The potential of local cassava yields as a food source in West Papua

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Abstract. Cassava is one of the staple foods and a source of food for the community. This study investigates the impact of various local cassava varieties on their growth and production. The parameters observed in this study include growth and yield indicators, stem diameter, plant height, total biomass weight in the ground, and fresh tube weight per plant. The study was designed using three treatments and three replications Randomized Block Design (RBD). Treatment consisted of varieties A, B, and C. The study results show that the total weight of biomass above ground was significant, with the highest weight of variety C at 4.15 kg, followed by B at 2.45 kg, and A at 1.78 kg. The fresh weight per plant has no significant differences, and the highest values were found in C (3.81 kg), followed by A (2.91 kg) and B (2.38kg). The local cassava varieties A, B, and C produced tuber quantities of 58.20 tonnes per hectare, 47.67 tonnes per hectare, and 76.16 tonnes per hectare respectively. Cassava production from these three local varieties has great potential to be developed as a food source for the community.

1 Introduction

Cassava (*Manihot esculenta* Crantz) is one of the most vital food crops globally, following rice, wheat, and maize. It is crucial for food security [1]. Cassava is a drought-tolerant crop that can thrive in regions with unpredictable rainfall [2]. Cassava grows well in various types of soil and still grows well in soil with low fertility [3]. Climate change has resulted in decreased food sources, cassava plants are one of the plants that contribute to food security because plants can adapt and survive in dry conditions and tubers can survive for a long time in the soil [4]. Cassava is a key food crop and a potentially important nutritional resource for developing nations in tropical and subtropical regions, as it provides a rich source of carbohydrates, vitamins, and protein [5]. Constraints that cause low cassava productivity include the unavailability of superior cassava cultivars, pest and plant disease attacks, poor post-harvest practices, and climate change that threaten cassava plant production and productivity [6]. Cassava productivity is still low because it has not implemented proper cultivation. Traditional local cassava farmers are very profitable by maintaining high genetic

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diversity in their plants for food security sources [7]. One solution to realizing food security is oriented towards utilizing local resource potential [8].

The study seeks to explore the potential of local cassava genetic resources for food diversification and to examine the diversity of three top local cassava varieties that could serve as viable options for farmers to cultivate.

2 Materials and methods

The research was conducted in Andai Village, Manokwari Regency, West Papua Province. The location was purposely selected with careful consideration. The materials and equipment used in the study included three local cassava cuttings, hoes, rakes, sickles, machetes, scales, plastic sacks, and stationery. The cassava cuttings were sourced from unregistered plants of the local community. Before planting, the land at the research site was cleared of all weeds. No pest or disease control measures were implemented during the study. The study was carried out using a Randomized Block Design (RBD), with 3 treatments each repeated 3 times, resulting in 9 experimental units. The variety was the treatment factor, with the treatment design consisting of: V1 (Variety A), V2 (Variety B), and V3 (Variety C). For plant observations, five plants were sampled per block, giving a total of 15 plants for observation.

Before planting cassava, the land is first cleaned from various dirt. During the research, no control of pests and plant diseases was carried out. Plant maintenance was carried out by cleaning weeds that grew around the planting area which was done manually. Planting of cassava cuttings was carried out in the afternoon so that the cassava cuttings did not experience dehydration. Plant cuttings were taken from healthy plant stems, before the cuttings were planted, they were first cut into pieces with a length of ± 15 cm. Cassava cuttings were planted using a tile system with a planting distance of 100 m x 50 m. The number of stem cuttings planted was 1 cutting per planting hole. If there are plant cuttings that do not grow or do not grow normally, replanting is carried out 2 weeks after planting

The parameters observed were environmental components including soil temperature around the plant, and soil pH around the plant, growth components including plant height and diameter, and yield components including the fresh weight of cassava tubers and the total weight of plants (tuber and upper part of the plant). The data collected from the observations were analyzed using analysis of variance (ANOVA) at the 5% significance level. If the F value from the ANOVA was greater than the F Table value, it indicated a significant difference between treatments, followed by the Duncan Multiple Range Test (DMRT) at the 5% level. To assess the degree of similarity between the three cassava varieties, Hierarchical Cluster analysis was used, and correlation analysis (Ilyas, 2013) was conducted to examine the relationship between the observation variables. To determine the influence of factors such as plant height, stem diameter, and total weight of the upper stalk (independent variables) on the base weight of tubers per plant (dependent variable), multiple regression analysis was performed using the automatic linear modeling feature in SPSS 23.

3 Results and discussion

3.1 Results of temperature and pH of soil around cassava plants

The results of the soil temperature around the cassava plants differed very little from the results on the soil around the variety A plants at a temperature of 30.40°C while the soil temperature around the variety B and variety C plants was 30°C (Fig.1).

