Frontiers in Crop Improvement, Vol. 8 (1) : 11-19 (2020)
Print ISSN : 2393-8234, Online ISSN : 2454-6011
ASTHA FOUNDATION
Meerut (U.P.) INDIA

CHARACTERIZATION OF URDBEAN (*VIGNA MUNGO* L. HEPPER) GENOTYPES THROUGH PLANT MORPHOLOGICAL CHARACTERS

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ABSTRACT

An experiment was carried out at the Pulses Research Station, Junagadh Agricultural University, Junagadh, to characterize thirty urdbean genotypes based on plant morphological characters. For plant height, all the thirty genotypes were tall. Based on plant habit, genotypes were grouped into semi-determinate (4 genotypes) and determinate (26 genotypes) types. Based on growth habit, genotypes were grouped into erect (11 genotypes), semi erect (17 genotypes) and spreading (1 genotype) types. Based on number of branches per plant, genotypes were grouped into medium (29 genotypes) and high (1 genotype) types. Based on twining habit, the genotypes were grouped into non-viny (26 genotypes) and viny (4 genotypes) types. Based on petiole color, the genotypes were grouped into green (1 genotype), green with purple splashes (26 genotypes) and purple (3 genotypes) types. Based on petiole length, 30 genotypes under study were grouped into medium (28 genotypes) and long (2 genotypes) types. Based on petiole hairiness, the genotypes were grouped into absent (1 genotype), sparse (19 genotypes) and dense (10 genotypes) types. Based on length of peduncle, 30 genotypes under study were grouped into short (6 genotypes) and medium (24 genotypes) types. Based on days to maturity, genotypes were grouped into early (22 genotypes) and medium (8 genotypes) types.

Key words : *Urdbean, genotypes, growth habit, characterization.*

Vigna mungo (L.) Hepper (2n=22) also referred to as the urad, blackgram, urdbean, mash, black lentil or white lentil. It belongs to the family Fabaceae and sub family Papilionoideae and has a haploid chromosome number of 11. It is considered to have been domesticated in India from its wild ancestral form (*Vigna mungo var. silvestris*) (Lukoki *et al.,* 1980). The seeds of blackgram contain a moderately high amount of calories (calorific value of 350 cal/100g), carbohydrates (56.6%), proteins (26.2%) and fat (1.2%), it is also rich in essential mineral and vitamins for human body (1). Being a short duration crop, it is grown primarily as intercrop with jowar, bajra, pigeonpea, etc. during *kharif* and as a sole crop during *rabi* and *zaid*. It can be used as green manure crop with residues incorporated into soil after pods have been harvested. It helps to enrich the soil by symbiotic relationship with specific soil rhizobia of the genus *Brady rhizobium*. It also helps in soil conservation through thick canopy.

As a pulse crop in India, blackgram stands third in terms of production after chickpea and pigeonpea. Because of the high protein content pulses are a food of choice among the vegetarian population. They are comparatively a cheaper source of proteins to overcome protein malnutrition in human beings. Blackgram occupies about 12% of the total pulse area, contributing to about 8% of the total pulse production. It is mostly cultivated in Madhya Pradesh, Uttar Pradesh, Andhra Pradesh, Rajasthan, Tamil Nadu, Maharashtra, Jharkhand and Gujarat. In India, pulses are grown in nearly 293.6 lakh hectare area with production status of nearly 245.1 lakh tons at an average productivity level of 835 kg/ha (2). As of the 2017-18 cultivation statistics in India, blackgram was grown on 50.31 lakh hectares with a production status of 32.84 lakh tones and productivity of 652 kg/ha. In Gujarat, blackgram was grown on 1.33 lakh hectares with a production status of 0.96 lakh tons and productivity of 721 kg/ha (2).

Maintenance of genetic purity of varieties is of primary importance for preventing varietal deterioration during successive regeneration cycles and for ensuring varietal performance at an expected level. The aspects of Distinctness, Uniformity and Stability (DUS) are fundamental for characterization of varieties. In countries having Plant Breeder's Right (PBR) in operation, a new variety is registered only, if it is distinct from other varieties, uniform in its characteristics and genetically stable. In the light of the above facts, the present study on the documentation of characters for urdbean genotypes was planned with the objective to identify stable diagnostic characteristics of plant morphology of urdbean genotypes.

