

**INFLUENCE OF LIME CONCENTRATION AND SOAKING DURATION
FOR LIMING ON PROCESSING OF BLEACHED GINGER
(*Zingiber officinale* Roscoe)**

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INTRODUCTION

- ❑ Ginger an herbaceous perennial of *Zingiber officinale* Roscoe belong to the family **Zingiberaceae** is grown commercially in most tropical regions.
- ❑ Ginger rhizomes has been used as a spice and medicine in India and China since ancient times.
- ❑ Global production is **1,387,445 Mt** and Sri Lanka - **10,780 Mt**, 1890 ha (2010)
- ❑ According to the Sri Lankan customs, in 2009, 594 Mt of value Rs 71 Million of ginger has been imported to the country.
- ❑ India, Indonesia, Nepal, Nigeria, Bangladesh, Japan, Philippines and Sri Lanka are the top ten producers.
- ❑ Fresh ginger and dried ginger are the major forms of ginger available in the market.



...INTRODUCTION

- ❑ Dried ginger is used as a spice, ayurvedic medicine and also for the extraction of ginger oil and ginger oleoresin.
- ❑ The method preparation of dried ginger varies in different countries of production as well as purpose of use.
- ❑ Method of dried ginger
 - “unscraped”
 - “scraped”
 - Sliced
 - Bleached/ limed
- ❑ Bleached/limed ginger is widely used in Sri Lanka for preparation of ayurvedic drugs.

...INTRODUCTION

□ What is bleached/limed ginger?



Peeling, liming and
drying



□ Peeled ginger is treated with calcium hydroxide $[\text{Ca}(\text{OH})_2]$ for producing bleached ginger. Bleaching expects

- To get good appearance and colour, minimize shrinkage and pest attacks, and improved physical and chemical quality of dried ginger. Bleaching improve the keeping quality of dried ginger.
- As the chemical quality of dried ginger is mainly depending on oil, oleoresin and calcium percentages

...INTRODUCTION

□ Aim of the study was to determine the lime concentration and the soaking duration for production of bleached/limed ginger.

□ Specific objectives

To find the influence of

- Lime concentration and soaking period on **oil** of bleached ginger
- Lime concentration and soaking period on **oleoresin** of bleached ginger
- Lime concentration and soaking period on **Ca** percentage of bleached ginger
- Lime concentration and soaking period on **outer color** of bleached ginger

MATERIALS AND METHODS

- ❑ Location: Central Research Station of the Department of Export Agriculture, Matale.
- ❑ The treatments were arranged as a two-factor factorial in a complete randomized design (CRD) with three replicates.

Factor I \ Factor II	Lime Concentration (%)				
	Level	0	1	2	4
Soaking Time period (hr)	2	C_0T_2	C_1T_2	C_2T_2	C_4T_2
	4	C_0T_4	C_1T_4	C_2T_4	C_4T_4
	6	C_0T_6	C_1T_6	C_2T_6	C_4T_6

- ❑ No of treatments = 12 No of replicates = 3

...MATERIALS AND METHODS

Sample preparation

- ❑ Ginger rhizomes (Local variety) at the same maturity stage were obtained from the Central Research Station, Matale.
- ❑ They were cleaned, soaked overnight and peeled. ginger were divided into 1.5 kg samples and were soaked in 0%, 1%, 2% and 4%, calcium Hydroxide concentration solutions for 2, 4 and 6 hrs separately.
- ❑ After soaking, ginger samples were dried in the sun to reduce moisture content to 12% (wet basis).
- ❑ The dried ginger samples were used for chemical and physical analysis.



...MATERIALS AND METHODS



Samples analysis

- ❑ Moisture content - Dean and Stalk method, using toluene distillation apparatus, and calculated on wet basis.
- ❑ The essential oil - modified Clevenger method using Clevenger's apparatus. calculated as % dry basis.
- ❑ The oleoresin content - Soxhlet apparatus and calculated as % of the as dry basis.
- ❑ The calcium content - AAS method (Atomic Absorption Spectrophotometer) and calculated as % dry basis.
- ❑ The outer color - digital colorimeter (Konica Minolta Color Reader,CR10).

