ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 06, pp.51659-51661, June, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

PROXIMATE AND MINERAL COMPOSITION OF GREEN GRAM VARIETIES

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ARTICLE INFO

Article History:
Received 07th March, 2017
Received in revised form
10th April, 2017
Accepted 16th May, 2017
Published online 20th June, 2017

Key words:

Proximate composition, Elite entries.

ABSTRACT

Twelve green gram varieties including both elite entries and released varieties procured from the AICRP on MULLaRP (Mungbean, Urdbean, Lentil, Lathyrus, Rajmah and Peas), Main Agriculture Research Station University of Agricultural Sciences, Dharwad and they were analysed for proximate composition and mineral content. DGG-3 had highest crude protein content, BGS-9 had highest fat and carbohydrate content, PusaBaisaki had highest moisture content, Selection-04 had highest crude fibre and calcium content, DGG-1 had highest ash, zinc and copper content, DGG-8 and DGG-7 had highest iron and manganese content respectively. The variation in nutritional compositions between the varieties could be from location, varietal differences, soil and climatic condition and also depends on fertilizer treatment. The results of the present study revealed that elite entries are on par with released varieties with regard to nutrient composition.

Citation: Bindu, B. M., Kasturiba, B., Dr. Usha Malagi and Dr. Ganajaxi Math, 2017. "Proximate and mineral composition of green gram varieties", *International Journal of Current Research*, 9, (06), 51659-51661.

INTRODUCTION

Legumes are widely grown throughout the world and their dietary and economic importance is well established. They are rich in protein and essential amino acid like lysine, which perform significant role in human nutrition. Legumes not only add variety to human diet but also serve as an economical source of supplementary proteins (20-30 per cent of protein) for a large population in developing countries like India, where majority of the population is vegetarian (Tresina *et al.,* 2014). Plant proteins are cheaper than animal proteins therefore; people consume legume seeds worldwide as major source of protein and especially in developing countries. Hence, legumes are considered as a "poor man's meat". There is great need to increase the production and utilization of pulses. In this regard, breeders have a great responsibility to release high yielding varieties with high nutritional value, good cooking quality characteristics and acceptable varieties (Petchiammal and Hopper, 2014). One of the important legumes like green gram which is short season, summer growing crop grows widely throughout tropics and subtropics of the world. It is also known as green gram, moong and golden gram. Green gram is the third most important legume crop in India. This plant is a native of India and since ancient time it has been in cultivation but its production is now common throughout Asia and other tropical countries. It is widely grown in Asia, particularly in Thailand, India and Pakistan. Major states growing green gram in India are Rajasthan, Maharashtra, Karnataka, Andhra Pradesh, Orissa, Bihar and Tamil Nadu (Anwar *et al*., 2007). Green gram is an excellent source of protein, low in fat and contains good amount of minerals and vitamins. It is free from heaviness and tendency to flatulence, which is associated with other legumes (Habibullah *et al*., 2005). The present investigation was undertaken to study the nutrient composition of selected elite entries and released green gram varieties.

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MATERIALS AND METHODS

Twelve different varieties were procured from the AICRP on MULLaRP (Mungbean, Urdbean, Lentil, Lathyrus, Rajmah and Peas), Main Agriculture Research Station University of Agricultural Sciences Dharwad, Karnataka state in India. Among the twelve varieties six varieties are elite entries (DGG-1, DGG-03, DGG-05, DGG-06, DGG-07 and DGG-08) and six are released varieties (DGGV-02, IPM-04-14, Selection-04, Chinamoong, BGS-9 and PusaBaisaki). For the preparation of composite sample, the seeds were then grinded in a mechanical grinder, mixed and finally kept in an airtight container.

Proximate composition

Proximate composition of green gram was determined using standard method (AOAC, 2005). Minerals (iron, zinc, manganese and copper) were analyzed by atomic absorption spectrophotometer. Calcium was estimated by titrimetric

method (Raghuramulu *et al.,* 2003). Sugars were estimated by Nelson Somogyi's method and starch content was determined by Anthrone method, according to the procedure given by Sadasivam and Manickam, 2008.

