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Research Article

Morphological characterization of pigeonpea genotypes using DUS descriptors

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Abstract
Characterization of 80 pigeonpea genotypes using 17 morphological traits was done at different stages of plant growth. The traits stem colour, pod constriction and pod pubescence were monomorphic. Five traits *viz.,* plant growth habit, leaf shape, pod length, number of seeds per pod and seed colour pattern were dimorphic. Seven traits *viz.,* plant branching pattern, time of flowering, colour of base of petal, pod colour, plant height, seed shape and seed size were trimorphic. The trait pattern of streaks on standard petal was tetramorphic. The accessions used in this study exhibited five different seed colours and it was dominated by brown seed colour while the frequency of accessions with other colours was very low. Phenotypic diversity in the studied collection proves it to be suitable for developing superior varieties with prefarable features. The pigeonpea genotypes were subjected to cluster analysis which grouped them into five clusters. Cluster II was big with 39 genotypes and cluster IV was small with two genotypes. Cluster I consisted of 10 genotypes and cluster III comprised of 15 genotypes. Thirteen genotypes were placed in cluster V. The pigeonpea genotypes ICPL 11255 and ICPL 20338 are very early, thus can be utilized in future breeding programmes for development of early maturing varieties.

Keywords: Pigeonpea, Characterization, Diversity, Cluster.

INTRODUCTION

Pigeonpea serves as a source of high dietary protein particularly for vegetarians. It is adaptable to a wide range of climatic conditions and predominantly cultivated under rainfed conditions. The edible seeds comprises protein, carbohydrate, minerals and vitamins such as thiamine, riboflavin, niacin and B-complex (Talari and Shakappa, 2018). The highest level of polymorphism of pigeonpea wild relatives and landraces was observed in India, representing center of origin and domestication of pigeonpea (Saxena *et al*., 2014). It improves the soil fertility by providing 40-60 kg N/ha to the subsequent crop (Sarkar *et al.,* 2020). Morphological characterization as a traditional and inexpensive method provides a better understanding of the crop species based on the phenotype without requiring special facilities or procedures (Kimaro *et al*., 2021). The qualitative traits can be used as molecular markers in characterization and evaluation of genotypes and they are quite stable. Characterization of cultivated species or genotypes aids in varietal description and ensures genetic purity (Ranjani and Jayamani 2021).

Diversity assessment is a suitable precursor for improvemet of any crop species as hybrids of diverse parents display greater heterosis. Cluster analysis serves as a useful method to analyse a multivariate data. Hierarchical cluster analysis is a tool to classify the germplasm collections based on their degree of similarity (Peeters and Martinelli, 1989). Characterization and evaluation of

pigeonpea for different agro-morphological traits have been successfully made to study the genetic diversity in available germplasm (Zavinon *et al*., 2019; Géofroy *et al*., 2020; Kimaro *et al*., 2021). The objective of this study was to identify the persisting variability among pigeonpea collections by characterizing for various morphological traits and to select unique genotypes for different traits as donors for its utilization in pigeonpea breeding programmes.

MATERIALS AND METHODS

The plant material constituting 80 genotypes of pigeonpea were raised in the farm area of Regional Research Station, Paiyur for characterization (**Table 1**). The genotypes were obtained from ICRISAT, Department of Plant Genetic Resources and Department of Pulses of Tamil Nadu Agricultural University. Genotypes were sown in two rows of 2.5 m length with a spacing of 60 x 30 cm during *rabi*, 2021-2022 following Randomized Block Design (RBD) in two replications. Seventeen different morphological characters were scored which includes plant branching pattern, time of flowering, plant growth habit, stem colour, leaf shape, colour of base of petal, pattern of streaks on standard petal, pod colour, pod pubescence, pod constriction, pod length, number of seeds per pod, plant height, seed colour, seed colour pattern, seed shape and seed size. Qualitative characters were assessed by visual observation of individual plants or plant parts and scores were given based on the note values of the DUS characters provided by PPV& FRA, 2007. Hierarchical clustering of pigeonpea genotypes was done using Statistical Tool for Agricultural Research (STAR) package

