ADAPTATION, PREVALENCE, AND POST-HARVEST SHELF LIFE OF SALAK CULTIVARS

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ABSTRACT

Salak (snake fruit) cultivars in production centers exhibit remarkable diversity, distinguished by variations in shape, aroma, taste, and skin color. However, the adaptation of each cultivar, the dominance of specific types, and the shelf life of the dominant cultivars remain poorly understood. This study aims to evaluate the adaptation and dominance of salak cultivars and analyze the shelf life of the most widely cultivated types. The research was conducted in villages recognized as salak development centers in Bali, using a survey method. Activities included collecting secondary data, field observations, sampling, interviews with farmers, and laboratory analyses. Surveys were conducted across agroecosystems at altitudes of 450–780 meters above sea level, with locations selected through purposive sampling. Type dominance (D) was calculated using the formula: D = (types found / total found) × 100%. Shelf life assessment of dominant salak types was conducted using a Completely Randomized Design (CRD) with four replications. The study identified 16 salak types: 16 types in Sibetan- Karangasem; 6 in Pupuan-Tabanan; and 4 in each of Tembuku-Bangli; Kerta-Gianyar; Petang-Badung; and Busungbiu-Buleleng. Among these, the Gulapasir cultivar demonstrated the widest adaptation and dominant, followed by Nangka, Nenas, and Gondok. No significant differences in shelf life were observed among these cultivars. After 7,5 days of storage, salak fruit began to deteriorate and eventually rot.

Keywords: *Adaptation, dominance, postharvest, salak, agroecosystem*

1. INTRODUCTION

The Balinese salak cultivar (Salacca zalacca var. Amboinensis) is a unique tropical palm that produces fruit botanically classified as drupes. The skin of the salak fruit is scaly, resembling snake skin. The nutritional value of salak is comparable to well-known fruits such as mango and apple due to its rich content of antioxidants, phenolics, vitamins, and minerals (Cepkova et al., 2021; Mazumdar et al., 2019; Hakim et al.,). Despite its remarkable nutritional and medicinal properties, salak remains underutilized and relatively unknown globally. To enhance market acceptance, selecting superior salak cultivars is essential to meet market demand and fulfill community nutritional needs.

Salak cultivars found in production centers exhibit significant diversity based on shape, aroma, taste, skin color, and cultivation location (Darmadi et al., 2002). Although 11 species of salak have been recorded (Darmadi et al., 2022), the Gulapasir cultivar is considered the most superior due to its sweet taste and higher price, which is four times that of Balinese salak (Sumantra et al., 2014; Sumantra and Martiningsih, 2016). Plant propagation using seeds has contributed to the emergence of new salak variants (Sumantra et al., 2012; Sumantra et al., 2023; Sumantra et al., 2024). The superiority of Gulapasir has encouraged cultivation in regions beyond Sibetan-Karangasem. However, farmers face challenges such as lower fruit quality and reduced prices for Gulapasir grown outside Sibetan-Karangasem.

Consequently, evaluation is not balanced to salak Gulapasir, which comes from outside Sibeta-Karangasem, and is worried that income and continuity production will take effect. Because that required capable research to answer the problem.

Balinese salak has been classified into two superior categories under the Decree of the Minister of Agriculture of the Republic of Indonesia (1994): Salak Bali and Salak Gulapasir. Gulapasir is highly sought after for its thick flesh and non-adherent seeds, making it ideal for both domestic and export markets.

Environmental factors and plant management significantly influence the adaptation of salak cultivars (Sumantra and Martininsih, 2018; Adelina et al., 2021; Kumar et al., 2020) and growth hormone (Prihastanti and Haryanti. 2022), water status and soil quality (Raharjo et al., 2022; Ritonga et al.,2018). Fruit quantity and quality are strongly influenced by environmental factors, including high water and nutrient content (Ashari, 2013; Lestari et al., 2011), altitude (Sumantra et al., 2014), and plant management (Sukewijaya et al., 2009).