Statistical analysis

The results were statistically analysed by one way ANOVA followed by paired t-test, using SPSS software.

Table 1. Characteristics of selected green gram varieties

Varieties	Growing season	Yield (kg/ha)	Crop duration (days)	Colour	Shape
Released varieties					
DGGV-02	Kharif	12-13	75	Shine green	Oval
BGS-9	Kharif	11-12	75	Shine green	Oval
Selection-04	Kharif	10-11	74	Shine green	Oval
Chinamoong	Kharif	9-10	72	Shine green	Oval
IPM-02-14	Rabi and summer	11-12	76	Shine green	Oval
PusaBaisaki	Kharif, Rabi and summer	8-10	72	Dull green	Oval
Elite entries					
DGG-1	Kharif	13-14	74	Shine green	Oval
DGG-3	Kharif	13-14	76	Dull green	Oval
DGG-5	Kharif and summer	13-14	68	Shine green	Oval
DGG-6	Kharif and summer	13-14	68	Shine green	Oval
DGG-7	Kharif and summer	13-14	74	Shine green	Oval
DGG-8	Rabi and summer	13-14	74	Shine green	Oval

Table 2. Proximate composition of green gram varieties (g/100g)

Varieties	Moisture	Fat	Crude protein	Cured fibre	Ash	Carbohydrate
Released varieties						
DGGV-02	10.30±0.08	1.25±0.02	27.71±1.97	5.91±0.01	3.59±0.01	51.21±1.91
BGS-9	10.21±0.11	1.53±0.01	25.58±0.30	4.61±0.02	3.62±0.03	54.43±0.43
Selection-04	10.01±0.02	1.31±0.01	27.65±1.26	6.95±0.05	3.46±0.06	50.60±1.30
Chinamoong	10.32±0.17	1.46±0.06	28.23±0.40	6.52±0.03	3.70±0.04	49.75±0.26
IPM-02-14	10.03±0.05	1.30±0.01	26.48±0.40	5.52±0.06	3.63±0.02	53.02±0.51
PusaBaisaki	10.46±0.06	1.26±0.02	25.78±0.20	5.36±0.08	3.63±0.00	53.49±0.14
Elite entries						
DGG-1	10.43±0.16	0.81±0.02	27.18±0.20	5.79±0.01	3.70±0.00	52.08±0.38
DGG-3	10.39±0.06	0.69±0.01	28.70±0.00	5.53±0.01	3.62±0.07	51.06±0.07
DGG-5	10.35±0.09	1.29±0.02	26.48±0.40	6.10±0.02	3.67±0.04	52.10±0.38
DGG-6	10.20±0.19	1.04±0.01	27.30±0.00	5.49±0.08	3.71±0.05	52.24±0.30
DGG-7	10.43±0.23	1.26±0.02	25.78±0.20	4.88±0.04	3.67±0.06	53.96±0.08
DGG-8	10.40±0.38	0.87±0.01	27.41±0.20	5.17±0.03	3.46±0.01	52.67±0.54
Mean±SD	10.30±0.13	1.18±0.02	27.03±0.46	5.66±0.03	3.62±0.03	52.22±0.52
Sem±	0.09	0.01	0.41	0.02	0.02	0.44
CD	0.29*	0.04*	1.28*	0.08*	0.07*	1.34*
F-value	2.62	430.8	5.87	721.0	13.1	10.6

Note: Values are mean of three replications, SEm: Standard Error of Mean, CD: Critical Difference. *Significant @ 5%

Table 3. Comparison of proximate composition between released and elite entries green gram varieties (g/100g)

Varieties	Moisture	Fat	Crude protein	Cured fibre	Ash	Carbohydrate
Released varieties	10.23±0.18	1.36±0.11	26.91±1.12	5.82±0.85	3.60±0.08	53.80±5.26
Elite entries	10.38±0.09	1.00±0.24	27.14±0.98	5.50±0.44	3.63±0.10	54.10±4.50
t-value	1.79 NS	2.88*	0.34 NS	1.12 NS	0.59 NS	0.32 NS

