

Effect of Various Drying Methods on Essential Components of Ginger (*Zingiber officinale* R) Sliced

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Abstract

Essential components of ginger such as oleoresin and essential oil are important substances that determine the quality of ginger. Those components could be decreased during process handling especially on the drying process. In this research, various drying methods ie. direct sun drying, indirect sun drying (material was cover by black color cloth), oven drying, stationary drying and rotary drying at 45-50⁰C were carried out to dry out fresh ginger sliced (of 2 ginger varieties) to be 9-12% moisture contents. Oleoresin content as well as essential oil of dried ginger were measured by standard manners. Results noted that the use dryer machines were better than those of traditional drying methods. Oleoresin of dried slice-ginger obtained from direct sun dry was in range of 19.20-20.90% (depend on the variety), indirect sun dry 19.00-21.39%, stationary drying 19.37-22.12%, and rotary drying 19.23-22.02%. Essential oil of ginger dried by direct and indirect sun dry, stationary drying and rotary drying are 2.39-, 2.80, 3.05 and 3.17% respectively.

Key words: drying method, ginger sliced, oleoresin, essential oil

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Introduction

Ginger is native to India and China. It takes its name from the Sanskrit word *stringa-vera*, which means “with a body like a horn”, as in antlers. Ginger has been important in Chinese medicine for many centuries, and is mentioned in the writings of Confucius. It is also named in the Koran, the sacred book of the Moslems, indicating it was known in Arab countries as far back as 650 A.D. It was one of the earliest spice known in Western Europe, used since the ninth century. It became so popular in Europe that it was included in every table setting, like salt and pepper (Anon, 2003).

Basically, ginger contains of fiber, starch and essential components that varies in proportions depend on varieties. The essential component of ginger consists of essential oil and oleoresin. The essential oil, which is causes the fragrance of the spice are sesquiterpenoids with zingiberene as the main component. Lesser amounts of other sesquiterpenoids such as β -sesquisphelladrene, bisabolene and farnesene, and small monoterpenoids such as β -phelladrene, cineol and citral also found in essential oil. Oleoresin substances consists of nonvolatile phenylpropanoids (particularly gingerol and zingerone) and diarylheptanoids

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(gingerols and shogaols). The pungent taste of ginger is due to the oleoresin substances, where diarylheptanoids are more pungent and usually it form from phenylpropanoids when ginger is dried.

In Indonesia farmers produced dried sliced ginger and sell it to the processing industry. Process activities to obtain dried sliced ginger consist of washing, slicing and drying. In the initial step, rhizome was washing, where the moisture content is predicted around 85-90%. Cleaned rhizome was then sliced with thickness in range of 7-8 mm. After dried, the thickness of slice ginger become thickness 5-6 mm, that means the ginger has lose the weight around 60-70%. Essential components of ginger (oleoresin and essential oil) are important substances that determine the quality of ginger. Those components could be decreased during process handling especially on the drying process (Paramawati *et al.*, 2006).

Several researches about rhizome drying especially for ginger has been conducted both in Indonesia or abroad. Hanapie (1988) reported the used of cabinet dryer with electrical energy at 69.5°C to dry ginger. He noted that the drying time to obtain dried ginger with 8.58% moisture content was 12 hours, with drying efficiency about 59.90%. A similar research conducted by Risfaheri *et al.* (2002), used flat bed dryer that modified using some racks. Drying temperature was managed at 61°C, drying time was 13 hours with drying rate was about 6.85 kg water/hour, an average yield was 13.5% with drying efficiency 38.84%. According to Purseglove *et al.* (1981) drying process to dry ginger can be conducted at temperature in range of 48.5-81°C. Commonly the drying temperature is 57°C, while if the aim of the drying is to obtain a material for extraction purposes the temperature is about 81°C.

Drying ration, a ratio of fresh ginger with dried ginger, will determine the physical as well as the chemical characteristics of product that will effect to the commercial aspect. Drying process for ginger in Fiji is carry out with drying ratio at 8:1 (dried ginger weight become 1/8 initial fresh ginger). While in Australia, ginger drying is carried out with drying ratio in range of 9:1 until 6:1.

Materials and Methods

The main materials used in this research were ginger red and ginger white varieties. The process to obtain dried ginger is displayed at the Figure 1, where 5 methods were conducted such as direct sun drying, indirect sun drying (using black cloth as a cover), oven drying (using oven chamber), stationary drying (using cabinet dryer), and rotary dryer (using rotary drum dryer). Oven drying, stationary drying and rotary drying was carried out at drying temperature in range of 45-50°C, to dry out fresh ginger sliced (of 2 ginger varieties) to be 9-12% moisture contents.