Preliminary research indicates that Gulapasir salak from Sibetan-Karangasem has better fruit quality compared to other regions (Sumantra et al., 2012). The average shelf life of Gulapasir salak is six days, similar to Bali salak (Sumantra et al., 2016). Fruits stored beyond seven days quickly decay. Factors contributing to the short shelf life are not fully understood but may include climatic conditions, soil factors, or cultivation techniques.

The low fruit quality is due to traditional cultivation practices using very simple methods (Sumantra et al., 2023). Fertilization has not been conducted intensively (Ashari, 2002; Sukewijaya et al., 2009), nor has fruit regulation been implemented (Sumantra et al., 2024). Consequently, the weight and size of the fruit are not optimal, in addition to varying across seasons (Sumantra et al., 2023), and the fruit does not last long (Sumantra et al., 2016).

Information on various problems that support or hinder the production, both in terms of quantity and quality, of salak fruit in production centers outside Sibetan, Karangasem, is crucial to identify. Efforts to improve yields and fruit quality through extensification and intensification for the development of salak in regions outside Sibetan-Karangasem need to involve mapping phenotypes and genotypes, agroecosystems, potential mapping, harvest season mapping, and post-harvest handling processes. This will help discover improvement techniques and solutions for post-harvest management. The study aims to evaluate the adaptation and dominance of salak cultivars and analyze the shelf life of the most widely cultivated types.

2. RESEARCH METODOLOGY

The study was conducted in villages recognized as salak development centers in Bali, including Karangasem, Bangli, Gianyar, Badung, Tabanan, and Buleleng Regencies, using a survey method. Activities included collecting secondary data, field observations, sampling, interviews with farmers, and laboratory analyses. Surveys were conducted across agroecosystems at altitudes of 450–780 meters above sea level, with locations selected through purposive sampling.

Type dominance (D) was calculated using the formula: D = (types found / total found) × 100%. Shelf life assessment of dominant salak types was conducted using a Completely Randomized Design (CRD) with four replications. Salak plants with uniform growth levels, fruiting, and an average age of eight years were used in the study. Shelf life data were analyzed using variance analysis at a 5% significance level.

3. RESULTS AND DISCUSSION

3.1 Dominance and Adaptation of Salak Cultivars

Based on the data in Table 1, 16 salak cultivars were found in Karangasem, with Gulapasir salak being the most dominant (63.52%). In Tabanan Regency, six types were found, with Gulapasir salak remaining the dominant type (80.04%). In Bangli, Gianyar, and Badung, the Nangka cultivar was dominant, while in Buleleng Regency, Gulapasir maintained its dominance (48%).

Production areas in Karangasem Regency are concentrated in the Bebandem and Selat sub-districts, accounting for 58% and 39% of the total area, respectively. Limited cultivars were found in the districts of Bangli, Gianyar, and Badung.

In Karangasem Regency, 16 cultivars salak were found, with population dominant is salak Gulapasir, Nangka, Gondok, and Nenas (Table 1). Whereas limited cultivars were Injin, Gonong, salak barak, salak Bingin, and salak putih (Table 1).

In Bangli regency, the depelovment of salak located in Tebuku district, though reported plant salak is also found in the district Bangli, Susut, and the district Kintamani; however, cultivation no as intensive as is done in the District Tebuku. In Bangli regency found four types of salak (Table 1) In Gianyar regency, center development plant salak located in district Payangan. The type of salak found was Nangka, Gondok, Nenas and Gulapasir (Table 1). In Kabupaten Badung center development plant salak is located in Petang district. The type cultivated was salak Nangka, Gondok, Nenas and Gulapasir (Table 1). In Tabanan Regency, the cultivars salak dominant is salak gulapasir, then followed salak Nangka, Gondok, Merah, Nenas and salak putih (Table 1).

In Buleleng center development of plant salak is located in district Busungbiu, with the population the most found in the village Bongancina and its surroundings. Four type salak found in the area this the most salak Gulapasir then follow types of nangka, gondok, and nenas (Table 1).

