



MORPHOLOGICAL CHARACTERIZATION OF YARDLONG BEAN– AN UNDER EXPLOITED VEGETABLE

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ABSTRACT

The experiment was conducted at Student Research Farm, College of Horticulture, Rajendranagar, Hyderabad during *Khariif*, 2013 in a randomized block design with three replications. The morphological characterization was done as per minimal descriptors of NBPGR developed for Cowpea. The results revealed that there was lot of diversity among the genotypes for various characters studied. Growth habit varied from pole type to bush type while flower colour light purple, purple, dark purple, pink and white. However pod colour was light green, dark green, light green with purple tip and purple with green tip. Similarly seed colour varied from red, deep red, red with white tipped, red spotted, brown, mottled brown, off white, black and buff. However, seeds are in kidney shape. The seed eye pattern varied from small black ring, small dark red ring, medium dark red ring, large mottled brown ring, brown holstein pattern and red holstein pattern. On the basis of mean performance of the genotypes for all the traits studied, four genotypes IC-582859, NSJ-362, IC-582850 and IC-582872 were found to be superior with desirable characters. Hence, these genotypes could be used for selection programme and as parental sources for future breeding programmes.

KEYWORDS: Yardlong bean, Minor legume vegetable, Germplasm, Quantitative traits, Qualitative traits,

INTRODUCTION

Yardlong bean (*Vigna unguiculata* (L.) Walp. ssp. *sesquipedalis* Verdc.) is one of the most important leguminous vegetable crops. All cultivated cowpeas are found within the universally accepted *V. unguiculata* subspecies *unguiculata* classification, which is then commonly divided into four cultivar groups: *unguiculata*, *biflora*, *sesquipedalis*, and *textilis* (Perrino *et al.*, 1993 and Singh *et al.*, 1997). Yardlong bean is widely grown throughout Asia especially in the South and South East Asian countries. The Tropical Vegetable Research Center (TVRC), Kasetsart University, Thailand has a large collection of Yardlong bean germplasm collected from Thailand and other parts of Asia. This germplasm has been morphologically characterized and found to contain significant variation among accessions. There is a large morphological diversity found within the crop, and the growth conditions and grower preferences for each variety vary from region to region (Singh *et al.*, 1997). Morphological characters are useful to characterize germplasm against high heritability and stable traits. Further, association of any morphological character with desirable traits/yield components serves as phenotypic marker in the selection process. Being underexploited vegetable Yardlong bean has to be characterized to select the best genotypes for further improvement in this crop. Hence the present investigation was conducted to characterize forty one genotypes of Yardlong bean based on morphological and yield related characters.

MATERIALS & METHODS

The experiment was conducted at Student Research Farm, College of Horticulture, Rajendranagar, Hyderabad in randomized block design with three replications during the

period from August 2013 to February 2014 and spacing adopted was 3.0 m between rows and 1.0 m between plants. The climate of Hyderabad is semi arid tropical and it lies at latitude of 17.19⁰ N and longitude of 79.23⁰ E, with an altitude of 542.3m above the Mean Sea Level. All the package of practices to raise the crop was followed as recommended for Cowpea. The need based plant protection measures were taken to raise the healthy crop. The morphological characterization was done as per minimal descriptors of NBPGR developed for Cowpea (Srivastava *et al.*, 2001). Data on 6 morphological and 10 pod yield and seed related traits were recorded on single plant basis on five randomly selected plants in each genotype from each replication. Ascorbic acid content of pod samples was determined by 2, 6-dichlorophenol indophenol titration method (Ranganna, 1986). The protein content of seed samples was estimated by micro kjeldahl distillation (Piper, 1966).

RESULTS & DISCUSSION

The results on morphological characters of Yardlong bean (Table 1) revealed a lot of diversity among the genotypes. Out of 41 genotypes, forty genotypes exhibited pole type and the remaining one genotype showed bush type plant growth habit. Sarikamis *et al.* (2009), Angela *et al.* (2010), Madakbas and Ergin (2011) also characterized for plant growth in French bean; Golani *et al.* (2006), Chattopadhyay and Dutta (2010) for Dolichos bean and reported pole type as well as bush type growth habit. For flower colour, twenty genotypes exhibited light purple flower colour, two genotypes showed dark purple colour, eleven genotypes exhibited purple flower colour, seven genotypes exhibited white flower colour and one genotype

showed pink flower colour. Madakbas and Ergin (2011), Pandey *et al.* (2011), Stoilova *et al.* (2013), in French bean

and Chattopadhyay and Dutta (2010) in Dolichos bean reported different flower colours.

