PRESERVATION OF GARDEN EGGS BY DEHYDRATION

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Summary

Fresh garden eggs or egg plants have been satisfactorily dehydrated in a cabinet hot-air dryer. The powder retained good organoleptic qualities and the nutritive value of the product was not considered to have been seriously affected before and after 5 months' storage.

Introduction

The fruit of the local garden egg plant *Solonum intergrifolum* and other related varieties is a seasonal vegetable crop used in stews and soups throughout Ghana. When it is in season the market gets flooded and aside from the farmer not getting a good price for this product, much of it is wasted through spoilage. Unl ke pepper, okro and some other greens that are traditionally preserved by sun-drying, the garden egg is not traditionally preserved by this or any other method. Even though it is being canned whole locally, the quantity of the vegetable preserved in this manner is so small that the garden egg has, in the main, been eaten fresh.

Published work on this vegetable has mainly been limited to its proximate composition (Burton, 1965; Platt, 1962), vitamins (FAO-UN, 1968), pigments (Casoli & Dall'Aglio, 1968) and enzymes (Knapp, 1961).

Recently Jackson & Mohammed (1969) outlined methods for sun-drying of a number of vegetables but the garden egg was not included.

The traditional usage of this vegetable by mashing the cooked fresh form is not expected to offer much resistance to the introduction of dried powdered form. It is intended in this paper to describe a method of dehydration of the garden egg.

Materials and methods

Samples of garden eggs were obtained from the Faculty of Agriculture, University of Science and Technology, Kumasi. The samples consisted of nine selected varieties SN1, SN6, SN9, SN20, SN21, SN23, SN24, SN34, and SN35, which are currently undergoing breeding and selection. They were transported to Accra by road and were received two days after harvesting.

Preparation of samples

In the laboratory, the stalks of the vegetables were removed and the samples were washed. Each sample was then divided into two parts (A & B). One part was sliced to a thickness of approximately 0.5cm and the other part cooked and turned into puree.

Sliced sample

The garden eggs were weighed and sliced with a stainless steel knife. The slices were immediately dipped in a solution of sodium metabisulphite (3,000 ppm) for three minutes, to prevent browning. They were steam blanched and spread on a stainless steel tray precoated with liquid paraffin, to prevent sticking (Jackson & Mohammed, 1969).

Puree

Weighed quantities of garden eggs were blanched whole in boiling water for 10 min or in the case of large fruited varieties, for 15 min. They were cooled in tap water and the skins removed. They were then dipped into a solution of sodium metabisulphite (3,000 ppm) for 3 min, drained and blended in a Kenwood Chef food mixer. The resulting puree was spread to a depth of about 0.5 cm thick on a stainless steel tray which had been precoated with liquid paraffin.

Dehydration and storage

All samples were dehydrated in a cabinet hot-air dryer at 70°C for 3½h in the case of puree and for 7h in the case of slices. The slices appeared leathery when dry while the puree dried into thin flakes.

Because of the tedium involved in the hand slicing and the fact that it took about double the time of drying the puree to dry the slices to about the same moisture content, further investigation into dehydration of the sliced form was discontinued.

The puree flakes were milled in a C & N laboratory mill (mesh size No. 7) and packed in polythene pouches in 40g packs. The samples were held under two different conditions of storage for a period of 5 months. One was placed on a laboratory shelf and the other was held in the dark in a sealed container.

Analysis

Proximate composition and minerals were determined by methods outlined by the Association of Official Agricultural Chemists (A.O.A.C., 1965) and Pearson (1962). The vitamin C content of the fresh vegetable as well as the powdered flakes was determined by the N-bromosuccinimide method (Barakat & Abdalla, 1964) before and after five months' storage.

Acceptability test

Samples of the powdered garden eggs were sent to the Consumption Section of the Food Research Institute (F.R.I.), and to selected housewives, to be used in stew and soup preparations for acceptability and flavour tests.