Preparation sliced-ginger was under go washing and slicing processes. Oleoresin content as well as essential oil content were observed. The quality parameters to be observed were conducted such as moisture content by infra red, total phenol by titration, ash content by tunnel burning, and oleoresin and essential oil by HPLC.

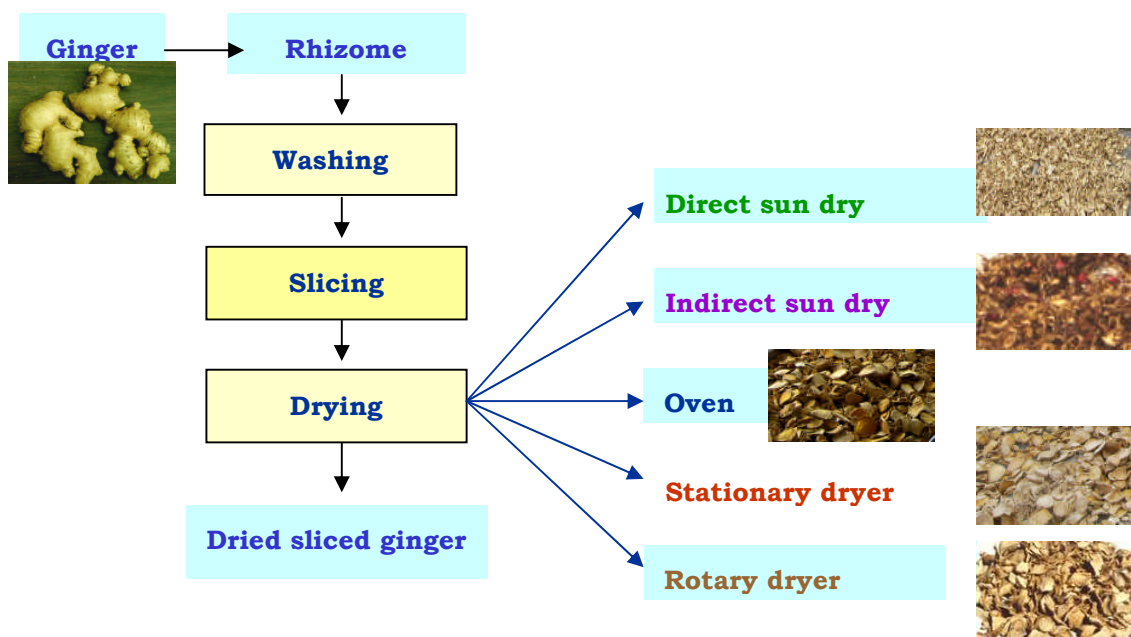


Figure 1. Flow chart of rhizome-ginger processing

Results and Discussions

To reach $\leq 12\%$ moisture content in dried sliced ginger (white or red varieties), dryer machine (both stationary and rotary) is better and more efficient than that of sun dry (both direct and indirect) and oven. Rotary dryer, which was noted as the shortest drying time, noted 20-21 hours to completely dry, while stationary dry needed longer time about 30-32 hours. In contrast, direct sun dry, indirect sun dry and oven dry needed very long time as noted at 3, 4 and 2 days respectively.

Table 1. Time consume to dry 20 kg sliced ginger (7-8 mm thickness)

	Direct sun dry	Indirect sun dry	Oven dry	Stationary dry	Rotary dry
Time consume	3 day	4 day	2 day	30-32 h	20-21 h

There were no specific effect from different drying methods to total phenol and ash content (see Table 2). Total phenol of samples treated with 5 drying methods were ranging from

2.88 to 3.97% (white ginger) and from 2.79 to 3.82% (red ginger), while ash contents were ranging from 5.00 to 6.01% (white ginger) and from 5.23 to 5.98% (red ginger).

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Table 2. Effect of drying on moisture content, total phenol and ash content

Drying Methods	Moisture Content (%)		Total Phenol (%)		Ash Content (%)	
	White	Red	White	Red	White	Red
Ginger varieties	White	Red	White	Red	White	Red
Direct sun dry	11.67	11.93	3.97	3.82	6.01	5.98
Indirect sun dry	11.12	11.00	2.88	2.79	5.89	5.72
Oven	12.00	12.33	3.10	3.14	5.13	5.23
Stationary dryer	10.90	10.98	3.43	3.57	5.42	5.35
Rotary dryer	10.11	10.23	3.56	3.24	5.00	5.23

Oleoresin of dried slice ginger obtained from direct sun dry was in range of 19.20-20.90% (depend on the variety), indirect sun dry 19.00-21.39%, oven 18.77-19.12%, stationary drying 19.37-22.12%, and rotary drying 19.23-22.02%. There were no significant different in oleoresin content among the drying methods.

