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Productivity of Sweet Potato (*Ipomoea Batatas* (L.) Lamb.) Crossed Between Antin 1 and Beta 2 Accessions

Sulistiono[1], Ida Rahmawati[2], Budhi Utami[3], Mumun Nurmilawati[4]

[1,2,3,4] Biology Education, University of Nusantara PGRI Kediri. JL. KH. Achmad Dahlan No 76 Kediri Indonesia 64114

ABSTRACT: The sweet potato is an important food source in the world because, in addition to carbohydrates, it contains several vitamins, minerals, β-carotene and anthocyanins. The presence of self-incompatibility causes high genetic and phenotypic variation in the wild. This allows the formation of new accessions with advanced characteristics. This study aims to determine the productivity of sweet potatoes resulting from the cross between Antin 1 and Beta 2 accessions. The research was conducted using the experimental method in a completely randomized design with 4 repeats. The stem cuttings along 7 - 8 nodes of 10 plants from the cross of Antin 1 and Beta 2 accession (the plant code = C1 to C10) were planted in planter bags with a volume of 100 liters with media consisting of a mixture of soil: sand: manure = 3: 2 : 1. The tubers were harvested at the age of 4 months after planting, then the fresh weight of the tubers produced was measured. The data obtained were analyzed by Anova, followed by the Least Significant Difference test. The highest productivity was obtained in plants with code C6, which was 1394.6 ± 62.41 g/plant, that is equivalent to 46,486 tons/ha.

KEYWORDS: cross, Antin 1, Beta 2, productivity

I. INTRODUCTION

Sweet potato (*Ipomoea batatas* (L.) Lamb.) is an important source of amylum after wheat, corn, potato and cassava (Huaman and Zhang, 1997). Besides being a source of amylum, the tubers of this plant also contain a lot of vitamins C, E and B1, Fe, Ca and P (Pattikawa et al., 2012), as well as β-carotene in orange tuber sweet potatoes (Awuni et al., 2017; Mbusa et al., 2018) and anthocyanins in purple tubers [Husna et al., 2013; Islam et al., 2002). The number of chromosomes in sweet potato is hexaploid (Srisuvan et al., 2006) and the flowers are self incompatible (Kowyama et al., 200; Tsuchiya, 2014; Baafi et al., 2016)]. Both of these cause a high level of genetic variation and result in a high level of phenotypic variation in plants in the wild. Each time crossing takes place, the offspring are potentially very diverse and have the potential to produce new accessions. As of the year 2020, 331 feature accessions have been collected from different regions in Indonesia (Rahajeng, 2020).

The Antin 1 and Beta 2 are two examples of feature accessions. The Antin 1 accession with purple tuber flesh has advantages of productivity and high anthocyanin content, good taste, and some resistance to *Sphaceloma batatas* and *Cylas formicarius* (SK Mentan, 2013), while accession Beta 2 with orange tuber flesh has advantages of productivity and high βcarotene content, good taste, and some resistance to *Sphaceloma batatas* and *Cylas formicarius* (SK Mentan, 2009). The purple color of the tubers is caused by anthocyanins, which are bioactive components of the purple flavonoid group that can prevent liver cancer (Choi et al., 2012), as well as anti-diabetes (Sancho & Pastore, 2012) and antioxidants (Takahata et al., 2011). The orange color is caused by carotene, which is a tetraterpene compound composed of 8 isoprene units condensed at both ends (Ameny & Wilson, 1997). In addition to being a provitamin A, ß-carotene also acts as an antioxidant to counteract free radicals (Takahata, 2011).

The crossed between the Antin 1 and Beta 2 accessions has been successfully carried out and as many as 10 plants have been collected and the morphological structure of the leaves and tubers has been described (Sulistiono et al., 2023), but the productivity of the plants resulting from the cross is not yet known.

Based on the above description, it is necessary to conduct research with the aim of knowing the productivity of sweet potatoes from the cross of Antin 1 and Beta 2 accessions. The results of this study will then be used as one of the bases for studying the content of anthocyanins, β-carotene and amylose, which are feature new accessions.

