

## Training on the Utilization of Lime to Empower the Lime Farmers in Bolo Village, Gresik

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### Abstract

Lime (*Citrus aurantifolia* (Christm.) Swingle) is one of the important agricultural commodities for residents in the Bolo village, Gresik. The resident of Bolo Village owns an average of 1/4 hectare of lime plantations. However, the price of lime is not stable. In the harvest season, when conditions become surplus in the market, lime prices often drop, causing losses for the farmers. Lack of knowledge about lime product processing is also an obstacle in the utilization and processing of crops. This community service activity aims to improve the knowledge and skills of citrus farmers in Bolo Village to utilize and process lime crops into Home Industry products, so they do not suffer losses when the lime price drops. Activities are carried out through learning using interactive lecture methods and training through product manufacturing demos. The successful indicator was carried out by evaluating the participants' level of understanding before and after the activity. The training activities significantly increased the participants' knowledge and experience. In addition, this activity also obtained data on the needs of lime farmers. It is hoped that this data can be used for the continuation of the next activity or can also be used by the local government, which wants to help advance agriculture and product diversification in the village of Bolo.

**Keywords:** Lime Farmers; Gresik; Home industry; SDGS; medicine

### Abstrak

Jeruk nipis (*Citrus aurantifolia* (Christm.) Swingle) merupakan salah satu komoditas pertanian penting bagi warga di desa Bolo, Gresik. Rata-rata warga Desa Bolo memiliki 1/4 hektar tanah yang ditanami jeruk nipis. Namun harga jeruk nipis ini tidak stabil. Pada musim panen dimana kondisi menjadi surplus di pasaran seringkali harga jeruk nipis menjadi anjlok sehingga menimbulkan kerugian bagi para petani di sana. Kurangnya pengetahuan mengenai berbagai cara dalam pengolahan jeruk nipis menjadi produk bernilai jual juga menjadi kendala dalam pemanfaatan dan pengolahan hasil panen. Kegiatan pengabdian masyarakat yang dilakukan ini bertujuan meningkatkan pengetahuan dan ketrampilan petani jeruk di Desa Bolo ini untuk dapat memanfaatkan dan mengolah hasil panen jeruk nipis menjadi produk Industri rumah tangga (IRT) sehingga tidak mengalami kerugian saat harga jeruk anjlok. Kegiatan dilaksanakan melalui pembelajaran menggunakan metode ceramah interaktif dan pelatihan melalui demo

pembuatan produk. Keberhasilan pelaksanaan kegiatan dilakukan dengan mengevaluasi tingkat pemahaman peserta sebelum dan sesudah kegiatan. Kegiatan ini juga memetakan materi edukasi dan sarana prasarana yang dibutuhkan oleh petani jeruk nipis untuk meningkatkan produktivitas hasil pertanian mereka. Kegiatan pelatihan yang dilakukan mampu meningkatkan pemahaman peserta secara signifikan. Selain itu, dari kegiatan ini juga diperoleh data kebutuhan para petani jeruk Nipis. Data ini diharapkan dapat digunakan oleh untuk keberlanjutan kegiatan berikutnya ataupun juga dapat digunakan oleh pemerintah setempat yang ingin membantu memajukan pertanian dan diversifikasi produk di desa Bolo.

**Kata kunci:** Petani Jeruk nipis; Gresik; Industri rumah tangga; SDGS; medicine

## INTRODUCTION

Lime (*Citrus aurantifolia* (Christm.) Swingle) is a species in the family Rutaceae that grows widely and is widely consumed worldwide, so it has economic importance. Lime fruit has smooth, thin skin, yellow green in color, and the water from the flesh is very acidic with a distinctive aroma and taste (Campelo *et al.*, 2014; Lv *et al.*, 2015). Therefore, this fruit is mostly consumed in fresh condition. Ripe fruit will turn yellow and soft and will be easily damaged during storage (Alhassan, Adjei and Mohammed, 2014).

Lime has also been used as functional food and drink because it has potential in medicine and diet. Some examples of its use are to prevent the formation of kidney stones, antioxidants, lower blood pressure, and cough suppressant (Lin *et al.*, 2019). Lime has a very large essential oil content and can be used for various purposes; for example, it is used as a flavoring in several goods, such as beverages, soaps, cosmetics, and household products. In addition, its essential oil has antimicrobial, antifungal, antibacterial, and antiparasitic properties (Estevam *et al.*, 2016). Chemical constituents in lime besides vitamin C are polyphenol and carotenoid compounds which have various pharmacological activities related to their antioxidant properties. Unfortunately, this antioxidant property also causes its stability to be very easily damaged during storage and processing (Lin *et al.*, 2019).

