



Source Identification and characteristics Genetics Power of Orange Plants



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Abstract

A concise and factual Morphological characteristic of some citrus plants (Citrus sp) in Bangli Regency. Citrus fruit plants are a small number of types of fruits that are cultivated in Bangli-Bali, starting from June to October 2020. This study aimed to find out information on the morphological characteristics of citrus plants found in the Bangli Regency. The research was conducted using a descriptive method. Sampling is not limited to each district that has been selected. The samples taken were a fruit, flowers, and leaves, then the samples were put into peanut envelopes before identification and characterization were carried out. Data collection and processing were carried out by describing morphological characteristics such as: stem shape, fruit, flowers, and leaves of citrus plants. The results of this study obtained 24 types of citrus plants in the Bangli Regency. They are differences in morphological characteristics of the diversity of citrus plants in the Bangli Regency. Kinship analysis of the 24 types of oranges that were sampled based on 30 characteristics, there is a very close relationship between Siamese citrus species and tangerines, based on fruit shape, namely the coefficient of similarity of 93%, a very far relationship is found in small fruit limes, namely the coefficient 50%.

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1 Introduction

Bali is rich in horticultural resources, especially fruit, but this wealth has not been utilized optimally. Fruit in Bali is not only used for consumption by residents but also for hotel needs related to Bali as a tourist destination, and to fulfill the religious ritual of the Hindu community in Bali. The use of fruits such as oranges must be done wisely to ensure continuity of supply while maintaining and improving the quality of tropical fruits. The genetic resources of tropical fruits are very abundant and have different characteristics from those in other regions. The genetic resources of local fruits such as oranges are all types and varieties of fruits that have been developed and cultivated in a certain area so that they become typical that area local citrus fruit is one of the genetic resources with great potential that has not been exploited to realize the integration of agriculture and tourism (Rai *et al.*, 2013). Regional Regulation No. 3 of 2013 needs to be realized so that germplasm as a source of local Balinese fruits is protected and its development can be carried out as well as possible. The development action taken is one of the obligations to maintain the balance and welfare of nature because nature is a place and source of life for human life. Therefore, all types of genetic resources owned must be preserved from generation to generation (Mace & Lande, 1991). One of the important things stated in the Local Fruit Protection Regulation is the need for the Bali Provincial Government to empower and protect genetic resources and local fruit products through integration activities with tourism.

Citrus fruit plants which are included as local fruit are one of the genetic resources with great. The local citrus fruit of the island of Bali is spread throughout the regencies in Bali. Bangli Regency is a district that produces local fruits that have not been explored and recorded properly. This research will identify horticultural fruits. Horticultural fruit is a plant product derived from the development of continuous fusion of pollen and pistil which is consumed fresh and cannot be stored for a long time (Garropha, 2013). Identification and characterization of local citrus fruits in the Bangli Regency were carried out by exploration. potential that have not been cultivated to realize the integration of agriculture and tourism (Rai *et al.*, 2013). Regional Regulation No. 3 of 2013 needs to be realized so that germplasm as a source of local Balinese fruits is protected and its development can be carried out as well as possible. The development action taken is one of the obligations to maintain integration activities with tourism. the balance and welfare of nature, because nature is a place and source of life for human life (Benjamini *et al.*, 2001; Prinz *et al.*, 2007; Lamont, 1998). Therefore, all types of genetic resources owned must be preserved from generation to generation. One of the important things stated in the local regulations on the Protection of Fruits, especially the type of citrus plant, is the need for the Provincial Government of Bali to empower and protect genetic resources and citrus fruit plant products.

Especially citrus fruit plants on the island of Bali, are scattered in the Bangli district in Bali. Bangli Regency is a district that produces local fruits, especially citrus fruits which have not been explored and recorded properly. This research will identify local horticulture fruits, especially citrus fruit. Horticultural fruit is a plant product that comes from the continuous development of the fusion of pollen and pistil which is consumed fresh and cannot be stored for a long time (Adelianie, 2015). Identification and characterization of local fruit, especially citrus fruit plants in Bangli Regency were carried out by exploration. Exploration is field exploration to gain more knowledge about the situation, especially the natural resources found in that place. The data collected is expected to be the initial database for the protection of the genetic resources of citrus fruit plants in Bali, especially in Bangli Regency. After collecting local citrus fruit data in the field, geographic mapping of genetic resources was carried out as a basis for the protection, preservation, and development of citrus fruit crops in the Bangli Regency (Liu *et al.*, 2003; Auran *et al.*, 1995). The objectives of this study are: 1) to identify the plant morphology includes canopy, stem, leaf, flower, and fruit, 2) identify the character

possessed by each type of citrus fruit plant, so that it becomes an attraction and can be a characteristic that distinguishes the types of citrus fruit plant varieties one another.

