



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(2): 104-106
Received: 13-01-2018
Accepted: 14-02-2018

Seema Gupta
Department of Horticulture,
RCA, MPUAT, Udaipur,
Rajasthan, India

Sunil Pareek
National Institute of Food
Technology Entrepreneurship
and Management, Kundli,
Haryana, India

KD Ameta
Department of Horticulture,
RCA, MPUAT, Udaipur,
Rajasthan, India

DK Sarolia
Central Institute for Arid
Horticulture, Bikaner,
Rajasthan, India

Shalini Pilonia
Department of Horticulture,
RCA, MPUAT, Udaipur,
Rajasthan, India

RA Kaushik
Department of Horticulture,
RCA, MPUAT, Udaipur,
Rajasthan, India

KB Shukla
Department of Horticulture,
RCA, MPUAT, Udaipur,
Rajasthan, India

Pramila Kumari
Department of Horticulture,
RCA, MPUAT, Udaipur,
Rajasthan, India

Correspondence

Seema Gupta
Department of Horticulture,
RCA, MPUAT, Udaipur,
Rajasthan, India

Analysis of nutritional composition of sweet potato vines

Seema Gupta, Sunil Pareek, KD Ameta, DK Sarolia, Shalini Pilonia, RA Kaushik, KB Shukla and Pramila Kumari

Abstract

This study was carried out to evaluate best germplasm of sweet potato for physiochemical characters. For this, research work was carried out in sixteen diversified sweet potato germplasm under randomized block design with three replications at Department of Horticulture, Rajasthan College of Agriculture, Udaipur. All parameters were observed at the end of harvest of crop. Results revealed that sweet potato vines are rich in nutritive value as protein content in vines ranges from 3.02 % to 7.38% while magnesium ranges 443.73 ppm to 471.84 ppm and this crop can be utilized as an alternative feed resource for ruminants to reduce competition between animals and humans.

Keywords: sweet potato, germplasm, vines, protein, magnesium

Introduction

Sweet potato (*Ipomoea batatas* L.) is a member of morning glory family (Convolvulaceae) (Yahaya *et al.* 2015) [18]. Sweet potato is among the major food crop in the world and is cultivated in all tropical and subtropical regions particularly in Asia, Africa and Pacific (De Moura *et al.*, 2015) [3]. Asia and Africa accounts for 95% of the production (EI Sheikiha and Ray, 2015) [6].

The crop is mainly grown for tubers, but a large volume of sweet potato vines (Stems and Leaves) are left after harvesting (Li *et al.*, 2017) [12]. The vines can be used as an alternative feed resource for ruminants to reduce competition between animals and humans for grains (maize and soyabean) (Nayatta *et al.*, 2000) [13]. The value of sweet potato vines as feed supplement is enriched by high palatability (Frye *et al.*, 1948) [8], moderate level of crude protein and water soluble carbohydrate (Rusoff *et al.*, 1950) [14], and high level of digestibility (>62%) (Foulkes *et al.* 1997; Ali *et al.*, 2015) [7, 6].

Sweet potato leaves are cooked as a vegetable in many parts of the world. They are rich in vitamin B, β -carotene, iron, calcium, zinc and protein and the crop is more tolerant of diseases, pests and high moisture than many other leafy vegetables grown in the tropics. Because sweet potato tops can be harvested several times a year, their annual yield is much higher than many other green vegetables and available on low cost. The content of these nutrient differs according to harvesting period and variety. Oxalic acid poses a problem when using sweet potato leaves as food, but its content does not change greatly according to the harvesting time and is less than one fifth that of spinach. Tewe *et al.* (2003) [17] reported that in some parts in Nigeria, sweet potato leaves were preferred as soup ingredient in terms of flavor, appearance, palatability, softness and acceptability.

Ishida *et al.* (2000) [9] studied two kinds of sweet potatoes and reported that the leaves contained high amount of protein (3.8 and 3.7 g 100g⁻¹), total dietary fiber (5.9 and 6.9 g 100g⁻¹) and ash (1.9 and 1.5 g 100g⁻¹). Pace *et al.*, (1996) [14] described the nutritional content of sweet potato greens as 4.0-6.0 per cent protein, 8.0-12.0 per cent carbohydrate, 60 mg 100g⁻¹ calcium and 80 mg 100g⁻¹ phosphorous.

