Direct RESEARCH JOURNALS

# Variability and correlation studies in spine gourd (*Momordica dioica* Roxb.)

**Direct Research Journal of Agriculture and Food Science (DRJAFS)** Vol.2 (7), pp. 77-81, August 2014
Available online at directresearchpublisher.org/drjafs
ISSN 2354-4147 ©2014 Direct Research Journals Publisher

*Research Paper*

**P BASUMATARY[1*], G C BORA[2], U C KALITA[3], L SAIKIA[4] and N C DEKA[5]**

[1]Regional Agricultural Research Station, Assam Agricultural university, Diphu 782460, India.
[2]Department of Horticulture, College of Agriculture, A.A.U, Jorhat 785013, India.
[3]Department of Plant breeding and genetics, College of Agriculture, A.A.U, Jorhat 785013, India.
[4]Department of Horticulture, College of Agriculture, A.A.U, Jorhat 785013, India.
[5]Department of Agronomy, College of Agriculture, A.A.U, Jorhat 785013, India.

## ABSTRACT

A field experiment was conducted during kharif, 2010 with 15 local germplasm of spine gourd (*Momordica dioica* Roxb.) at the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat. The analyses of variance revealed significant differences among the genotypes for all the characters studied. High genotypic variance followed by high genotypic coefficient variation was observed for node at which first female flower appears, vine length, 100 seed weight and fruit yield per plant. In general the phenotypic coefficient of variation (PCV) estimates were higher than the genotypic coefficient of variation (GCV) estimates for all the traits. Correlation study revealed highly significant and positive correlation of yield per plant with number of primary branches, internode length, fruits per plant, fruit diameter and single fruit weight. Days to 50 % flowering exhibited significant positive correlation with total soluble sugar (%). Simple selection for those component characters will make considerable improvement in yield.

**Key words :** Genetic variability; correlation; fruit yield; quality characters; spine gourd.

*Corresponding Author E-mail: poojabasumatary149@gmail.com

**Accepted 24 June 2014**

## INTRODUCTION

Spine gourd (*Momordica dioica* Roxb.) is a cucurbitaceous crop, belongs to the family cucurbitaceae with chromosome number 2n=28, under the genus Momordica (Raj *et al*., 1993) and is known by various names like Kakrol, Kartoli, Kankad, Teasel gourd or Bhat kerala. It is widely distributed in tropical and sub-tropical parts of India and adapted to different soil and climatic condition. For cultivation it requires a warm and humid climate with temperature ranging from 25-35°C and average rainfall of 1500-2500 mm. The crop is planted in February to March in Assam and the soil and climatic condition of the state is very much suitable for the cultivation of spine gourd. The wide genetic variability that exists in the available genotypes provides ample scope for further improvement. The correlation studies provide relative information on the nature and extent of relationship for bringing about improvement in yield and other traits. Correlation studies between yield and other traits of the crop will be of interest to the breeders in planning the hybridization programme and evaluating the individual plants in segregating populations. It also provides an indication of effective selection of desirable traits towards the improvement of varieties. The characters having high genetic coefficient of variation indicate high potential for effective selection. The present investigation was therefore undertaken to study the genetic variability and correlation between yield and its attributing characters.

## MATERIALS AND METHODS

The present experiment was conducted at the experimental field, Department of Horticulture, Assam Agricultural University, Jorhat during the period from March 2010-July 2010. The experimental material comprised of 15 spine gourd (*Momordica dioica* Roxb.) germplasm collected from farmer's field of different parts

**Table 1.** List of Genotypes with place of collection.

| S/N | Accessions | Place of collection | S/ N | Accessions | Place of collection |
|---|---|---|---|---|---|
| 1 | GB 16-01/09 | Noisiporia, Teok | 9 | SPG-13 | Rowta, Darang |
| 2 | GB 18-08/09 | Takawbari, Shillongoni | 10 | GB 18-07/09 | Chalchali Haibargaon |
| 3 | GB 18-09/09 | Takawbari, Shillongoni | 11 | GB 5-01/09 | Namdeuri, Jorhat |
| 4 | SPG-12 | RARS, Shillongoni | 12 | SPG-02 | Borkhongia, Jorhat |
| 5 | SPG-01 | Dhekiajuli, Jorhat | 13 | SPG-04 | Namdeuri, Jorhat |
| 6 | GB 18-05/09 | RARS, Shillongoni | 14 | SPG-06 | Nowjan, Golaghat |
| 7 | GB 18-03/09 | RARS, Shillongoni | 15 | SPG-10 | Borkhongia, Jorhat |
| 8 | GB18-10/09 | Bherbheri, Kachamari | 16 | SPG-05 (Male) | Borbheta, Jorhat |