2 Materials and Methods

Research place and time

The research was carried out for six months, from June to December 2020. This research was carried out in the Bangli Regency, which consists of four sub-districts, namely: Bangli District, Susut District, Kintamani District, and Tembuku District.

Materials and tools

The materials and tools used include a camera, altimeter, Global position system), ruler, razor blade, loupe (magnifying glass), knife meter, label paper, plastic, zatiobstationery, book for identification, and characterization entitled flora (Swamy, 2012).

Research implementation

The implementation of the research consisted of three stages of activities, namely, (1) secondary data collection, (2) primary data collection, (3) identification of morphological and agronomic characters of genetic resources, identification of the growing environment, and knowing the benefits of each citrus fruit already identified

1) Secondary Data Collection

Secondary data collection aims to obtain initial information about the genetic resources of citrus fruit plants and their distribution in the Bangli Regency. Secondary data were collected from various agencies and sources such as: statistical data, annual reports, literature, and publications that reveal the genetic resources of citrus fruit plants in Bangli Regency.

2) Primary Data Collection:

a) Direct observation Data collection by visual means.

Based on the data and information obtained from the secondary data above, a survey (field observation) was conducted to find the types of genetic resources of citrus fruit species in Bangli Regency which included the location where they were found (Village, District), growing environment (yard, dry field, rice fields, plantations forests).

b) Interviews, Interviews were conducted by direct question-and-answer with farmers or citrus fruit plant owners who were met in the field.

3) Growing Environment and its Benefits

Identification of each citrus fruit plant genetic resource found in the field by collecting all information related to field conditions to obtain data directly related to geographic mapping, including the location of existence, growing environment, and geographical distribution, as well as the benefits or uses of this type of plant the citrus fruit.

Tabulation and data analysis

The data obtained is a list of citrus fruit plant species which includes primary data and secondary data, then tabulated and analyzed descriptively to fully describe to find each genetic resource of citrus fruit species found, including their distribution in the form of geographic distribution maps. Secondary data used to assess the superiority of commodities in each sub-district and district were analyzed by analysis of LQ (location quotient) Suryani (2020). The formulation of commodity LG in the sub-district area is described as follows:

$$LQ_{ij} = \frac{LQ_{ij}}{X_{ip} / X_p} \quad (1)$$

LQ_{ij} = LQ of commodity in the X_i sub-district X_{kj} = output of commodity in the sub-district X_{kj} = Total output/aggregate of similar commodities in the sub-district area.

X_{ip} = Output of commodity i in the sub-district area X_p = Total output/aggregate of similar commodities in the district area $LQ > 1$ is classified as a leading commodity and $LQ \leq 1$ is classified as a non-seeded commodity. Based on the LQ value method, a commodity is included as a superior commodity if the production of a commodity produced by a region/community is large and has been cultivated and cannot be separated from the life and welfare of the people in an area.

Identification, morphological characteristic, and agronomy of genetic resources of fruits