MATERIALS AND METHODS

A field experiment was conducted at the Pulses Research Station, Junagadh Agricultural University, Junagadh, during *kharif* 2018 to characterize the 30 genotypes of urdbean (*Vigna mungo* L. Hepper) *viz.,*GJU 1506, GJU

Table-1 : Identification and grouping of urdbean genotypes based on plant height (cm), plant habit and growth habit.

Genotypes	Plant height (cm)	Groups	Plant habit	Growth habit
GJU 1506	74.00	Tall	Determinate	Erect
GJU 1509	73.33	Tall	Determinate	Semi erect
GJU 1601	72.00	Tall	Determinate	Semi erect
GJU 1603	76.00	Tall	Determinate	Erect
GJU 1607	63.50	Tall	Determinate	Erect
GJU 1608	76.67	Tall	Determinate	Erect
GU 1	64.00	Tall	Determinate	Semi erect
T 9	60.67	Tall	Determinate	Semi erect
Pant U 31	71.00	Tall	Determinate	Erect
Pant U 35	63.50	Tall	Determinate	Erect
Pant U 40	71.67	Tall	Determinate	Semi erect
TU 94-2	67.67	Tall	Determinate	Semi erect
TU 67	71.97	Tall	Determinate	Semi erect
Jawahar urd 2	69.00	Tall	Determinate	Erect
Jawahar urd 3	74.00	Tall	Determinate	Erect
TPU 4	74.33	Tall	Determinate	Semi erect
LBG 752	71.83	Tall	Determinate	Erect
COBG 593	74.67	Tall	Determinate	Semi erect
Vamban 8	66.27	Tall	Determinate	Semi erect
IC 1575	63.93	Tall	Determinate	Spreading
IC 3928 A	72.07	Tall	Determinate	Semi erect
IC 14691	70.43	Tall	Semi-determinate	Semi erect
IC 24811	65.41	Tall	Semi-determinate	Semi erect
IC 45208	65.33	Tall	Semi-determinate	Semi erect
IC 56051	75.33	Tall	Semi-determinate	Semi erect
IC 59718	66.67	Tall	Determinate	Semi erect
IC 61097	64.80	Tall	Determinate	Semi erect
IC 73291	71.00	Tall	Determinate	Erect
IC 214845	67.93	Tall	Determinate	Erect
IC 336975	64.33	Tal	Determinate	Erect
Mean	69.44			
S.Em ±	4.87			
C.D. at 5 %	13.78			
CV %	12.14			

Note : Plant height (Short : < 40 cm, Medium : 40-60 cm, Tall : > 60 cm)

1509, GJU 1601, GJU 1603, GJU 1607, GJU 1608, GU 1, T 9, Pant U 31, Pant U 35, Pant U 40, TU 94-2, TU 67, Jawahar urd 2, Jawahar urd 3, TPU 4, LBG 752, COBG 593, Vamban 8, IC 1575, IC 3928 A, IC 14691, IC 24811, IC 45208, IC 56051, IC 59718, IC 61097, IC 73291, IC 214845 and IC 336975 through plant morphological characters. They were sown at 45×10 cm distance. The experiment was laid out in field as per Randomized Block Design with three replications. All the necessary cultural practices were carried out during crop standing. The observations on plant morphological characters in the standing crop *viz*., plant height, plant habit, growth habit, number of branches per plant, twining habit, petiole color, petiole length, petiole hairiness, length of peduncle, days to maturity and harvest index (%). The data obtained from field experiment conducted in RBD were analyzed as per standard method suggested by (3).

RESULTS AND DISCUSSION

On the basis of the plant morphological characteristics such as plant height, plant habit, growth habit, number of branches per plant, twining habit, petiole color, petiole length, petiole hairiness, length of peduncle, days to maturity and harvest index genotypes were grouped into different categories (Table-1, 2, 3 and 4). Based on the variation in plant height, 30 genotypes under study were grouped into short <40 cm with zero genotype, medium (40-60 cm) with zero genotype and tall (>60 cm) with all thirty genotypes. Based on plant habit, genotypes were grouped as semi-determinate in four genotypes and determinate in twenty six genotypes. Based on growth habit, genotypes were grouped as erect with twelve genotypes, semi erect with seventeen genotypes and spreading with one genotype. Based on number of

Table-2 : Identification and grouping of urdbean genotypes based on number of branches per plant, twinning habit and growth habit.