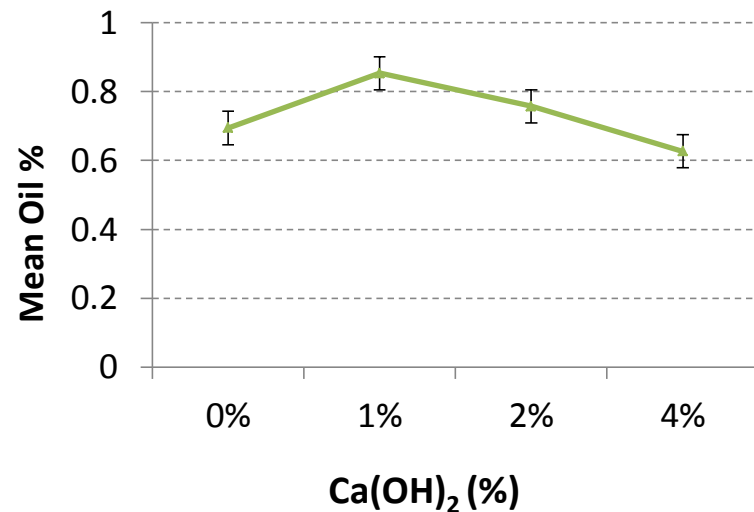
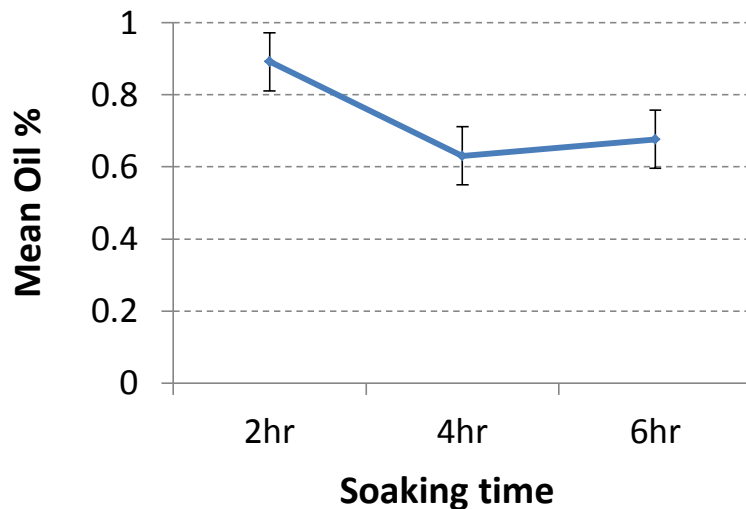
The data were analyzed by using the SAS statistical computer software.

RESULTS AND DISCUSSION

- ❑ Moisture content of all the dried ginger samples were $12\% \pm 0.5$.
- ❑ Ginger oil percentage varies from 0.56% to 1.05%
- ❑ The oil percentage of unpeeled fresh ginger and fresh peeled ginger were 1.24 and 0.90 respectively.
- ❑ 27 % of oil was lost from ginger due to peeling.
- ❑ 10% of oil was lost from ginger due to soaking and drying process.
- ❑ normally bleached ginger has less oil than unbleached ginger with skin.

