksh

@ 5 Ksh

Cake

Bread

Cookies

Mandazi

Table 12

Chi -Square Analysis (Test of Goodness Fit)

Where O_i = Observed frequency, and $E (n_i)$ = expected frequency

	O_i	$E (n_i)$	$O_i - E(n_i)$	$(O_i - E (n_i))^2 / E (n_i)$
<i>Cakes</i>	30	39.5	-9.75	2.3920
<i>Bread</i>	16	39.5	-23.75	14.1903
<i>Cookies</i>	90	39.5	50.25	63.5240
<i>Mandazi</i>	23	39.5	-16.75	7.0582
<i>Total</i>	159	159		87.1645

Table 13

Gross argin and Profits Analysis of Sweet Potato Processed Products

Oven baking capacity	sp%	Cakes 25% 20 cakes/hr	Bread 25% 6 bread /hr	Cookies 75 %48 cookies /hr
Total output /day		160	48	384
price /unit		15	42	10
Total revenue		2,000 ksh	1016ksh	3840ksh
Variable cost:				
processing costs:	2.7 kg	90 ksh	(6 kg) 204 ksh	1.5 kg 51 ksh
wheat flour	1.1 kg	55	2.2 kg 110/-	6 kg 300/-
SP flour	1.3 kg	57	720 g 31/-	1.5 kg 66/-
Sugar			96 g 60/-	
Yeast			2 lt 135/-	3.6 lt 243/-
Oil				46 176
Eggs	(43)	258		7 lt 368/-
Milk	(5lt)	250		
Margarine	(1.1 Kg)	220		
Miscellaneous cost		21	17/-	38
T.V.C		951	557	1342
Gros Margin		1449	1448	2498
Fixed Costs				
Labor (50/- per batch)		400		400 400
Electricity	5 units / batch	800		960(2 units/batch) 320
{ 20 Ksh/ unit)				
Total cost		2151		1917 2062
Unit cost		13		40 5
Net profit		249 ksh		99 ksh 1778 ksh

The prices indicated were the market running prices at the time of the project study.

In general, the test products were accepted by the respondents at varying degrees. Increasing SP flour to 75% produced coarse cookies. *Mandazi*, on the other hand, were preferred at SP flour ratio of 75%, which was also the most expensive to make because of the amount of oil used. Preference for cakes and bread increased with decreases in SP flour (Table 8). There was variation in taste and texture preferences for cookies. Cookies with SP flour ratios of up to 50% had highest preference rating (Table 9). Cookies scored quite low in texture although this did not affect their overall acceptability. These results are in agreement with Seralathan and Thirumara (1996) and Keane et al. (1986) who indicated that higher proportions of SP flour could be used in cakes, cookies, and *mandazi* but not bread. Percentages of SP potato flour of over 50% produced dense bread with poor rising qualities. These results are in agreement with an earlier study on French bread where increasing substitution levels of SP flour produced thicker and denser bread (Savielli et al., 1998). The results of this study are, however, more encouraging because the rates of SP flour used were much higher than those reported earlier.

Price Setting

Prices used did not actually reflect the unit costs but were chosen in relation to similar market price ratings of other commercial products made from 100% wheat flour. Cookies and *mandazi* were priced at Ksh 10.00 by 59% and 76 % of respondents, respectively (Table 10). A price of Ksh 20 was considered expensive for *mandazi* by 87% of the respondents. However, the majority of respondents preferred lower prices for the products. Bread and cakes were priced at Ksh 20.00 and Ksh 15 by 50 and 61% of the respondents, respectively. Price for bread was rated between 20 and 25 Ksh. A price of 30 Ksh/loaf of bread was considered as expensive by 82 % of respondents. The price for cakes was rated between 15 -20 Ksh by 50 % to 61% of respondents, respectively. These results concur with a study carried out in Lira, Uganda where price of SP bread fluctuated between 20-30 Ksh, and many consumers preferred to buy sliced bread for 3 Ksh each (Hagenimana & Owor, 1997).

Market Analysis

According to the actual market sales, cookies and cakes had a positive market reception. Bread received the least purchasing consumer percentage, which corresponded to the poor sensory evaluation it scored (Table 11). All samples of cookies with SP flour ratios 25%, 50% 70% were equally marketable unlike bread and cakes where only lower proportions of SP flour samples were preferred. In the case of *mandazi* the most preferred was the 75 % but turned out to be more expensive to produce because it utilized more sweet

potato flour and cooking oil. As a result *mandazi* made from 25% SP was chosen for the market study.

The actual price for cakes varied between 10 to 15 Ksh while that of *mandazi* and cookies was at 5 Ksh. The result of the test market showed that cookies and cakes had the highest weekly frequency of purchase than *mandazi* and bread. About 57% of consumers purchased cookies within the week of sale and generally topped the list of consumers throughout the selling period. Cakes had an average of 18% of purchasers within the selling period while bread had the lowest purchasing power even after a price reduction.

The χ^2 test assumed $H_0 = P_1 = P_2 = P_3 = P_4 = P_k$, i.e. preference is equally distributed for all sweet potato products (Table 12). In the χ^2 distribution below, there are $k-1$ degrees of freedom (df) and according to the data there are four categories, and hence 3 df. The critical χ^2 at $\alpha = 0.001$ is 16.268. Since the computed χ^2 value is 87.645, H_0 is rejected. This means that the overall acceptance of the products was influenced by their taste and texture, and since each sweet potato product had their own distinct quality in terms of taste and texture, there was a difference in their preference. Therefore, it is concluded that demand for sweet potato products varied according to the quality of each product as influenced by the percentage of SP flour.

