American Journal of Engineering Research (AJER) 2016
American Journal of Engineering Research (AJER)
e-ISSN: 2320-0847 p-ISSN : 2320-0936
Volume-5, Issue-8, pp-58-61
www.ajer.org
Research Paper Open Access

Effect of Oven Drying On Proximate Composition of Ginger

[1]C.S Agu,[1]J.E Igwe[2]N.N. Amanze, and [2]O.Oduma*
[1]*Department of Mechanical Engineering, College of Engineering and Engineering Technology, Michael Okpara University of Agriculture Umudike, Abia State, Nigeria*
[2]*Department of Agricultural and Bioresources Engineering, College of Engineering and Engineering Technology, Michael Okpara University of Agriculture, Umudike.*

ABSTRACT: *Ginger root (ZingiberOfficinale) was analyzed to identify its proximate composition. The effects of drying as a processing technique on ginger were investigated with respect to the proximate composition of the produce. Ginger rhizomes were collected, sorted, sliced and dried using the oven at 50^0C for five (5) hours. Fresh ginger slices were successfully dried from initial moisture content of 70% to 18 %. Ginger composition before drying were 1.81% ash, 7.85% fat, 3.06% protein, 9% fiber, and 8.18% carbohydrate. The analysis of the results of proximate composition showed that the moisture content of ginger reduced after oven drying while the ash, protein, crude fiber increased after drying. On the other hand, the ash content, crude fiber, protein, fat and carbohydrates were 2.35%, 11%, 13.13%, 8.20% and47.32% respectively. The oven-drying technique however was a better option for the drying process as it was more effective in removing sufficient moisture and more so enhanced some nutritional parameter of the produce.*

Keywords: *Ginger, rhizomes, oven- drying, proximate and moisture contents.*

I. INTRODUCTION

Ginger (Zingiberofficinale) is a very important spice cash crop in Nigeria due to its oleoresin and ginger oil contents. The spice ginger is obtained from the underground stems or rhizomes of ZingiberOfficinale, familyZingiberaceae. Ginger rhizome is typically consumed as a fresh paste, dried powder, slices preserved in syrup or candy or for flavoring tea (Famurewa*et al*, 2011). It has been used in herbal medicine practice for the treatment of arthritis, rheumatologicconditions and muscular discomfort (Gizanna*et al*, 2005). According to Ahmed (2010), ginger has also been suggested for the treatment of various other conditions including, sclerosis sore throat, hangover migraine headaches, nausea, high cholesterol, depressions and impotence. In addition to these medicinal uses, ginger continue to be valued around the world as an important cooking spice and is believed to help against common cold, flu-like symptom, and even to relief painful menstrual periods (Bartley and Jacobs, 2000).

In most Nigerian homes, the rhizome is only known as spice for flavoring soups, stews and variety of dishes. Some use it as added spicy flavoring for their fruit juice or drink and other local drinks such as “Kunu and Zobo” which is enjoyed in the family (Onwuka, 2002). It is expected that the world demand of ginger will double in the next five years. But due to improper post-harvest processing most of the ginger is consumed as a fresh vegetable and also some of the good qualities such as visual appeal, texture, aroma, flavor, structure and color of the material get affected.

The consumption of ginger has been associated with the prevention of decaying, rotten and its demand has been on the increase, proper, study and understanding of the storage processes/oven drying of ginger is very necessary for all year availability of ginger (Nwinuka, 2005).

The main objective of this work is to determine the effect of oven drying on proximate composition of ginger and the specific objectives are to: determine the moisture content of ginger before and after oven-drying at 50^0C for five (5) hours, the proximate composition of oven-dried ginger and compare the nutritive value of fresh and dried ginger after oven-drying at the above temperature.

II. MATERIALS AND METHOD

2.1. Research Materials

Freshlocalginger roots (Zingiberofficinale) were procured from Ndorumarket in Ikwu-ano L.G.A, Abia state. The ginger was properly washed and dried in oven at 50^0C for 5 hours then taken to laboratory for proximate analysis.

2.2 Chemical analysis

The proximate composition of the oven dried sample was determined using the standard method of Association of official analytical chemist as adopted by Shirim (2010).

