Quality control and production targets at the research center for orange and subtropical fruit city Batu City, East Java

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ABSTRACT: The purpose of this study was to describe the quality control and production targets of tangerines (Citrus reticula). The activity was carried out on March 02, 2020 to March 20, 2020 at the Research Institute for Citrus and Subtropical Fruits, Batu City, East Java Province and Supervised Street Vendors were carried out on June 1, 2020 to June 06, 2020 which were carried out virtually or online. The sub-achievements of students are able to control quality and production targets consist of 2 activities, namely organoleptic testing on citrus juice drinks and quality control of tangerines. The quality control of tangerines includes three stages, namely quality control before the production process, quality control during the production process, and post-harvest quality control of tangerines.

Keywords: citrus reticula, production target, quality control

INTRODUCTION

Tangerines are a term for oranges belonging to sweet oranges. The name of this tangerine is popular among the people of Java, Sunda and Madura. This orange is actually very popular among the people of Indonesia and the world, it’s just that the name tangerine which is only known in some areas makes this orange sound foreign. Andosols in Indonesia have an important role for the welfare of farming communities living around the mountains who generally use this land for farming vegetables, fruits, ornamental plants or plantations, especially on tangerine plantations. Andosol soil is one of the requirements for a good type of soil for the growth of tangerines. This soil is classified as a variable charged soil, soil pH is generally low to neutral, and high phosphate retention, pH (NaF) is between 9 to 12 which indicates that this soil has a high positive charge. Soil texture between sandy loam to dusty loam, high organic matter content, low bulk weight, very high water holding capacity, less plastic and non-sticky, irreversible if the soil mass is drying and the porosity/infiltration capacity is high (Setiono, 2014).

Oranges are a very promising fruit commodity. The national demand for citrus fruits is very high, but national production has not been able to meet the demand. Most of these needs are met by importing from abroad. Currently, Indonesia is the second largest citrus importing country in ASEAN after Malaysia, with an import volume of 94,696 tons (Agricultural Research and Development Agency, 2005). This condition is very ironic, considering that Indonesia has citrus cultivars that have superior properties that have the potential to be developed (Balijestro, 2020b). For example, the Tawangmangu orange (Citrus reticulata Blanco ssp Tawangmangu) is a superior fruit plant originating from the Tawangmangu area, Karanganyar, Central Java. The superiority of the Tawangmangu tangerines is stated in the Decree of the Minister of Agriculture Number: 456/Kpts/PD.210/9/2003 concerning the Release of Tawangmangu Tangerines as Superior Varieties dated September 15, 2003. These superior characteristics include good quality, easy peeling, attractive fruit appearance, sweet taste, high production and potential to promote and introduce local fruits to a wider audience. The distribution of this plant covers the Karanganyar, Magetan, and surrounding areas. Tawangmangu oranges experienced a heyday in 1980-1983 (Nafisah, 2013).

However, the Tawangmangu oranges experienced gloomy times a few years later due to the attack of Citrus Vein Phloem Degeneration (CVPD) starting in 1984 (Sutopo, 2013) until almost all of the Tawangmangu citrus plants died, even today it can be said to be extinct (Azelina Rizki et al., 2021). This disease can persist
for decades in the soil so farmers are very afraid to plant citrus trees again. This condition dragged on until around 1996 began research to restore Tawangmangu as the center of Tawangmangu citrus (Yolanda, 2016). Efforts to restore the glory of the Tawangmangu orange began to be carried out again around 2000 by replanting using seeds from the Malang research center. These seeds came from the parent tree of the Citrus and Subtropical Fruit Research Institute (Balijestro) collection which was taken from Tawangmangu before the spread of CVPD in 1984. This was based on the idea that all parent trees in Tawangmangu had died from CVPD disease or were destroyed due to CVPD. Some citrus farmers said that the Tawangmangu oranges produced by seeds from Malang had slightly different characteristics from the Tawangmangu oranges planted in the 1970s. The purpose of this study was to describe the quality control and production targets of tangerines (Citrus reticula).

**METHOD**

The activity was carried out on March 02, 2020 to March 20, 2020 at the Research Institute for Citrus and Subtropical Fruits, Batu City, East Java Province and Supervised Street Vendors were carried out on June 1, 2020 to June 06, 2020 which were carried out virtually or online (Polinela, 2020) (Utoyo & Yolanda, 2018) (Yolanda et al., 2021).

The methods of managing the production process include: potting or preparing citrus seedling planting media, installing mulch on citrus mounds, planting tangerines, fertilizing tangerine trees, embroidering tangerine trees, doing sanitation in citrus gardens. tangerines, spraying fungicides and insecticides for tangerines, trimming tangerine tree branches, and thinning citrus fruit plants (Wachjar et al., 2009) (Balijestro, 2014a). The methods for managing and procuring production inputs include: preparing enters or scions of citrus plants, carrying out potting activities or preparing planting media for rootstocks for citrus seedlings, and trimming leaves on citrus seedlings (Balijestro, 2014b) (Balijestro, 2019).

