AGRONOMSKI GLASNIK 4/2021.
ISSN 0002-1954

Original scientific paper
Izvorni znanstveni članak

GROWTH AND YIELD OF SWEET POTATO (*Ipomoea batatas* (L.) Lam.) AS INFLUENCED BY NUMBER OF CUTTING BUDS

UTJECAJ BROJA PUPOVA IZBOJA NA RAST I PRINOS BATATA (*Ipomoea batatas* (L.) Lam.)

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ABSTRACT

Sweet potatoes are propagated by rooting shoots with thickened roots, but the number of vine cutting buds can significantly affect the yield. Information on the preparation of quality material for the successful production of sweet potatoes among farmers in Nigeria is not uniform. The most favorable number of shoot buds used as a material for propagating sweet potatoes has not yet been determined. Therefore, the aim of this paper is to estimate the number of buds per shoot that will result in the highest yield of sweet potato roots. Four treatments with 2, 3, 4 and 5 buds per shoot were tested. The field trial was set up according to a randomized block design with five replications. Data on the length of the cuttings, number of leaves and the yield components of the sweet potato thickened are presented. A significant increase in the length of the cutting, the number of leaves and the average length and weight of the thickened root of sweet potatoes grown from shoots with 5 buds was found.

Therefore, the use of five-bud shoots is recommended for sweet potato propagation due to its positive effect on rooting, growth and yield of thickened sweet potato root.

Keywords: bud, cutting, shoot, sweet potato, vine.

SAŽETAK

Batat se razmnožava ukorjenjavanjem izboja zadebljalog korijena, no broj pupova odrezanih vriježa koji se ukorjenjavaju značajno može utjecati na prinos. Informacije o pripremanju kvalitetnog materijala za uspješnu proizvodnju batata među poljoprivrednicima u Nigeriji nisu ujednačene.

Najpovoljniji broj pupova izboja koji se koristi kao materijal za razmnožavanje batata još nije utvrđen. Stoga je cilj ovog rada procijeniti broj pupova po izboju koje će rezultirati najvećim prinosom korijena batata. U istraživanju su testirana četiri tretmana koja uključuju 2, 3, 4 i 5 pupa po izboju. Pokus je postavljen po slučajnom bloknom rasporedu u pet ponavljanja. Prikazani su podaci o dužini vriježa, broju listova te komponente prinosa zadebljalog korijena batata. Utvrđeno je značajno povećanje dužine vriježa, broja listova te prosječne dužine i mase zadebljalog korijena batata uzgojenog iz izboja s 5 pupova.

Stoga se za razmnožavanje batata preporučuje upotreba izboja s pet pupova zbog pozitivnog utjecaja na ukorjenjavanje, rast i prinos zadebljalog korijena batata.

Ključne riječi: batat, pup, rast, prinos, izboj

INTRODUCTION

Sweet potato (*Ipomoea batatas* (L.) Lam.) is an annual tropical root crop of the family Convolvulaceae (Tortoe, 2010). The crop is Central America by origin but introduced to Africa through South American trade (Nedunchezhiyan *et al.,* 2012). Sweet potato is among the world's most relevant and crucial underutilized food crop grown generally for its storage roots (Tortoe, 2010). The crop is propagated using vine cutting (Haung and Sun, 2000). This propagation allows producers to reserve storage roots for consumption or marketing instead of planting them. However, the length or number of buds per cutting of the vine varies from one farmer to another and from one location to the other (Belehu, 2003). In Nigeria, farmers use any type of cuttings which are available and easy to handle, without particular regard to the number of buds in their vine cuttings (Amoah, 1997). Some farmers plant short cuttings because they are easy to handle and more economical, while others use very long cuttings obtained from already established fields (Low *et al.* (2009). Onwueme and Sinha (1991) recommended cuttings of about 30 cm vine for the propagation beyond which described as a waste of planting material and also emphasized that shorter cuttings grow more slowly and produce poor yield. However, regardless of the size of the cuttings, the number of buds per cutting unit has recently been identified as an important aspect of yield variability in the crop. Therefore, the present study is aimed to determine the number of buds per vine cutting that will result with the optimum yield of storage roots.

MATERIALS AND METHODS

The experiment was carried out at the University of Ilorin, Botanical Garden in the Screen House from December 2018 to May 2019, located in the southern guinea savanna belt of Nigeria, with an annual rainfall of 1200 mm and temperature range of 19-37 °C and a distinct dry season. The experiment was laid out as a randomized complete block design consisting of four treatments (2, 3, 4 and 5 buds per cutting) and three replicates. The growth parameters such as vine length and number of leaves and yield components such as length of root, weight of root and girth of root. The vine length was measured using a centimeter calibrated scale, while the number of leaves was determined by manual counting all the photosynthetically active leaves. Weight of sweet potatoes was determined by the use of sweet potato hydrometer while length and girth was determined by grid intersect techniques. Plants were harvested at 24 weeks after planting.