In Africa and Japan, the leaves of the sweet potato are eaten, and the protein content has been reported to be as high as 27 per cent on dry weight basis (Diop, 1998) [4]. Ishiguro *et al.*, (2004) [10] described a newly developed sweet potato cv. 'Suioh' for utilization as vegetable greens which contained much higher polyphenol content and radical scavenging properties than that of spinach, broccoli, cabbage and lettuce. Also sweet potato tea made from 'Suioh' was more acceptable to sensory than other teas (Ishiguro *et al.*, 2004) [10]. For these reasons, the use of sweet potato leaves as a vegetable, for food processing and for ruminants as green fodder should definitely be encouraged.

A wide variability exists in sweet potato germplasm for vine physiology and nutrient composition. Therefore, the objective of this study was to evaluate selected

improved germplasm for adaptation, high nutritive value in terms of protein and magnesium.

Material and Methods

Materials and agronomic practices

The experiment was laid out at the AICRP Tuber Crops field, Department of Horticulture, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur during October 2011 to January 2012. The experimental material comprises with sixteen diversified sweet potato germplasm and evaluated under randomized block design with three replications. Both vine protein and magnesium were recorded at harvest.

Table 1: Detail of Germplasm and their source

| S. No. | Name | Source |
|--------|---------------|--|
| 1 | CIPSWA-2 | World Potato Regional Centre, New Delhi |
| 2 | CO-3-4 | CTCRI, Thiruvananthapuram |
| 3 | Gauri | CTCRI Regional Centre, Bhubaneswar |
| 4 | Gautam | CTCRI Regional Centre, Bhubaneswar |
| 5 | H-109-2 | Navsari Agricultural University, Navsari |
| 6 | Navsari Local | Navsari Agricultural University, Navsari |
| 7 | Pol-19-8-10 | CARI, Port Blair |
| 8 | Samrat | CTCRI, Thiruvananthapuram |
| 9 | SI-1 | Navsari Agricultural University, Navsari |
| 10 | Sree Arun | CTCRI, Thiruvananthapuram |
| 11 | Sree Nandini | CTCRI, Thiruvananthapuram |
| 12 | Sree Ratna | CTCRI, Thiruvananthapuram |
| 13 | Sree Vardhini | CTCRI, Thiruvananthapuram |
| 14 | ST-10 | CTCRI, Thiruvananthapuram |
| 15 | ST-14 | CTCRI, Thiruvananthapuram |
| 16 | SV-71 | BCKV, Kalyani |

Crop was raised as per standard practices according to the package of practices for the region. The primary nursery was raised at the field of AICRP on Tuber Crops in the month of July-August. Cuttings taken from primary nursery and secondary nursery were also raised. Cuttings were taken from secondary nursery for experiment purpose. Five hundred kg FYM was applied at the time of preparation of the nursery. The vines were planted at a spacing of 30 cm on ridges formed 60 cm apart. Only the middle of vine with nodes was buried to 5-10 cm depth keeping both ends exposed. The crop was fertilized with FYM @ 10 tons ha⁻¹ as basal dose, nitrogen, phosphorus and potassium as per recommended dose which is 100:50:50 kg NPK ha⁻¹, respectively. Half dose of nitrogen and full dose of phosphorus and potassium were applied at the time of planting while remaining half dose of nitrogen was applied one month after planting along with first weeding and earthing up. To maintain sufficient moisture for proper establishment of the crop, a light irrigation after transplanting was applied. Sweet potato is tolerant to drought but continuous long phase of drought reduces the tuber yield. So irrigation was given 15-20 days interval. After proper establishment, sweet potato starts growing vigorously. Therefore vines were lifted at nodes 30 days after planting to prevent rooting and to facilitate better tuber development at the basal end. First hoeing and weeding was done after 30 days of transplanting and second after 40 days of first weeding to keep plots weed free. In order to protect the vines against incidence of sweet potato weevil (*Cylas formicarius*) which cause serious damage to tubers, sprays with Fenitrothion (0.05%) at monthly intervals was done. The crop was harvested manually 120 days after planting. Proper care was taken to minimize the losses during harvesting. Light

irrigation 2-3 days before harvesting of tubers was given for easier digging.