Identification means revealing or establishing the identity or identity of a plant, and in this case, the aim is to determine its correct name and its proper place in the classification system. Identification or determination of plants is the granting or determination of a scientific name or taxon to a plant specimen whose scientific name or taxon is not yet known (Dror et al., 2006; Shah & Patel, 2014; Singapurwa et al., 2017). Identification can be done in the following ways: 1. Equating with pictures in books or magazines 2. Using the key of determination found in books such as Flora for schools in Indonesia 3. Equating with living plants whose names are known in the Botanical Gardens or Botanical Gardens Identification key is a method or analytical aid or sentence structure in which a choice can be made between two opposing circumstances which will result in the acceptance of one option and the rejection of the other (Chipojola et al., 2009). Identification of morphological characters was compiled by observing tree characters (plant shape, branching, canopy width, plant height, stem height), leaf characters (leaf type, leaf shape, petiole length, leaf blade length and width, leaf color), character flower (where the flower grows, flower regional growth. In this analysis, the economic activities of an area are divided into groups, namely 1. Base Sector is an economic activity that serves the market in the area itself and outside the area concerned. 2. Non-Based Sector is an economic activity that serves the market in the area itself. The formula for calculating LQ is as follows: X_{ij} / X_{kj} $LQ_{ij} = X_{ip} / X_p$ $LQ_{ij} = LQ$ of commodity i in the sub-district X_{ij} = Output of commodity i in the sub-district X_{kj} = Total output/aggregate of similar commodities in the sub-district X_{ip} = Output of commodity i in the sub-district area X_p = Total output/aggregate of similar commodities in the district $LQ > 1$ indicates that there is a relative concentration in an area compared to the whole region. This means that commodity i in a region is a basic sector that has a comparative advantage. $LQ = 1$ is a non-basic sector, meaning that commodity i in a region does not have a comparative advantage. The production of commodities produced is only sufficient to meet their own needs in the region. $LQ < 1$ is a non-basic sector, meaning that commodity i in a region does not have a comparative advantage, the production of commodity i in that region cannot meet its own needs and must obtain supplies from outside the region. Commodities that produce LQ values > 1 are normative standards to be determined as superior commodities. if many commodities produce an LQ value > 1 , the degree of comparative advantage is determined based on the higher LQ value in a region, because the higher the LQ value, the higher the potential of the commodity (Meiningsih, 2010).

3 Results and Discussions

3.1 Overview of the research area

Bangli Regency is a regency in Bali that does not have a coastal area. The geographical location of Bangli Regency is between 115° 13' 48" to 115° 27' 24" East Longitude and 8° 8' 30" to 8° 31' 87" South Latitude, with an altitude of 100 - 2,152 m asl and rainfall ranging from 400 mm per year. Bangli Regency has the following administrative boundaries: Buleleng Regency (North) Karangasem Regency (East), Klungkung Regency (South), Gianyar Regency, and Mundu Regency (West). The total area of the Bangli Regency is 52,081 Ha or 9.25% of the total area of Bali Province 563,666 Ha). Administratively, Bangli Regency is divided into 4

sub-districts and 72 villages/kelurahan, namely: Susut, Bangli, Tembuku, and Kintamani Districts. The natural conditions are quite favorable for the development of horticultural crops and agro-tourism (Karsinah et al., 2007). Identification and characteristics of citrus fruit in Bangli, Regency.

The genetic resources of citrus fruit species were found based on combing in various places, which were spread over four sub-districts in Bangli Regency, the types of citrus fruit consisted of: Batu tangerine 55 (*Citrus reticulata* Blanco), Brastagi sweet orange (*Citrus reticulata*), Sweet Orange Valensia (*Citrus reticulata*), Slayer Orange (*Citrus reticulata*), Red and White Pomelo (*Citrus maxima* (Burm.) Merr), Varigata Sweet Orange (*Citrus reticulata*), Besakih Tangerine (*Citrus reticulata*). Brastagi orange, Valencia orange, Dekopon orange.



Figure 1. Siam Orange



Figure 2. Keprok orange

3.2 Type of featured citrus fruit commodities

Leading commodities are commodities that are cultivated based on competitive and comparative advantages supported by the use of appropriate technology with agroecosystems to increase added value and have a "multiplier effect" on the development of other sectors (Dalimartha, 2003). LQ (Location quotient) is a method to determine the ability of the Bangli Regency in the agriculture sector.

The LQ value of the Bangli Regency is obtained by comparing the average number of fruit production in the last five years of Bangli Regency with the average number of production of Bali Province in the last five years for citrus commodities. The District LQ value is obtained by comparing the average number of citrus fruit production in the District with the district average production for citrus commodities. The data sources used from BPS are Bangli in 2009-2013 figures and Bali in 2009-2013 figures, after going through the analysis stage, the data obtained are as in Table 1. Table 1 shows, Bangli Regency has two superior citrus fruits, namely Siamese oranges, and tangerines, this is indicated by the LQ value of each citrus fruit is more than 1, which is 1,85.

Table 1
Leading Commodities of Citrus Fruits in Regencies and Districts

No	Types of citrus fruit District LQ Value	LQ value of 4 sub-districts Kabupaten Bangli	District LQ Value			
			Susut Regency	Kintamani Regency	Bangli Regency	Tembuku Regency
1	Kepron orange	1,82*	0,89	1,82*	0,97	0,87
2	Siam orange	1,85*	0,83	1,83*	0,67	0,76
3	Limo orange	0,21	0,24	0,45	0,56	0,15
4	Brastagi orange	0,87	0,85	0,93	0,87	0,79

From the KQ value shown by Siamese oranges and tangerines, the LQ value is greater than 1 so it needs to be developed.