of Assam in the year 2009. Being dioecious in nature, a common male parent namely SPG-05 was also included in the experiment in order to make effective pollination. Four cultivars already studied and maintained by All India Coordinated Research Project (AICRP) on Vegetable crops (VC), Jorhat centre were also used as check varieties in the study. The tubers of female and male genotypes were planted at the ratio of 10:1 to ensure better fertilization. The list of genotypes taken for the experiment is given (Table 1).

The experiment was laid out as per Augmented design where check genotypes were replicated thrice and the test genotypes were kept unreplicated and distributed unequally in the blocks. Recommended dose of manures and fertilizers were applied to provide better nutrition to the crop. The tubers were planted in 35cm deep trenches spaced at a distance of 1 m between rows and 1 m between plants. Above mentioned ratio of female and male plants was also maintained in the experimental plot. Stacking with bamboo tops was done to provide support to the plants to climb. Irrigation was provided as and when it was necessary. Data on different plant characters *viz.,* vine length (cm), number of primary branches, internode length (cm), petiole length (cm), leaf length (cm), leaf breadth (cm), node number at which first female flower appears, number of fruit per plant, number of marketable fruit harvest, peduncle length (cm), fruit length, diameter and girth (cm), single fruit weight (g), fruit yield per plant (g), number of seeds/fruit, 100 seed weight (g), tuber number, tuber size (cm), days to 50% flowering, days to first fruit harvest, days to last fruit harvest, ascorbic acid (mg/100 g), minerals- calcium (mg/100 g), phosphorus (mg/100 g); protein (mg/100 g) and total soluble sugars (%) were recorded. The data were analysed following statistical procedure of (Federer and Raghavarao,1975+.

## RESULTS AND DISCUSSION

### Variability studies

The estimated range, mean, genotypic and phenotypic variances, genotypic coefficient of variation and phenotypic coefficient of variation (GCV and PCV) respectively are presented in (Tables 2 to 7).

The analysis of variance revealed a wide range of variation among the 15 genotypes for all the characters. Genotypic variance was high in fruit yield per plant, vine length, single fruit weight and number of seeds per fruit. Low genotypic variance was observed in fruit diameter, internode length, fruit length and number of primary branches. High phenotypic variance was recorded in fruit yield per plant, vine length, single fruit weight and number of seeds per fruit. Low phenotypic variance was recorded in fruit diameter, internode length, and fruit length. The phenotypic coefficients of variation estimates were higher than the genotypic coefficient of variation estimates for all the traits.

The results were in confirmation with the works of Khan *et al.* (2009). Highest genotypic coefficient of variation was evident in number of primary branches (27.65%) followed by node at which first female flower appears (20.77%), fruit yield per plant (20.37%) and fruit length (19.71%), respectively. This indicated the presence of high amount of genetic variability. High phenotypic coefficient of variation was observed in number of primary branches (27.88%), node at which first female flower appears (20.92 %), fruit yield per plant (20.90%) and fruit length (20.45%) which emphasized the wide scope of selection for the improvement of the characters from a considerable amount of variability present. In most of the cases minor difference between genotypic and phenotypic coefficient of variations was observed indicating that environment had less influence on the expression of most of the characters. However, the magnitude of difference between PCV and GCV was less for all the characters. The existing variation for the characters was mainly due to the genetic factor. There is enough scope for selection based on these characters.

