



# Expedition, Collection and Evaluation of Rajmash (*Phaseolus vulgaris* L.) Folk Germplasm Accessions Collected from Eastern Ghats of Andhra Pradesh for Genetic Variability and Heritability Studies

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## ABSTRACT

**Background:** Rajmash is popularly known as Indian field bean, a neglected, underutilized crop grown in the hilly tracts with cool temperatures. Eastern ghats of Andhra Pradesh has rich biodiversity. It is very important to collect conserve and evaluate the rajmash germplasm accessions. Desirable germplasm accessions need to be utilized in the breeding programmes.

**Methods:** Seventy rajmash germplasm accessions are collected from the hilly tracts of eastern ghats of Andhra Pradesh, along with pass port data and evaluated for heritability and variability in two seasons for important traits *i.e.*, days to 50% flowering, plant height, number of pods per plant, pod length, number of seeds per pod, test weight and grain yield kg/ha.

**Result:** The germplasm accessions studied has shown high variability and heritability. Among all the germplasm accessions CTPL-RJM-2021-07 (2146 kg/ha) and CTPL-RJM-2021-65 (1842 kg/ha) recorded significant highest grain yield when compared with the best check Jwala (1477 kg/ha). The rajmash germplasm accessions has wide variability and heritability and may be utilized in the breeding programme based on the breeding objective.

**Key words:** Collection, Evaluation, Expedition, Germplasm, Heritability, Rajmash, Variability.

## INTRODUCTION

Rajmash or Indian field bean (*Phaseolus vulgaris* L.) is an important food legume in the world (Blair *et al.*, 2011). Rajmash is native of central and south America and widely cultivated in temperate and subtropical regions of the world (Zeven *et al.*, 1999). Rajmash (2n= 2x=22) belongs to family Leguminosae. The other vernacular names of Rajmash are Indian field bean, snap bean, kidney bean, haricot bean. Rajmash seeds are rich in protein, fibre, starch and minerals like iron, potassium, manganese, magnesium (Broughton *et al.*, 2003). Further, it is also rich in bioactive compounds, *viz.* phenolic compounds, lectins, phytates, *etc.* (Kumar *et al.*, 2008). The Eastern ghats of Andhra Pradesh *i.e.*, Araku region is a rich source of diversified germplasm in legumes, medicinal plants, millets and ancient crops (Sirisha, 2022). In tribal areas, it is used as one of the important pulse crops and widely grown as mixed crop along with paddy, maize or pure crop after maize. Several landraces of Rajmash beans grown by farmers, vary in shape, size, taste, maturity and in nutritive values (Thirugnanavel *et al.*, 2019). Conservation and utilization of this rich genetic wealth of Rajmash bean is a major challenge. The main objective of this research is to collect the germplasm accessions and landraces from the tribal farmers of eastern ghats of Andhra Pradesh. In the present study germplasm exploration, collection and conservation of Rajmash folk accessions or landraces was carried out along with the pass port data.

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The variability, heritability studies in collected germplasm accessions of Rajmash is carried out to further utilize in the breeding programme.

## MATERIALS AND METHODS

### Expedition and collection

The eastern ghats of Andhra Pradesh include Araku, Chintapalle, G.K. Veedhi, Paderu areas located in Alluri Sitaramaraju district with rich biodiversity of germplasm of many crop and wild species exists. This region is located

at a mean sea level of 1800 to 3000 m. Initial survey conducted with the local tribal people regarding the season of growing, availability and area to be explored for collection of the rajmash land races. The germplasm accessions are collected during the *Kharif* in the month of July 2021. Approach to local tribal farmers is channelized through scientific staff of Regional Agricultural Research Station, Chintapalli. Exploration is carried out and 70 folk land races were collected along with GPS co-ordinates using hand held GPS machine (Garmin etrex 30x) from different villages of Chintapalle, G.Madugula, G.K.Veedi mandals etc. Bulk and random sampling methods were adopted for collecting the germplasm (Table 1). As per the standard procedures provided by ICAR-NBPGR, New Delhi, Passport data of each accession line was collected from different villages of Chintapalle, G.Madugula, G.K.Veedi mandals etc. The procedure is referred by the authors Pareek *et al.* (2000), Kanwar and Mehta (2018), Sirisha (2022). Data on test weight, colour and size of the germplasm accessions are studied and recorded (Table 1).

