

SELECTION OF SINGLE PLANTS OF SWEET POTATO (IPOMOEA BATATAS L.) RESULTS OF OPEN-CROSS IN FEMALE PARENT BETA-2 FOR ORANGE-FLESHED SWEET POTATO AND HIGH PRODUCTION

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ABSTRACT

Sweet potato (*Ipomoea batatas* L.) is one of the alternative commodities in food diversification. Apart from being a source of carbohydrates, orange-fleshed sweet potatoes contain lots of beta-carotene (pro-vitamin A) and antioxidants that contribute greatly to health. Efforts to improve the quality of orange sweet potatoes in quantity and quality are still very much needed, one of which is by crossing. The study aimed to obtain high-yielding orange-fleshed sweet potato lines from free crosses between female parent Beta-2 and male parent local sweet potato Lampung (LPG-01, LPG-03, LPG-06, LPG-11), Cilembu, Ayamurasaki. The method used in this selection is a single planting selection method by looking at the morphological characters of each line. Single planting selection is the initial selection after successful crossing. The results showed that of the 79 lines that were crossed by a female parent of Beta-2, there were 19 lines with orange flesh and high yields, namely Beta2 OP1, Beta2 OP3, Beta2 OP4, Beta2 OP6, Beta2 OP8, Beta2 OP19, Beta2 OP25, Beta2 OP30, Beta2 OP33, Beta2 OP34, Beta2 OP36, Beta2 OP38, Beta2 OP42, Beta2 OP43, Beta2 OP54, Beta2 OP58, Beta2 OP63, Beta2 OP73, Beta2 OP77.

Keywords: beta-2, orange flesh, female parent, cross, sweet potato

INTRODUCTION

Sweet potato (*Ipomoea batatas* L.) is an alternative commodity in food diversification. Aside from being a source of carbohydrates, sweet potatoes with orange flesh contain lots of beta-carotene (pro vitamin A) and antioxidants that contribute greatly to health. Girard et al. (2017); Alam et al. (2016) and Kurabachew (2015) reported that orange-fleshed sweet potato is rich in carotenoids and rich in β -carotene, which is a precursor of vitamin A, and can play an important role in alleviating vitamin A deficiency in children from developing countries. Food technologists and nutritionists are very interested in the orange-fleshed sweet potato, its health effects have been felt in Uganda, Mozambique, Kenya and Nigeria (Neela and Fanta (2019).

In Indonesia, sweet potatoes with orange flesh still need attention both in terms of quantity and quality. One of the efforts in the development of orange-fleshed sweet potatoes is by hybridization (open pollination) using a Beta-2 female parent which has a high content of beta carotene with several male Lampung local clones which have several superior characteristics.

Open crosses (open pollination) are pollination in which only the identity of the female parent is known and occurs uncontrollably by insects, birds, bats, wind, rain or humans who touch them (Hassani, 2022). Seeds from open pollination produce new plants according to the nature of the parent. In open pollination, each flower of the same plant species can pollinate each other, possibly producing different genetic traits in the population that is formed. Davis (2022), states that open pollination brings wide genetic diversity, so it is good for producing biodiversity.

The aim of this study was to obtain orange-fleshed and high yielding sweet potato lines from open crosses between Beta-2 female parents and local Lampung sweet potato male parents

(LPG-01, LPG-03, LPG-06, LPG-11), Cilembu , and Ayamurasaki. Breeding sweet potatoes with orange flesh helps reduce vitamin A deficiency among the rural poor (Andrade et al. 2016).

RESEARCH METHOD













The data collection method is carried out through primary data collection activities and secondary data collection.


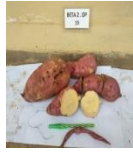









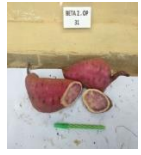





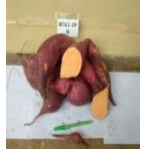


RESULTS AND DISCUSSION




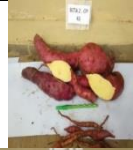













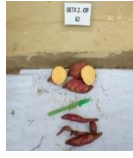

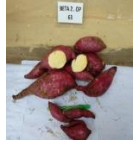
Free crosses or open crosses (open pollination) of Beta-2 female parent sweet potato with seven male parents produced 79 lines which varied in flesh color from white, cream, yellow, orange, white purple and purple flesh color. Of the 79 lines produced, there were 32 lines which had tuber color from yellow to orange (Table 1).













