



## EVALUATION OF ORANGE FLESHED SWEET POTATO GENOTYPES FOR STORAGE ROOT YIELD AND DRY MATTER CONTENT

Aswathy G.H. Nair<sup>1</sup>, P. Vidya<sup>2</sup>, V. Ambu<sup>3</sup>, J. Sreekumar<sup>4</sup> and C. Mohan<sup>5</sup>

<sup>1,2,3,4,5</sup>ICAR-Central Tuber Crops Research Institute, Thiruvananthapuram, 695 017, Kerala, India

### Abstract

*Sweet potato (*Ipomoea batatas* (L.) Lam) is the seventh most important food crop in the world. In many developing countries, sweet potato is used as a staple food crop because of easy propagation, high yield and rich in nutrient content under varied climatic conditions. Orange fleshed sweet potato (OFSP), in particular produces storage roots rich in  $\beta$ -carotene, a precursor of Vitamin A. Therefore, OFSP is a promising genotype to address the Vitamin A deficiency needs of women & children and to prevent malnutrition in poverty & tribal areas. OFSP varieties are important in Africa and other developing countries to reduce night blindness. A total of forty OFSP genotypes were selected and yield trials were conducted in two different seasons, kharif season (May-July) and rabi season (Sep-Nov) in 2011. The total yield and dry matter content of the tubers was estimated immediately after harvest and the data obtained from the two seasons were compared. From the result it was found that the rabi season is more favourable for total tuber yield production. The genotype, ST-14/47 has recorded highest tuber yield of 27.19 t ha<sup>-1</sup> with 24% dry matter. Dry matter content of 37% was recorded in CO3-50- 43 variety with a tuber yield of 16.60 t ha<sup>-1</sup>. These genotypes could be popularized among farmers as a source of Vitamin A rich food and to get higher tuber yield.*

**Keywords:** Orange fleshed Sweet potato, storage root yield, dry matter content

### I. INTRODUCTION

Sweet potato (*Ipomoea batatas* (L.) Lam.) is a herbaceous, perennial plant belonging to the family Convolvulaceae. According to the Food and Agriculture Organization (FAO) statistics [8], world production of sweet potato in 2013 was more than 110 MT, and Asia accounts almost 86% of the world's production. China is the biggest producer of around 79 MT from about 3.5 M ha. Indian production is 1.1 MT in an area of 111.8 ha, of which maximum is contributed by Odisha.

Sweet potato is one of the appreciated crops producing the highest root dry matter content for human consumption. 70 per cent of the dry weight of sweet potato is constituted by the starch content [23, 16] and high dry matter content as a significant characteristic of a good sweet potato variety [13]. Tubers with high starch content are important characteristics desired by the sweet potato industry [16]. Due to the absence of oxidation reactions, high starch and low soluble sugar contents decrease the cost of sweet potato processing [12]. Sweet potato is an important raw material to manufacture different products such as noodles, vermicelli, soluble and refined starch, and alcohol drinks [10, 23]. Orange-fleshed sweet potatoes (OFSP), are very nutritious, being an excellent source of  $\beta$ -carotene and vitamin C. It is grown more in developing countries than any other crop. Developing countries account for 98% of the world's sweet potato production. Wide adaptability on marginal land and rich nutritional content has the potential to prevent malnutrition and enhance food security in the developing world [7]. The storage roots also contain vitamins C, B complex, and E as well as potassium, calcium, and iron. The

skin colour ranges between red, purple, brown and white. Its flesh colour ranges from white through yellow, orange and purple. Sweet potato varieties with dark orange flesh have more  $\beta$ -carotene than those with light colored flesh. Now the crop is directed as an important source for biofuel production because of its ability to deliver high amount of starch biomass which can be fermented and converted into ethanol [10, 6]. The objective of the present study was to find out the tuber yield variability within the selected forty orange-fleshed sweet potato genotypes and to identify high yielding genotypes with high dry matter content.

## **II. MATERIALS AND METHODS**

### **A) Planting of genotypes**

A total number of forty genotypes were selected for the present study. Yield trials were conducted in two different seasons, Rabi season (March-May) and Kharif season (Sep-Nov) in 2011 in the field of ICAR-Central Tuber Crops Research Institute (ICAR-CTCRI), Sreekariyam Thiruvananthapuram. Vines were collected from mature plants maintained in ICAR-CTCRI field. Each plant/replication was planted on ten mounts with four vine cuttings per mount. The spacing followed was 60 x 20 cm within and between the rows and the recommended package of practices was adopted. Regular weeding and earthing up were done periodically and during fertilizer applications.