2.3 Moisture content determination

Five grams (5g) of sample was weighed, transferred into an oven and dried at 50^0C for 5 hours. Re-weighing at intervals of 30 minutes, thereafter, allowedto cool in a desiccator. The following mathematical deductions according to (Waheed, 2014) were made to obtain the moisture contents of the ginger samples

Given that:

The weight of empty moisture can = W_0

Weight of can + Sample = W_1

Weight of can + Oven dried sample = W3

$\therefore$ Moisture content % $= \frac{W3-W0}{W1-W0} \times \frac{100}{1}$(1)

2.4 Crude fiber determination

- Defat 2g of sample with per ether, (repeating twice)
- Add preheated 200ml of 1.25% H2So4 and boil gently for 30 minutes.
- Filter hot through pre-heated buckner flask tunnel (under suction) by pouring hot water into the empty flask.
- Residues are washed severally with boiling water transfer to beaker or flask and add 200ml of 1.25% NaoH and boil for 30 minutes.
- Dry residue using moisture can in the oven at 650C for 24 hrs and weight.
- The moisture can be placed on furnace can ask for 400 – 6000C cool and weight.
- The crude fiber was determined from the expression suggested by Yilep (2005)

Crude fiber % = dry weight after drying wt after ashing × 100(2)
Weight

2.5 Crude fat determination

Crude fat is determined by washing a 250-300ml extraction flask, allowed to dry in the oven, cooled in a dessicator and weighed (Orherba, 2003).

- The soxletextractor was flitted up with reflex condenser and water flow started.
- 3-5g dried sample on a filter paper was folded, and transferred into a fat-free extraction thimble and plugged tightly with a cotton wool.
- The thimble was replaced into the extraction barrel and added petroleum ether/hexane until it siphons over once in the flask directly.
- Flask and reflux sample was heated for 4-5 hours.
- After the extraction the thimble was removed from the extraction barrel and dried.
- The flask containing the fat was dried in the oven at low temperature ^{0}c.
- Then the flask plus fat was weighed and calculated.

2.6 Protein determination

Crude proteins in the residue were determined by the routine of semi- micro kjeldal procedure. It consists of three (3) techniques of analysis namely: Digestion, Distillation and Titration. 0.2g sample in a digestion flask was weighed. 0.8g of mixed catalyst powder was added. 10ml of concentrated H_2SO_4 was fixed in the flask into the digester for 2- 3 hours until a clear solution was obtained. Cool and transfer the digest into a 100ml volumetric flask and make up to mark with distilled water.

- 5ml of 4% boric acid was pipette into a conical flask and 2 drops of indicator added.
- The conical flask and distillation flask was fixed in a place and 7ml of 40% NaOH was 4added through the glass funnel into the digest.

The steam exit was closed and timing started until when the solution of the boric acid and indicator turns blue.(75ml distillate was collected).

- Distill for 15minutes.
- Titrate the distillate with 0.01 NHCl and calculate thus;

$$\% \text{ total Nitrogen} = \frac{14.01 \times (\text{sample titre} - \text{blank titre}) \times N \times 6.25}{\text{sample weight}} \quad (3)$$

Where *N*= Normality of the acid.

2.7 Crude ash determination

- Crucible was washed, dried in the oven and allowed to cool in the dessicator.
- 2g of dried material was placed in an empty porcelain crucible which has been previously ignited and weighed.
- Ignite the material over a low flame or on a hot plate in the fume cupboard to char organic matter.
- Crucible wasplaced in a muffle furnace maintained at a temperature of 600^0c for six (6) hours.
- The crucible was transferred directly to a dessicator, cooled and weighed immediately.

$$\% \text{ Ash} = \frac{(\text{weight of crucible} + \text{ash}) - \text{weight of empty crucible} \times 100}{\text{sample weight}} \quad (4)$$

III. RESULTS AND DISCUSSION

3.1 Results

The results obtained in the study and results of the proximate analysis are presented in Table 1.

Table 1: Proximate composition of Ginger for fresh and oven dried samples**.**

S/No	Parameter	Fresh ginger %	Dried ginger %
1	Moisture Content	70.10	18
2	Crude Ash	1.81	2.35
3	Fat	7.85	8.20
4	Protein	3.06	13.13
5	Crude Fiber	9	11
6	Carbohydrate (calculated)	8.18	47.32

3.2 Discussions

The proximate composition of dry ginger was determined and the results are shown in Table 1.