...RESULTS AND DISCUSSION

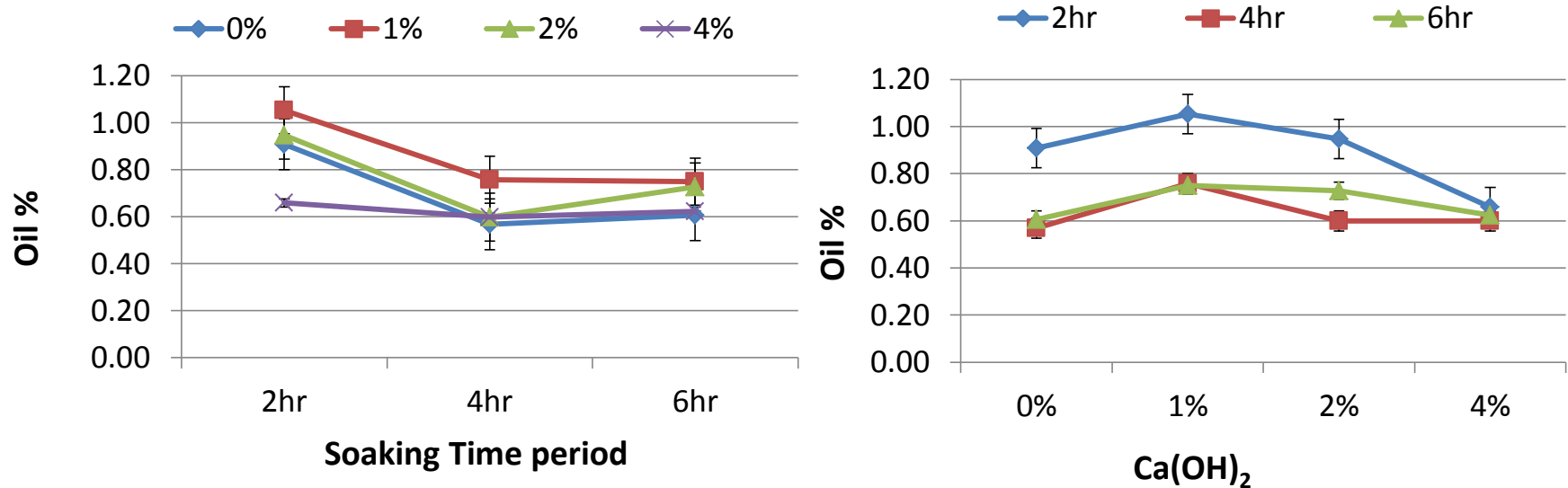
- Effect of lime concentration and soaking duration on essential oil of bleached ginger



- Both factors were effected on oil percentage of bleached ginger. There were interaction effect also. It can be concluded that essential oil percentage in bleached ginger depends on soaking time period and concentration of calcium hydroxide .
- Oil percentage in bleached ginger decreased with increasing soaking period

...RESULTS AND DISCUSSION

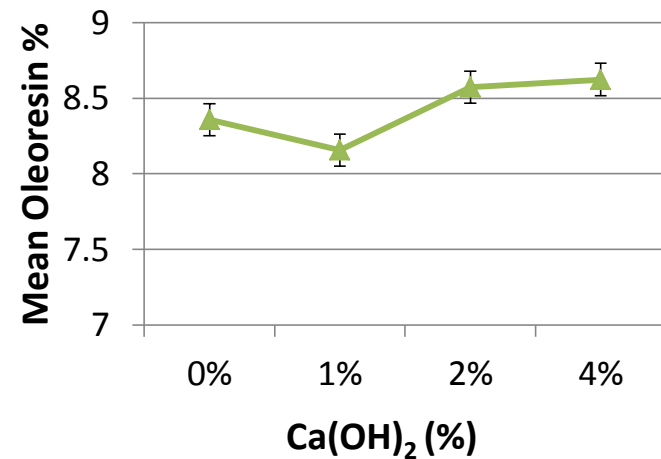
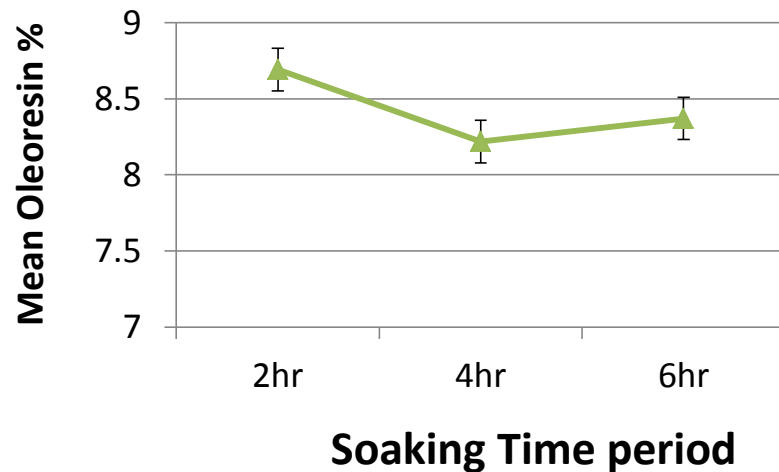
Effect of lime concentration and soaking duration on essential oil of bleached ginger



- The highest mean oil percentage (1.05%) - ginger samples which soaked **two hours in 1%** lime percentage.

