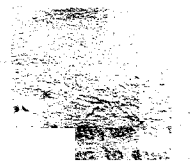

63

A Research Note

Method of Preparation and Sensory Evaluation of Sweet Potato Patties

M. W. HOOVER, W. M. WALTER JR., and F. G. GIESBRECHT

ABSTRACT

Sweet potato patties were prepared from Jewel and Centennial cultivars which were freshly harvested or cured and stored. The patties were prepared with additions of sugar, starch and other minor ingredients to peeled, cooked sweet potatoes. The resulting mixture was comminuted, heated by steam injection, vacuum cooled and molded into patties. The patties were cooked in peanut oil and evaluated by a sensory panel. The evaluations indicated that patties of acceptable quality could be prepared from either freshly harvested sweet potatoes or from roots that had been cured and stored for up to 6 months.

INTRODUCTION

THERE IS A WIDE VARIANCE in the size of fresh sweet potato roots ranging from 4 cm (canners) to 15 cm (Jumbos) in diameter. In general, there has been a good market for the small roots for the canning trade and the no. 1 or medium size roots for the fresh market. However, it is often difficult to find a market for the large "jumbo" and misshapened roots except at a very reduced price. Thus, there is a need for better utilization of the large roots in order for the farmer to market them in a more economic manner.

Sweet potatoes are normally harvested and cured at about 30°C and 80–90% relative humidity for 5–8 days (Wilson et al., 1980). During curing, there is a rapid build-up of alpha-amylase (Deobald et al., 1969). This enzyme, in concert with endogenous beta-amylase, softens the tissue during cooking by starch hydrolysis (Walter et al., 1975). However, if the roots are rapidly heated, the amylolytic enzymes are inactivated before significant starch hydrolysis and accompanhing softening occurs (Hoover and Harmon, 1967). Rapid enzyme inactivation is necessary if processed sweet potato products such as French fries or patties are to be produced from cured and stored roots.

In the United States sweet potatoes are normally harvested from about August 15 to November 15. Good quality sweet potato patties have been produced commercially for several years from freshly harvested Centennial variety roots (Kimbrough and Kimbrough, 1961). However, due to the short harvest season, only a limited number of patties could be produced from freshly harvested roots. Up to now a good quality patty from cured roots has not been available.

The purpose of this study was to develop a method for producing a good quality, firmly textured patty from cured and stored sweet potatoes. This capability could extend the processing period from about 3 months to as much as 8 or 9 months. Among the factors investigated were the effects of curing, storage, variety, and varying amounts of added starch and sugar.

Author Hoover is affiliated with the Dept. of Food Science, and Author Giesbracht is affiliated with the Dept. of Statistics, North Carolina State Univ., Raleigh, NC 27650. Author Walter is affiliated with the USDA-ARS Southern Region, and North Carolina Agricultural Research Service, Dept. of Food Science, North Carolina State Univ., Raleigh, NC 27650.

MATERIALS & METHODS

CENTENNIAL AND JEWEL sweet potatoes were harvested and cured for 8 days at 30°C and 80–90% relative humidity. After curing, the roots were held at about 15°C (80% relative humidity) until processed. Roots were processed immediately after harvesting (uncured), immediately after curing and at 2-month intervals thereafter up to 6 months of cured storage.

Processing conditions

Roots were washed, peeled and cut into strips 3/4-inch wide and 1/4-inch thick. The strips were then cooked for 5 min in a continuous cooker at 100°C. After cooking, varying amounts of unmoidified cornstarch and sucrose were added. The starch added ranged from 6–15% by weight of the cooked potato. The sucrose added ranged from 0–15% by weight of the cooked potato. In addition, the following minor ingredients were added to each formulation based on the weight of cooked sweet potatoes: mono- and diglycerides, 1%; sodium chloride, 0.3%; sodium acid pyrophosphate, 0.05%; FD/C yellow no. 6 color, 0.015%. After the cooked strips and other ingredients were blended together in a Hobart mixer, the mass was ground through a 0.25 inch screen in a Fitz mill operated at medium speed, heated in a steam injector cooker to 104–116°C in order to finish the cook and gelatinize the added starch and then vacuum cooled at 0.5 atmosphere to about 60–71°C to better facilitate the forming of the patties. The warm puree was filled into a mold under pressure to give patties that were 2 inches in diameter by 1/2 inch thick. The patties were then frozen and stored in polyethylene bags at −26°C until evaluated.