Vine Biochemicals (At harvest)

Protein (%): Fresh vines with leaves were washed with 0.2 per cent lab detergent, N/10 conc. HCl and distilled water subsequently after that spread them on paper to wash off excess water. They were dried in oven at 60°C for 24 hours and were grinded. 0.1 g well ground and dried sample were taken with 2 ml conc. H₂SO₄ in 100 ml Kjeldal flask and place on digestion assembly till it was digested. After cooling of flask add 0.5 ml of 30 per cent H₂O₂, again heating till become colorless. Then digested solution was transferred into 100 ml volumetric flask and made volume. Five ml of digested solution was taken into 50 ml volumetric flask and added few ml water, 2 ml 10 per cent NaOH, 1ml 10 per cent sodium silicate solution, 1.6 ml Nessler reagent and made its volume. Reading of sample using spectrophotometer at a wavelength of 420 nm was taken and calculated nitrogen with the help of standard curve (Snell and Snell, 1949) [16] and multiplied with 6.25 for estimating the protein value.

Weight of leaf powder = 0.1 g
 Volume of digested material = 100 ml
 Volume of extract take = 5 ml
 Final volume prepared = 50 ml

$$\text{Dilution factor} = \frac{100 \times 50}{0.1 \times 0.5}$$

Concentration of N in ppm = N from standard curve (R) × 10,000

$$\% \text{ N in sample} = \frac{R \times 1000}{10,000}$$

Protein (%) = N (%) × 6.25

Magnesium (PPM): Fresh vines along with leaves were washed with 0.2 per cent lab detergent, N/10 conc. HCl and distilled water and after that spread them on paper to wash off excess water. They were dried in oven at 60°C for 24 hours and were grinded. Vine powder was kept in 10 ml Nitric acid for whole night. Next day 3 ml Perchloric acid was added and digested on hot plate till colour disappeared. After cooling of flask 20 ml distilled water was added and was extracted through funnel. From extract magnesium was found out using Atomic Absorption Spectrophotometer (ELICO, Hyderabad, India) (Bhargava and Raghupathi, 1995) [2].

Weight of plant sample taken = 5 g
 Volume of extract prepared = 100 ml

$$\text{Mg (\%)} \text{ in plant sample} = \frac{R \times 100 \times 10}{\text{Weight of plant sample} \times 100}$$

Where R is the ppm from standard curve.

Results and Discussion

Results indicates that vine protein (%) at harvest was significantly different among germplasm studied. Maximum protein (%) was found in 'CO-3-4' (7.38%) while maximum Mg content was found in 'SV-71' (471.84 ppm). Similarly, for both attributes protein and Mg minimum value was observed in 'ST-10' (3.02%, 443.73 ppm) respectively. These

results were also supported by Ji *et al.*, 2015 [11] and Dung, 2001 [5].

Table 2

| Genotype | Protein (%) | Mg (ppm) |
|---------------|-------------|---------------|
| CIPSWA-2 | 6.40 | 454.87 |
| CO-3-4 | 7.38 | 445.77 |
| Gauri | 3.47 | 461.84 |
| Gautam | 3.24 | 462.93 |
| H-109-2 | 5.80 | 457.89 |
| Navsari Local | 3.80 | 456.94 |
| POL-19-8-10 | 4.12 | 459.77 |
| Samrat | 5.50 | 449.60 |
| SI-1 | 4.00 | 450.86 |
| Sree Arun | 7.01 | 455.82 |
| Sree Nandini | 5.51 | 461.92 |
| Sree Ratna | 3.68 | 453.77 |
| Sree Vardhini | 3.43 | 458.83 |
| ST-10 | 3.02 | 443.73 |
| ST-14 | 3.87 | 457.79 |
| SV-71 | 4.00 | 471.84 |
| Mean | 4.64 | 456.51 |
| Range | 3.02-7.38 | 443.73-471.84 |
| SEm± | 0.18 | 16.83 |
| CD (P=0.05) | 0.52 | 48.60 |
| CV (%) | 6.75 | 6.38 |