3.3 Agrotourism development potential

Considering the rapidly growing area of tourism development on the island of Bali in general and the Bangli Regency in particular, the need for horticultural food is increasing. In addition, the need for community fruits, tourism, and the needs of foreign markets make great potential to reach the export market. Therefore, the development of horticultural agriculture is very promising because all people cannot be separated from food sources such as fruits which are needed by the body as a source of vitamins. In addition, the rapid development of tourism in the Bangli Regency can make fruit commodities have great opportunities to be developed. This can be seen, among others, by the large number of imported fruits entering the traditional market and filling the tourism market. Therefore, the rich genetic resources of these local fruits need to be utilized as much as possible to meet the needs of these fruits (Ezeonu et al., 2001; Al-Qaradawi & Salman, 2002; Lehrner et al., 2005). The genetic resources of local fruits in the Bangli Regency that have the potential to be developed are citrus fruits and bananas, which until now the existence of citrus and banana plants is quite attractive for cultivation due to high market demand and high economic value. Other fruits that are classified as superior fruits in each sub-district in Bangli Regency also have the potential to be developed. This is done to maintain these superior fruits, including avocado, durian, guava, mango, pineapple, papaya, rambutan, salak, and sapodilla. The usefulness of each fruit in Bangli Regency is very diverse, this is evidenced by the life of the Balinese people cannot be separated from the existence of traditional ceremonies and religious rituals, to support religious ceremonies and rituals, Hindus in Bali mostly use local fruits that are produced by themselves. The fruits are used, among others, to make offerings or offerings, gebogan or pajegan, ajuman or sodan, sacred offerings, chess. One of them is a citrus fruit which has become an icon of Kintamani District, Bangli Regency, until now Siem Kintamani Oranges have entered the export market, inter-island, tourism market, and not a few locations become agro-tourism places (Sulistyo, 2011).

The problem in the field is the low level of human resources in the local community, causing these natural and cultural resources cannot be managed independently, even though if managed according to standards with adequate promotion, they can become very attractive and salable tour packages for tourists. Products produced by the community, such as agricultural products, due to insufficient quality and/or limited access, are not absorbed in the tourism market (hotels and restaurants). The selling price of agricultural products is very low, far below the prices prevailing in the tourism market. As a result, the economic benefits generated from tourism are not enjoyed by local communities but are mostly enjoyed by hoteliers and other tourism service entrepreneurs (Ashari, 2006).

3.4 Based on morphological characteristics

Morphological identification was carried out based on observations of 20 samples with 25 observation variables. While the anatomy is done based on 20 leaves from each tree sampled with 6 observation variables. The analysis was continued by using the cluster analysis method. Cluster analysis was used to analyze plant diversity and classification based on morphologically identified data and parameters. According to Hendayana

(2003), that group analysis or cluster analysis is a data analysis technique that aims to group individuals/objects into groups that have different properties between groups, so that individuals or objects located in one group will have relatively homogeneous properties. Data from observations on citrus plants there are various types of grouping with grouping/cluster analysis.

The close relationship between sample numbers in 20 samples of citrus plants is based on group analysis. In grouping, the distance from 0.0 to 0.1 is the Euclidean distance which states the properties. Euclidean distance is used because each feature has a comparable scale. The results of cluster analysis in Bangli Village showed that, on a scale of 0.492, nine groups were formed with different morphological diversity. At the end of the 0.835 scales, all accessions were combined into one group, each group represented by TM04 (group I), KA01 (group II), KA03, and (III) KA9. Based on the photo above, it can be seen that three accessions have different Euclidean distances, so it can be determined that three accessions have different main characteristics for a character.

4 Conclusion

- a) The results of field observations found 3 types of superior citrus cultivated in four sub-districts in the Bangli Regency.
- b) The citrus plant profile consists of 2 pieces. The profile concerns the morphological characters, production, and photographs of the genetic resources of citrus fruits.
- c) Based on the LQ value, Bangli Regency has 3 leading commodities, namely Oranges and tangerines and Siamese brestagi oranges. Oranges with the highest production of 10,967 tons/year were found in Catur Village, Kec. Kintamani.

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