TABLE 1

Drying characteristics and moisture content of nine garden egg varieties

Sample	% Moisture content of fresh vegetable (wet weight basis)	% Moisture content of powder (wet weight basis)	Rate of drying (% loss of moisture/h)	Drying ratio
SN34	91.7	7.0	24.2	1:11
SN24	91.6	6.0	24.5	1:9
SN21	92.3	5.8	24.7	1:9
SN23	92.2	7.0	24.3	1:10
SN20	91.3	7.5	23.9	1:9
SN35	80.6	4.0	21.9	1:4
SN6	91.6	7.9	23.9	1:9
SN9	91.8	6.3	24.4	1:7
SN1	90.7	6.6	24.0	1:10

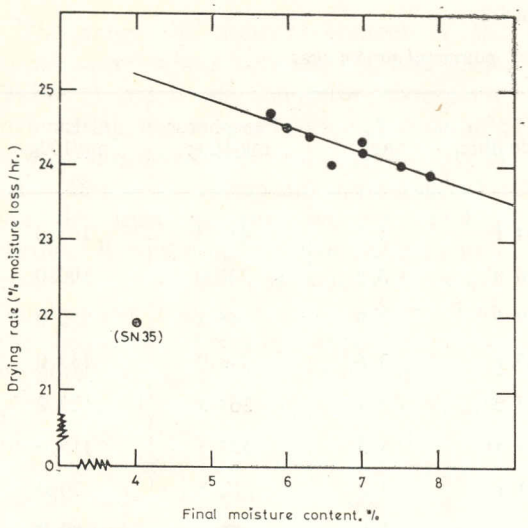

Fig. 1. Rate of moisture loss against drying rate.

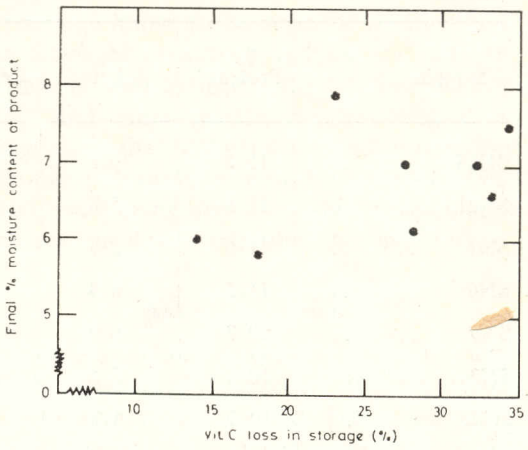

Fig. 2. Loss of vitamin C against final moisture content (%).

TABLE 2

Changes in vitamin C content of nine garden egg varieties during processing and storage

Sample	Vitamin C content (mg/100g wet wt. basis)			% Loss in vitamin C	
	Fresh vegetable	Powder	Powder (after 5-month storage)	During drying	In storage
SN6	8.6	3.5 (32.1)*	2.7	59.4	22.9
SN35	8.0	3.0 (24.2)*	2.4	62.5	20.0
SN34	6.6	4.0 (36.7)*	2.9	39.4	27.5
SN20	6.1	3.8 (34.7)*	2.5	37.6	34.2
SN1	5.8	3.3 (29.1)*	2.2	43.1	33.3
SN24	5.8	2.9 (26.6)*	2.5	50.0	13.8
SN23	5.8	4.0 (36.8)*	2.7	31.0	32.5
SN21	4.4	3.2 (29.5)*	2.6	27.3	18.7
SN9	3.7	3.6 (33.0)*	2.6	2.8	27.8
Average ..	6.1	3.5 (31.4)*	2.6	42.9	25.6

( )* dry weight.