Table 1. List of evaluated pigeonpea genotypes

Code	Genotypes	Code	Genotypes	Code	Genotypes
1	ICPL 11255*	31	IC 525413*	61	CRG 9302**
2	ICPL 11301*	32	IC 525426*	62	ICPL 86020**
3	ICPL 20325*	33	IC 525427*	63	ICPL 87**
4	ICPL 20338*	34	IC 525429*	64	CRG 5**
5	ICPL 88039*	35	IC 525430*	65	CRG 9060**
6	ICPL 88034*	36	IC 525431*	66	ICPL 84031**
7	ICPL 151*	37	IC 525447*	67	ICPL 83027**
8	ICPL 161*	38	IC 525452*	68	ICPL 90028**
9	ICPL 87091*	39	IC 525458*	69	ICPL 91018**
10	CRG-16-01**	40	IC 525462*	70	ICPL 91045**
11	CRG-16-04**	41	IC 525475*	71	AF 284**
12	CRG-16-12**	42	IC 525483*	72	ICPL 88027**
13	CRG-19-05**	43	IC 525516*	73	ARG 102**
14	TT 401**	44	IC 525531*	74	PA 128**
15	APK 1**	45	IC 525565*	75	TAT-93-47**
16	VBN 3**	46	ICP 9162*	76	ICPL 85010**
17	Co(Rg) 7**	47	ICP 9562*	77	AS 46**
18	ICPL 87119*	48	ICP 10788*	78	ICP 9116**
19	ICPL 332*	49	ICP 13576*	79	AL 601**
20	ICPL 99050*	50	ICP 14041*	80	ICP 2376**
21	ICP 7035*	51	C 2185**		
22	IC 245335*	52	IC 73799*		
23	IC 245474*	53	ICP 4765*		
24	ICP 245532*	54	ICP 7674*		
25	ICP 245534*	55	ICP 7731*		
26	AL 611**	56	ICP 9419*		
27	IC 525505*	57	ICP 11292*		
28	ICPR 2431*	58	ICP 11743*		
29	ICPR 2863*	59	ICP 12325*		
30	ICPL 525585*	60	VBN 1**		

*Source – ICRISAT, **Source – TNAU, Coimbatore.

RESULTS AND DISCUSSION

Morphological characterization using DUS descriptors: The frequency distribution of different classes within each qualitative character is depicted in **Table 2**. Pigeonpea genotypes were characterized based on 17 different morphological descriptors. The plant branching pattern was highly variable with 43.75% erect, 32.50% semi-spreading and 23.75% spreading (**Fig. 1**). The variation observed at the time of flowering showed three classes such as very early (2.50%), early (60.00%) and medium (37.50%). The genotypes ICPL 11255 and ICPL 20338 are suitable for various agro-ecological zones because half of the population flowers within 60days. These results were in accordance with the findings of Ranjani *et al*. (2018). Indeterminate (85%) plant growth habit was dominant followed by determinate type (15%) (**Fig. 2**). Ranjani and Jayamani (2021) also reported indeterminate type of growth habit as prominent in pigeonpea. The leaf shape was oblong (81.25%) and obovate (18.75%). The majority of accessions in the collection had yellow (95%) flower colour, followed by red (3.75%) and orange yellow (1.25%) (**Fig. 3**). Red flowers were observed in APK 1, ICPL 87091 and ICP 7035. Similar results were reported earlier by Chaudhary *et al.* (2021) and Priya *et al*. (2022) that yellow flower colour was prominent in pigeonpea.

For the flower pattern of streaks on petal, sparse amount of streaks was observed in 46.25%, followed by medium streaks (33.75%), absence of streaks (13.75%) and dense streaks (6.25%). Most of the pods were green with purple streaks (93.75%) followed by green pods (5.00%) and purple pods (1.25%) (**Fig. 4**). The genotype ICP 7035 had purple pods. Pod length above 5 cm was observed in 58.75% of accessions, while pod length of 4-5 cm was observed in 41.25% of accessions. The collection was composed of 95.00% accessions with four seeds per pod and 5.00% with three seeds per pod. Plant height varied through three different classes as short (41.25%), medium (41.25%) and tall (17.50%).