Genotypes	Number of branches per plant	Groups	Twining habit
GJU 1506	3.67	Medium	Non-viny
GJU 1509	4.43	High	Non-viny
GJU 1601	3.67	Medium	Non-viny
GJU 1603	3.67	Medium	Non-viny
GJU 1607	3.33	Medium	Non-viny
GJU 1608	3.33	Medium	Non-viny
GU 1	3.67	Medium	Non-viny
T 9	3.00	Medium	Non-viny
Pant U 31	3.67	Medium	Non-viny
Pant U 35	4.00	Medium	Non-viny
Pant U 40	4.00	Medium	Non-viny
TU 94-2	4.00	Medium	Non-viny
TU 67	4.00	Medium	Non-viny
Jawahar urd 2	4.00	Medium	Non-viny
Jawahar urd 3	4.00	Medium	Non-viny
TPU 4	3.33	Medium	Non-viny
LBG 752	3.00	Medium	Non-viny
COBG 593	3.67	Medium	Non-viny
Vamban 8	3.67	Medium	Non-viny
IC 1575	4.00	Medium	Non-viny
IC 3928 A	3.67	Medium	Non-viny
IC 14691	3.33	Medium	Viny
IC 24811	3.67	Medium	Viny
IC 45208	3.67	Medium	Viny
IC 56051	4.00	Medium	Viny
IC 59718	3.00	Medium	Non-viny
IC 61097	3.33	Medium	Non-viny
IC 73291	3.67	Medium	Non-viny
IC 214845	2.67	Medium	Non-viny
IC 336975	4.00	Medium	Non-viny
Mean	3.63		
S.Em ±	0.28		
C.D. at 5 %	0.80		
CV %	13.54		

Note : Number of branches/plant (Low : 1-2, Medium : 3-4, High : >4)

branches per plant, genotypes were grouped as low (1-2) with zero genotype, medium (3-4) with twenty nine genotypes and high (>4) with one genotype. Based on twining habit, the genotypes were grouped as non-viny with twenty six genotypes and viny with four genotypes. Based on petiole color, the genotypes were grouped as green with one genotype, green with purple splashes with twenty six genotypes and purple with three genotypes. Based on petiole length, 30 genotypes under study were grouped into short < 7 cm with zero genotype, medium (7-10 cm) with twenty eight genotypes and long (>10 cm) with two genotypes. Based on petiole hairiness, the genotypes were grouped as absent with one genotype, sparse with nineteen genotypes and dense with ten genotypes. Based on length of peduncle, 30 genotypes under study were grouped into short <15 cm with six genotypes, medium (15-20 cm) with twenty four genotypes and long (>20 cm) with zero genotype. Based on days to maturity, genotypes were grouped into early (70-80 days) with twenty two genotypes, medium (81-90 days) with eight genotypes and late (>90 days) with zero genotype. The harvest index ranged from 9.95 (IC 59718) to 13.25 (Jawahar urd 3) with a mean biological yield per plant of 11.80.

On the basis of plant morphological characteristics discussed above, genotypic identification keys were prepared (Figure-1). The genotypes *viz.,* GJU 1603, LBG 752 and IC 73291 were having similar plant morphology *viz.,* tall plant height, determinate growth habit, erect plant habit, non-viny twining habit, medium number of branches, green with purple splashes petiole color, medium petiole length, sparse petiole hairiness, medium length of peduncle and early days to maturity, while the genotype GJU 1608 varied from above genotypes with