The variation in the color of the meat resulting from the open crosses of the beta-2 female parents was due to the fact that more than one male parent was used, namely seven male parents. Hassani (2022), states that seeds from open crosses will produce new plants that match the characteristics of their parents. Wide genetic diversity in the presence of open crosses (Davis, 2022).

Table 1.
Sweet potato lines as a result of single planting selection in open crosses of beta-2 female parents containing beta carotene

No	strain	Leaf	tubers
1	Beta 2 OP 1		
2	Beta 2 OP 3		
3	Beta 2 OP 4		
4	Beta 2 OP 6		
5	Beta 2 OP 8		
6	Beta 2 OP 14		





No	strain	Leaf	tubers
7	Beta 2 OP 19		
8	Beta 2 OP 23		
9	Beta 2 OP 25		
10	Beta 2 OP 29		
11	Beta 2 OP 30		
12	Beta 2 OP 31		
13	Beta 2 OP 33		
14	Beta 2 OP 34		
15	Beta 2 OP 36		
16	Beta 2 OP 38		

No	strain	Leaf	tubers
17	Beta 2 OP 42		
18	Beta 2 OP 43		
19	Beta 2 OP 45		
20	Beta 2 OP 52		
21	Beta 2 OP 54		
22	Beta 2 OP 57		
23	Beta 2 OP 58		
24	Beta 2 OP 60		
25	Beta 2 OP 62		
26	Beta 2 OP 63		





















No	strain	Leaf	tubers
27	Beta 2 OP 66		
28	Beta 2 OP 69		
29	Beta 2 OP 73		
30	Beta 2 OP 76		
31	Beta 2 OP 77		
32	Beta 2 OP 78		

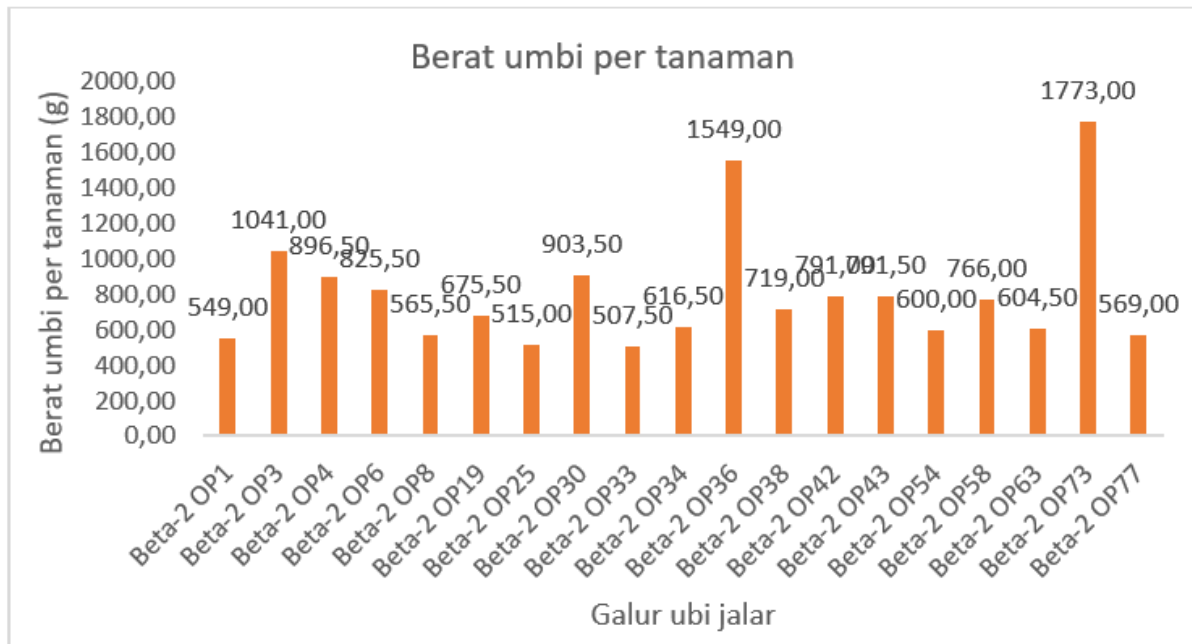
of the 32 lines that have yellow to orange flesh color, there are 19 lines that have high beta carotene content and high production (Table 2). The high beta-carotene characteristic of this new strain was due to the characteristics of the female and male parents who had high beta-carotene genes, namely beta-2 as the female parent and LPG-01 as the male parent. High production characters can come from parents who have high yield potential. The female and male parents used in this open crosses have high yield potential, except for LPG-06. The lines that have production per plant of more than 1000 kg per plant are the Beta2 OP3, Beta2 OP36 and Beta2 OP73 lines (Graph 1).