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II. METHODS

The research was conducted experimentally using a fully randomized design with 4 repeats, with the following tools, materials, and work procedures:

a. Tools and Materials

The tools and materials used were 100 l capacity planter bags, agricultural tools, scales, paddy soil, sand, manure, TSP fertilizer, and 4 stem shoots each from 10 sweet potato plants (the plant codes are C1 to C10) from the cross between Antin 1 and Beta 2 accessions carried out by Sulistiono et al. (2021) and Sulistiono et al. (2023).

b. Procedure

The planting medium consisting of a mixture of paddy soil, sand and manure in the ratio of 3:2:1 is filled up to 75% of the volume in the planter bag. Then, stem cuttings with the length of 7 - 8 nodes were planted in the planting medium. The planting was done by inserting 3 - 4 nodes of the basal of the stem shoots into the soil in a horizontal position and then burying them with the planting medium to a thickness of ± 10 cm. Then, according to the fully randomized design, all the plants in the planter bag were positioned. When the planting media began to dry out, weed control and watering were performed. The plants were fertilized with TSP at a rate of 5 g per plant when they were 2 months old. The plants were harvested 4 months after planting and the fresh weight of the tuber was measured and then analyzed by Anova followed by the Least Significant Difference test.

III. RESULTS AND DISCUSSION

Ten plants were successfully obtained by crossing sweet potato Antin 1 with Beta 2 accession (Sulistiono, et al., 2021; Sulistiono et al., 2023). One plant (code C3) did not form tubers, while the other 9 plants (C1, C2, C4, C5, C6, C7, C8, C9 and C10) formed tubers. The tuber fresh weight is shown in Figure 1.

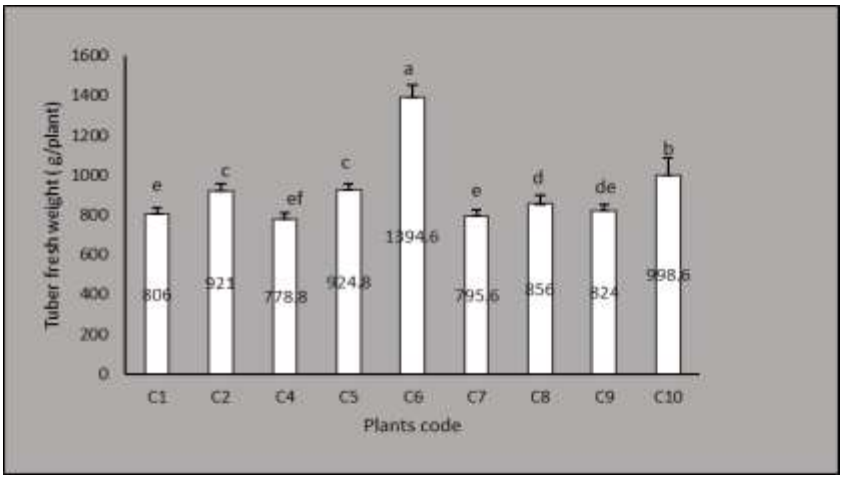

Figure 1. Fresh weight (g/plant), standard deviation (T) and BNT notation (a to f) of tubers from the crossed between Antin 1 and Beta 2. Accession

The results of the analysis using Anova obtained F_{test} (61.8171) > F_{table} (2.45) at the 5% significance level, which means that 9 individual sweet potatoes resulting from the cross between Antin 1 and Beta 2 have different productivity. The results of the Least Significant Difference test show that plants coded C6 have morphological structural characteristics of ovate tuber shape, cream tuber skin color, yellow tuber flesh color, triangular leaf shape, palmati partitus leaf margins, number of lobes 5 and purple leaf vein color (Sulistiono et al., 2023). It also has the highest productivity, 1394.6 g per plant or 46,486 t/ha, assuming a number of plants per hectare is 33,333 plants (distance between mounds = 1 m and planting distance 30 cm). This productivity is higher than the potential productivity of its two parents, which is 33.2 tons per hectare for Antin 1 (SK Mentan, 2013) and 34.7 tons per hectare for Beta 2 (SK Mentan, 2009). Therefore, the C6 plants resulting from the crossed between Antin 1 and Beta 2 have the potential to be proposed as a new supreme accession. Nevertheless, further research at field scale and a comprehensive characterization are still needed.

IV. CONCLUSIONS

The highest productivity of sweet potato plants from the crossed of the Antin 1 and Beta 2 accession was obtained in the plants with the code C6, which amounted to 1,394.6 g per plant, which is equivalent to 46,486 t/ha,

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