Erect (APK 1) Semi-spreading (ICP 9419) Spreading (ICP 7674)

Fig. 1. Variation in plant branching pattern

Determinate (VBN 1) Indeterminate (ICPL 83027)

Fig. 2. Variation in plant growth habit

Table 2. Characterization of 80 pigeonpea genotypes based on DUS descriptors

S. No.	Morphological characters	Descriptors	Note	Absolute frequency	Relative frequency (%)
1	Plant branching pattern	Erect (<30°)	3	35	43.75
		Semi-spreading (30°-60°)	5	26	32.50
		Spreading (>60°)	7	19	23.75
2	Time of flowering (50% of the plants with at least one open flower)	Very early (<60 days)	1	2	2.50
		Early (61-90 days)	3	48	60.00
		Medium (90-130 days)	5	30	37.50
		Late(131-160days)	7	0	0.00
		Very late (>160 days)	9	0	0.00
3	Plant growth habit	Determinate	1	12	15.00
		Indeterminate	3	68	85.00
4	Stem colour	Green	1	80	100.00
		Purple	2	0	0.00
5	Leaf shape	Oblong	1	65	81.25
		Obovate	3	15	18.75
		Narrowly oblong	5	0	0.00
6	Flower colour of base of petal (standard)	Light yellow	1	0	0.00
		Yellow	2	76	95.00
		Orange yellow	3	1	1.25
		Purple	4	0	0.00
		Red	5	3	3.75
7	Flower pattern of streaks on petal (standard)	Absent	1	11	13.75
		Sparse	3	37	46.25
		Medium	5	27	33.75
		Dense	7	5	6.25
		Mosaic	9	0	0.00
8	Pod colour	Green	1	4	5.00
		Green with brown streak	2	0	0.00
		Green with purple streak	3	75	93.75
		Purple	4	1	1.25
		Dark purple	5	0	0.00
9	Pod pubescence	Absent	1	0	0.00
		Present	9	80	100.00
10	Pod constriction	Slight	3	0	0.00
		Prominent	7	80	100.00
11	Pod length	<4 cm	3	0	0.00
		4-5 cm	5	33	41.25
		>5 cm	7	47	58.75
12	Number of seeds per pod	2	3	0	0.00
		3	5	4	5.00
		4	7	76	95.00
13	Plant height	Short (<100cm)	3	33	41.25
		Medium (100-150)	5	33	41.25
		Tall(>150cm)	7	14	17.50
14	Seed colour	Cream	1	8	10.00
		Brown	2	9	11.25
		Dark brown	3	61	76.25
		Gray	4	1	1.25
		Purple	5	1	1.25
15	Seed colour pattern	Uniform	1	61	76.25
		mottled	2	19	23.75
16	Seed shape	Oval	1	27	33.75
		Globular	2	34	42.50
		Elongate	3	19	23.75
17	Seed size (100 seed weight)	Small(<7g)	3	0	0.00
		Medium(7-9g)	5	41	51.25
		Large(9-11g)	7	36	45.00
		Very large(>11)	9	3	3.75

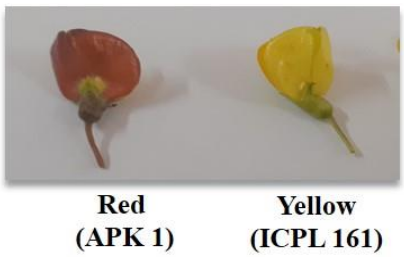

Fig. 3. Variation in flower colour

The colour of seeds were dark brown (76.25%), brown (11.25%), cream (10.00%), gray (1.25%) and purple (1.25%) (**Fig. 5**). Similar results were found by Ranjani and Jayamani (2021) for prevalence of dark brown colour seeds. Individuals with uniform and mottled seed colour pattern represented 76.25% and 23.75% (**Fig. 6**). Dhanushasree *et al*. (2022) and Chaudhary *et al*. (2021) also reported uniform seed colour as more prominent in pigeonpea. Globular seed shape was dominant (42.50%), while others had oval (33.75%) and elongate (23.75%) seed shape. The frequency of seed size was distributed as medium (51.25%), large (45.00%) and very large (3.75%) (**Fig. 7**). Seed size was very large in ICP 7035, ICPL 87091 and ICPL 151. Among the studied traits wide variation was exhibited by plant branching pattern, plant growth habit, plant height, seed colour and seed shape. Priya *et al*. (2022) studied 55 pigeonpea genotypes based on 20 morphological traits and observed more variations for traits *viz.,* flower colour, pattern of streaks, pod colour, seed colour, seed shape and size. Vanniarajan *et al*. (2021) observed wide variations in the following traits namely leaflet shape, stem colour, pattern of streaks and seed coat colour.