### Correlation studies

Vine length is highly correlated with internode length, fruit diameter and 100 seed weight. Again number of primary branches was highly correlated with internode length and fruit yield. Internode length highly correlated with fruits per plant, fruit diameter and fruit yield. Days to 50 percent flowering showed highly positive correlation with total

**Table 2.** Analysis of variance for Plant Characters.

| Source of variation | MEAN SQUARES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Vine length (cm) | Number of primary branches | Inter-node length (cm) | Petiole length (cm) | Leaf size (cm) | | |
| | | | | | Leaf length | Leaf breadth | Node number at which first female flower appears |
| Entries (e) | 15135.1** | 14.25** | 3.47** | 3.30** | 2.13** | 2.79** | 35.82** |
| Checks (c) | 2600.00** | 0.48 * | 1.80 | 1.29** | 1.97** | 3.50** | 93.78** |
| Varieties (v) | 19204.3** | 12.08** | 4.16** | 3.56** | 2.37** | 2.85** | 17.36** |
| Checkvs Variety | 12048.2** | 77.25** | 1.58 | 6.75** | 0.27 | 0.03 | 46.57** |
| Error | 310.00 | 0.08 | 0.57 | 0.13 | 0.14 | 0.07 | 0.17 |

**Table 3.** Analysis of variance for Yield and Fruit Characters.

| Source of variation | MEAN SQUARES | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Number of fruits per plant | Number of marketable fruit per plant | Peduncle length (cm) | Fruit length (cm) | Fruit diameter (cm) | Fruit girth (cm) | Single fruit weight (g) | Fruit yield per plant (g) |
| Entries (e) | 28.49** | 26.94** | 36.57** | 7.24** | 0.61** | 15.64** | 197.03** | 117039.30** |
| Checks (c) | 15.64** | 29.00** | 45.15** | 20.4** | 0.84** | 47.96** | 479.31** | 46993.51** |
| Varieties (v) | 29.62** | 17.40** | 33.87** | 3.63** | 0.61** | 7.43** | 116.59** | 149610.60** |
| Check vs Variety | 55.78** | 116.22** | 37.92** | 3.93** | 0.0004 | 0.81 | 154.60** | 1463.84 |
| Error | 0.75 | 2.50 | 0.16 | 0.17 | 0.02 | 0.19 | 1.19 | 1960.66 |

** Significant at 1% level.

**Table 4.** Analysis of variance for Seed and Tuber Characters.

| Source of variation | MEAN SQUARES | | | | |
|---|---|---|---|---|---|
| | Number of seeds per fruit | 100 seed weight (g) | Tuber number | Tuber size (cm) | |
| | | | | Tuber length | Tuber breadth |
| Entries (e) | 70.57** | 36.03** | 9.47* | 44.41** | 1.77** |
| Checks (c) | 113.44** | 0.62 | 10.00* | 55.88** | 2.97** |
| Varieties (v) | 31.69** | 36.66** | 9.62* | 42.18** | 1.38** |
| Check vs Variety | 333.70** | 135.92** | 6.45 | 32.31** | 2.16** |
| Error | 1.83 | 0.53 | 2.33 | 0.07 | 0.002 |

* Significant at 1% level, ** Significant at 5% level.

soluble sugars (%). Highly significant positive correlation was observed between numbers of fruit per plant and fruit yield per plant; fruit length and single fruit weight. Dora *et al.* (2002) reported positive correlation of fruits per plant with yield per plant in pointed gourd;with number of primary branches and fruit weight (Singh *et al.*, 2009) in cucumber. Fruit diameter was found to be positively correlated with fruit girth, single fruit weight and fruit yield. The association between single fruit weight and fruit yield; and 100 seed weight and Vitamin C content was highly positive.

**Table 5.** Analysis of variance for Crop Duration and Biochemical Characters.

| Source of variation | MEAN SQUARES | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Days to 50% flowering | Days to first fruit harvest | Days to last fruit harvest | Ascorbic Acid (mg/100g) | Protein (g) | Total Soluble Sugars (%) | Calcium (mg/100g) | Phosphorus (mg/100g) |
| Entries (e) | 44.71** | 83.35** | 65.92** | 58708.62** | 0.001** | 2.10** | 21.47** | 154.27** |
| Checks (c) | 61.78** | 106.89** | 114.97** | 233.21** | 0.0004** | 6.18** | 56.90** | 540.14** |
| Varieties (v) | 30.56* | 83.60** | 55.09** | 1794.74** | 0.00006* | 1.03** | 10.65** | 53.80** |
| Check vs Variety | 134.91** | 10.20* | 27.13 | 803273.60** | 0.00009* | 0.42** | 23.27** | 1.38** |
| Error | 3.42 | 1.50 | 5.75 | 0.05 | 0.00001 | 0.005 | 0.04 | 0.08 |

* Significant at 5% level, **- Significant at 1% level.

