

NUTRIENT UPTAKE OF ASH GOURD [*BENINCASA HISPIDA* (THUNB.) COGN.] GERMPLASM

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Abstract: A field experiment was conducted during *kharif* season of 2015-16 at All India Coordinated Research Project on Vegetable Crops, Odisha University of Agriculture and Technology, Bhubaneswar, to assess the nutrient uptake of different genotypes of ash gourd. Eighteen genotypes of ash gourd including 7 released variety (Kashi Dhawal, Kashi Ujwal, Kashi Surbhi, Pusa Ujjwal, Pusa Urmi, Pusa Sabji Petha and Pusa Shreyali) and 11 land races (BAGS-1, BAGS-2, BAGS-3, BAGS-4, BAGS-5, BAGS-6, BAGS-7, BAGS-8, BAGS-9, BAGS-10, BAGS-11) were used for the experiment. The nitrogen concentration of fruit showed a range of 0.59% (BAGS-6) to 1.18% (BAGS-3). Genotype BAGS-8 recorded maximum concentration of K (6.75%), S (0.80%) and Mn (229.70 mg kg⁻¹). BAGS-2, BAGS-10, Pusa Shreyali scored highest concentration of Zn (62.44 mg kg⁻¹), P (0.62%) and Ca (10.00%) respectively. Highest concentration of magnesium was seen in BAGS-6 as well as Pusa Ujjwal i.e 5.60% where as Pusa Urmi and BAGS-10 found to be lowest i.e 1.80%. BAGS-9 (6598.50 mg kg⁻¹) recorded highest concentration of iron followed by Pusa Shreyali (5230.40 mg kg⁻¹) and Kashi Surbhi (4852 mg kg⁻¹).

Keywords: Genotypes, Micronutrient, Nutrient, Season

INTRODUCTION

Ash gourd [(*Benincasa hispida* (Thunb.)Cogn.] is an important vegetable crop of India, China, the Philippines and many other parts of Asian countries. It is also grown in Latin America and the Caribbean. Ash gourd is an important cucurbit vegetable, grown for vegetable and processed product-Petha. The fruits are also made into mash cakes. Its pulp is used as substitute in tomato ketchups in place of tomatoes. Ash gourd fruits contain various mineral elements and vitamins particularly high level of K and low Na, with low calorific value and no fat. From the Index of Nutritional Quality Value (INQV), it has been evaluated as a quality vegetable. Its mature fruits are mostly used by confectioners for sweet making and in villages it is used for 'Bari'(Nugget) making, which is popular ingredient of vegetable. The fruit contains 11-70 mg of calcium per 100 g and 0.3-0.45 per cent of other minerals; also 0.38 ppm of iodine and 3 ppm of fluorine are present other than the numerous compounds. Various part of the ash gourd plant are valued in indigenous medicine (Ayurvedic medicinal preparation). The ash gourd fruit juice is used in Ayurvedic medicine for treating a range of ailments including insanity and epilepsy (Ramesh *et al.*, 1989), urinary infection and biliousness (Nayar and More, 1998), possesses anti-ulcer activity (Grover *et al.*, 2001, and as a tonic for heart (Nayar and More, 1998). The juice of the leaves is cooling and rubbed on bruises. The fruit of ash gourd is a

good source of carbohydrates, vitamin A, vitamin C and minerals (Randhawa *et al.*, 1983). A decoction of the fruit is styptic, laxative, diuretic and given to cure internal haemorrhages and diseases of the respiratory tract. It is also a popular anti-mercurial and an antidote for alcoholic poisoning. The fruits are made into 'Kushmanda lehyam' which can be stored for several years. It is recommended for various ailments like epilepsy, constipation, constipation, piles, dyspepsia, syphilis and diabetes. The ash of fruit rind is applied on painful swellings. The seeds and their oil are considered anthelmintic and prescribed in cases of roundworm and tapeworm infestations. In China, it is used to treat acute appendicitis and the seed ash is a prized remedy for gonorrhoea. Ash gourd is valued for its medicinal attributes especially in Ayurveda for the cure of peptic ulcers. Apart from various use of ash gourd viz. vegetable, petha (sweet), Ayurvedic medicine, its utilization as potential rootstocks has recently been attracted the attentions of growers and nurserymen. Keeping in view the importance the present study was undertaken to evaluate the Nutrient Uptake of Ash Gourd [(*Benincasa hispida* (Thunb.)Cogn.] Germplasm.