Table 1. Salak Cultivars in development area in Bali

No	Cultivars Salak	Karangasem	Bangli	Gianyar	Badung	Tabanan	Buleleng
1	Gulapasir	+(63.52)	+(30.00)	+(20,0)	+(35,0)	+(80.04)	+(48.00)
2	Nangka	+(17.7)	+(40.00)	+(50,0)	+(50,0)	+(15.23)	+(39,62)
3	Nenas	+ (5.5)	+(10.00)	+(10,0)	+(10,0)	+ (0,10)	+(2,38)
4	Gondok	+ (12.7)	+(20.00)	+(20,0)	+(5.00)	+(2.28)	+(10.00)
5	Putih	+ (0.06)	-	-	-	+ (0.07)	-
6	Merah	+(0.10)	-	-	-	+(2.28)	-
7	Bingin	+ (0.09)	-	-	-	-	-
8	Injin	+ (0.01)	-	-	-	-	-
9	Sudamala	+ (0.06)	-	-	-	-	-
10	Layu	+ (0.01)	-	-	-	-	-
11	Gonong	+ (0.01)	-	-	-	-	-
12	Jake	+ (0.03)	-	-	-	-	-
13	Kelapa	+ (0.07)	-	-	-	-	-
14	Penyalin	+ (0.06)	-	-	-	-	-
15	Pade	+(0.06)	-	-	-	-	-
16	Muani	+(0.027)	-	-	-	-	-

Description: +: Found; - Not found ; (…): number in brackets percentage salak found with total plant salak in each district.

3.2 Shelf Life of Salak Fruit

The market development of salak faces challenges related to fruit susceptibility to damage and inadequate post-harvest handling. Table 2 shows weight loss percentages during storage. Salak Nangka from Pupuan-Tabanan exhibited the highest weight loss, followed by Tembuku-Bangli. Relatively similar weight loss percentages were recorded for salak Nangka from Busungbiu, Petang, and Payangan, while Sibetan recorded the lowest average weight loss (18.43%).

Table 2 shows the percentage of weight loss over a storage period, with no significant differences observed from Day 1 to Day 5. However, salak Nangka from Pupuan-Tabanan exhibited the highest weight loss, followed by salak Nangka from Tembuku-Bangli. Salak Nangka from Busungbiu, Petang, and Payangan demonstrated relatively similar weight loss percentages, ranging from 19,94 % to 20,56 %, while salak Nangka from Sibetan had the lowest average weight loss percentage of 18,43 %.

Table 2. Shelf life and weight loss of salak from two cultivars

Locations	Salak Gulapasir		Salak Nangka	
	Shelf Life (day)	Weight loss (%)	Shelf Life (day	Weight loss (%)
Busungbiu-Buleleng	6,2 ab	19,26	6,2ab	20,55
Pupuan-Tabanan	6,1 b	26,76	5,0 b	25,75
Petang-Badung	7,1 a	20,88	6,4 a	20,14
Payangan-Gianyar	6,5 a	35,00	6,5 a	19,94
Tembuku-Bangli	5,9 b	25,45	5,5 b	23,43
Sibetan-Karangasem	7,5 a	19,61	7,2 a	18,43
Average	6,55	25,49	6,13	21,37

Note: The number followed the sama letter shows not significant different at LSD 5%

Salak Gulapasir also experienced weight loss during storage. Payangan recorded the highest average weight loss, while Sibetan and Busungbiu exhibited similar averages (19.61% and 19.26%, respectively). This study indicates that the rate and extent of fruit weight loss are significantly influenced by the fruit's water content. A water content exceeding 74% affects the storage life of salak fruit (Tabel 1). Nangka lasted for an average of 6.13 days at room temperature, whereas Gulapasir had a slightly longer shelf life, averaging 6.55 days, ranging from 5.9 to 7.5 days, after which the fruit began to rot.

4. CONCLUSION

1. The study identified 16 salak types: 16 types in Sibetan- Karangasem; 6 in Pupuan-Tabanan; and 4 in each of Tembuku-Bangli; Kerta-Gianyar; Petang-Badung; and Busungbiu-Buleleng.
2. The Gulapasir cultivar demonstrated the widest adaptation and dominance, followed by Nangka, Nenas, and Gondok.
3. No significant differences in shelf life were observed among these cultivars. After 7,5 days of storage, salak fruit began to deteriorate and eventually rot.

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