This temperature difference is very small, so it is likely not to affect environmental conditions between treatments significantly. The results of the soil pH around the plants showed that the variety A and C plants had a pH (of 5.10 and 5.00), while the variety B plants had a soil pH around the plants of 5.60 (Fig.1). The results of the soil pH around the plants of all varieties were acidic but the pH of the variety B plants was higher and slightly closer to neutral than the variety A and variety C plants (Fig. 1). Soil pH is not a concern for farmers, as cassava is highly tolerant of low soil pH [9].

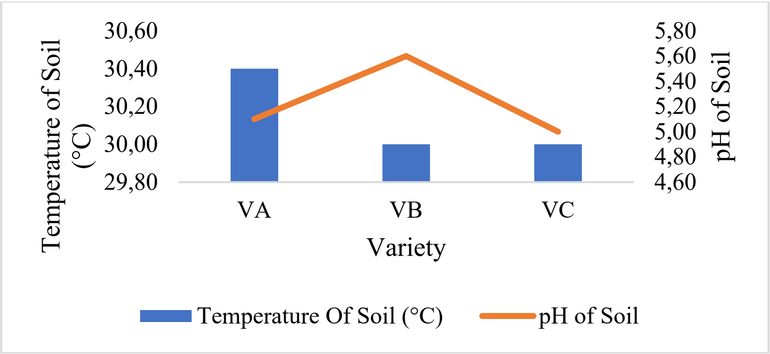

Fig. 1. Temperature and pH of Soil Around Cassava Plants

3.2 Results of analysis of stem diameter and plant height of cassava plant

The analysis results indicated that there was no significant difference in stem diameter among the different variety treatments (Fig.2). The highest stem diameter results were found in variety C (29.06 cm) followed by B (24.90 cm), and the lowest variety A at 20.97 cm. The analysis of cassava stem diameter with an error rate of 5% showed no significant difference with various treatments [10].

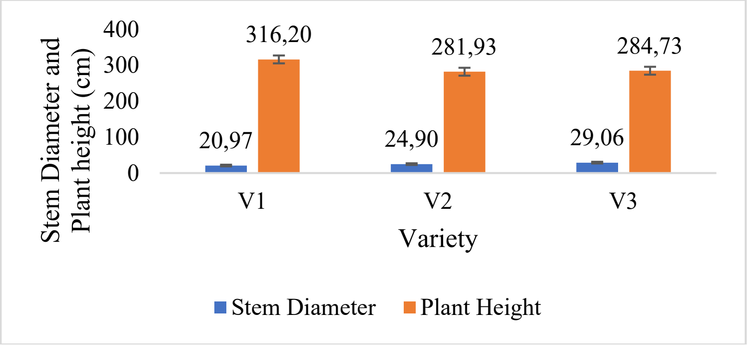

Fig. 2. Cassava Plant Stem Diameter and Height

The height of cassava plants did not show a significant difference across the variety of treatments (Fig.2). The highest plant height was recorded in variety A (316.20 m), while varieties B and C had lower values of 281.93 m and 284.73 m, respectively (Fig.2).

3.3 Results of analysis of total weight of the upper plant

The analysis results revealed a significant difference between cassava variety C and variety A, but no significant difference when compared to variety B. The highest total weight of the upper plant was seen in cassava variety C plants (4.15 kg), followed by variety B plants (2.45 kg), and the lowest results were in variety A plants at 1.78 kg (Fig.3). The study by [11] found a significant impact of variety treatment on the weight of scaffolding per stem in local cassava varieties.

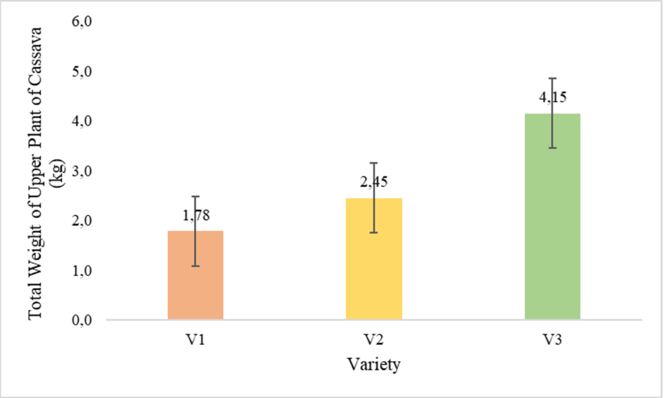

Fig 3. Total Weight of the Upper Plant of Cassava (kg)

3.4 Results of analysis total weight of cassava tubers per plant

The analysis results indicated that the average fresh tuber weight per plant did not differ significantly between plant varieties (Fig. 4). The highest average result of wet tuber weight per plant was found in variety C (3.81 kg) followed by variety A (2.91 kg) and the lowest was in variety B at 2.38 kg. The study by [12] reported that there were no significant differences between the butter and yellow sweet varieties, with the tuber weight per plant of the butter variety being higher than that of the yellow sweet variety.