Table 2.
Sweet potato lines as a result of single planting selection in open crosses of beta-2 female parents which have the character of orange tuber color and high production

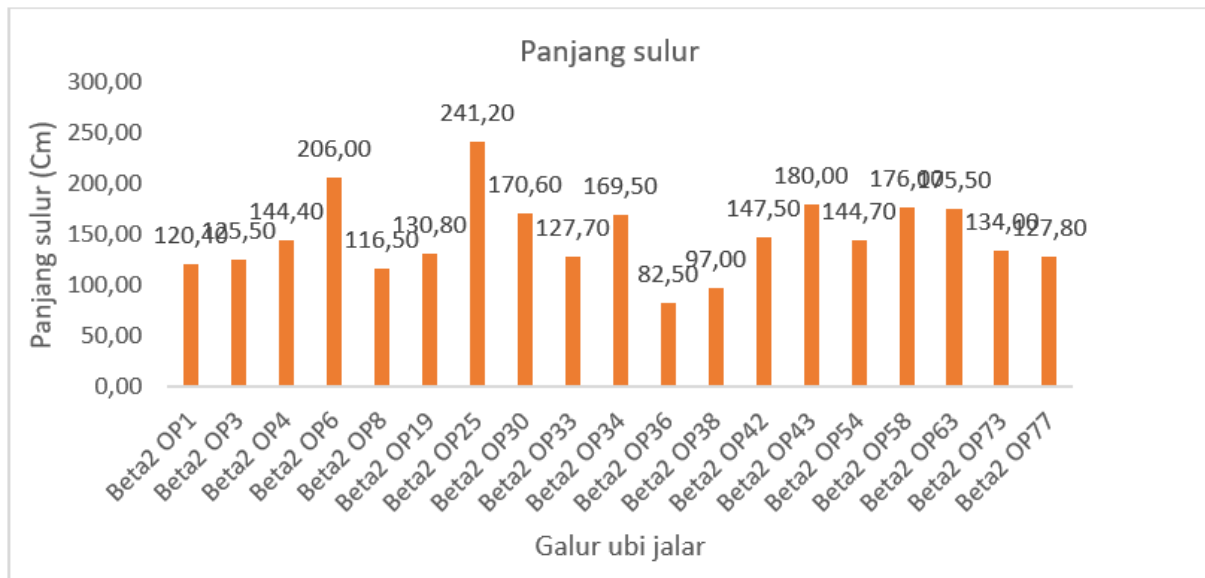
No	strain	Leaf	tubers	Large Tuber Weight (g)
1	Beta 2 OP 1			549
2	Beta 2 OP 3			1029

No	Galur	Daun	Umbi
3	Beta 2 OP 4		
4	Beta 2 OP 6		
5	Beta 2 OP 8		
6	Beta 2 OP 19		
7	Beta 2 OP 25		
8	Beta 2 OP 30		
9	Beta 2 OP 33		

10	Beta 2 OP 34			583
11	Beta 2 OP 36			1542.5
12	Beta 2 OP 38			640.5
No	Galur	Daun	Umbi	Berat Umbi Besar (g)
13	Beta 2 OP 42			772.5
14	Beta 2 OP 43			769
15	Beta 2 OP 54			600
16	Beta 2 OP 58			753.5
17	Beta 2 OP 63			562.5
18	Beta 2 OP 73			1773
19	Beta 2 OP 77			569



Graph 1.
Tuber weight per plant on orange-fleshed sweet potato lines



Graph 2.
Length of vines of orange-fleshed sweet potato

CONCLUSION

The results showed that the strains that had high yield potential (Beta2 OP3, Beta2 OP36, and Beta2 OP73) had relatively shorter tendrils lengths. This is in line with Dewi et al. (2019), who reported that vine length was negatively correlated with tuber weight. Long tendrils will require more intake of photosynthetic products to be distributed throughout the plant body, so that the amount of photosynthate to the tuber becomes lower.

The conclusions from the results of this study were: single cropping selection in a population of 79 lines resulting from open crosses of Beta-2 female parents, there were 32 lines that had tuber flesh color from yellow to orange. Of the 32 lines, there are 19 lines that have the character of orange tuber flesh and high yield potential. . The lines that have production per plant of more than 1000 kg per plant are the Beta2 OP3, Beta2 OP36 and Beta2 OP73 lines. High tuber weight generally has a low vine length.

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