TABLE 1: Various morphological characters of Yardlong bean genotypes

| Genotypes | PGH | FC | Pod colour | SC | SS | SEP |
|----------------|-----|------|------------|-------|----|------|
| IC – 582827 | PT | LP | LGWPT | DR | KS | SBR |
| IC – 582828 | PT | LP | LG | RWWT | KS | SDRR |
| IC – 582829 | PT | LP | LG | RED | KS | SDRR |
| IC – 582835 | PT | LP | LG | RED | KS | SDRR |
| IC – 582836 | PT | LP | LG | RED | KS | SBR |
| IC – 582839 | PT | LP | LG | BROWN | KS | RHP |
| IC – 582841 | PT | P | DG | RS | KS | MDRR |
| IC – 582842 | PT | P | DG | RED | KS | MDRR |
| IC – 582843 | PT | W | LGWPT | OW | KS | LMBR |
| IC – 582844 | PT | LP | DG | RED | KS | SBR |
| IC – 582845 | PT | W | LGWPT | MB | KS | LMBR |
| IC – 582846 | PT | P | LG | RED | KS | SBR |
| IC – 582847 | PT | PINK | LG | DR | KS | SDRR |
| IC – 582850 | PT | LP | LG | RWWT | KS | SBR |
| IC – 582851 | PT | P | PGWT | RED | KS | SBR |
| IC – 582857 | PT | W | LGPWT | OW | KS | LMBR |
| IC – 582859 | PT | DP | LG | DR | KS | SDRR |
| IC – 582860 | PT | LP | LG | DR | KS | SDRR |
| IC – 582861 | PT | LP | LG | RED | KS | SDRR |
| IC – 582862 | PT | P | LG | DR | KS | SDRR |
| IC – 582863 | PT | LP | LG | RED | KS | SDRR |
| IC – 582864 | PT | W | LG | OW | KS | LMBR |
| IC – 582866 | PT | LP | LG | OW | KS | RHP |
| IC – 582867 | PT | LP | LG | DR | KS | SDRR |
| IC – 582870 | PT | LP | LGWPT | RED | KS | SDRR |
| IC – 582872 | PT | LP | LG | RWWT | KS | SDRR |
| IC – 582873 | PT | DP | DG | RED | KS | SDRR |
| IC – 582874 | PT | W | LGWPT | OW | KS | LMBR |
| IC – 582875 | PT | P | LG | DR | KS | SDRR |
| IC – 582877 | PT | P | LG | DR | KS | SDRR |
| IC – 582882 | PT | LP | LG | DR | KS | SDRR |
| IC – 582883 | PT | LP | LG | DR | KS | SDRR |
| IC – 582884 | PT | LP | LG | DR | KS | SDRR |
| IC – 582887 | PT | P | LG | RED | KS | SDRR |
| IC – 582889 | PT | P | LG | DR | KS | SDRR |
| NSJ – 132 | PT | W | LGWPT | OW | KS | LMBR |
| NSJ – 362 | PT | P | LG | RED | KS | SDRR |
| LOLA | PT | LP | LGWPT | BLACK | KS | SBR |
| BHAGYA LAKSHMI | BT | W | LG | OW | KS | BHP |
| ARKA MANGALA | PT | LP | LG | RWWT | KS | SBR |
| ANASHWARYA | PT | P | LG | BUFF | KS | SDRR |

PGH = plant growth habit, PT = pole type, BT = bush type, FC = flower colour, P = purple, LP = light purple, DP = dark purple, W = white; LGWPT= Light green with purple tip; PWGT= Purple with green tip; DG=Dark green; LG = Light green; SC = seed colour, RS = red spotted, OW = off white, DR=Deep red; RWWT=Red with white tip; MB= Mottled brown; SS = seed shape, KS = kidney shape; SEP= seed eye pattern, SBR = small black ring, SDRR = small dark red ring, RHP = red holstein pattern, MDRR = medium dark red ring, LMBR = large mottled brown ring, BHP = brown holstein pattern.