Eighty pigeonpea genotypes were grouped into various morphological classes using 17 morphological traits (**Table 3**). Five traits *viz.,* plant growth habit, leaf shape, pod length, number of seeds per pod and seed colour pattern grouped the pigeonpea genotypes into two

Fig. 4. Variation in pod colour

different morphological classes. Seven traits *viz.,* plant branching pattern, time of flowering, colour of base of petal, pod colour, plant height, seed shape and seed size categorized the collection into three morphological classes. The genotypes were grouped into four morphological classes based on pattern of streaks on standard petal and five morphological classes based on seed colour. Green stem was observed in all the studied genotypes. All eighty pigeonpea genotypes had pubescence and prominent constriction in their pods. Similar results were reported by Ranjani and Jayamani (2021) for stem colour, Dhanushasree *et al*. (2022) for pod constriction and Chaudhary *et al*. (2021) for pod pubescence in pigeonpea.

Cluster analysis: The distribution of 80 genotypes of pigeonpea into different clusters based on qualitative traits were presented in **Table 4**. Five distinct clusters were formed using agglomerative hierarchical clustering method based on gower distance measure. Cluster II was the largest one with a maximum of 39 genotypes (**Fig. 8**). It was followed by the cluster III which had 15 genotypes making it the second largest cluster. Thirteen genotypes

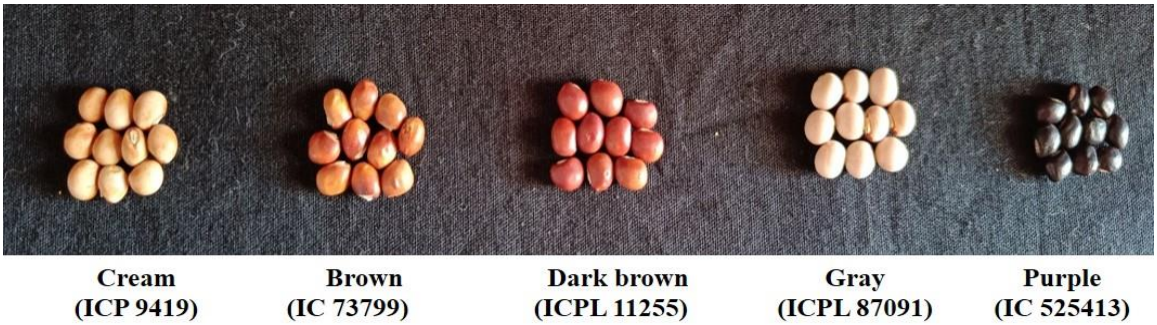

Fig. 5. Variation in seed colour

Mottled (ICPL 151) Uniform (ICP 7035)

Fig. 6. Variation in seed colour pattern

Small to large

Fig. 7. Variation in seed size

Table 3. Grouping of 80 pigeonpea genotypes based on DUS descriptors

S. No.	Morphological characters	State	Code of Genotypes
1	Plant branching pattern	Erect	1, 2, 4, 5, 7, 9, 11, 15, 16, 21, 22, 23, 24, 25, 28, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79
		Semi-spreading	3, 6, 8, 10, 12, 13, 14, 17, 19, 20, 27, 29, 30, 32, 34, 37, 40, 41, 47, 50, 52, 53, 55, 56, 58, 80
		Spreading	18, 26, 31, 33, 35, 36, 38, 39, 42, 43, 44, 45, 46, 48, 49, 51, 54, 57, 59
2	Time of flowering (50% of the plants with at least one open flower)	Very early	1,4
		Early	2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 42, 43, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 72, 73, 74, 75, 76, 77
		Medium	18, 19, 20, 21, 34, 37, 38, 39, 40, 41, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 71, 78, 79, 80
		Late	-
		Very late	-
3	Plant growth habit	Determinate	1, 4, 7, 9, 15, 16, 25, 60, 61, 63, 66, 76
		Indeterminate	2, 3, 5, 6, 8, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 62, 64, 65, 67, 68, 69, 70, 71, 72, 73, 74, 75, 77, 78, 79, 80
4	Stem colour	Green	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80
		Purple	-
5	Leaf shape	Oblong	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 25, 26, 27, 29, 30, 31, 33, 34, 36, 37, 38, 39, 41, 43, 44, 45, 47, 48, 49, 50, 51, 53, 55, 56, 57, 58, 60, 61, 63, 64, 65, 67, 68, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80
		Obovate	19, 23, 24, 28, 32, 35, 40, 42, 46, 52, 54, 59, 62, 66, 69
		Narrowly oblong	-