MATERIALS AND METHODS

The present investigation entitled "Nutrient uptake of Ash Gourd [(*Benincasa hispida* (Thunb.)Cogn.] Germplasm" was carried out during *Kharif*, 2015-16, at All India Coordinated Research Project on

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A fertilizer dose of 200 kg N, 100 kg P₂O₅ and 100 kg K₂O per ha were applied. The total amount of phosphorous and 20% of potash and nitrogen were applied to the soil before planting. Remaining amount of nitrogen and potash were applied in other

two-splits. The first top dressing was done at the time of sowing @ 40% each of nitrogen and potash. The second top dressing was done 30 days after sowing at the doses similar to that of first top dressing. All other cultural practices were uniformly adopted for all the genotypes over replications.

Table 1. List of genotypes taken for the study

Local land races/ released varieties	Source
BAGS-1	Balangir (Bhaludunguri)
BAGS-2	Balangir (Gambhari)
BAGS-3	Sundargarh (Rungaon)
BAGS-4	Nuapada (Kuligaon)
BAGS-5	Nuapada (Banjibahal)
BAGS-6	Nuapada (Biswanathpur)
BAGS-7	Angul (Badasasan)
BAGS-8	Nuapada (Jholpathar)
BAGS-9	Balangir (Gambhari)
BAGS-10	Nuapada (Kuligaon)
BAGS-11	Nayagarh (Dashapalla)
Kashi Dhawal	IIVR, Varanasi
Kashi Ujwal	IIVR, Varanasi
Kashi Surbhi	IIVR, Varanasi
Pusa Ujwal	IARI, New Delhi
Pusa Urmi	IARI, New Delhi
Pusa Sabji Petha	IARI, New Delhi
Pusa Shreyali	IARI, New Delhi

Fruit nutrient analysis

Samples of fruit from different treatments were taken at the time of fruit maturation to analyze their NPK content. This analysis was performed with composite (composed over 3 replications) samples of 18 genotypes.

Total nutrient (%) and micronutrient concentration (mg kg⁻¹)

Nitrogen estimation

Nitrogen was estimated by micro Kjeldhal distillation method (Page *et al.*, 1982). 2.5g fresh plant sample was taken in digestion tube. One blank tube was also taken. 20g digestion mixture was added to it. 4ml of conc. H₂SO₄ was mix to it. Then it was kept overnight. Then 2 crystals of sodium thiosulphate were added and digestion continued in a 40 ml digestion tube until blue syrupy liquid was obtained without any bubbling. Then digestion tube was cooled. After that it was diluted to 100ml and this diluted extract was used for estimation of nitrogen.

Transfer 20 ml of diluted sample extract to distillation unit. Then add 10 ml of 40% NaOH and continue distillation for 10 minutes. Collect liberated ammonia by absorbing 10 ml saturated boric acid present in 100 ml conical flask containing 2 drops of mix indicator. After completion of digestion, dilute was titrated against 0.02 N HCl.

% of N sample =

$$\frac{\text{sample titer} - \text{blank titer}}{\text{sample wt. (g)}} \times \frac{N \text{ of HCl}}{100} \times 5$$

Determination of phosphorus and potassium

2.5g of fresh sample was taken in 100mL conical flask. 5mL of conc. HNO₃ was added to it and kept overnight. The flask was heated in hot plate till brown fumes come out. The 5ml dia acid mixture was added. Again the flask was heated till white fumes came out and encircled inside the flask. The flask was taken out from the hot plate and allowed to cool. Then 1ml 1N HCl was added and heated gently for 1 minute. 15ml warm distilled water was added to it. Then the content was transferred to a 50 ml

volumetric flask which has been rinsed twice with distilled water. The volume was made up to 50 ml with distilled water. The aliquot was filtered by using filter paper.