For this reason, product development from lime must pay attention to the stability of its antioxidant content. In addition, it increases the shelf life of lime. The drying process can improve the shelf life of the fruit. Various drying methods can suppress moisture content and retain nutrients. For example, a study by Kumari (2016) stated that reducing the humidity level to 8% required a minimum drying time of 27 hours at 45 °C (Kumari and Bandaranayake, 2016). Processing products using natural preservatives (e.g., high sugar content) can also be an alternative to suppress microbial growth to avoid spoilage.

Based on the considerations that have been described regarding the lime commodity, the goal of community service from the Department of Pharmaceutical Sciences, Faculty of Pharmacy, Airlangga University, is to empower the community of lime farmers in Bolo Village, Gresik by disseminating knowledge based on scientific data through training activities.

## GENERAL DESCRIPTION OF THE COMMUNITY, PROBLEMS AND TARGET SOLUTIONS

### General description

Bolo Village, Ujungpangkah District, Gresik, East Java Province, a partner in this activity, is known as one of the lime-producing areas. Bolo Village is a village that borders the ocean and rice fields and has a population of 3375 people with a total of 900 families. The productive age of the residents is 48% and 879 people are farmers.

Bolo villagers have an average of 1/4 hectare of land planted with lime. In the village of Bolo, some farmers work on their land or as sharecroppers. They chose lime cultivation and left rice cultivation because of the losses caused by rat pests that damaged their rice plants. At first, lime is a commodity that is quite promising. The price of lime can reach Rp.10.000 - Rp.15.000 /kg, but if there is a harvest surplus, the price of lime drops to around Rp. 5.000 - Rp. 6.000 /kg. Under these conditions, farmers want to diversify lime into home industry products so that they do not experience losses if the price of lime drops.

### Problem

At the initial meeting, lime farmers, who are partners in this activity, were very interested in processing limes into commercial products. However, there are several obstacles faced, such as:

1. Lack of knowledge about the benefits and potential of lime
2. Lack of knowledge of product innovations made from lime
3. Lack of knowledge and skills on how to process limes into commercial products

### Target solution

To help and empower lime farmers in Bolo Gresik village, the team carried out educational and training activities to improve the knowledge and skills of the local community to develop lime commodities as local wisdom in their area.

The SDGs targets to be achieved are:

- SDG3: ensure healthy lives and promote well-being for all ages through education on the use of lime in supporting health based on scientific evidence.
- SDG8: promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all through education and training on the empowerment of lime farmers in improving the family economy.
- SDG12: ensure sustainable consumption and production patterns through education and training on processing limes into home industry products to extend the shelf life of lime-based products.

### METHOD

The method used in this activity is education and training, which is appropriate to increase knowledge and skills in community empowerment. This activity targets lime farmers in Bolo Village, Ujungpangkah District, Gresik Regency.

The approach method used in the process of implementing this activity is:

- 1) Survey to identify the situation and needs of lime farmers

- 2) Provide education to increase understanding about the use of lime
- 3) Training on creating lime products

Evaluation of the achievement of performance indicators for implementing activities use a before (pre-test) and after (post-test) questionnaire. In addition, participants were asked about topics related to knowledge about the development of lime products and the participants' responses about the characteristics of limes, the stability of compounds and nutrients in limes, food additives (BTP) that can be used in the home industry products, and about regulations.

## RESULTS AND DISCUSSION

This activity is an implementation of community service from the Department of Pharmaceutical Sciences, Faculty of Pharmacy, Universitas Airlangga, with the title "Education and Training on the Use of Lime as a Home Industry Product in Bolo Village, Gresik as a Strategy for Strengthening Community Partnerships in Achieving SDGs Goals." This activity was carried out on August 10, 2022, at the Sumber Terang Islamic Boarding School, Bolo village, Ujungpangkah, Gresik. This activity was attended by 46 participants, 46% male, and 54% female. All participants are villagers of productive age, 68% of participants are 20-30 years old, 27% are 31-40 years old, and the remaining 2% are over 41 years old.

The number of participants interested in developing limes is quite large, with 80% of participants wanting to learn to process limes into commercial products. A total of 6 participants have made several kinds of product innovations from lime. Several products that want to be developed from lime are drinks, soaps, food, cakes, syrups, jams, and beauty products such as masks and skin care.