7	Flower pattern of streaks on petal (standard)	Absent	8, 9, 15, 21, 31, 46, 51, 53, 63, 64, 80
		Sparse	3, 5, 6, 10, 11, 14, 16, 17, 18, 19, 20, 22, 27, 30, 32, 33, 34, 35, 36, 37, 38, 41, 45, 47, 50, 52, 55, 56, 57, 58, 62, 65, 66, 67, 68, 74, 75
		Medium	1, 2, 4, 7, 12, 13, 23, 24, 25, 26, 39, 40, 43, 44, 48, 49, 54, 59, 60, 61, 69, 70, 71, 72, 76, 77, 78
		Dense	28, 29, 42, 73, 79
		Mosaic	-
8	Pod colour	Green	9, 13, 46, 61
		Green with brown streak	-
		Green with purple streak	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80
		Purple	21
		Dark purple	-
9	Pod pubescence	Absent	-
		Present	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80
10	Pod constriction	Slight	-
		Prominent	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80
11	Pod length	<4 cm	-
		4-5 cm	8, 19, 26, 27, 31, 32, 33, 34, 35, 37, 39, 40, 41, 42, 45, 46, 47, 48, 49, 51, 52, 53, 54, 55, 58, 59, 63, 65, 66, 67, 71, 78, 79
		>5 cm	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 25, 28, 29, 30, 36, 38, 43, 44, 50, 56, 57, 60, 61, 62, 64, 68, 69, 70, 72, 73, 74, 75, 76, 77, 80
12	Number of seeds per pod	2	-
		3	23, 25, 45, 54
		4	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 24, 26, 27,28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 46, 47, 48, 49, 50, 51, 52, 53, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64,65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80
13	Plant height	Short	1, 2, 3, 4, 5, 6, 7, 8, 9, 13, 14, 15, 16, 21, 22, 23, 24, 25, 27, 28, 29, 31, 60, 63, 66, 68, 69, 70, 73, 74, 76, 77, 79
		Medium	10, 11, 12, 17, 19, 26, 30, 32, 33, 34, 35, 36, 39, 40, 41, 42, 44, 47, 48, 50, 53, 55, 56, 59, 61, 62, 64, 65, 71, 72, 75, 78, 80
		Tall	18, 20, 37, 38, 43, 45, 46, 49, 51, 52, 54, 57, 58, 67
14	Seed colour	Cream	7, 37, 39, 53, 56, 61, 73, 80
		Brown	6, 21, 28, 36, 52, 55, 58, 63, 69
		Dark brown	1, 2, 3, 4, 5, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27, 29, 30, 32, 33, 34, 35, 38, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 54, 57, 59, 60, 62, 64, 65, 66, 67, 68, 70, 71, 72, 74, 75, 76, 77, 78, 79
		Gray	9
		Purple	31
15	Seed colour pattern	Uniform	1, 2, 3, 4, 8, 9, 10, 11, 12, 14, 16, 17, 21, 24, 26, 27, 28, 30, 31, 32, 35, 36, 38, 40, 41, 42, 43, 44, 45, 46, 47, 48, 50, 51, 52, 53, 54, 55, 56, 57, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 74, 75, 76, 77, 78, 79, 80
		mottled	5, 6, 7, 13, 15, 18, 19, 20, 22, 23, 25, 29, 33, 34, 37, 39, 49, 58, 73
16	Seed shape	Oval	10, 11, 12, 14, 16, 17, 23, 24, 25, 29, 32, 37, 38, 42, 43, 45, 51, 53, 54, 60, 62, 67, 68, 70, 75, 77, 79
		Globular	1, 2, 3, 6, 7, 8, 9, 13, 15, 18, 19, 21, 22, 26, 33, 34, 36, 39, 40, 41, 46, 48, 49, 52, 56, 58, 59, 61, 66, 72, 73, 76, 78, 80
		Elongate	4, 5, 20, 27, 28, 30, 31, 35, 44, 47, 50, 55, 57, 63, 64, 65, 69, 71, 74
17	Seed size (100 seed weight)	Small	-
		Medium	1, 2, 3, 4, 8, 11, 16, 19, 24, 25, 27, 29, 30, 32, 35, 38, 40, 41, 42, 44, 47, 48, 53, 54, 56, 59, 60, 61, 63, 65, 66, 67, 70, 71, 72, 73, 74, 77, 78, 79, 80
		Large	6, 7, 10, 11, 12, 15, 17, 22, 23, 27, 30, 31, 35, 36, 37, 39, 41, 43, 49, 51, 54, 55, 57, 61, 62, 63, 64, 65, 66, 67, 69, 73, 77, 78, 79, 80 5, 6, 10, 12, 13, 14, 15, 17, 18, 20, 22, 23, 26, 28, 31, 33, 34, 36, 37, 39, 43, 45, 46, 49, 50, 51, 52, 55, 57, 58, 62, 64, 68, 69, 75, 76
		Very large	7, 9, 21