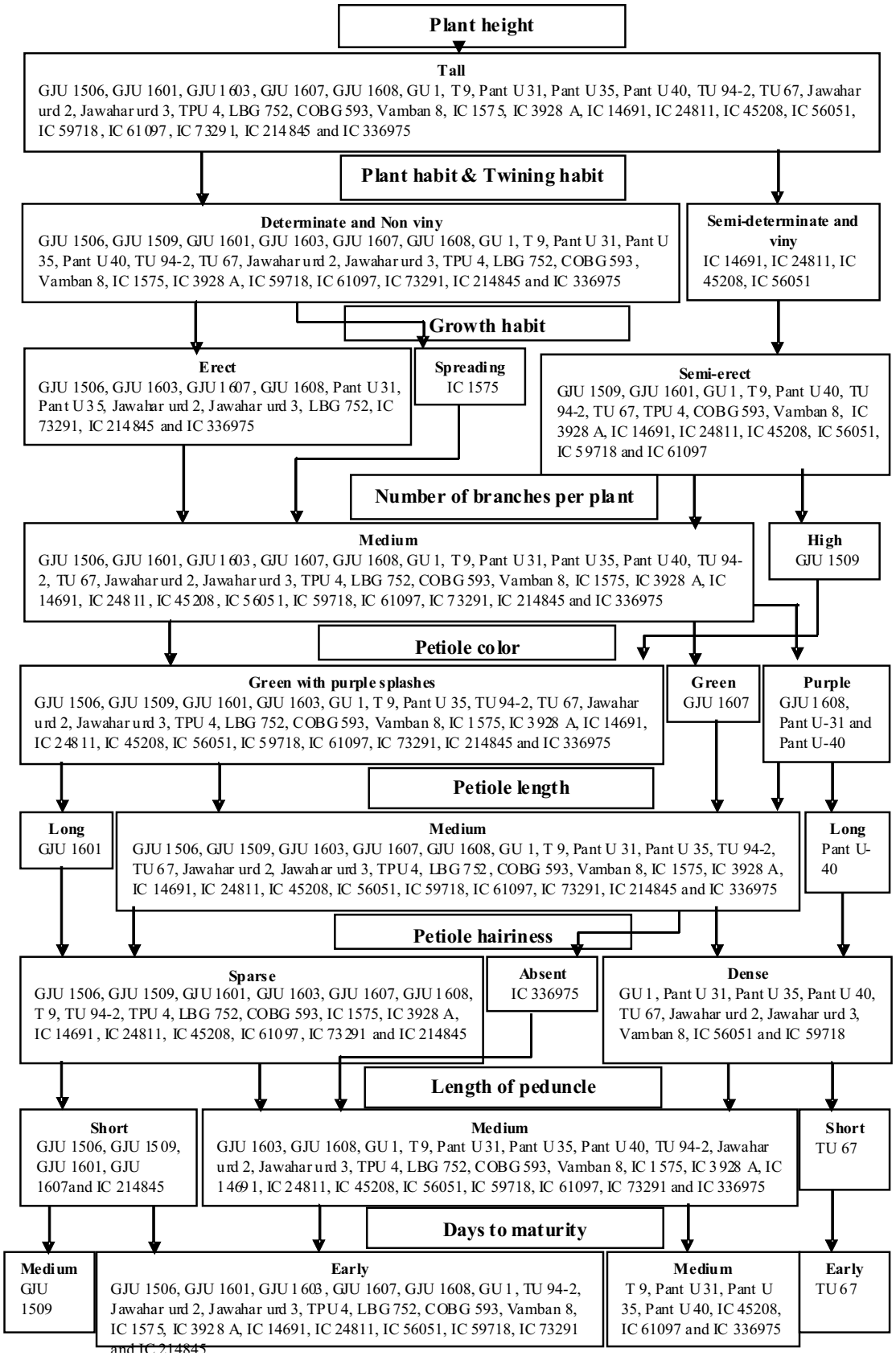

Fig.-1 : Urdbean genotypes identification keys on the basis of plant morphological characters.

Table-3 : Identification and grouping of urdbean genotypes based on petiole color, petiole length and petiole hairiness.