Estimation of phosphorus present in ash gourd fruit:

Phosphoric acid was estimated by 1,2,4-aminonaphtholsulphate reduced molybdatephosphoric blue colour method in perchloric acid system after Jackson (1967) by using Klett summerson photoelectric colorimeter.

Dissolve 55g monobasic potassium sulphate in distilled water and dilute to 500 ml standard of 0, 2.5, 5, 7.5, 10 ml of 25 ppm phosphorus solution and 2 ml digested sample extract were taken in 25 ml volumetric flask. Then required amount of distilled water was added to each flask to make the volume 15 ml. Thereafter, 2.5ml molybdate-vandate solution was added. Final volume was made up to 25 ml distilled water and flask was shaken well. Absorbance was measured by colorimeter at 240 nm after 20 minutes of shaking. The phosphorus content was calculated in percentage by using standard curve.

Estimation of potassium:

Potash was estimated by the help of KCl, flame photometer (Jackson (1967). 1ml digested extracts were taken in 25 ml of volumetric flask and the volume was made upto 25ml with distilled water. Similarly 1, 2, 3, 4, 5ml standard potassium solution were prepared by diluting 1, 2,3,4,5 ml of 100 ppm potassium solution (0.1907g KCl /l) in 100 ml volumetric flask with water. The reading for standard and sample were taken in digital flame photometer. As per the standard curve, the ppm of potassium present in extracting solution was calculated. Then the percentage of potassium present in plant was calculated.

Plant sulphur

Plant sulphur was determined by precipitation of sulphate from the digest as barium sulphate with addition of BaCl_2 salt (turbidimetric method) in acidic medium. The plant sample was digested with di-acid mixture as outlined (Tandon 1993). One gram of plant sample was digested with 10ml of diacid mixture (HNO_3 and HClO_4 in a ratio of 9:4) on a sand bath. The content was heated vigorously until the production of red NO_2 fumes ceased. The completion of digestion was confirmed when the liquid became colorless. After cooling, 20ml of double distilled water was added. Then it was filtered through whatman no.42 filter paper into a 50ml volumetric flask and final volume was made with double distilled water. Sulphur in the plant sample was determined using Turbidity meter 135 exactly in the same manner as described for available S in the soil.

Plant micronutrients (Zn, Fe and Mn)

Micronutrients (Fe, Mn and Zn) of plant samples

Plant samples of 0.5g were dry ashed in muffle furnace and after cooling, the contents were dissolved in 6N HCl followed by filtering the contents with Whatman No. 42 filter paper and final volume made up to 25ml. The micronutrient contents viz., Fe, Mn and Zn in the plant tissue extracts were determined using PinAAcle 900F atomic absorption spectrophotometer.

P, K, Ca, Mg and S

The samples were digested in diacid mixture [HNO_3 : HClO_4 (3:2)]. The P and S were estimated spectrophotometrically, K, flame photometrically, Ca &Mg by EDTA titration method (Jackson,1967).

RESULTS AND DISCUSSION

The nitrogen concentration of fruit showed a significant variation of 0.59 % (BAGS-6) to 1.18% (BAGS-3). Maximum phosphorus content was recorded by BAGS-10 (0.62%) and minimum was by Pusa Urmi *i.e* 0.15%. The result on different concentration of potash among the genotypes was recorded with significant variation of 2.50% (Pusa Urmi) to 6.75% (BAGS-8). BAGS-8 recorded highest sulphur content of 0.80% and lowest was found in Kashi Surbhi (0.20%). Range of concentration of calcium in Ash Gourd fruit extended from 4.40% (Kashi Ujwal) to Pusa Shreyali *i.e* 10.00 %. Magnesium concentration in fruit sample was found to be highest in BAGS-6 as well as in Pusa Ujjwal *i.e* 5.60% and lowest was recorded by BAGS-10 and Pusa Urmi *i.e* 1.80%. A significant range of variation ($602.70 - 6598.50 \text{ mg kg}^{-1}$) among eighteen genotypes was recorded for concentration of iron in fruit sample. BAGS-9 ($6598.50 \text{ mg kg}^{-1}$) recorded highest concentration followed by Pusa Shreyali ($5230.40 \text{ mg kg}^{-1}$) and Kashi Surabhi ($4852.00 \text{ mg kg}^{-1}$). The range extended from 61.22 mg kg^{-1} (Pusa Shreyali) to $229.70 \text{ mg kg}^{-1}$ (BAGS-8) for manganese concentration .Maximum concentration of zinc was observed in BAGS-2(62.44 mg kg^{-1}) and minimum in BAGS-11 (16.00 mg kg^{-1}). Among the genotypes tested, BAGS-8 was the richest source of K, S and Mn. Singh *et al.*(2014) reported that ash gourd fruits contain high levels of potassium (Table.1).