For pod colour, twenty eight genotypes was found to be light green in colour, while four genotypes showed dark green colour pods, eight genotypes exhibited light green with purple tip colour pods and one genotype had purple with green colour tip pods. Madakbas and Ergin (2011) and Pandey *et al.* (2011) reported different pod colours in French bean. Regarding seed colour, highest variation was found among genotypes for this character. Thirteen

genotypes showed red seed colour, twelve genotypes exhibited deep red colour seeds, seven genotypes showed off white seed colour, four genotypes exhibited red with white tip colour seeds, one brown, one mottled brown, one red spotted, one black and one genotype showed buff colour. Angela *et al.* (2010), Pandey *et al.* (2011), Bode *et al.* (2013) and Stoilova *et al.* (2013) also reported different seed colours in French bean.

TABLE 2: Mean values of the various traits in 41 genotypes of Yardlong bean

| Genotypes | PH (cm) | D to 95% PM | No. of pods/plant | PL (cm) | PG (mm) | Pod Vit-C (mg/100g) | Seed No./pod | 100 SW (g) | SPC (%) | PY/ plant (g) |
|-------------|---------|-------------|-------------------|---------|---------|---------------------|--------------|------------|---------|---------------|
| IC – 582827 | 237.83 | 65.00 | 104.98 | 36.82 | 19.56 | 21.20 | 15.10 | 11.14 | 26.42 | 1304.16 |
| IC – 582828 | 218.66 | 59.66 | 89.72 | 54.26 | 18.76 | 8.12 | 13.34 | 14.78 | 27.56 | 1208.66 |
| IC – 582829 | 261.89 | 57.00 | 154.32 | 39.90 | 26.10 | 7.27 | 16.16 | 13.74 | 26.00 | 1737.44 |