### **B) Total Yield trials**

The trials were harvested at 90 days after planting for both the seasons. The Storage root yield ( $t\ ha^{-1}$ ) of each genotype was recorded immediately after the harvest. Yield data were obtained by harvesting the plants from each plot (Kg). Total root yield was then converted to mean tuber yield per hectare ( $t\ ha^{-1}$ ).

### **C) Dry matter determinations**

At harvest, two to three medium sized storage roots per genotypes were selected for dry matter determinations. 50g of each tuber samples was sliced into small pieces and dried in hot air oven at 60°C for 3 days with three replications. Dry matter content was determined by weighing the initial and final weight, and calculating the percentage of dried weight. The same procedures were followed for all the replications.

$$\text{Dry matter (\%)} = \text{Dry weight of the tuber} / \text{Fresh weight of the tuber} \times 100$$

### **D) Determination of starch content**

Starch content was determined based on dry matter content of storage roots. Using a dry weight conversion method, dry matter was measured by the percentage of dry weight to the fresh weight of harvested storage roots. The conversion formula of the starch content in sweet potato is as followed,  $y = 0.86945x - 6.34587$ , in which y is the starch content and x is dry matter content [22].

### **E) Data Analysis**

T-Test: The analysis for comparison of mean values at different seasons was carried out using PROC t-TEST in SAS 9.3 [17]. Statistical analysis for all the parameters was carried out using SAS system.

## **III. RESULTS AND DISCUSSION**

Environmental factors plays an important role on the growth, production and yield of sweet potato. The storage root of the sweet potato is the commercial part of the sweet potato plant and root yield is said to be a variable quantitative character [9]. Wide range of variability was observed for tuber yield and dry matter content. Sweet potato cultivars yield maximum in seasons having night temperature between 14-22°C [14,15,18].

Forty orange-fleshed genotypes were selected through germplasm screening at ICAR-CTCRI, Sreekariyam and were tested in the field conditions during the year 2011. The genotypes showed differences in the value of tuber yield and dry matter content from both the rabi and kharif seasons.

The tuber yield ranged from 08.66 to 32.86 (t ha<sup>-1</sup>) for both the rabi and kharif seasons. The highest yield was obtained by the genotype ST-14-47 with 32.86 t ha<sup>-1</sup> in the rabi season and KS-115 with 31.81 t ha<sup>-1</sup> in the kharif season. The lowest yield was obtained by ST-14-48 (8.66 t ha<sup>-1</sup>) in the rabi season and 11.30 t ha<sup>-1</sup> in CO3-50-34 in the kharif season. In general, the storage root yield was higher at lowland than at upland conditions which could have resulted from differences in the available moisture in the soil as well as the genetic variability between the hybrids [20].

The storage root weight per plant was a measure of total tuber sink capacity [21]. In this study, the variation in root yield in different genotypes may be either due to the difference in the number of storage roots per plant or size of individual roots or difference in bulking rate as reported by [11]. The studies also revealed that the orange-fleshed sweet potato with high tuber yield can be popularized as an excellent source of  $\beta$ -carotene to control Vitamin A deficiency which affects millions of children in the developing countries since it is a precursor of Vitamin A.

The highest dry matter content of 35% was obtained by CO3-50-43 in the rabi season and 37% in the kharif season, the lowest by the ST-14-34 (18%) and SV3-8 (14%) for rabi and kharif season respectively. The average dry matter content in sweet potato is approximately 25% and also found to vary widely depending on the factors such as cultivar, location, climate, day length, soil type, incidence of pests, diseases and cultivation practices [5]. The dry matter percent will be generally low in OFSP genotypes. In the present study, the dry matter content observed for OFSP genotypes was also low and recorded in the range of 14-35% compared to the 30.2 - 43.6% by previous report.

Growth and production of a crop are a result of interactions of its genetic potential and environment. Crops perform well in environments in which they are reformed [2]. The performance of genotypes is measured in terms of a wide and specific adaptability and yield stability [1]. The crops characteristics that meet the farmers', consumers' and market preferences have to be considered in the selection process of new cultivars. Prior to release of a new variety, genotypes of high yield potential are assessed at different locations and several years to identify their G×E interaction and yield stability [2]. Therefore, breeders need strong biometrical methods to estimate phenotypic stability and to analyse G×E interactions [3, 4].

#### **IV. CONCLUSION**

It is clear from the present study that sweet potato genotypes ST-14-47, 362-7-1, CO3-50-23, ST-14-1 and KS-2 was found to be high yielding with high dry matter content and is found to be suitable for popularization in the state. These cultivars were found to be suitable under the agro-climatic conditions of Kerala, so they can be recommended for commercial cultivation during kharif and rabi seasons.

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