In view of tremendously increasing importance of ash gourd and its research needs due attention is being paid to improvement of the ash gourd.

CONCLUSION

It was concluded that local land races of Ash Gourd BAGS-2 and BAGS-9 consist of Fe (6598.50 mg/Kg) and Zn (62.44 mg/Kg), which is essential nutrient for human health and growth. So these germplasms can be recommended to the Ash Gourd farmers/growers for maximizing production.

Table 1. Total Nutrient Concentration of different Gerplasm of Ash Gourd Fruit

GENOTYPES	N (%)	P (%)	K (%)	S (%)	Ca (%)	Mg (%)	Fe (mg kg ⁻¹)	Mn (mg kg ⁻¹)	Zn (mg kg ⁻¹)
BAGS-1	0.75	0.41	4.90	0.60	7.40	4.30	1612.50	84.11	29.43
BAGS-2	0.82	0.42	4.10	0.60	8.70	3.20	1359.80	172.40	62.44
BAGS-3	1.18	0.39	5.30	0.70	9.30	5.50	1366.70	88.70	43.23
BAGS-4	0.97	0.26	5.30	0.70	7.60	4.90	2623.70	158.60	45.15
BAGS-5	0.86	0.26	4.10	0.40	6.10	3.80	1129.10	141.60	33.52
BAGS-6	0.59	0.42	5.60	0.60	7.30	5.60	2814.60	98.63	45.08
BAGS-7	1.16	0.29	4.20	0.60	4.60	3.10	664.60	61.90	58.57
BAGS-8	0.93	0.17	6.75	0.80	5.60	3.90	602.70	229.70	30.30
BAGS-9	0.86	0.60	3.70	0.60	8.00	2.00	6598.50	103.20	26.84
BAGS-10	0.72	0.62	4.80	0.60	7.40	1.80	1768.00	160.20	60.21
BAGS-11	0.84	0.30	4.60	0.40	5.20	2.20	911.10	72.50	16.00
KASHI DHAWAL	1.03	0.55	5.50	0.30	8.80	5.00	1776.40	68.60	21.12
KASHI UJWAL	0.98	0.41	2.80	0.40	4.40	3.10	4178.70	109.60	25.07
KASHI SURBHI	0.86	0.29	2.90	0.20	4.60	4.00	4852.00	104.00	35.79
PUSA UJJWAL	0.67	0.16	3.20	0.40	5.00	5.60	1546.30	89.60	39.47
PUSA URMI	0.87	0.15	2.50	0.40	6.80	1.80	1381.80	147.00	23.54
PUSA SABJI PETHA	0.64	0.16	2.70	0.40	7.50	2.30	2126.00	73.40	38.27
PUSA SHREYALI	0.61	0.27	3.40	0.50	10.00	4.70	5230.40	61.22	30.56
SE(m) <u>±</u>	0.09	0.07	0.43	0.14	1.34	0.72	372.44	5.33	2.73
CD(0.05)	0.26	0.20	1.27	0.41	4.00	2.15	1111.10	15.91	8.14
CV(%)	14.33	27.49	14.24	37.96	27.44	27.46	22.29	6.70	10.45

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