(Name and code of pigeonpea genotypes are given in Table 1)

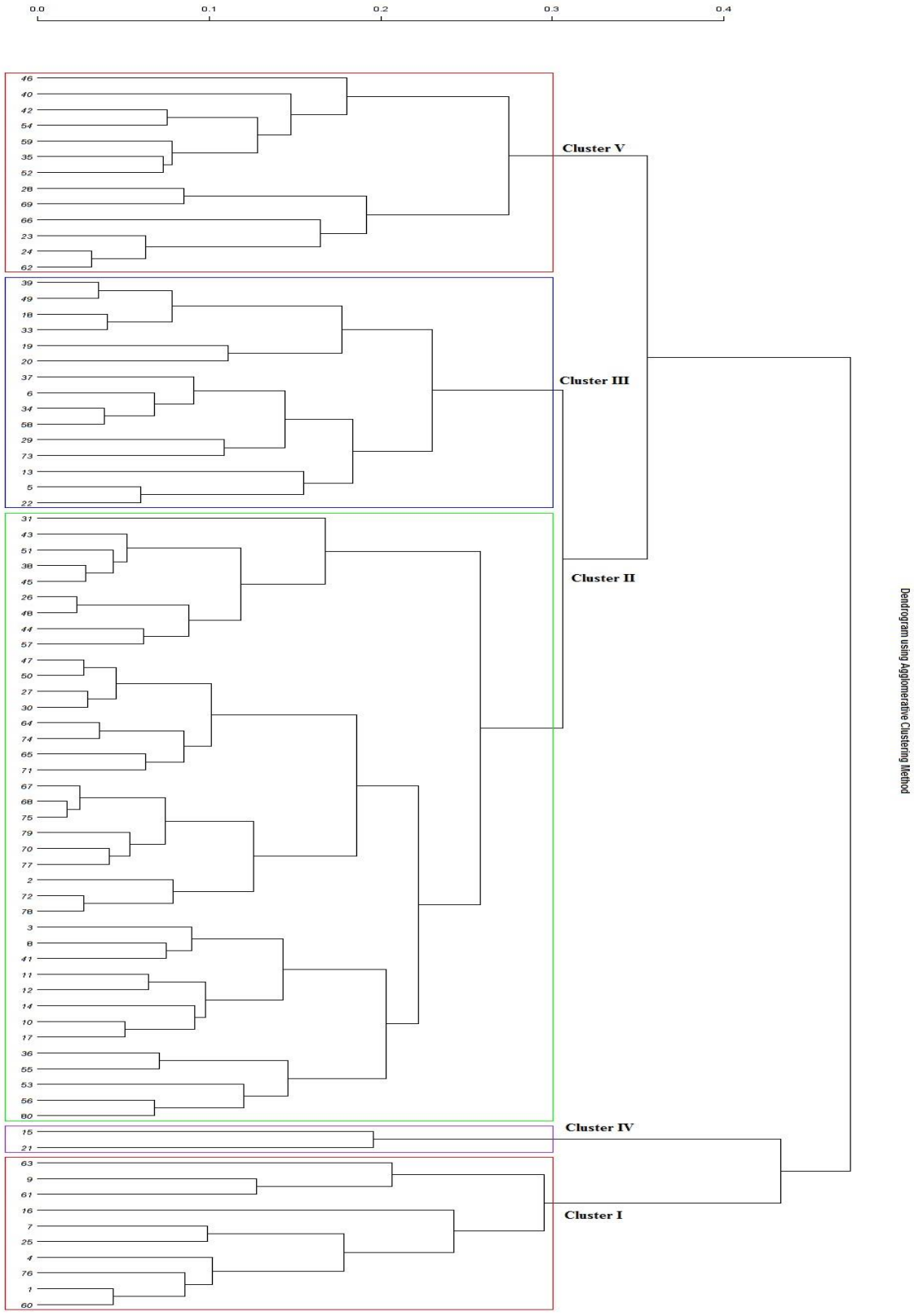

Fig. 8. Dendrogram of 80 pigeonpea genotypes based on 17 morphological traits using agglomerative hierarchical clustering

Table 4. Hierarchical cluster grouping in 80 pigeonpea genotypes based on 17 morphological traits

Cluster	Cluster size	Genotypes
1	10	ICPL 11255, ICPL 20338, ICPL 151, ICPL 87091, VBN 3, ICP 245534, VBN 1, CRG 9302, ICPL 87, ICPL 85010
2	39	ICPL 11301, ICPL 20325, ICPL 161, CRG-16-01, CRG-16-04, CRG-16-12, TT 401, Co (Rg) 7, AL 611, IC 525505, ICPL 525585, IC 525413, IC 525431, IC 525452, IC 525475, IC 525516, IC 525531, IC 525565, ICP 9562, ICP 10788, ICP 14041, C 2185, ICP 4765, ICP 7731, ICP 9419, ICP 11292, CRG 5, CRG 9060, ICPL 83027, ICPL 90028, ICPL 91045, AF 284, ICPL 88027, PA 128, TAT-93-47, AS 46, ICP 9116, AL 601, ICP 2376
3	15	ICPL 88039, ICPL 88034, CRG-19-05, ICPL 87119, ICPL 332, ICPL 99050, IC 245335, ICPR 2863, IC 525427, IC 525429, IC 525447, IC 525458, ICP 13576, ICP 11743, ARG 102
4	2	APK 1, ICP 7035
5	13	IC 245474, ICP 245532, ICPR 2431, IC 525430, IC 525462, IC 525483, ICP 9162, IC 73799, ICP 7674, ICP 12325, ICPL 86020, ICPL 84031, ICPL 91018

were included in cluster V and 10 genotypes were included in cluster I. Cluster IV was smallest with two genotypes. Erect, determinate and early genotypes of cluster I was separated into two subgroups with ICPL 87091, CRG 9302 and ICPL 87 in subgroup I and ICPL 11255, ICPL 20338, ICPL 151, VBN 3, ICP 245534, VBN 1 and ICPL 85010 in subgroup II. These genotypes can be used for developing early maturing varieties. Cluster II was further divided into two subgroups with 9 genotypes in subgroup I which