Genotypes	Petiole color	Petiole length (cm)	Groups	Petiole hairiness
GJU 1506	Green with purple splashes	7.93	Medium	Sparse
GJU 1509	Green with purple splashes	9.03	Medium	Sparse
GJU 1601	Green with purple splashes	13.50	Long	Sparse
GJU 1603	Green with purple splashes	8.70	Medium	Sparse
GJU 1607	Green	7.97	Medium	Sparse
GJU 1608	Purple	8.83	Medium	Sparse
GU 1	Green with purple splashes	7.40	Medium	Dense
T 9	Green with purple splashes	8.90	Medium	Sparse
Pant U 31	Purple	8.30	Medium	Dense
Pant U 35	Green with purple splashes	7.37	Medium	Dense
Pant U 40	Purple	9.40	Medium	Dense
TU 94-2	Green with purple splashes	7.63	Medium	Sparse
TU 67	Green with purple splashes	8.17	Medium	Dense
Jawahar urd 2	Green with purple splashes	7.70	Medium	Dense
Jawahar urd 3	Green with purple splashes	8.07	Medium	Dense
TPU 4	Green with purple splashes	8.67	Medium	Sparse
LBG 752	Green with purple splashes	8.13	Medium	Sparse
COBG 593	Green with purple splashes	8.63	Medium	Sparse
Vamban 8	Green with purple splashes	7.73	Medium	Dense
IC 1575	Green with purple splashes	8.63	Medium	Sparse
IC 3928 A	Green with purple splashes	8.50	Medium	Sparse
IC 14691	Green with purple splashes	8.77	Medium	Sparse
IC 24811	Green with purple splashes	7.63	Medium	Sparse
IC 45208	Green with purple splashes	8.53	Medium	Sparse
IC 56051	Green with purple splashes	7.77	Medium	Dense
IC 59718	Green with purple splashes	7.37	Medium	Dense
IC 61097	Green with purple splashes	8.40	Medium	Sparse
IC 73291	Green with purple splashes	9.30	Medium	Sparse
IC 214845	Green with purple splashes	12.40	Long	Sparse
IC 336975	Green with purple splashes	7.90	Medium	Absent
Mean		8.57		
S.Em ±		0.73		
C.D. at 5 %		2.06		
CV %		14.66		

Note : Petiole length (Short : <7cm, Medium : -10cm, Tall : >10 cm)

respect to purple petiole color and genotype GJU 1506 with respect to short length of peduncle.

The genotypes *viz.,* GU 1, Vamban 8 and IC 59718 were having similar plant morphology *viz.,* tall plant height, determinate growth habit, semi-erect plant habit, non-viny twining habit, medium number of branches, green with purple splashes petiole color, medium petiole length, dense petiole hairiness, medium length of peduncle and early days to maturity while the genotypes TU 94-2, TPU 4, COBG 593 and IC 3928 A varied from the above genotypes with respect to sparse petiole hairiness.

The genotypes *viz.,* IC 14691, IC 24811, and were having similar plant morphology *viz.,* tall plant height, semi-determinate growth habit, semi-erect plant habit, viny twining habit, medium number of branches, green with purple splashes petiole color, medium petiole length, sparse petiole hairiness, medium length of peduncle and early days to maturity, while the genotype, IC 45208 was differing from the above genotypes with respect to medium days to maturity and genotype IC 56051 were differing from the above genotypes with respect to dense petiole hairiness.

The genotypes *viz.,* GJU 1607, Pant U-31, Pant U-35, Jawahar urd-2, Jawahar urd-3, IC-214845 and IC-336975 were having similar tall plant height, determinate growth habit, erect plant habit, non–viny twining habit, medium number of branches, green with purple splashes petiole color, medium petiole length, sparse petiole hairiness, medium length of peduncle and early days to maturity except IC-214845 has short length of peduncle, GJU 1607 has green petiole color and Pant

Table-4 : Identification and grouping of urdbean genotypes based on length of peduncle, days to maturity and harvest index.