**Table 6.**Genotypic variance, phenotypic variance, genotypic coefficient of variation, phenotypic coefficient of variation, range and mean of yield and yield attributing characters of 15 spine gourd germplasm.

| Characters | Genotypic variance | Phenotypic variance | Genotypic coefficient of variation (%) | Phenotypic coefficient of variation (%) | Range | Mean ± SE |
|---|---|---|---|---|---|---|
| Days to 50% flowering | 14.27 | 17.68 | 5.33 | 5.49 | 62.67- 79.00 | 70.76 ± 2.13 |
| Node at which 1st female flower appears | 11.35 | 11.55 | 20.77 | 20.92 | 10.00-24.00 | 16.24 ± 0.47 |
| Internode length (cm) | 0.92 | 1.49 | 10.65 | 13.55 | 6.00-12.40 | 9.03±0.87 |
| Vine length (cm) | 4731.42 | 5041.42 | 17.38 | 17.88 | 150-560 | 397.09 ± 20.33 |
| Number of primary branches | 4.52 | 4.60 | 27.65 | 27.88 | 3.60-14.00 | 7.69 ± 0.32 |
| Number of fruits per plant | 8.85 | 9.60 | 16.21 | 16.88 | 9.30-24.50 | 18.36 ± 1.00 |
| Fruit length (cm) | 2.26 | 2.43 | 19.71 | 20.45 | 3.70-10.90 | 7.67 ± 0.48 |
| Fruit breadth (cm) | 0.18 | 0.20 | 9.50 | 9.97 | 3.00-5.20 | 4.40 ± 0.18 |
| Single fruit weight (g) | 62.50 | 63.69 | 14.41 | 15.56 | 34.56-71.42 | 51.30 ± 1.26 |
| Number of seeds per fruit | 21.94 | 23.77 | 12.10 | 12.60 | 28.00-49.67 | 38.70 ± 1.56 |
| 100 seed weight (g) | 11.33 | 11.86 | 18.39 | 18.82 | 6.42-23.56 | 18.29 ± 0.84 |
| Yield per plant (g) | 36727.22 | 38687.88 | 20.37 | 20.90 | 356.00-1369.80 | 940.75 ± 51.13 |

**Table 7.** Correlation between yield and its attributing characters.

| Characters | Number of primary branches | Internode Length (cm) | Node of first female flower appearance | Days to 50% flowering | Number of fruits per plant | Fruit length (cm) | Fruit diameter (cm) | Fruit girth (cm) | Single fruit wt (cm) | 100 seed weight (g) | Vit. C (mg/ 100 g) | Protein (g) | Total Soluble sugars (%) | Fruit yield per plant (g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vine length (cm) | 0.41 | 0.70** | -0.13 | -0.27 | 0.51 | 0.39 | 0.68** | 0.52* | 0.59* | 0.72** | 0.29 | 0.47 | 0.05 | 0.63* |
| Number of primary branches | | 0.70** | -0.31 | -0.35 | 0.54* | 0.52* | 0.50 | 0.49 | 0.62* | 0.12 | -0.20 | 0.32 | 0.22 | 0.75** |
| Internode Length (cm) | | | -0.22 | -0.35 | 0.72** | 0.24 | 0.69** | 0.47 | 0.45 | 0.31 | -0.05 | 0.39 | -0.02 | 0.73** |
| Node of 1st female flower appearance | | | | -0.08 | 0.01 | 0.09 | 0.14 | 0.14 | -0.15 | 0.09 | 0.48 | 0.14 | 0.10 | -0.11 |
| Days to 50 % flowering | | | | | -0.63* | 0.18 | -0.30 | -0.23 | 0.24 | 0.09 | -0.35 | -0.50 | 0.72** | -0.29 |
| Number of fruits per plant | | | | | | 0.20 | 0.64* | 0.42 | 0.27 | 0.43 | 0.33 | 0.58* | -0.21 | 0.84** |
| Fruit length (cm) | | | | | | | 0.50 | 0.58* | 0.83** | 0.22 | 0.23 | 0.05 | 0.48 | 0.60* |
| Fruit diameter (cm) | | | | | | | | 0.82** | 0.58** | 0.58* | 0.43 | 0.50 | -0.03 | 0.73** |
| Fruit girth (cm) | | | | | | | | | 0.56* | 0.46 | 0.35 | 0.44 | -0.12 | 0.59* |
| Single fruit weight (g) | | | | | | | | | | 0.51 | 0.22 | 0.24 | 0.42 | 0.74** |
| 100 seed weight (g) | | | | | | | | | | | 0.64** | 0.43 | -0.06 | 0.54* |
| Ascorbic acid (mg/100 g) | | | | | | | | | | | | 0.43 | -0.14 | 0.30 |
| Protein (g) | | | | | | | | | | | | | -0.18 | 0.52* |
| Total soluble sugars (%) | | | | | | | | | | | | | | 0.07 |