were spreading, indeterminate types and 30 genotypes in subgroup II. Indeterminate genotypes of cluster III was split into six genotypes in subgroup I and nine genotypes in subgroup II. APK 1 and ICP 7035 in cluster IV were highly comparable. Seven genotypes were present in subgroup I and six genotypes in subgroup II of cluster V. Geofroy *et al.* (2020) clustered 50 pigeonpea accessions into eight morphological classes using qualitative traits. Ranjani and Jayamani (2021) characterized pigeonpea genotypes using DUS descriptors and clustered them into four major groups. Priya *et al*. (2022) categorized pigeonpea genotypes into six clusters. Dhanushasree *et al*. (2022) used cluster analysis to partition 68 early duration pigeonpea genotypes into eight major clusters.

Characterization revealed the existence of wide morphological variability among the studied accessions. All the studied traits exhibited wide variation except stem colour, pod constriction and pod pubescence. The available information will be useful for breeders to distinguish lines or cultivars in public domain. Eighty pigeonpea genotypes were partitioned into five clusters based on qualitative characters. Early genotypes of Cluster I *viz.,* ICPL 87091, CRG 9302, ICPL 87, ICPL 11255, ICPL 20338, ICPL 151, VBN 3, ICP 245534, VBN 1 and ICPL 85010 can be used as donors for earliness in pigeonpea breeding. Hybridization between different clusters with the highest genetic divergence as parental lines is suggested to develop a new genotype or variety. Preferable genotypes based on trait specific data can be forwarded as donors in pigeonpea breeding and varietal development.

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