Education was conducted to increase knowledge about the benefits and potential of lime, various product innovations made from lime, and how to process lime into commercial products.

The participants' knowledge was measured using a questionnaire given before (pretest) and after (posttest) of the activity. The comparison of the results of the participants' achievements in the pretest and posttest can be seen in table 1.

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**Table 3.** Participants' achievements in the pretest and posttest

Question	score	
	Pretest	Posttest
<b>1) Lime characteristic</b>		
Mention 2 types of lime varieties sold in the Indonesian market!	80,6	80,6
What ingredients cause discoloration in lime products?	61,1	94,4
Fruit peel is the cause of the bitter taste in lime (T/F)	97,2	97,2
Lime can be used as an ingredient in cosmetics or food products because it contains high antioxidants (T/F).	97,2	100,0
<b>2) The stability of lime constituents</b>		
How do you add lime juice to a beverage production process that uses boiling method?	66,7	97,2
Boiling lime with hot water several times can reduce the bitter taste in lime products (T/F)	50,0	41,7
The heating process can increase the content of active compounds in lime (T/F)	44,4	75,0
To maintain stability during storage, bottles are filled with product without remaining space (T/F).	38,9	77,8
The production of dried lime slices is carried out by drying at a temperature of approximately 100°C (T/F).	22,2	50,0
<b>3) Food additives for lime product</b>		
What is a food additive used to prevent microbial growth?	94,4	55,6
What are the other functions of sugar other than as a sweetener in syrup products?	47,2	91,7
If you want to add artificial sweeteners to your product, you must write: "contains artificial sweeteners" on the packaging (T/F)	83,3	97,2
<b>4) Regulation</b>		
Where will you register to get a PIRT license number?	38,9	50,0

Table 1 shows that the knowledge of most participants increased by 9-100% in the posttest compared to the pretest. The average pretest score of the participants was 58.55 while the posttest average was 72.01, so in general, the participants' average score increased by 23%. To improve the skills of the participants in processing limes, the training activity was to conduct a demonstration of the process of making several products from lime. Some of the products made during the training can be seen in Figure 6.

The main problem related to the development of lime products is the instability of their chemical content, especially vitamin C. This instability is caused by exposure to oxygen or heat during processing. Some of the ways that can be done to prevent damage to the vitamin C content in limes are to dry them at low temperatures for a short time. Based on research conducted by Zou et al., 2016, vitamin C decreased exponentially when oranges were heated at 100-120 C. Vitamin C was not even detected when limes were exposed to that temperature for 1.5 hours. Therefore, drying/heating of limes should be carried out at temperatures below 60°C (Zou et al., 2016).

Another problem with processing lime is the bitter taste that occurs due to storage and processing. The bitter taste can cause a decrease in the quality, consumer acceptance, and economic value of fruit-based products (Li et al., 2019; Suri et al., 2022). Various metabolites in

lime fruit have a bitter taste, such as naringin, tangeretin, nobiletin, sinensetin, quercetin, limonin, nomilin and neohesperidin. The dominant bitter taste comes from naringin/naringenin and limonin (Fajarika and Noor, 2015; Kore and Chakraborty, 2015).

From the research results, the basic principles for reducing the bitter taste in oranges include i) removal of the bitter compounds naringenin and limonin, ii) removal of pith/pectin from the structure of citrus fruits, iii) flavor enhancers and the use of bitter reducing compounds (salt, sugar, florisol), iv) processing with enzymatic assistance (addition of naringinase and -l-rhamnosidase enzymes) which can break down bitter compounds, and v) use of genetic engineering techniques to modulate the synthetic pathway of bitter compounds (Purewal and Sandhu, 2021). Among these methods, the addition of bitter reducer compounds and removal of pith/pectin is possible in the home industry.

## **CONCLUSIONS AND SUGGESTIONS**

The empowerment of lime farmers in Bolo Village, Gresik, is carried out through educational activities through lecture methods, discussions, and product processing training. This activity can increase participants' knowledge about the general character of lime, the stability of compounds and nutrients of lime, and Food Additives (BTP) that can be used in IRT products regarding the regulation of home industry products (IRT). However, more comprehensive education efforts are needed to improve the understanding and skills of farmers, especially regarding lime processing techniques that can retain beneficial compounds/nutrients and reduce their bitter taste.

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