Genotypes	Length of peduncle	Groups	Days to maturity	Groups	Harvest index
GJU 1506	12.50	Short	72.00	Early	12.08
GJU 1509	13.47	Short	87.00	Medium	12.72
GJU 1601	11.83	Short	76.67	Early	10.71
GJU 1603	18.70	Medium	71.33	Early	12.78
GJU 1607	12.97	Short	72.67	Early	11.30
GJU 1608	17.43	Medium	76.67	Early	11.46
GU 1	18.47	Medium	72.00	Early	12.36
T 9	17.10	Medium	82.33	Medium	12.74
Pant U 31	18.36	Medium	83.00	Medium	10.82
Pant U 35	16.33	Medium	82.33	Medium	12.15
Pant U 40	17.43	Medium	84.33	Medium	12.03
TU 94-2	18.73	Medium	73.67	Early	11.42
TU 67	12.80	Short	77.33	Early	12.13
Jawahar urd 2	18.30	Medium	71.00	Early	11.56
Jawahar urd 3	19.17	Medium	76.33	Early	13.25
TPU 4	17.60	Medium	79.33	Early	12.49
LBG 752	17.43	Medium	76.00	Early	12.86
COBG 593	18.03	Medium	78.00	Early	11.22
Vamban 8	17.77	Medium	78.33	Early	13.13
IC 1575	17.60	Medium	76.33	Early	11.44
IC 3928 A	17.47	Medium	75.67	Early	12.85
IC 14691	18.03	Medium	79.33	Early	9.98
IC 24811	17.70	Medium	79.67	Early	11.95
IC 45208	18.23	Medium	80.67	Medium	11.08
IC 56051	18.50	Medium	74.33	Early	10.44
IC 59718	16.40	Medium	73.67	Early	9.95
IC 61097	18.57	Medium	80.00	Medium	10.55
IC 73291	16.43	Medium	79.33	Early	11.14
IC 214845	12.87	Short	79.67	Early	12.76
IC 336975	18.60	Medium	83.00	Medium	12.60
Mean	16.82		77.73		11.79
S.Em ±	0.61		3.04		0.73
C.D. at 5 %	1.72		8.62		2.06
CV %	6.24		6.78		10.66

Note : Days to maturity (Early : 70-80 days, Medium : 81-90 days, Late : >90 days), Length of peduncle (Short : <15cm, Medium : 15-20 cm, Long : >20 cm)

U-31 have purple petiole color and Pant U-31, Pant U-35, Jawahar urd-2, Jawahar urd-3, IC 214845 and IC 336975 have dense petiole hairiness and Pant U-31, Pant U-35 and IC 336975 medium days to maturity except IC 336975 has absent petiole hairiness.

The genotypes *viz.,* GJU 1509, GJU 1601, T-9, Pant U-40, TU-67, IC 1575 and IC 61097 have tall plant height, determinate growth habit, semi-erect plant habit, non-viny twining habit, medium number of branches, green with purple splashes petiole color, medium petiole length, sparse petiole hairiness, medium length of peduncle and medium days to maturity except GJU 1509 has high number of branches, GJU 1601, TU-67 and IC 1575 have early days to maturity, GJU 1601 and Pant U-40 long petiole length, GJU 1601 and GJU 1509 and TU-67 has short length of peduncle, Pant U-40 has purple petiole color, IC 1575 has spreading plant habit and Pant U-40 and TU-67 have dense petiole hairiness.

Similar characterization and grouping of genotypes based on plant morphological characters were made by (4, 5, 6) in urdbean. (7, 8, 9, 10) in mungbean; (11) in soybean; in cowpea.

CONCLUSION

Assessment of genetic purity is an important criterion in seed production programme. Therefore, simple and reliable techniques need to be developed for genetic purity assessment and genotype characterization. The study suggested that plant morphological characteristics were found to be useful in broad classification of urdbean genotypes.

Plant Habit

DETERMINATE: GJU 1506

SEMI-DETERMINATE: IC 14691

GROWTH HABIT

ERECT: GJU 1506

SEMI-ERECT: IC 14691

TWINING HABIT

NON-VINY: GJU 1506

VINY: IC 14691

Fig.-1 : Plant habit, growth habit and twining habit of urdbean genotypes.

PETIOLE COLOR

PURPLE : GJU 1608

GREEN : GJU 1607

NUMBER OF PRIMARY BRANCHES

GREEN WITH PURPLE SPLASHES: IC 14691

MEDIUM: GJU 1506

Fig.-2 : Petiole color and number of primary branches of urdbean genotypes.

PETIOLE HAIRINESS

DENSE: Vamban 8

SPARSE: TPU 4

Fig.-3 : Petiole hairiness of urdbean genotypes.

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Received : November-2019 Revised : December-2019 Accepted : December-2019