...RESULTS AND DISCUSSION

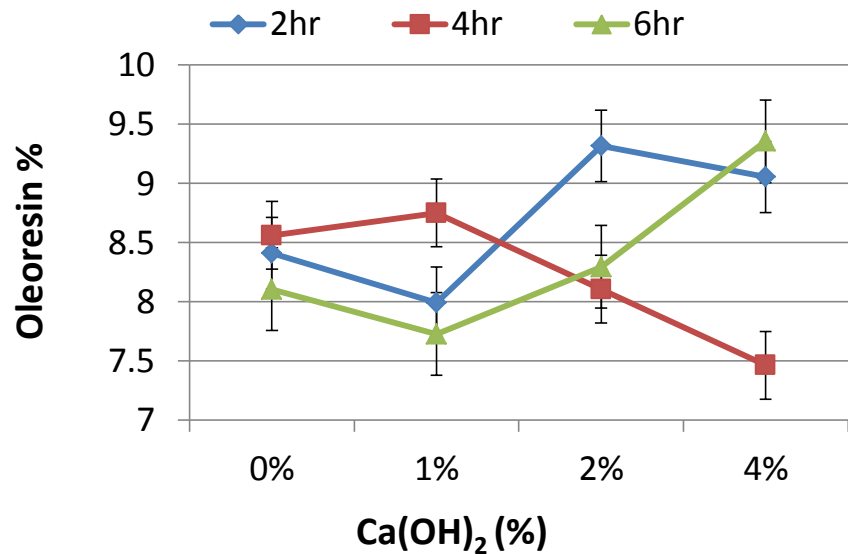
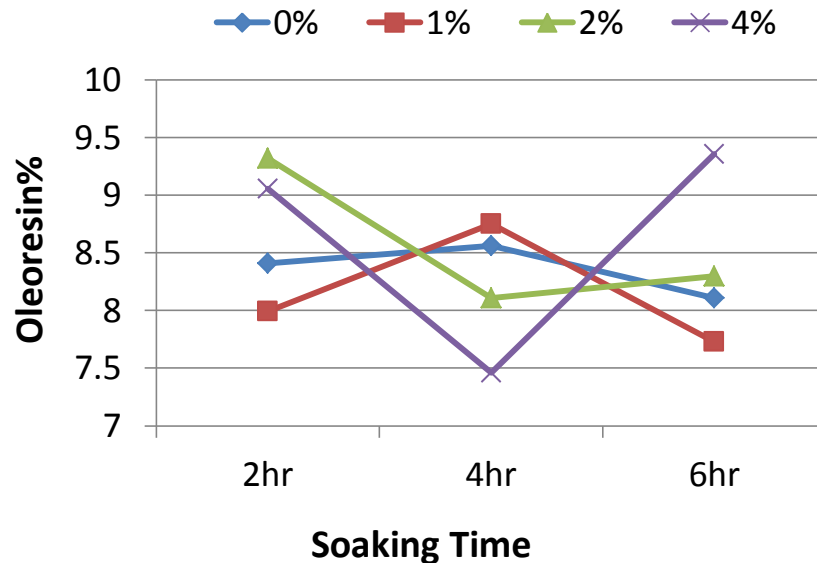
- Effect of lime concentration and soaking period on oleoresin percentage of bleached ginger



- Both factors were effected on oleoresin content of bleached ginger. And interaction effect is also present.
- The highest mean - soaked in 4% lime concentration (8.623%) and increased with lime.

