Varietal Evaluation in Sweet potato cultivated under Prayagraj conditions, India

Abstract

Sweet potato is regarded as one of the most important food crops mostly grown in sub - Saharan Africa, Pacific islands and parts of Asia. It is mostly grown for human consumptions. It has been domesticated for more than 5000 years in the Latin America and further more cultivated in the developing countries. This research experiment was conducted in the Horticulture research field, at Department of Horticulture under Sam Higginbottom University of Agriculture, Technology and Science, Prayagraj, Uttar Pradesh, India. Five different cultivars of Sweet potato were evaluated by replicating thrice in Randomized block design method during *rabi* season 2023. Among the growth parameters and yield parameters the character that were observed are like Vines length(cm),Number of leaves per plant, Numbers of vines per plant, Inter-nodal length(cm),Numbers of tubers per plant, Tuber length (cm), Tuber diameter (cm), Tuber weight (g), Tuber yield per plant (kg).Tuber yield (q ha^{-1}). Among the cultivars Samrat has been seen with highest number tubers (4.43), highest tuber length (23.8 cm), high tuber diameter (5.1 cm) and other observable characters among the test parameters.This variety has been recommended to the farmers for having good results in the prayagraj environmental conditions.

***Keywords*:** Cultivar,Growth, Parameters, Sweet potato, Tuber

1. Introduction

Sweet Potato (*Ipomoea batatas*) is regarded as one of the high yielding and drought tolerant crop due to its wider adaptability to various farming system and climate (Bovell *et al.* 2007)[2]. Sweet potato is indigenous to tropical America and widely grown in many parts of the tropics and subtropics as the main staple food (Hahn *et al*.1977)[5]. Sweet potato (*Ipomoea batatas)* belongs to family Convolvulaceae. The storage roots of the sweet potato are used as staple food and raw materials for animal feed and in the production of alcohol (Srisuwan *et al.* 2006)[13]. Sweet potato has ahexapolyploid set of chromosomes with 2n=6x=90, with its wild species having *I.leucantha* (2n=2x=30), *I.littoralis* (2n=4x=60) and *I.trifida* (2n=6x=90) which are the progenitors of the sweet potato (6x) (Nishiyama *et al.* 1975)[9]. It has high nutritional value, which is 50% more than Potato and thus plays an important role in world population diet (Krochmal *et al.* 2014)[8]. The main sweet potato nutrients are carbohydrates

starch 12.6 gm, high vitamin A content 0.078 mg, calcium 30 mg, vitamin C 2.4 mg,carotene content 8510 µg,energy 86 kcal,protein1.57 gm and Iron 0.61 mg ((United StatesDepartment of Agriculture (USDA) Nutrient Database). Sweet potato tubers have high anti-diabetic,anti-proliferative and anti-oxidant properties due to its high nutrients and minerals components (Krochmal *et al.* 2014)[8]. The flesh colour of sweet potato can be white, purple, beige, yellow and orange (Allen*et al.* 2010)[3]. The orange flesh colour in sweet potato have rich source of carotene content and known as provitamin A as the dominant carotene content in sweet potato is β-carotene (Slosar *et al.* 2019)[12]. In India, Odisha has the highest production and cultivation of sweet potato (Kar *et al.* 2022)[7].

2. Materials and methods

The field trial of sweet potato was conducted on the Land of Sam Higginbottom University of Agriculture, Technology and Science, Prayagraj, Uttar Pradesh in 2023. The experimental site was in the Horticultural Research field in Department of Horticulture. The experimental area was located on the absolute altitude of 98 meter above the mean sea level. The climatic condition of the experimental area is dry and warm summers and dry to very dry winters. The maximum temperature recorded at summer is 47^0 C and the minimum temperature recorded was 1.5^0 C.

2.1 Plant materials

The vine cuttings of sweet potato were collected from ICAR-CTCRI Regional centre, Bhubaneswar. Five different varieties of sweet potato cuttings were used for the research work. The varieties include Samart, Kalinga, BHU Krishna, Gouri and Sree Bhadra. These varieties are of excellent quality and well adapted by the grower and consumers of Odisha. The vine Cuttings obtained were healthy and disease free.

2.2 Experimental requirement

Sweet potato is a warm climatic crop. A warm season lasting for four month with an average temperature more than 20^0 C is required for proper tuber growth of the crop (Antonio *et al.* 2011)[1]. In the view of Optimum Temperature the vine cuttings were transplanted on 29th January 2023 to avoid the risk of spring freezing.

The soil was well prepared for the sweet potato cultivation. Required amount of FYM, Nitrogen, Phosphorus and Potassium are applied in the plot area. The sweet potato was

transplanted in ridges and furrow system. Spacing of 50×50 cm for row to row and 20×20 cm for plant to plant was given.

2.3 Morphological parameters of Sweet Potato

The selected morphological characters for tubers were evaluated accurately. 15 tubers from each cultivar were evaluated for the morphological characters. The parameters for tubers were evaluated are shape, skin color, flesh color, main flesh color intensity.

2.4 Quantitative Parameter of Sweet Potato

Within the research work, the quantitative parameters like Vine length (cm), Number of leaves, Number of vines, Internodal length (cm), Number of tubers, Tuber length (cm),Tuber Diameter(cm), Tuber Weight (gm),Tuber yield per plant (Kg),Tuber yield (q/ha) were evaluated.

2.5 Statistical Analysis

The results were statistically analyzed and evaluated by the analysis of variance and mathematical function.

3. Results and Discussion

3.1 Morphological parameters

The results obtained from the sweet potato cultivation shows a high level of morphological differences (Table 1). Sweet potato crop was distinguished by variety of morphological characters. It was observed that, the tubers have shown a very wide range of characters. Variety Samrat has brown flesh colour, while Kalinga and Sree Bhadra have cream color flesh. BHU Krishna and Gouri have purple and orange flesh colour respectively. Similar results have been found by (Pavithra *et al.* 2022)[10].