Economic Analysis

The break-even computation was carried out using specific prices and quantity recommended in production, to determine the profit maximization points in terms of quantity that has to be produced (Table 13). The analysis was done by using the linear function: $C(q) = M(q) + C(o)$; $R = pq$, where

$$C(q) = \text{Total costs,}$$

$$q = \text{Units produced,}$$

$$p = \text{price,}$$

$$C(o) = \text{Fixed costs,}$$

$$M = \text{Unit price}$$

$$R = \text{Revenue}$$

Cakes : Break even points ;/ Unit price = 15ksh, $15q = 13q + 1200$, $q = 600$ units

Bread : Break point:/ Unit price = 42 Ksh, $30q = 40q + 1360$, $q = 680$ units

Cookies : Break point:/ Unit price = 10 Ksh, $10q = 5q + 720$, $q = 144$ units

Mandazi: Break point:/ Unit price = 10 Ksh, $10q = 9q + 560$, $q = 560$ Units

The economic analysis was based on the total cost concept and gross margins, to determine the profitability of sweet potato product diversification. The prices were determined by using the mark up percentage. Cookies had the highest net profits and mark up percentage of 86%. The raw material cost was computed

according to the number of products produced per batch/day depending on the capacity of the oven used.

Cookies produced from an oven with a capacity of baking 24 cookies /25 minutes, sold 10 Ksh/unit would earn a profit of 1778 Ksh at 5 Ksh per unit. The expected break-even sales for cookies would occur after selling 144 units. Since demand and acceptability for cookies was not significantly affected by SP flour substitution ratios, any combination between 25 - 75% of SP flour could be used to maximize profit. Therefore, cookies could be considered as an economically rational sweet potato product unlike bread where the overall acceptance depended on the SP flour to wheat flour ratios.

Cakes earned the second highest profits after cookies at a selling price of 15 Ksh, and it was less costly in terms of sweet potato flour used compared to other products with an expected break even sale of 600 units. *Mandazi* at a price of 10 Ksh gave a profit margin of 1 Ksh /unit and earned the second highest gross margin after cookies. However, *mandazi* was an expensive product in terms the cost of oil and flour used which constituted 43 % of overall variable costs. The break even sale for *mandazi* occurred after producing 560 units. The results on *mandazi* are in agreement with Hegenimana & Owori , 1997) who reported that the use of 50% of SP flour in *mandazi* resulted to an increased uptake of oil. Bread was found to be the most expensive and earned the least net returns.

According to the market analysis for bread, there would be a narrow opportunity to increase profits from bread due to the low demand. Bread had the lowest mark up percentage (5%) and least net profit. The break even point for bread occurred after selling 680 loaves. Cookies had the lowest break even points of 144. The break even points for cakes, bread and *mandazi* generally occurred after selling above 500 units. It would be necessary to include preservatives to increase the shelf life of the products.

Conclusion

Generally, the test products were accepted by the respondents at varying degrees. The investigation indicated that SP cookies, cakes and *mandazi* have a high acceptability. Cookies with SP flour ratios of up to 50% had highest preference rating. Increasing SP flour to 75% produced coarse cookies. *Mandazi*, on the other hand, were preferred at SP ratios of 75%, which was also the most expensive to make because of the amount of oil used. Preference for cakes and bread decreased with increases of sweet potato flour. The most profitable SP products according to the gross margin analysis were cakes and cookies. Demand for the products was influenced

by the presence of similar products made from 100% wheat flour.

Chi-square test of goodness of fit showed that acceptance of the products was influenced by taste and texture as a result of the various proportions of sweet potato flour to wheat.

Recommendations

- It would be economically feasible to start up micro-enterprise on sweet potato processing in order to add value and reduce bulkiness of the crop by producing various secondary products such as cookies, cakes *mandazi* because their market potential and returns are fairly high. This is possible especially in cases where producers experience high post -harvest losses and high transport costs in relation to the production costs.
- With a good market strategy and consumer awareness of the nutritious value of sweet potato, its utilization can be enhanced. The success of this however depends on keeping the production and processing costs low.

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THE EVALUATION OF A MIXED METHODOLOGICAL MODEL TO IMPROVE THE PRODUCTIVE AND RECEPTIVE SKILLS IN SPANISH AS A FL/SL: AN EXPERIMENTAL STUDY

Kerwin A. Livingstone

University of Guyana,

Turkeyen Campus, Turkeyen, East Coast Demerara, Georgetown, Guyana, South America.

Telephone # 592-222-4923

Fax # 592-222-5501

Email profesordelenguasmodernas@yahoo.es

Abstract

This present article seeks to provide a mixed methodological model for the development and implementation of a Teaching Module for Spanish as a Foreign Language in the face to face environment. The primary objective is to portray how methodological principles from different language teaching approaches - in this case, task based language teaching and cooperative learning - can be combined effectively in designing activities for face to face contexts. In this regard, empirical evidence is analysed in order to determine the effectiveness of the mixed methodology in the teaching-learning of Spanish as a Foreign Language in the said settings, in a study based on a longitudinal experimental design with pre-test and post-test, but without control group. The findings will help to provide researchers, educators and language teachers with valid guidelines as it relates to the development of Teaching Modules and Units for Foreign Language Learning. The results show an increase in the acquisition of specific knowledge in Spanish as a Foreign Language, thus improving the students' linguistic and communicative competence. It is therefore proposed that mixed methodological models be integrated and implemented when designing Teaching Modules for Language Learning, since they are the most suited for Second and Foreign Language Acquisition.

Key words: language, task-based approach, cooperative learning, mixed methodological model.