...RESULTS AND DISCUSSION

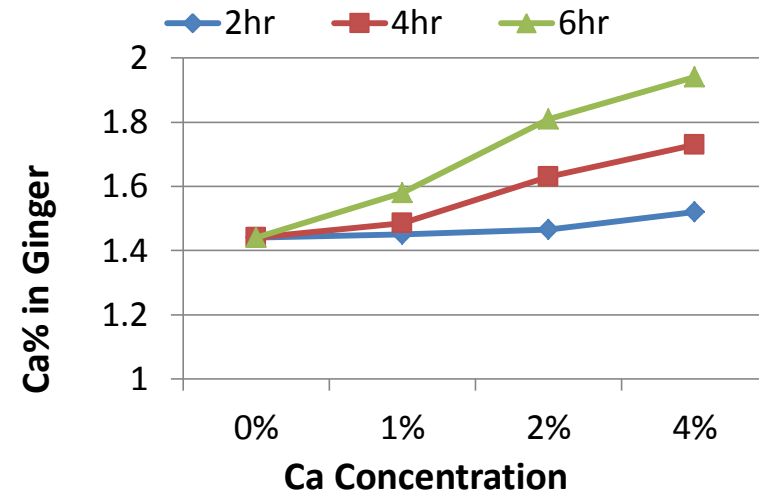
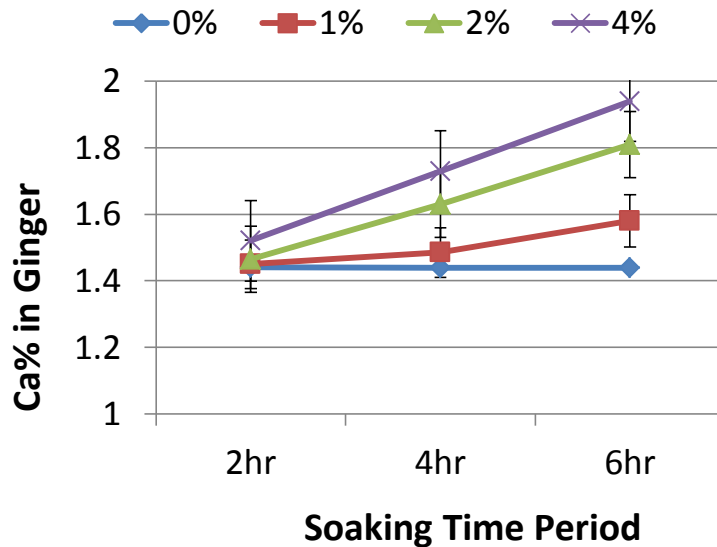
Effect of lime concentration and soaking period on oleoresin percentage of bleached ginger



- Best oleoresin percentage was obtained in the treatment which soaked in 4% lime concentration for six hours (9.3560%)

...RESULTS AND DISCUSSION

Effect of lime concentration and soaking period on Calcium % in bleached ginger

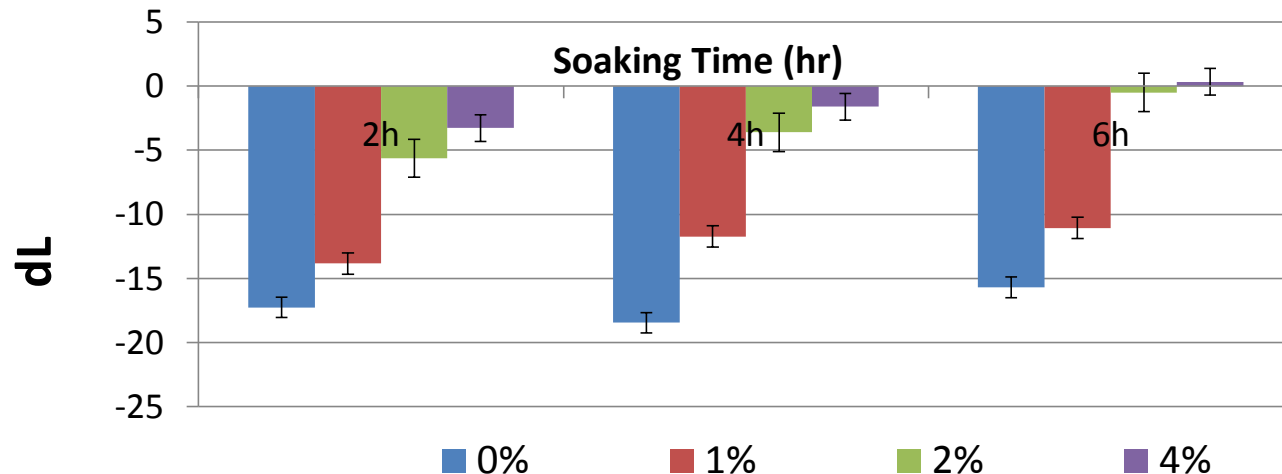


- Both factors lime concentration and soaking time period are effected to calcium percentage of bleached ginger.
- Calcium percentage in ginger is increased when increasing lime concentration and soaking time period.
- The highest calcium percentage was obtained by the ginger sample which soaked for six hours in 4% lime concentration.