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|----------------|--------|-------|--------|-------|-------|-------|-------|-------|-------|---------|
| IC – 582835 | 249.77 | 65.00 | 104.62 | 35.36 | 19.66 | 6.56 | 15.93 | 11.97 | 26.72 | 1338.44 |
| IC – 582836 | 291.66 | 62.33 | 119.05 | 64.84 | 21.26 | 7.29 | 15.40 | 17.91 | 27.14 | 1415.78 |
| IC – 582839 | 277.66 | 65.00 | 75.62 | 30.48 | 16.87 | 8.34 | 15.06 | 13.05 | 26.75 | 930.39 |
| IC – 582841 | 281.11 | 57.00 | 89.49 | 33.52 | 17.90 | 9.13 | 16.63 | 12.41 | 25.44 | 1205.66 |
| IC – 582842 | 247.55 | 57.00 | 131.18 | 31.79 | 21.73 | 10.41 | 16.63 | 12.44 | 29.49 | 1557.11 |
| IC – 582843 | 264.55 | 57.00 | 101.79 | 32.45 | 20.76 | 8.26 | 14.60 | 10.64 | 23.48 | 1361.00 |
| IC – 582844 | 256.22 | 59.66 | 95.85 | 48.67 | 19.86 | 8.91 | 17.10 | 9.73 | 19.42 | 1291.66 |
| IC – 582845 | 266.22 | 59.66 | 146.85 | 30.40 | 22.23 | 8.86 | 15.96 | 9.89 | 22.61 | 1657.33 |
| IC – 582846 | 294.16 | 57.00 | 88.70 | 24.65 | 17.96 | 8.22 | 11.36 | 13.42 | 23.58 | 1061.16 |
| IC – 582847 | 255.33 | 59.66 | 95.83 | 37.54 | 18.56 | 15.53 | 16.13 | 15.54 | 26.37 | 1255.33 |
| IC – 582850 | 340.00 | 62.33 | 157.58 | 71.78 | 26.35 | 13.74 | 18.90 | 19.03 | 29.21 | 1783.33 |
| IC – 582851 | 269.22 | 59.66 | 145.65 | 27.57 | 24.46 | 12.26 | 14.00 | 11.99 | 25.42 | 1637.89 |
| IC – 582857 | 298.89 | 59.66 | 84.23 | 30.24 | 16.26 | 6.58 | 16.20 | 10.45 | 23.34 | 1130.55 |
| IC – 582859 | 277.55 | 57.00 | 196.94 | 38.68 | 30.10 | 7.82 | 16.50 | 14.23 | 23.30 | 2495.00 |
| IC – 582860 | 307.00 | 62.33 | 88.81 | 36.72 | 17.20 | 8.68 | 15.70 | 11.74 | 24.34 | 1146.22 |
| IC – 582861 | 327.89 | 60.33 | 83.47 | 53.74 | 17.13 | 12.54 | 16.36 | 15.10 | 30.33 | 1133.55 |
| IC – 582862 | 293.89 | 56.66 | 93.22 | 45.15 | 18.33 | 7.68 | 16.13 | 12.79 | 25.39 | 1264.55 |
| IC – 582863 | 294.11 | 63.66 | 95.96 | 62.98 | 19.36 | 8.28 | 15.90 | 16.46 | 24.53 | 1274.33 |
| IC – 582864 | 272.44 | 57.00 | 104.32 | 30.12 | 21.06 | 8.12 | 15.50 | 10.83 | 24.20 | 1338.11 |
| IC – 582866 | 307.44 | 62.33 | 152.52 | 32.12 | 24.03 | 6.82 | 14.43 | 13.64 | 24.30 | 1794.55 |
| IC – 582867 | 313.66 | 59.66 | 114.53 | 56.32 | 22.06 | 14.17 | 13.36 | 13.03 | 26.80 | 1411.55 |
| IC – 582870 | 268.33 | 59.66 | 126.61 | 30.05 | 23.16 | 18.02 | 14.40 | 13.28 | 25.42 | 1597.66 |
| IC – 582872 | 306.22 | 57.00 | 140.62 | 63.10 | 24.26 | 12.24 | 15.30 | 19.61 | 28.80 | 1681.00 |
| IC – 582873 | 300.11 | 57.00 | 126.91 | 40.17 | 22.96 | 20.57 | 16.16 | 16.31 | 25.64 | 1538.40 |
| IC – 582874 | 303.00 | 59.66 | 118.30 | 31.05 | 23.70 | 8.72 | 18.16 | 11.21 | 24.71 | 1401.89 |
| IC – 582875 | 313.22 | 65.00 | 121.18 | 38.34 | 23.88 | 8.39 | 15.10 | 14.99 | 25.92 | 1469.66 |
| IC – 582877 | 245.22 | 57.00 | 124.35 | 33.09 | 23.92 | 14.46 | 14.63 | 15.13 | 26.74 | 1479.11 |
| IC – 582882 | 337.22 | 57.00 | 93.17 | 36.26 | 17.76 | 9.07 | 16.43 | 15.11 | 24.28 | 1238.55 |
| IC – 582883 | 300.66 | 59.66 | 78.66 | 33.62 | 16.56 | 11.75 | 14.90 | 15.41 | 26.50 | 1069.11 |
| IC – 582884 | 281.11 | 59.66 | 119.63 | 43.44 | 22.23 | 17.54 | 14.76 | 12.56 | 23.34 | 1477.00 |
| IC – 582887 | 266.77 | 59.66 | 136.93 | 37.54 | 24.50 | 13.27 | 17.60 | 15.08 | 26.39 | 1636.44 |
| IC – 582889 | 357.89 | 57.00 | 103.30 | 29.56 | 18.56 | 20.55 | 16.16 | 11.72 | 24.41 | 1373.66 |
| NSJ – 132 | 288.66 | 57.00 | 130.76 | 30.74 | 22.40 | 8.53 | 16.10 | 10.98 | 23.45 | 1447.66 |
| NSJ – 362 | 312.66 | 57.00 | 170.33 | 47.29 | 26.36 | 16.53 | 19.33 | 17.02 | 25.75 | 1916.33 |
| LOLA | 355.77 | 62.33 | 177.54 | 49.01 | 26.90 | 9.62 | 17.50 | 15.25 | 25.72 | 1989.89 |
| BHAGYA LAKSHMI | 36.33 | 62.33 | 75.36 | 20.37 | 16.00 | 9.18 | 15.86 | 8.83 | 23.36 | 904.87 |
| ARKA MANGALA | 259.89 | 59.66 | 122.22 | 63.94 | 21.76 | 15.52 | 16.26 | 19.25 | 27.22 | 1408.00 |
| ANASHWARYA | 295.22 | 62.33 | 104.80 | 31.46 | 20.80 | 9.54 | 17.76 | 16.52 | 24.00 | 1302.55 |
| Mean | 281.29 | 59.77 | 116.73 | 4.12 | 21.30 | 11.18 | 15.82 | 13.76 | 25.45 | 1430.87 |
| C.V. | 8.79 | 5.57 | 11.01 | 3.04 | 3.91 | 8.08 | 6.64 | 3.80 | 5.31 | 11.63 |
| S.E. m± | 14.28 | 1.92 | 7.42 | 0.70 | 0.48 | 0.52 | 0.60 | 0.30 | 0.78 | 96.08 |
| C.D 5% | 40.21 | 5.41 | 20.88 | 1.98 | 1.35 | 1.46 | 1.71 | 0.85 | 2.19 | 270.43 |
| CD 1% | 53.31 | 7.17 | 27.69 | 2.63 | 1.79 | 1.94 | 2.26 | 1.12 | 2.91 | 358.57 |