RESULTS AND DISCUSSION

The number of leaves and vine length were significantly affected by the number of buds per cutting (Tables 1 and 2). Regardless of the sampling period, the number of leaves and the length of vines for 2 buds per cutting were significantly lower than for all other treatments under concentration. The values obtained for number of leaves and vine length for plants propagated with vine cuttings with 3, 4 and 5 buds were statistically the same from 4 to 16 weeks after planting beyond which values for 4 and 5 buds were significantly higher than values for vine cutting with 3 buds. The higher vine length and leaf number for 4 and 5 buds per cutting indicates faster plant establishment, as root initiation is more pronounced in cuttings with a higher number of buds than in cuttings with a lower number of buds. Dumbuya *et al.* (2017) also attributed increase in the vegetative growth parameters in cuttings with higher buds number to the greater number of nodes, which may have facilitated establishment by development of more roots. Ray *et al.*, (2011) also reported that increasing the number of buds increased number of leaves and vine length in potatoes. Similar result had earlier been reported by Amoah, 1997 in a study on how number of nodes per cutting and fertilizer application affects the growth of sweet potato.

Table 1 Effects of number of buds on the number of leaves of sweet potato

Tablica 1. Utjecaj broja pupova na broj listova batata

No of bud	Weeks after planting (WAP)					
	4	**8**	**12**	**16**	**18**	**24**
2	10.67^{b}	18.67^{b}	32.67^{c}	38.00^{c}	42.67^{d}	46.00^{c}
3	17.33^{ab}	25.33^{ab}	38.00^{ab}	45.33^{ab}	50.00^{bc}	54.67^{b}
4	20.67^{ab}	26.00^{ab}	36.00^{ab}	47.00^{ab}	53.33^{b}	56.67^{b}
5	21.67^{a}	27.33^{a}	39.00^{a}	48.00^{a}	56.33^{a}	61.33^{a}

Values with the same superscript along the same row are significantly the same at $p<0.05$

Table 2 Effects of number of buds on the vine length of sweet potato

Tablica 2. Utjecaj broja pupova na duljinu vriježa batata (cm)

No of bud	Weeks after planting (WAP)					
	4	**8**	**12**	**16**	**18**	**24**
2	18.20^{c}	25.80^{c}	31.47^{c}	38.23^{c}	44.43^{c}	46.23^{c}
3	27.77^{a}	35.10^{a}	39.47^{a}	44.80^{ab}	48.20^{b}	49.86^{b}
4	28.37^{a}	35.17^{a}	39.17^{a}	46.30^{a}	50.00^{a}	53.13^{a}
5	24.77^{ab}	32.40^{ab}	36.63^{ab}	46.53^{a}	50.30^{a}	55.00^{a}

Values with the same superscript along the same row are significantly the same at $p<0.05$

Sweet potato roots length, weight and girth were also significantly ($p<0.05$) affected by the number of buds per cutting (Table 3). The significantly lowest values for the above yield attributes were found in plants propagated with 2 buds per cutting. The significantly highest length and weight of roots were obtained in plants propagated with 5 buds per cutting compared to all other treatments considered. However, the number of buds per cutting had no significant effect on the roots girth (Table 3). The significantly higher length and weight of roots at 5 buds per cutting could be due to the accumulation of photosynthetic assimilate as the photosynthetic surface area of the plant is increased (Essilfie *et al.*, 2016), as shown by the higher leaf number and length of vines at 4 and 5 buds per cutting in this study. It could also be adduced to the early establishment in 4 and 5 bud per vine cuttings when compared to 2 buds per vine cutting. Amoah (1997) reported that roots initiation and bulking begin earlier on vine cuttings with more nodes than those with fewer nodes. The result is in agreement with Onwueme and Sinha (2011) who reported that root yield tends to increase with increase in the number of buds per cutting.

Table 3 Effects of number of buds on the morphological traits of sweet potato roots

Tablica 3. Utjecaj broja pupova na morfološka svojstva korijena batata

Number of buds	Length (cm)	Weight of roots (g)	Girth (cm)
2	10.70^{bc}	83.62^{c}	19.10^{ab}
3	10.73^{bc}	148.30^{b}	12.97^{b}
4	12.67^{b}	117.8^{b}	16.40^{ab}
5	19.70^{a}	208.65^{a}	19.30^{a}

Values with the same superscript along the same row are significantly the same at $p<0.05$

CONCLUSION

The result of this study is an indication that a higher number of buds per cutting can enhance vegetative growth and storage root yield of sweet potato by facilitating root initiation and establishment. Therefore, the use of 5 buds per vine cutting should be adopted for the sweet potato propagation.

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Received – Primljeno:
15.06.2021.