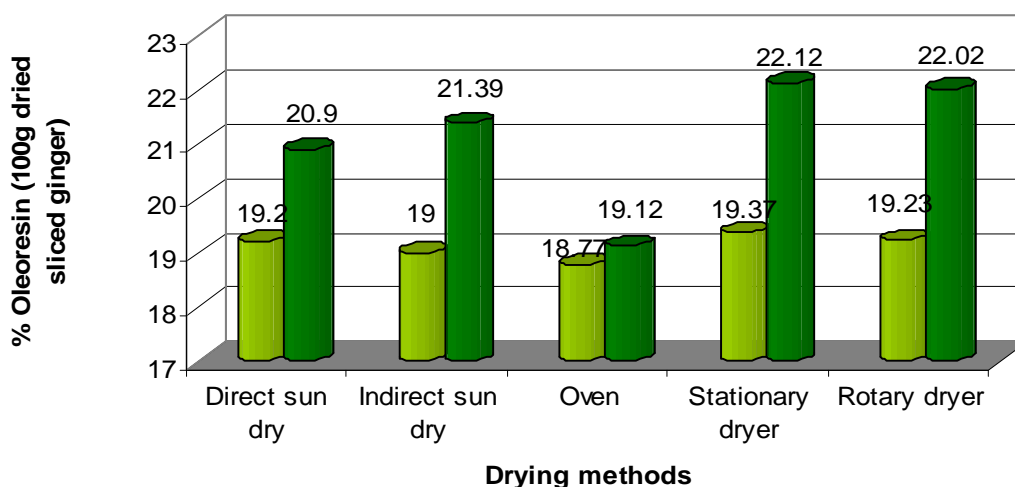


Figure 2. Oleoresin content of dried slice ginger

According to Figure 3, essential oil of ginger dried by direct and indirect sun dry, oven, stationary drying and rotary drying of red ginger were 2.39, 2.80, 3.54, 3.05 and 3.17%, while white ginger noted 2.20, 2.35, 3.34, 2.95 and 3.02% respectively. This results noted that there is

no significant different between the two (2) varieties of ginger in essential oil content. However, results noted that stationary drying and rotary drying obtained higher essential oil compare to direct and indirect sun dry as well as oven.

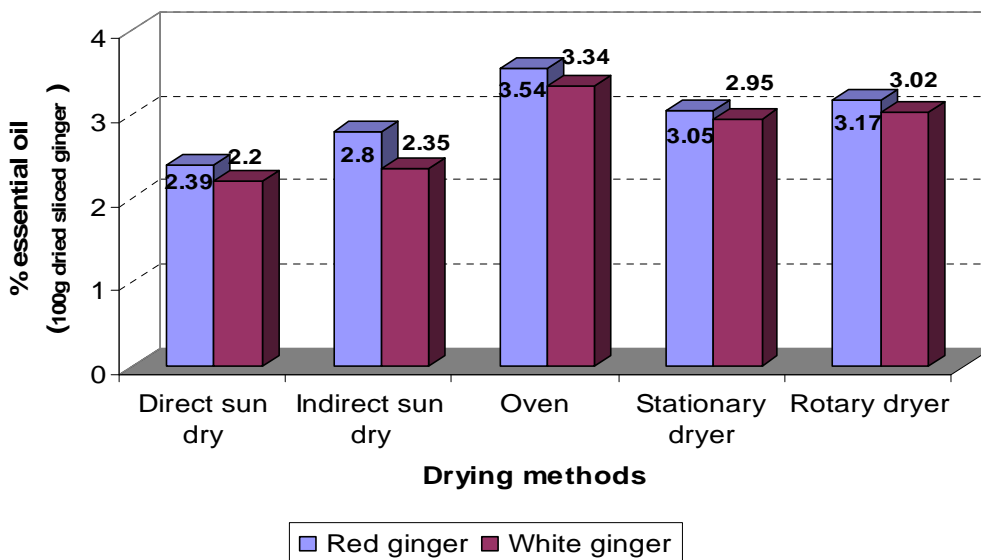


Figure 3. Essential oil content of dried slice ginger

Conclusion

Results noted that the use dryer machines were better than those of traditional drying methods. Oleoresin of dried slice-ginger obtained from direct sun dry was in range of 19.20-20.90% (depend on the variety), indirect sun dry 19.00-21.39%, stationary drying 19.37-22.12%, and rotary drying 19.23-22.02%. Essential oil of ginger dried by direct and indirect sun dry, stationary drying and rotary drying are 2.39, 2.80, 3.05 and 3.17% respectively.

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