The ash content increased from 1.81 %(fresh ginger) to 2.35% when oven dried. Carbohydrates (calculated) increased from 8.18% to 47.32%, after oven drying. There are significant changes/differences in Fat, Protein and Crude fiber also as their composition increased after oven drying respectively.

IV. CONCLUSION AND RECOMMENDATION

4.1 Conclusion

Based on the results obtained in this study, it was concluded that during drying of ginger rhizomes, not only the moisture of the produce was affected but other nutritional parameters were also affected. The oven-localeffective in removing sufficient moisture and also enhanced some nutritional parameters of the produce (ginger).

4.2 Recommendation

However, since the demand for the dried ginger of good quality is high in the market, it can be concluded from this study that oven drying method will give a better end product to meet the market demand considering the high nutritional components which are part of attributes of quality desired by customers. Therefore, slicing and oven drying at 50^0c is recommended for post-harvest storage and for production of ginger powder because the effect of oven drying enhances its proximate composition.

REFERENCES

[1]. Ahmed, H. E, Muhammad N. Faqir M. A., Shahzad H. and Muhammad N. (2010). A comparative study on chemical composition and antioxidant activity of ginger (ZingiberOfficinale) and Cumin (Cumin cyminum); Journal of Agricultural and Food Chemistry, VOL.58, Pp. 8231 – 8237.

[2]. Bartley, J.and Jacobs, A. (2000): Efffects of drying on flavor compounds in Australian – grown ginger (Zingiberofficinale). J. Sci. Food Agric., 80(2) 209-215.

[3]. Famurewa, A.V., Enuekele, P.O. and Jaiyeoba, K.F. (2011): Effect of drying and size reduction on the chemical and volatile oil contents of ginger (Zingiberofficnale);; Journal of medicinal plants research Vol. 5 (14) pp. 2941 – 2944, 18 July, 2011. http://www.academijournals.org.

[4]. Gizanna, R., Lindmark, L., Frondoza, C. (2005). Ginger a Merbal medicinal product with broad anti-inflammatory actions. J. med. Food, 8(2): Ppg 125 -62.

[5]. Iwu, M.M. (1993). Handbook of African Medicinal Plants.CRC Press.Baca Raton.

[6]. Nwinuka, N., Ibej, Ekele, G. (2005): Proximate composition and levels fo some toxicants in four commonly consumed spices. J. Appl. Sci Environ. Mgt. 9(1): 150-155.

[7]. Onwuka, G.L., Nwokoha, G.U., Asumugha, G.N. (2002); Evaluation of processing methods for the production of ginger drinks. Proceedings of 26th Annual NIFEST Conference, Owerri.
[8]. Orherba, B.A., Egbita, C.O. (ZingiberOfficinaleRosc.) (2003) Asian Academic Research Journal of Multidisciplinary.The effect of drying on the nutritional properties of ginger.
[9]. Ranganna, S. (1986). Handbook of analysis and quality control for fruit and vegetable products, Tata McGraw-Hil.
[10]. Saliey, K.M. and Singh, K.K. (2005). Unit operations in agricultural processing.2nd ed. VIKAS Publishing PVT Ltd. New Dellipp 125-130.
[11]. Shirim Adel P.R. and Jomuna P. (2010): Chemical Composition and antioxidant properties of ginger root (Zingiberofficinale). Journal of Medicinal Plants Resaerch Vol. 4 (24), pp. 2674 – 2679, 18 December, 2010.
[12]. Waheed, A. D., Mahesh N.V.,Chang K.Y. and Kailas L.W. (2014). Investigation of sola drying of Ginger (Zingiberofficinale): Empirical modeling. Drying characteristics and Quality study. Chinese Journal of Engineering volume), Article ID 305823.
[13]. Yilep, Y., Fumen, G., Ajisegiri, E. (2005). "The Effects of peeling, splitting and drying quality".Agric. Eng. Int. CIGRE J. Manuscript. FP 05 009.vol, VII.