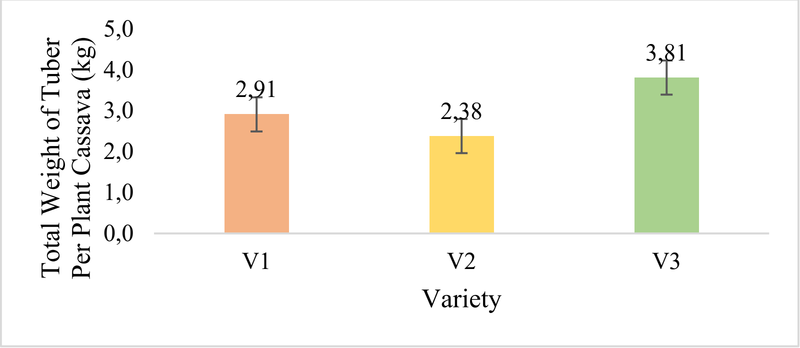

Fig 4. Total Weight of Tuber per Plant Cassava

The results of variety C plants obtained the highest base weight of tubers per plant compared to other varieties and were linear with the results of the analysis of the total weight of the upper stover data in Fig. 4. Cassava tuber production of variety A was 58.20 tons ha^{-1}, variety B 47.67 tons ha^{-1}, and variety C was 76.16 tons ha^{-1} while Indonesian cassava production in 2017 was 24.46 tons ha^{-1} [13]. Cassava production of the three local varieties is more than 50% of national production so the three cassava varieties are very potential as a food source. Farmers on the Kenyan coast prefer to plant local varieties of cassava for consumption [14].

3.5 Result of integrated regression analysis (automatic linear modeling)

The regression analysis results with modeling indicate that the parameters of plant height (Sig. 0.02) and total weight of the upper plant (Sig. 0.038) significantly influence the increase in fresh tuber weight per plant (Fig.5). [15] Stated that growth parameters (plant height, stem diameter, number of leaves) and yield factors (tuber weight per plant, number of tubers per plant) have a major impact on the final yield of cassava tubers.

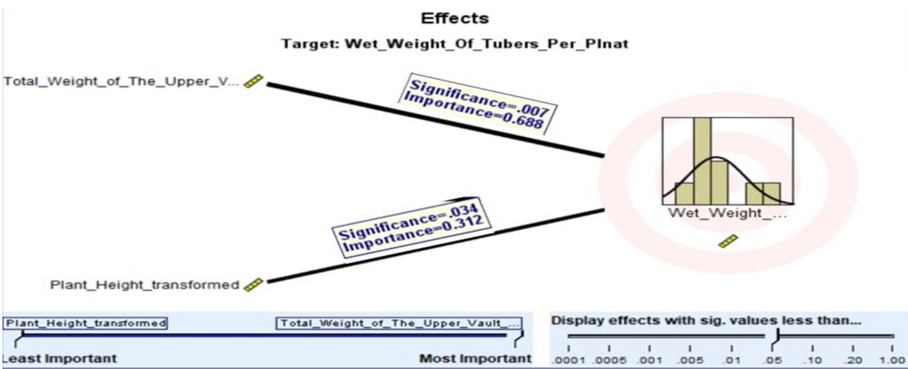

Fig 5. Results of the Regression Analysis of the Total Weight of the Upper Part and Plant Height have a Significant Effect on the Total Weight of Tubers per Cassava Plant

3.6 Results of cluster analysis between cassava varieties

Based on the results of the cluster analysis in Fig. 1, it can be said that varieties A and B are combined at a very small distance, while variety C is combined at a much larger distance 25 based on plant height, stem diameter, and total upper shoots and fresh weight of tubers per plant cassava (Fig. 6). This dendrogram shows that varieties A and B are more similar to each other compared to variety C which joins the cluster at a greater distance.

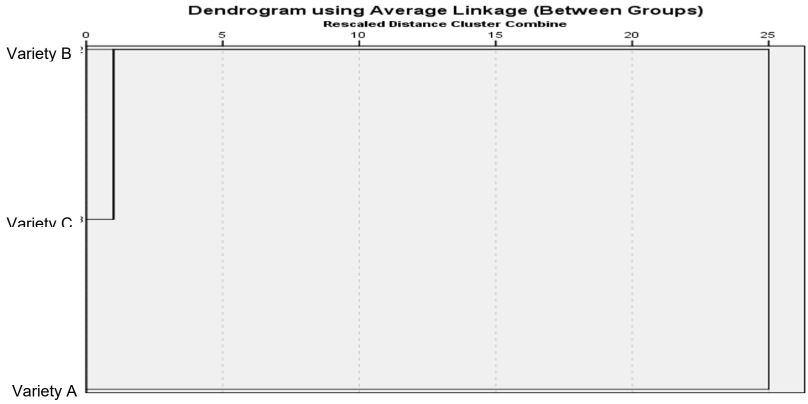

Fig 6. Dendrogram of Cluster Analysis Results of Several Cassava Varieties Based on Growth and Yield Components

4 Conclusion

The production of variety A is 58.20 ton per hectare, variety B is 47.67 ton per hectare and variety C is 76.16 ton per hectare, so that the three local cassava varieties of West Papua have potential to be developed as a food source for the community.

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