Note: Values are mean of three replications, SEm: Standard Error of Mean, CD: Critical Difference. *Significant @ 5%, NS-Not Significant

Table 4. Mineral contents of green gram varieties (mg/100g)

Varieties	Ca	Fe	Zn	Mn	Cu
Released varieties					
DGGV-02	80.16±0.01	5.00±0.10	2.83±0.06	2.46±0.00	0.38±0.01
BGS-9	80.59±0.40	4.86±0.06	2.96±0.06	2.48±0.01	0.38±0.01
Selection-04	120.5±0.10	4.40±0.00	3.03±0.06	2.48±0.01	0.37±0.01
Chinamoong	100.4±0.37	4.53±0.06	2.66±0.06	2.48±0.01	0.36±0.00
IPM-02-14	100.3±0.25	4.73±0.06	2.70±0.00	2.46±0.00	0.37±0.00
PusaBaisaki	100.6±0.36	4.56±0.06	3.03±0.06	2.45±0.00	0.38±0.01
Elite entries					
DGG-1	100.3±0.21	4.46±0.06	3.06±0.06	2.46±0.01	0.39±0.00
DGG-3	80.17±0.02	4.53±0.06	2.70±0.00	2.49±0.01	0.37±0.01
DGG-5	120.2±0.03	4.76±0.06	2.96±0.06	2.48±0.00	0.36±0.00
DGG-6	100.4±0.25	4.73±0.06	2.93±0.06	2.46±0.01	0.37±0.01
DGG-7	100.3±0.18	5.03±0.06	2.83±0.06	2.50±0.00	0.36±0.01
DGG-8	100.3±0.11	5.06±0.06	2.80±0.00	2.47±0.01	0.38±0.01
Mean±SD	98.53±0.19	4.72±0.06	2.87±0.04	2.47±0.00	0.37±0.00
Sem±	7.74	0.03	0.03	0.00	0.00
CD	23.84*	0.11*	0.09*	0.01*	0.01*
F-value	2.83	43.82	24.08	37.50	15.36

Note: Values are mean of three replications, SEm: Standard Error of Mean, CD: Critical Difference. *Significant @ 5%

RESULTS AND DISCUSSION

Proximate composition

Green gram is an ideal legume for protein and is consequently becoming an important part of the people's diet in many parts of the world. The impact of genotypes on all the proximate composition was statistically significant ($p \leq 0.05$). Moisture, protein, fat, ash, crude fiber and total carbohydrate of green gram varieties are presented in Table 2. Moisture content ranged between 10.01-10.46g/100g. PusaBaisaki had highest moisture content *i.e*10.46g/100g followed by DGG-7 and DGG-1 (10.43g/100g) and Selection-04 recoded least moisture content (10.01g/100g). The moisture content determines the shelf life and milling characteristics of grains. The moisture content observed in the present investigation (10.30g/100g) was in agreement with those reported in two varieties of green gram by Habibullah*et al.* (2005). The fat content varied from 0.69-1.53g/100g. BGS-9 had highest fat content (1.53g/100g) followed by Chinamoong (1.46g/100g) and IPM - 02-14 (1.30g/100g) and DGG-3 had least fat content (0.69g/100g). The fat content ranged from 0.69-1.53g/100g in green gram is comparable with values reported by Paul *et al*., 2011 (*i.e* 1.53g/100g). Protein content ranged from 25.58-28.70g/100g. DGG-3 had highest protein content (28.70g/100g) followed by Chinamoong (28.23g/100g) and DGGV-02 (27.71g/100g). BGS-9 had least protein content (25.58g/100g). Green gram contains appreciable amount of protein (27.03g/100g) which was comparable with the values reported by Tresina *et al.* (2010). The crude fiber content varied from 4.61-6.95g/100g. Highest was observed in Selection -04 (6.95g/100g) followed by Chinamoong (6.52g/100g) and DGG-5 (6.10g/100g), BGS-9 had recorded least crude fiber content (4.61g/100g).The ash content varied from 3.46-3.70 g/100g. Highest was found in DGG-1 and Chinamoong (3.70g/100g) and DGG-8 and Selection-04 recoded least ash content (3.46g/100g). Similarly Habibullah *et al.* (2005) reported that fiber and ash contents varied from 6.8-7.1 per cent and 3.9-3.0 per cent respectively.