...RESULTS AND DISCUSSION

□ *Effect on outer colour of bleached ginger*

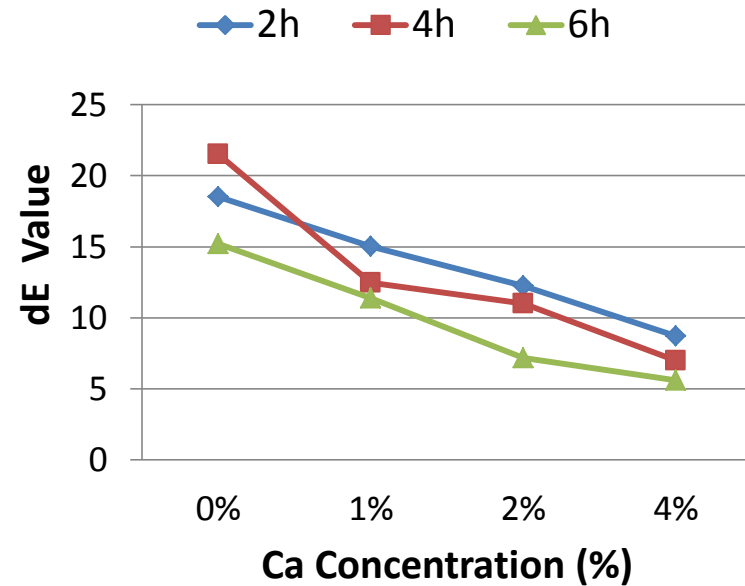
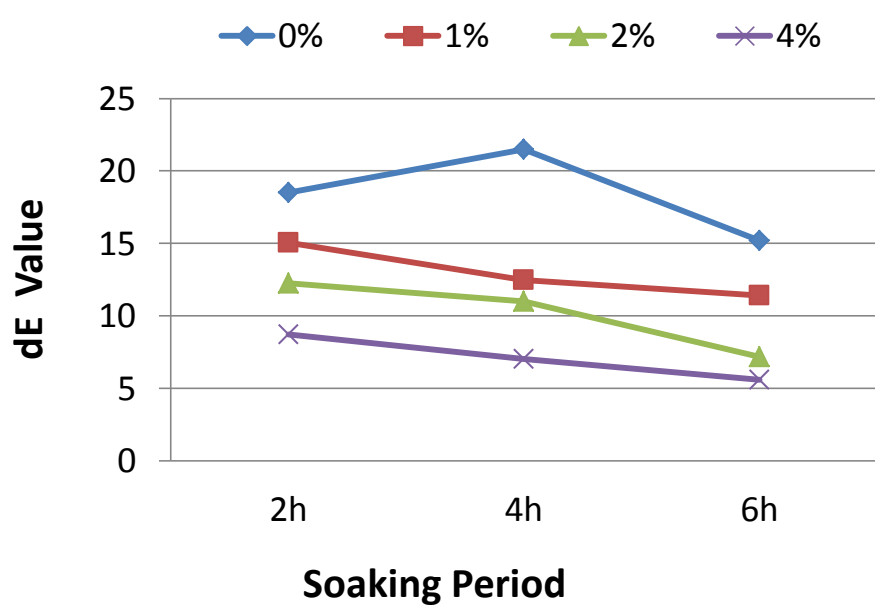
- Differences of lightness (dL) and total colour value were measured base on a bleached ginger sample which import from India.



- All the Lightness differences (dL) were mines except the sample which soaked for six hours in 4% lime concentration.

...RESULTS AND DISCUSSION

Value of dE decreased when increasing soaking period and lime concentration. It can be concluded that the soaking time period and concentration cause to improve the colour of bleached ginger.



CONCLUSIONS

- ❑ Oil in ginger is lost during the peeling and soaking of processing of bleached ginger.
- ❑ Lime concentration and soaking period are influenced on oil and oleoresin content of bleached ginger.
- ❑ High $\text{Ca}(\text{OH})_2$ concentration and long soaking periods improve the outer colour and oleoresin content of bleached ginger. However reduce oil content to some extent.
- ❑ Calcium concentration in the solution and soaking periods directly affect calcium content in bleached ginger.
- ❑ The optimum treatment combination was 4% Lime solution and 6 hrs of soaking among all treatment combinations for producing bleached ginger for the ayurvedic market.

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