Sensory evaluation

Immediately before sensory evaluation, the frozen patties were cooked in peanut oil (170°C for 2.5 min). The oil-cooked patties were presented to a 20-member, untrained sensory panel consisting of staff and graduate students from the Dept. of Food Science. Panelists were served coded samples on white plates in fluorescent lighted rooms and were asked to evaluate color, flavor and texture on a 5-point scale (5 = excellent, 1 = unacceptable). At each sitting the treatments from one variety were evaluated (3 to 6 patties). Each set of samples was evaluated at three sittings. The data were analyzed with the Statistical Analysis System's (SAS, 1979) analysis of variance (ANOVA) and general linear mode (GLM) procedures.

RESULTS & DISCUSSION

AFTER MUCH PRELIMINARY WORK, the procedure reported in this paper was selected as the one best suited for this investigation. A number of cooking methods were treid and eliminated for various reasons. These included cooking in water at varying temperatures, different cooking times and also grinding the raw product prior to steam cooking. Several starches were evaluated. Unmodified cornstarch provided the best combination of characteristics compatible with the desired sensory and physical properties for the product. Most of the modified starches evaluated either caused off-flavor when added at the desired level or affected the texture by forming a tough skin on the surface of the patty when it was cooked.

Serial addition of sucrose and starch to patties

The addition of various levels of sucrose ranging from 0–15% to patties containing 8% starch (group A) and varying amounts of starch ranging from 6–15% to patties con-

Table 1—Effect of varying the starch and sugar content on the color, flavor, and texture of sweet potato patties utilizing cured (4-month storage) Jewel variety roots

Group[a]	Sucrose (%)[b]	Starch (%)[b]	Color rating	Flavor rating	Texture rating
A	0	8	4.2	2.8[c]	3.3[c]
	3	8	4.1	3.2	3.5
	6	8	4.1	3.7	3.8
	9	8	4.2	3.9	3.6
	12	8	4.2	4.2	4.0
	15	8	4.2	4.2	3.9
B	10	6	4.2	4.3	3.6[d]
	10	9	4.2	4.3	4.2
	10	12	4.3	3.7	4.0
	10	15	3.9	3.4	3.4
C	12	8	4.3	4.0	3.6
	12	9	4.2	4.0	3.7
	12	10	4.2	3.9	3.6
D	10	9	4.0	3.9	3.6
	12	9	4.0	3.9	3.7
	14	9	3.9	3.7	3.5

[a] Groups: A—8% starch, variable sucrose; B—10% sucrose, variable starch; C—12% sucrose variable starch; D—9% starch, variable sucrose.
[b] Added as percent of weight of cooked sweet potatoes.
[c] Statistically significant ($P \leq 0.01$) linear trend within respective group.
[d] Statistically significant quadratic function ($P \leq 0.01$) indicating that texture score is highest at the two intermediate starch levels.

taining 10% added sucrose (group B) resulted in significant flavor and texture differences (Table 1). Statistical analysis of the sensory data for group A indicated that flavor and texture ratings increased linearly ($P \leq 0.01$) until between 9 and 12% sucrose had been added. In group B there was a linear decrease ($P \leq 0.01$) in the flavor rating of patties with more than 9% added starch and a plateau in texture rating was reached between 9 and 12% starch addition ($P \leq 0.01$). Patties made from cured roots to which less than 8% starch was added were too soft to mold well, and when deep fat fried, tended to disintegrate. There was no significant difference in the color rating that could be attributed to any of the treatments, probably because the added FD&C yellow no. 6 was present in sufficient amounts to mask any natural color differences. Moreover, there were no significant differences in the flavor and texture of samples in groups C or D. Since the data in this study indicated that the addition of 8–12% unmodified cornstarch and 10–12% sucrose provided the most acceptable patties, we chose a mixture containing 8% cornstarch and 10% sucrose for the study of curing and storage on patty acceptability.