Table 5. Comparison of mineral contents of released and elite entries green gram varieties (mg/100g)

Varieties	Ca	Fe	Zn	Mn	Cu
Released varieties	96.86±15.09	4.68±0.22	2.88±0.16	2.47±0.02	0.38±0.02
Elite entries	100.2±12.68	4.77±0.25	2.88±0.14	2.49±0.01	0.38±0.02
t-value	1.00 NS	0.49NS	0.13NS	1.16NS	0.00NS

Note: Values are mean of three replications, SEm: Standard Error of Mean, CD: Critical Difference. NS-Not Significant

The carbohydrate is an important fuel nutrient which was ranged from 49.75-54.43g/100g. BGS-9 had recorded highest *i.e*54.43g/100g followed by DGG-7 (53.96g/100g) and PusaBaisaki (53.49g/100g) and least was observed in Chinamoong (49.75g/100g). The present study reveals that carbohydrate content of green gram is 52.22g/100g, which was comparable with the values reported by Habibullah *et al.* (2005). Table 3 depicts the comparison of proximate composition between released and elite entries. There was no significant difference found in the proximate composition of released and elite entries green gram varieties except for fat content, whereas released had higher values for fat content compared to elite entries. Variation in proximate compositions has been attributed to location, varietal differences, soil and climatic condition and also depends on fertilizer treatment.

Mineral content: Table 4 depicts the mineral content of green gram varieties. Significant difference was observed among the varieties ($p \leq 0.05$), whereas Calcium content ranged from 80.16-120.5mg/100g. Selection-04 had highest calcium content (120.5mg/100g) followed by DGG-5 (120.2mg/100g) and PusaBaisaki (100.6mg/100g) and least was found in DGGV-02 (80.16mg/100g).The iron content varied from 4.40-5.06mg/100g. DGG-8 had highest iron content followed by DGG-7 (5.03mg/100g) and DGGV-02 (5.00mg/100g) whereas Selection-04 had least iron content *i.e* 4.40mg/100g. Zinc content in green gram varied from 2.66-3.06mg/100g. Highest was found in DGG-1 (3.06mg/100g) followed by Selection-04 and PusaBaisaki (3.03mg/100g). Chinamoong had least zinc content *i.e*2.66mg/100g.The manganese content ranged from 2.46-2.50mg/100g. Highest manganese content was found in DGG-7 whereas DGG-1, DGGV-02 and DGG-6 had lowest manganese content *i.e* 2.46mg/100g. Copper content of green gram ranged from 0.36-0.39mg/100g. DGG-1 recorded highest copper content (0.39mg/100g) whereas lowest was found in DGG-5 and Chinamoong (0.36mg/100g). Table 5 depicts the comparison of mineral content between released and elite entries of green gram varieties. Results showed that there was no significant difference found in mineral content between two groups. However, the elite entries had higher values compared to released varieties. Habibullah *et al*., 2005 reported that M1 had relatively higher concentration of Ca (216mg/100g), Fe (11.34mg/100g) and Zn (1.88mg/100g), whereas NM-92 had higher values of Cu (1.92mg/100g) and Mn (1.49mg/100g). Similar results were also reported by Tresina *et al*., 2014 and Paul *et al*., 2011. Dahiya (2013) where the significant difference in the mineral content was found among the varieties, this may be attributed to ability of the root to absorb mineral from the soil. Therefore, from the present study it can be concluded that elite entries are on par with released varieties with regard to nutrient composition.

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