Table 1: Morphological parameters of sweet potato tubers.

Tuber Parameter	Samrat	Kalinga	Gouri	Sree Bhadra	BHU-Krishna
Shape	Fusiform	Spindle shaped	Elliptic	fusiform	Obviate

Skin colour	Light brown	Purple red skin	Purple red	Light pink	Purple red
Flesh colour	white	Cream colour	Orange flesh	Cream colour	Purple colour
main flesh color intensity	medium	medium	Medium	light	Medium

3.2 Agronomic and yield traits

The results obtained from the experiment revealed a significant difference for growth and yield characters of different varieties.

3.2.1 Agronomic traits

The vine length of the sweet potato crop was observed at the harvestable stage and the average length was calculated. The analysis of variance showed a wide range of significant difference in the vine length of different varieties. The observed vine length varied from 147.33 cm to 75.66 cm (Table 2). Variety Samrat showed more vine length of 147.33 cm followed by Sree Bhadra 127.33 cm and the lowest was BHU Krishna with 75.67cm. The variation in the vine length is due to the genetic makeup of the genotypes which in some way have influenced the morphological characters (Kar *et al.*2022)[7]. With significance in the vine length, significant difference in number of leaves was observed. Variety Samrat has maximum leaves count of 179.33 followed by Sree Bhadra with 175.66 leaves count and the minimum was observed for BHU Krishna with 121.33 leaves count (Table 2). The variation in production of leaves can be different in similar growing conditions. Similar findings were observed by (Hayati *et al.*2020)[6].

There was a significant difference in the number of vines and inter nodal length in different sweet potato varieties. The highest numbers of vines were observed in variety Samrat with 17.66 and lowest was found with BHU Krishna 7.33 (Table 2). Similar findings are observed by (Kar *et al.*2022)[7]. Thehighest internodal length was see in variety Samrat with 4.43 cm and lowest was recorded in Gouri with 3.83 cm (Table 2). The internodal length is determined by the cultivars and time (Egbe *et al.* 2012)[4].

3.2.2 Yield traits

Yield trait is a very complex as it is influenced by different factors. In sweet potato crop the major yield contributing parameters are number of tubers per plant, tuber length, tuber diameter, tuber weight, tuber yield per plant and tuber yield per hectare.

The highest number of tubers was found in variety Samrat and Sree Bhadra with 4.33 numbers of tubers and lowest with BHU Krishna having1.67 number of tubers (Table 3). The quantity of tubers varies greatly due the genetic diversity in various genotypes .similar results were found by (Kar *et al.* 2022, Pavithra *et al.* 2022)[7, 10]. The highest tuber length was observed to be 23.8 cm of variety Samrat and lowest tuber length was recorded by 8.82 cm by BHU Krishna. The length of tubers varies according to the sweet potato variety. Similar results were found by (Kar *et al*.2022)[7]. Sweet potato genotypes and different environmental conditions have significant impact on the tuber length and tuber diameter. The highest tuber diameter was observed by variety Sree Bhadra with 7.46 cm and lowest tuber diameter was recorded by variety Kalinga 3.7 cm. The highest tuber weight was observed for Samrat with 94.66 gm and lowest tuber weight was observed for BHU Krishna with 57.67 gm. The genetic makeup of the different genotypes controls the storage root characters (yooyongwech *et al.* 2014)[13].

Tuber yield per plant is a very important character which influences the gross return of the tuber. The highest tuber yield per plant was 1.31 kg for Samrat followed by Sree Bhadra with1.28 kg and lowest was found in BHU Krishna with 0.14 kg. The findings are similar to (Pavithra *et al*.2022)[10].The variation in the yield of the tubers may be influenced due to location, period and variety. Tuber yield per plant is an economic advantage to tuber yield per hectare. The highest tuber yield per hectare was found in variety Samrat 103.47 q/ha and lowest was found at BHU Krishna with 61.45 q/ha. The variation in the tuber yield per hectare can be due to genetic diversity in various sweet potato cultivars (Egbe *et al.* 2012)[4].

Samrat Kalinga **Gouri**

BHU Krishna **Sree Bhadra**

Fig 1: sweet potato varieties

Table 2: Observed Agronomic traits of sweet potato

Variety	Vine length	Number of leaves	Number of vines	Internodal Length	Number of Tubers	Tuber Length	Tuber Diameter	Tuber Weight	Tuber Yield per plant	Tuber yield (Q/Ha)
Samrat	147.33	179.33	17.67	4.43	4.33	23.80	5.10	94.67	1.31	103.47
Kalinga	90.33	148.67	10.67	4.20	3.33	17.10	3.70	67.33	0.52	62.85
Gouri	76.67	125.67	11.33	3.83	3.33	17.43	4.50	70.67	0.53	65.11
Sree Bhadra	127.33	175.67	11.33	4.13	4.33	18.77	7.46	88.67	1.28	86.38
BHU Krishna	75.67	121.33	7.33	3.90	1.67	8.82	4.53	57.67	0.14	61.45
CV	5.85	10.74	8.78	3.18	17.81	6.97	6.31	2.40	5.06	2.19
CD (0.05)	11.40	30.37	1.93	0.25	1.14	2.25	0.60	3.43	0.07	3.12

4. Conclusion

From the experiment it was observed that there were significant differences in different sweet

potato cultivars. The differences are observed under morphological and agronomical parameters. With the current findings, it was concluded that sweet potato variety under Prayagraj conditions were well to grow. Variety Samrat yielded better followed by Sree Bhadra. Hence, these two varieties can be recommended to the farmers of Prayagraj for cultivation under field conditions.

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