### Evaluation

Evaluation of these 70 rajmash germplasm accessions collected after exploration are sown in augmented block design in two blocks along with three checks conducted during *Rabi* 2021 and 2022 for two seasons. The mean performance of the two seasons is presented in Table 2. Each germplasm accession is sown in three rows each of 4m row length with 30 × 10 cm spacing. The experiment is conducted at Acharya N G Ranaga, Regional Agricultural Research Station, Chintapalli, Andhra Pradesh. The germplasm lines are characterized for important yield attributing characters with the descriptor list and conserved for the further study. The discussion is in accordance with Kanwar and Mehta (2018), Sirisha (2022). All the germplasm accessions are evaluated and studied for the yield attributing characters *i.e.*, days to 50% flowering, plant height, number of pods per plant, pod length, number of seeds per pod, test weight and grain yield kg/ha. The mean performance of the two seasons is depicted in Table 2.

### Statistical analysis

Data is statistically analyzed for phenotypic coefficient of variation (PCV), genotypic coefficient variation (GCV), (Burton, 1952), genetic advance as per cent mean (Johnson *et al.*, 1955) and heritability (Allard, 1960). Statistical analysis is carried out using SPAR 2.0 (Ahuja *et al.*, 2008).

## RESULTS AND DISCUSSION

### Expedition and collection

The germplasm accessions are collected along with the passport data along with GPS co-ordinates (Table 1). Rajmash germplasm accessions are collected at 17° and 18° North latitude and 82° East longitude and elevation ranging from 2500 m to 3500 m from the mean sea level. (Table 1) (Sirisha, 2022). Test weight of the rajmash accessions ranged from minimum of 8 g (CTPL RJM 2021-02)

to maximum of 41.5 g (CTPL RJM 2021-02). A wide range of variability is observed in colour ranging from maroon red, red, brown, light brown, black, beige, variegated. A wide range of variability is also observed in size from small, medium and big size. The results are depicted Table 1, Fig 1. Similar results are recorded by Dar *et al.* (2009); Sirisha, (2022).

### Performance, variability and heritability studies of the germplasm accessions

All the 70 folk germplasm accessions collected during *Kharif* 2021 and evaluated in two seasons *i.e.*, *Rabi* 2021 and 2022. Among the 70 germplasm accessions collected, 10 germplasm accessions not germinated. Remaining sixty germplasm accessions are studied and the mean performance of the germplasm accessions are presented in Table 2. As per the ANOVA Table 3 the treatments, checks, checks+ var vs, entries checks vs varieties recorded statistical significant difference among the genotypes (Table 3).

Heritability, genetic advance as percent mean at 5% level and gene action for the yield attributing parameters are discussed hereunder in detail as depicted in the Table 4.

### Days to 50% flowering

Range of variation for this character ranged from 26 days (CTPL-RJM 2021-61) to 55 days (CTPL-RJM-2021-29) with a mean of 55 days and showed moderate PCV (15.09%) and GCV (14.29%). High heritability (89.72 %) coupled with moderate genetic advance of percent mean (27.89%) indicating the operation of both additive and non-additive gene action, this trait may be improved by mass and progeny selection (Ahmed, 2011; Iqbal *et al.*, 2011).

### Plant height

This parameter ranged from 12.9 cm (CTPL-RJM 2021-24) to 164.5 cm (CTPL-RJM 2021-07) with a mean of 66.7 cm. PCV (69.26%) and GCV (68.65%) is high. High heritability (98.23%) coupled with high genetic advance as % mean (140.164%) was recorded. Additive gene action is observed which can be improved with simple selection.

### Number of pods per plant

This character showed a range of variation from one (CTPL-Red) to sixteen (CTPL-RJM 2021-36) number of pods with a mean of six pods per plant. The PCV (33.38%) and GCV (28.66%) is high. High heritability (73.72%) and high genetic advance per cent mean (50.69) is observed indicating the operation of additive gene action in which simple selection may be operated for improving the trait (Ahmed, 2011; Iqbal *et al.*, 2011).

### Pod length

The parameter recorded range of variation from 6.0 cm to 13.02 cm with a mean of 9.90 cm. PCV (11.36%) and GCV (10.03%) is moderate. High heritability (77.96%) coupled with moderate genetic advance as % mean (18.85%) was recorded. Both additive and non-additive gene effects observed may be improved through mass selection, progeny selection.

**Table 1:** Passport data and characters of Rajmash (*Phaseolus vulgaris* L.) germplasm accessions collected from the eastern ghats of Andhra Pradesh during Kharif 2021.