Effect of curing and storage on patty acceptability

There was little variation in the color rating of Centennial patties that could be attributed to curing and storage treatments; however, the color rating of Jewel patties was higher for those prepared from roots stored for 2 and 4 months (Table 2). The color rating of Centennial patties was higher ($P \leq 0.05$) than Jewel only for roots stored 4 months. There was a significant decline in texture scores after 4 months of storage for Centennial patties, while Jewel patties showed no significant changes in either flavor or texture ratings that could be attributed to storage treatments. If ratings for the two varieties are considered on the basis of each storage date, there were no significant differences except that Jewel patties made from roots stored 6 months received a higher acceptance rating for texture than Centennial patties from similar storage. Our data indicate that high quality sweet potato patties can be prepared from both freshly harvested and cured stored roots from Centennial and Jewel cultivars.

Table 2—Effect of curing and storage on the color, flavor and texture of sweet potato patties[a]

Factor	Uncured	Freshly cured	Storage 2 months	4 months	6 months	LSD[b]
Centennial variety						
Color (mean)	4.20	4.35	4.44	4.25	4.26	0.29
Flavor (mean)	3.30	3.75	3.75	3.60	3.60	0.44
Texture (mean)	3.70	3.70	3.80	3.25	3.15	0.49
Jewel variety						
Color (mean)	4.25	4.15	4.70	4.90	4.30	0.29
Flavor (mean)	3.50	3.65	3.85	3.75	3.90	0.44
Texture (mean)	3.75	3.95	4.05	3.75	3.75	0.49

[a] Prepared from a mixture containing the following components based on the weight of cooked sweet potatoes: 10% sucrose, 8% cornstarch, 1% mono- and diglycerides, 0.3% NaCl, 0.05% sodium acid pyrophosphate, and 0.015% FD and C eyllow no. 6.
[b] Least significant different ($P \leq 0.05$).

REFERENCES

Deobald, H.J., Hasling, V.C., Catalano, E.A., and McLemore, T.A. 1969. Relationship of sugar formation and sweet potato alpha-amylase activity during processing for flake production. Food Technol. 23: 118.

Hoover, M.W. and Harmon, S.J. 1967. Carbohydrate changes in sweet potato flakes made by the enzyme activation technique. Food Technol. 21: 115.

Kimbrough, R.L. and Kimbrough, D.J. 1961. Process of preparing a frozen food product from sweet potatoes. U.S. Patent No. 3,007,800.

SAS Institute. 1979. "SAS User's Guide." SAS Institute Inc., Cary, NC.

Walter, W.M. Jr., Purcell, A.E., and Nelson, A.M. 1975. Effects of amylolytic enzyme on 'moistness' and carbohydrate changes of baked sweet potato cultivars. J. Food Sci. 40: 793.

Wilson, L.G., Averre, C.W., Baird, J.V., Estes, E.A., Sorenson, K.A., Beasley, E.O., Skroch, W.A. 1980. Growing and marketing quality sweet potatoes. N.C. State Univ. Exten. Pub. Ag-09.

Ms received 5/20/83; accepted 5/24/83.

Paper no. 8830 of the Journal Series of the North Carolina Agricultural Research Service, Raleigh, NC.

Mention of a trademark or proprietary product does not constitute a guarantee or warranty of the product by the U.S. Dept. of Agriculture or North Carolina Agricultural Research Service, nor does it imply approval to the exclusion of other products that may be suitable.