*Significant at 5% probability level,** Significant at 1% probability level.

Correlation coefficients among component character indicated highly significant positive correlation of single fruit weight with fruit length and fruit diameter. Singh (2004) reported positive correlation of fruit weight with fruit diameter and vine length in chow-chow (*Sechium edule*). The significant and positive correlation of fruit yield has been reported earlier with number of fruits per plant, fruit weight, vine length and number of primary branches (Swamy, 1986) in musk melon; and with fruit weight, fruit diameter and number of primary branches (Sarkar *et al*., 1999) in pointed gourd.

From this study it could be concluded that there was sufficient genetic variability among the germplasm lines for most of the characters under study. Hence selection will be operative for improvement of those characters. The significance of positive correlation for yield with number of primary branches, internode length, fruits per plant, fruit diameter and single fruit weight indicates that simple selection for any of these characters will result in considerable improvement of yield in spine gourd.

***This is a part of the thesis submitted by the first author to the Assam Agricultural University, Jorhat for partial fulfillment of the degree of M Sc (Agri.) in Horticulture.**

## REFFRENCE


Dora DK, Behera TK, Acharya GC, Mohapatra P, Mishra B (2002). Genetic variability and character association in pointed gourd (*Trichosanthes dioica* Roxb.). *Indian J. Hort.* 60(2): 163-166.

Federer WT, Raghavarao D (1975). On augmented designs. *Biometrics* 31(1): 29-35.

Fiske C H and Subba Rao Y (1925). Determination of phosphorus content. *J. Biol. Chem.* 66: 375.

Freed M (1966). Method of vitamin assay. Interscience Publication Inc., New York.

Khan A S M M R, Kabir M Y and Alam M M (2009). Variability, correlation path analysis of yield and yield components of pointed gourd. *J. Agric. Rural Dev.* 7(1&2): 93-98.

Lowry O H, Rosebrough N J, Farr A L and Randall R J (1951). Protein measurement with folin reagent. *J. Biol. Chem.* 193: 265-273.

Raj NM, Prasanna KP, Peter KV (1993). *Momordica* spp. In: Kallo G, Berge Bo (Eds).Genetic Improvement of Vegetables Crops. pergamon press; Oxford, pp. 239-243.

Sarkar S, Maity TK, Roy K, Som MG (1999). Correlation and path coefficient studies in pointed gourd (*Trichosanthes dioica* Roxb.). *Indian J. Hort.* 56(3).

Singh R, Kumar S, Singh SK, Singh BK, Kumar M (2009). Character association and path coeffiient studies in cucumber (*Cucumis sativus* L.). *J. Environ. and Ecol.* 27(3): 1066-1069.

Singh RK (2004). Correlation and path coefficient studies in chow-chow (*Sechium edule*). *Indian J. Hort.* 61(2): 154-157.

Swamy KRM (1986). Studies on improvement for qualitative and quantitative characters in muskmelon (*Cucumis melo* L.). *Mysore J. Agric. Sci.*19: 283.

Thimmaiah S R (2006). Standard methods of biochemical analysis. Kalyani Publication, New Delhi, pp. 54-55.

Ward G M and Johnston F B (1962). Chemical methods of plant analysis, Canada Department of Agriculture, Publication No. 1064.