Collection code	North latitude (°)	East longitude (°)	Elevation (m)	Test weight (g)	Colour of the seed	Size of the seed
CTPL RJM 2021-01	17.855	82.402	2519	28.5	Maroon red	Medium
CTPL RJM 2021-02	17.857	82.410	2591	41.5	Light brown (variegated)	Large
CTPL RJM 2021-03	17.856	82.419	2582	21	Brown	Extra long
CTPL RJM 2021-04	17.881	82.269	2782	25.5	Light brown	Small
CTPL RJM 2021-05	17.873	82.269	2687	36	Brown	Extra long
CTPL RJM 2021-06	17.865	82.269	2687	31.5	Brown	Medium
CTPL RJM 2021-07	17.871	82.269	2687	24.5	Light brown	Small
CTPL RJM 2021-08	17.866	82.269	2687	22	Brownvariegated	Medium
CTPL RJM 2021-09	17.872	82.269	2687	34.5	Light brown (variegated)	Long
CTPL RJM 2021-10	17.861	82.269	2687	20.5	Brown	Small
CTPL RJM 2021-11	17.876	82.269	2687	34	Light brown (variegated)	long
CTPL RJM 2021-12	17.867	82.267	2834	29	Brown	Small
CTPL RJM 2021-13	17.856	82.196	2703	35	Light brown (variegated)	Long
CTPL RJM 2021-14	17.853	82.184	2811	29	Brown	Small
CTPL RJM 2021-15	17.851	82.184	2811	37.5	Light brown (variegated)	Long
CTPL RJM 2021-16	17.852	82.184	2811	28.5	Brown	Small
CTPL RJM 2021-17	17.853	82.184	2811	27	Light brown	Long
CTPL RJM 2021-18	17.888	82.236	2820	31	Light brown (variegated)	Long
CTPL RJM 2021-19	17.868	82.187	2821	21	Black	Small
CTPL RJM 2021-20	17.867	82.355	2631	24	Light brown	Long
CTPL RJM 2021-21	17.904	82.359	2532	30.5	Brown	Small
CTPL RJM 2021-22	17.911	82.364	2575	11	Red (variegated)	Long
CTPL RJM 2021-23	17.911	82.372	2490	26.5	Brown	Small
CTPL RJM 2021-24	17.925	82.368	2526	10	Red (variegated)	Long
CTPL RJM 2021-25	17.930	82.369	2421	34	Brown	Medium
CTPL RJM 2021-26	17.935	82.376	2460	28.5	Light brown (variegated)	Long
CTPL RJM 2021-27	17.904	82.362	2500	30.5	Brown	Medium
CTPL RJM 2021-28	17.841	82.290	2769	18	Light brown (variegated)	Long
CTPL RJM 2021-29	17.754	82.305	2801	29.5	Brown	Small
CTPL RJM 2021-30	17.795	82.278	2759	1.5	Cream (variegated)	Extra long
CTPL RJM 2021-31	17.860	82.335	2739	26.5	Brown	Small
CTPL RJM 2021-32	17.820	82.490	2667	31.5	Brown	Small
CTPL RJM 2021-33	17.853	82.491	2575	29.5	Light brown (variegated)	Long
CTPL RJM 2021-34	17.820	82.491	2670	24.5	Brown	Small
CTPL RJM 2021-35	17.835	82.488	2657	16	Brown	Small
CTPL RJM 2021-36	17.836	82.461	2680	22	Light brown	Small
CTPL RJM 2021-37	17.843	82.490	2549	23.5	Brown	Small

Table 1: Continue...

Table 1: Continue...