References

- Ali R, Mlambo V, Mangwe MC, Dlamini BJ. Chemical composition, nitrogen degradability and *in vitro* ruminal biological activity of tannins in vines harvested from four tropical sweet potato (*Ipomoea batatas* L.) varieties. *Journal of Animal Physiology and Animal Nutrition*. 2016; 100:61-68.
- Bhargva BS, Raghupathi HB. Analysis of plant material for macro and micronutrient. In: *Methods of Analysis of Soils, Plants, Water, and Fertilizers* (Tandon, H.L.S., Ed.). Fertilizer Development and Consultation Organization, New Delhi, India, 1995, 49-82.
- De Moura FF, Millof A, Boy E. Retention of provitamin A carotenoids in sample crops targeted for biofortification in Africa: cassava, maize and sweet potato. *Critical Reviews in Food Science and Nutrition*. 2015; 55:1246-1269.
- Diop A. Storage and processing of roots and tubers in the tropics. In: *FAO, Agro- Industries and Post-Harvest Management Service*, 1998, 38-50.
- Dung NNX. Evaluation of green plants and by-products from the Mekong Delta with emphasis on fibre utilization by pigs (Doctoral thesis). *Sweedis University of Agricultural Sciences: Uppasala, Sweeden*, 2001.
- EI Sheikha AF, Ray RC. Potential impacts of bioprocessing of sweet potato: review. *Critical Reviews in Food Nutrition*, 2015.
- Floulkes D, Hovell FD, Preston TR. Sweet potato forage as cattle feed: voluntary intake and digestibility of mixtures of sweet potato forage and sugarcane. *Tropical Animal Production*. 1997; 3:140-144.
- Frye JBJ, Hawkins GEJ, Henderson HB. The value of winter pasture and sweet potato meal for lactating dairy cows. *Journal of Dairy Science*. 1948; 31:1215-1221.
- Ishida H, Suzuno H, Sugiyama N, Innami S, Tadokoro T, Maekawa A. Nutritive evaluation on chemical component of leaves, stalks and stems of sweet potato. *Food Chemistry*. 2000; 68:359-367.
- Ishiguro K, Toyama J, Islam S, Yoshimoto M, Kumagai T, Kai T et al. Suioh, a new sweet potato cultivar for utilization in vegetable greens. *Acta Horticulturae*. 1. 2004; 637:339-345.
- Ji H, Zhang H, Li H, Li Y. Analysis on the nutrition composition and antioxidant activity of different types of sweet potato cultivars. *Food and Nutrition Sciences*. 2015; 6:161-167.
- Li P, Shuren J, Wang Q, Qin M, Hou C, Shen Y. Adding sweet potato vines improve the quality of rice straw silage. *Animal Science Journal*. 2017; 88:625-632.
- Nayaata OZ, Dorward PT, Keatinge JDH, O'Neil MK. Availability and use of dry season feed resources on small holder dairy farms in central Kenya. *Agroforestry System*. 2000; 50:315-331.
- Pace RD, Phillips BW, Adeyeye SO, Gilliard FM. Eat smart menus and receipts with sweet potato greens. *Publication Tuskegee University, Tuskegee, AL*. 1996, 110-196.
- Rusoff LL, Miller GD, Burch BL, Frye JB. Dehydrated sweet potatoes as a substitute for corn-soyabean silage. *Journal of Dairy Science*. 1950; 33:657-660.
- Snell FD, Snell CT. *Calorimetric method of analysis*. Van Nostrand Company, Inc., New York, 950.
- Tewe OO, Ojeniyi FE, Abu OA. Sweet potato production, utilisation and marketing in Nigeria. *International Potato Center, Lima, Peru*, 2003.
- Yhaya SU, Saad AM, Mohammed SG, Afuape SO. Evaluating the performance of improved sweet potato (*Ipomoea batatas* L. Lam) advanced lines in Kano, Sudan savanna of Nigeria. *International Journal of Agronomy and Agricultural Research*. 2015; 7(4):52-60.