PH = plant height, D to 95% PM = days to 95% pod maturity, PL = pod length, PG = pod girth, 100SW = 100 seed weight, SPC = seed protein content, PY = pod yield

The shape of forty one genotypes was found to be kidney shaped only. In case of the seed eye pattern of twenty two genotypes showed small dark red ring, eight genotypes showed small black ring, six genotypes showed large mottled brown ring, two genotypes showed red holstein pattern, two genotypes showed medium dark red ring and one genotype showed brown holstein pattern. Similar findings were reported by Egbadzor *et al.* (2012) and Reda *et al.* (2015) in Cowpea for seed eye pattern. The results based on the mean performance (Table 2), maximum plant height was recorded by IC-582889 and minimum by Bhagya Lakshmi. Among the genotypes IC-582862 showed minimum days to 95 per cent pod maturity (56.66 days) while maximum (65.00 days) was recorded in IC-582827, IC-5828435, IC-582839, and IC-582875. Twenty seven genotypes were at par with the check, Arka Mangala (59.66 days) for days to 95 % pod maturity. The genotype IC-582850 recorded maximum pod length, whereas the genotype IC-582859 recorded maximums pod girth. The genotype Bhagya Lakshmi recorded minimum values for pod length and pod girth. The genotype IC-582827

recorded maximum pod ascorbic acid content, whereas the genotype IC-582835 recorded minimum value. The genotype IC-582872 recorded the maximum 100 seed weight (19.61g) and the check, Bhagya Lakshmi recorded the minimum 100 seed weight (8.83g). Seed protein content was highest in the genotype IC-582861, whereas the lowest seed protein content was in IC-582844. The genotype IC-582859 recorded the maximum pod yield per plant (2495.00g) and the minimum pod yield was recorded in the check, Bhagya Lakshmi (904.87g). Only one genotype IC-582859 recorded significant and superior pod yield per plant (2495.00g) at par with the highest yielding check, Lola (1989.89g) due to more plant height, number of primary branches per plant, length of harvesting time, length of cluster stalk, number of clusters per plant, number of pods per cluster, number of pods per plant, pod girth and earlier to days to 95 % pod maturity. Similar findings for the mean values of above traits in Yardlong bean were earlier reported by Vidya *et al.* (2002), Mishra and Dash (2009) and Mahmudul Huque *et al.* (2012).

CONCLUSION

The present study revealed that there is a considerable variability in Yardlong bean genotypes for most of the traits like growth habit, flower colour, pod colour, seed colour and seed eye pattern. Hence, there is lot of scope to select desirable genotypes for further improvement in this crop. On the basis of mean performance of the genotypes for all the traits studied, four genotypes IC-582859, NSJ-362, IC-582850 and IC-582872 were found to be superior with desirable characters. Hence, these genotypes could be used for selection programme and as parental sources for future breeding programmes. Being an underexploited vegetable, the package of practices for commercial cultivation has to be standardized and its nutritional quality may be exploited.

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