**RESULT AND DISCUSSION**

**Organoleptic test on orange juice drink**

Organoleptic test or sensory test or sensory test itself is a test method using the human senses as the main tool for measuring product acceptance. Organoleptic testing has an important role in the application of quality. Organoleptic testing can give an indication of spoilage, deterioration and other defects of the product. Organoleptic tests were carried out on 14 samples of orange juice drinks. Organoleptic test variables, including color, aroma, taste, age of panelists, gender of panelists, appearance, sweetness, sour taste, texture of the mouth, liking, suitability for sale (Balitbangtan, 2015).

A. Quality control of tangerines

Quality control activities include three stages of the process, namely quality control before the production process, quality control during the production process, and post-harvest quality control.

1. Quality control before production process

The first stage of quality control focuses on production facilities and equipment (SAPRODI) and production inputs. One form of production input is tangerine seeds. Quality tangerine seeds will produce quality oranges. Good quality seeds have criteria, namely the results of grafting from Paste Eyes Multiplication Block (BPMT) on Japanske Citroen (JC) rootstock in polybags, labeled, and normal growth and roots (Balijestro, 2020a).

Quality citrus seeds are seeds that are free from seven kinds of systematic pathogens, namely Citrus Vein Phloem Degeneration (CVPD), Citrus Tristeza Virus (CTV), Citrus Vein Enation Virus (CVEV) which are vector-borne and non-transmitted vectors, Citrus Exocortis Viroid (CEV), Citrus Psorosis Virus (CPsV), CcaV and CTLV. The criteria for quality citrus seeds according to (Balijestro, 2020b) are:

a) Free from seven kinds of systematic pathogens
b) Breeding or seed production according to standard procedures  
c) Citrus seeds labeled or certified from BPSB (Seed Supervisory and Certification Center)  
d) Varieties clear or similar to the parent (Commercial Seed Multiplication Block)  
e) Orange seeds reach a height of approximately 50 cm  
f) Healthy roots are not bent

2. Quality control during the production process

Quality oranges are not only influenced by superior seeds, but actions during the production process also affect good citrus yields. (Balijestro, 2014b) explains that quality control during the production process is influenced by site selection, land preparation, and plant maintenance.

a) Location selection
Oranges with tangerine varieties produce optimally if planted in the lowlands (approximately 400 m asl) with a temperature of 13-35˚C, rainfall of 1,000 – 3,000 mm/year (optimum 1,500 – 2,500 mm/year).

b) Land preparation
The land preparation process starts from land preparation and mounds are made. The mounds were made with a size of 1 x 1 m with a mound height of 10 cm and a spacing for tangerines of 5 x 4 m². The process of land preparation is better done approximately one month before the planting period. A good planting period is at the beginning of the rainy season, because at the beginning of the rainy season the water needs will be quite fulfilled. The mounds that have been then applied with plastic mulch with the installation time are done one week before planting the kerpok orange seeds. Installation of plastic mulch as a form of pest control, namely weeds, because the presence of plastic mulch will increase weed growth.

c) Plant maintenance
There are several quality control activities at the plant maintenance stage, namely:

a. Fertilization
The form of quality control during the fertilization process is more directed at the type of fertilizer given, the amount of fertilizer dose, the time and method of applying fertilizer that is adjusted to the type of citrus variety.

The right way of application for tangerine plants aged 1-2 years is to apply drum fertilizer and dolomite which is spread under the canopy at the end of the dry season, then mixed with soil to a depth of 10 cm. The following year manure mixed with lime was put into a circular ditch below the edge of 20 cm. Chemical fertilizers are applied after the kendang, lime and soil fertilizers undergo a complete reaction (about 4 weeks). The close application time between chemical fertilizers and manure will cause a negative reaction. In addition to manure and chemical fertilizers, tangerine plants also need micro fertilizers. The micro fertilizer required is less than chemical fertilizers and Kandan, by spraying it in the morning 2-3 times at the time of budding

b. Fruit thinning
Thinning fruit is one form of quality control of tangerines. This is intended to arrange the fruit in one bunch so that the fruit does not grow crowded so that the fruit develops optimally and the fruit color is uniform. The way to thin the fruit is to leave 2 pieces per bunch using pruning shears. The criteria for discarded fruit are defects, diseased pests, and the smallest size.

c. Harvest
The right harvest for tangerines is when the fruit is ripe and has not yet entered the final phase of fruit ripening. Characteristics of fruit that is ready to be harvested or ripe, namely:

a) If the massage is not hard;  
b) The bottom of the fruit when massaged feels soft and if it is flicked with a finger it does not make a loud sound;  
c) Attractive color (yellow color appears)
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Quality control at harvest according to Balitjestro (2011), namely:
a) Harvesting is done in the morning (06.00 – 07.30 WIB)
b) Fruit stalks should not be too long so as not to injure other citrus fruits so they must be cut and left about 2 mm from the fruit.
c) Harvesting fruit on tall trees must use a ladder, so that branches and twigs are not damaged.
d) It is not recommended to harvest by climbing trees when the feet are dirty, because it can spread disease on trees.
e) The fruit container is made of soft, clean material, and the fruit is placed slowly.