TABLE 3

Proximate composition of powdered garden eggs

Sample	% Protein	% Fat	% Crude fibre	% Ash	Phosphorus mg/100g	Calcium mg/100g
SN35	15.8	10.3	14.1	4.2	481.3	165.0
SN21	11.8	5.6	16.8	3.8	325.0	100.0
SN1	11.6	2.9	19.1	3.9	368.8	150.0
SN6	11.5	6.4	15.8	3.6	318.9	135.0
SN9	10.7	6.9	15.0	3.9	362.5	130.0
SN24	10.6	5.5	15.4	3.5	337.5	115.0
SN23	10.3	4.2	13.1	3.2	312.5	70.0
SN34	10.2	4.4	15.5	3.8	337.5	80.0
SN20	10.2	3.6	11.9	3.6	306.3	130.0
Average	11.4	5.5	15.2	3.7	350.0	119.4

Results and discussions

It was observed in this work that the dehydrated puree stuck hard to the stainless steel tray during drying despite the tray's liquid paraffin undercoat. This difficulty was overcome by scraping off the puree mid-way during the drying process; this unduly prolonged drying time which would have been avoided if either the film dryer or rolled dryer (Brennan *et al.*, 1965) were used.

The taste panel judges convened by the Food Consumption Section of the F.R.I. to comment upon the soup and stew preparations made from the powdered samples, reported favourably on the products. The selected housewives to whom identical samples were sent also presented favourable reports. In particular, the flavour was acceptable. The texture of the stew produced from the powdered samples was, on the other hand, reported to be smoother than the panelists were used to.

The drying characteristics show that the rate of moisture loss during drying was related to the final moisture content of the dried samples, except for the sample SN 35 which from the scatter diagram may be considered to belong to a different group (Fig.1).

The vitamin C content of fresh local garden eggs (Table 2) compared favourably with published results (Burton, 1965; Platt, 1962; FAO—UN, 1968), and processing losses were of the order reported by Oke (1967) and Pasrica (1967). The levels of vitamin C in dehydrated foodstuffs is known to fall during storage (Karel & Nickerson, 1964; Notter *et al.*, 1959) and the fall is highly influenced by the moisture level of the product. The results of this work agree with these findings. It may be observed from Table 2 that an average of about 25% of vitamin C was lost in the dry powder during a five-month storage period. This loss was found to be related to the moisture content of the powder; the higher the moisture content, the greater the loss observed (Fig. 2).

The range of moisture content of the stored samples was between 4% and 7.9% (Table 1) and it was interesting to observe that during the storage period, the sample showed various degrees of colour stability in light. The most colour-stable product also had the least moisture content at 4%. Further, it was observed that samples protected from light did not undergo browning discoloration like those exposed to light. The browning, therefore, appeared to be promoted by light. Like the destruction of ascorbic acid, moisture plays an important role in most browning reactions (Karel & Nickerson, 1964; Lea, 1958), and drying to a sufficiently low moisture content is the usual method of control.

It has been indicated in the preceding paragraphs that SN35 does not belong to the same group as the other samples studied; indeed it was undesirably small in size compared with the others. Nonetheless, it proved superior not only in terms of proximate and mineral composition (Table 3) but also in dry matter content (Table 1).

Conclusions

It has been shown that garden eggs can be successfully dehydrated for stew and soup preparation and it is quicker to dehydrate garden eggs in the form of puree rather than by slicing.

Vitamin C losses during processing and storage were as expected. The deletarious effect of light and moisture on colour and vitamin C stability of the product suggests that garden eggs should be dehydrated to a low moisture content of about 4% or less and that the dry product should be stored in a light and moisture-proof container.

For the light weight of the product, it is expected that more garden eggs will be consumed in the dry form as compared with the fresh form to compensate for the losses of vitamin C during processing and storage.

The sample SN35, which was found to be very small in size, and, therefore unattractive, was found to be superior to all others in terms of proximate and mineral composition as well as in dry matter content. For this and other garden egg varieties, it is suggested that dehydration and powdering should constitute a means of preservation and overcoming any size liability that might be detrimental to consumer acceptability.

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