A. Post-harvest quality control
The form of post-harvest quality control can be done by sorting, grouping or grading, waxing, and storing.
1) Sorting
Sorting or selection is one of a series of post-harvest activities that are generally carried out in the packing ward or in the garden with the aim of separating the suitable and unfit fruit. The criteria for suitable and unfit tangerines can be seen in Table 1.

<table>
<thead>
<tr>
<th>Fruit criteria</th>
<th>Worthy</th>
<th>Not feasible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>Relatively uniform</td>
<td>Relatively non-uniform</td>
</tr>
<tr>
<td>Color</td>
<td>Yellow color on the skin evenly</td>
<td>Uneven skin yellow color</td>
</tr>
<tr>
<td>Fruit skin type</td>
<td>Smooth, no traces of pest attack, dull dotted disease</td>
<td>It's not smooth, there are scars from pest attacks, dotted and dull</td>
</tr>
</tbody>
</table>

Sorting is done to meet the quality requirements set by the government or the market. Sorting is done by:
a. Citrus fruits are washed with running water to clean dirt and pesticides that are still attached to the surface of the fruit skin.
b. The fruit is soaked in water mixed with 0.5-1% detergent or cleaning liquid, then rubbed gently using a soft cloth or soft brush so as not to damage the skin.
c. The fruit is rinsed with clean water, dried using a soft and clean cloth or drained.

1) Grouping or grading
Grouping or grading aims to classify fruit based on quality, namely: size, weight, color, shape, texture, and freedom of fruit from dirt or foreign materials. The government's role is not only limited to marketing. Determination of fruit standardization, which includes fruit quality, is based on the Indonesian National Standard (SNI) which classifies citrus fruits into 2 quality classes based on the weight or diameter of the fruit. SNI quality requirements for tangerines can be seen in Table 2.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Quality I</th>
<th>Quality II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Similarity of varietal traits</td>
<td>Uniform</td>
<td>Uniform</td>
</tr>
<tr>
<td>Aging level</td>
<td>Old, but not very ripe</td>
<td>Old, but not very ripe</td>
</tr>
<tr>
<td>Violence</td>
<td>Hard</td>
<td>Hard Enough</td>
</tr>
<tr>
<td>Size</td>
<td>Uniform</td>
<td>Uniform</td>
</tr>
<tr>
<td>Max damage (number/number) (%)</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Dirt</td>
<td>Free</td>
<td>Free</td>
</tr>
<tr>
<td>Max rot (number/number) (%)</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

1) Wax
Wax coating on fruit actually replaces and adds to the natural waxy layer found in fruit which is mostly lost during handling because the wax coating that covers the pores of the fruit can suppress respiration and transpiration so that the fruit's shelf life is longer and its selling value is better.
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The wax conditions used are: does not affect the smell and taste of the fruit, dries quickly, is not sticky, does not break easily, is shiny and slippery, is thin, does not contain toxins, is cheap and easy to obtain. The conditions for the coated commodities are fresh (freshly harvested) and clean, healthy (not attacked by pests/diseases), and sufficiently aged. The most widely used wax is emulsified beeswax with a concentration of 4 – 12%. Types of wax that can be used include carnauba wax, shellac, beeswax (Cera vlava), sugarcane wax, spermaceti. How to apply wax in the form of an emulsion can be given by spraying, dipping, brushing and giving in the form of foam.

2) Storage
Citrus fruit storage aims to extend the usefulness, accommodate abundant harvests, provide citrus fruit throughout the year, assist marketing arrangements, increase financial profits, maintain the quality of citrus stored. The principle of storage treatment is to control the rate of respiration and transpiration, control or prevent disease and changes that are not desired by consumers.
Storage in a cold room (10˚C ± 2˚C) can reduce respiratory and metabolic activity, softening, water loss and wilting, damage due to microbial activity (bacteria, mold/fungus). The optimum temperature for citrus fruit storage is 5 – 10˚C. Stored oranges should be free from skin abrasions, bruises, rot and other damage. The temperature of the storage room is kept stable to get good results.

CONCLUSION
The sub-achievements of students are able to control quality and production targets consist of 2 activities, namely organoleptic testing on citrus juice drinks and quality control of tangerines. The quality control of tangerines includes three stages, namely quality control before the production process, quality control during the production process, and post-harvest quality control of tangerines.

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