CTPL RJM 2021-38	17,843	82,490	2549	18	Light brown (variegated)	Medium
CTPL RJM 2021-39	17,968	82,396	2326	18.5	Brown	Small
CTPL RJM 2021-40	17,984	82,430	2345	31.5	Light brown (variegated)	Long
CTPL RJM 2021-41	17,991	82,465	2568	23.5	Brown	Medium
CTPL RJM 2021-42	17,993	82,480	2550	20.5	Light brown (variegated)	Long
CTPL RJM 2021-43	18,002	82,485	3175	10	Light brown (variegated)	Long
CTPL RJM 2021-44	18,002	82,485	3175	8	Light brown (variegated)	Medium
CTPL RJM 2021-45	18,002	82,485	3175	39	Beige	Medium
CTPL RJM 2021-46	18,002	82,485	3175	30.5	Brown	Small
CTPL RJM 2021-47	18,011	82,491	3126	24.5	Brown	Small
CTPL RJM 2021-48	18,009	82,490	3235	23.5	Brown	Small
CTPL RJM 2021-49	18,009	82,490	3235	22	Brown	Small
CTPL RJM 2021-50	18,013	82,509	3307	38	Cream	Medium
CTPL RJM 2021-51	18,013	82,509	3307	23	Brown	Medium
CTPL RJM 2021-52	18,008	82,522	3546	33.5	Light brown (variegated)	Long
CTPL RJM 2021-53	18,017	82,540	3389	32	Light brown (variegated)	Long
CTPL RJM 2021-54	18,017	82,540	3389	28.5	Brown	Small
CTPL RJM 2021-55	18,017	82,540	3389	33	Light brown (variegated)	Medium
CTPL RJM 2021-56	18,017	82,540	3389	23.5	Brown	Small
CTPL RJM 2021-57	18,006	82,538	3471	36	Light brown (variegated)	Long
CTPL RJM 2021-58	18,024	82,542	3382	40.5	Brown	Extra long
CTPL RJM 2021-59	18,024	82,542	3382	34	Light brown	Long
CTPL RJM 2021-60	18,013	82,529	3546	22.5	Brown	Extra long
CTPL RJM 2021-61	18,110	82,488	3166	29	Brown	Long
CTPL RJM 2021-62	18,110	82,488	3166	24.5	Brown	Small
CTPL RJM 2021-63	18,069	82,517	3010	36	Light brown (variegated)	Medium
CTPL RJM 2021-64	18,029	82,543	3349	35	Brown	Extra long
CTPL RJM 2021-65	18,049	82,524	3059	17	Cream	Small
CTPL RJM 2021-66	18,049	82,524	2983	10	Dark brown	Extra long
CTPL RJM 2021-67	18,049	82,524	2983	29	Brown	Small
CTPL RJM 2021-68	17,842	82,256	2986	21.5	Brown	Small
CTPL RJM 2021-69	17,842	82,257	2986	24	Brown	Medium
CTPL RJM 2021-70	17,840	82,257	2986	17.5	Red (variegated)	Long

**Table 2:** Mean performance of characters of Rajmash (*Phaseolus vulgaris* L.) germplasm accessions of *Rabi* 2021 and 2022.

Entry	Days to 50% flowering (days)	Plant height (cm)	No. of pods/plant	Pod length (cm)	No. of seeds/pod	Test weight (g)	Grain yield kg/ha
CTPL RJM 2021-01	47	113.4	6	10.5	7	23.5	802*
CTPL RJM 2021-02	36	16.5	5	9.3	4	39	416
CTPL RJM 2021-03	41	37.4	5	10.9	4	41	213
CTPL RJM 2021-04	51	97.6	9	9.6	6	21.2	109
CTPL RJM 2021-05	37	53.6	7	13.0	5	50	955*
CTPL RJM 2021-06	48	139.0	8	12.0	7	28	572*
CTPL RJM 2021-07	48	164.5	10	9.6	6	24.5	<b>2146***</b>
CTPL RJM 2021-08	47	55.9	6	10.5	7	22.5	491*
CTPL RJM 2021-09	37	22.2	5	10.3	4	33.5	361
CTPL RJM 2021-11	34	20.2	7	10.9	4	37.5	833**
CTPL RJM 2021-12	42	98.6	6	11.0	7	23	333
CTPL RJM 2021-13	35	16.6	3	9.3	4	20.4	243
CTPL RJM 2021-14	52	138.2	6	11.8	7	21.5	915*
CTPL RJM 2021-15	36	19.6	4	9.0	4	36	459*
CTPL RJM 2021-16	40	125.1	6	10.2	7	25	994*
CTPL RJM 2021-17	36	18.8	6	10.8	4	39	409*
CTPL RJM 2021-18	40	15.1	4	8.3	4	35.5	287
CTPL RJM 2021-19	50	136.5	7	7.6	7	21	1440**
CTPL RJM 2021-20	35	19.0	5	8.8	4	38	687*
CTPL RJM 2021-21	50	78.1	6	9.8	6	23.5	402*
CTPL RJM 2021-23	44	81.3	7	10.7	7	26	1096*
CTPL RJM 2021-22	35	18.4	3	10.8	7	23.5	341
CTPL RJM 2021-24	40	12.9	4	9.4	3	32	122
CTPL RJM 2021-26	34	23.1	7	10.3	4	36	611*
CTPL RJM 2021-29	<b>55</b>	101.3	6	9.6	6	24	131
CTPL RJM 2021-31	47	99.9	8	12.5	8	24	918*
CTPL RJM 2021-32	51	121.7	9	10.8	6	25	287
CTPL RJM 2021-34	44	107.6	8	11.2	7	25	1400**
CTPL RJM 2021-35	43	103.0	7	11.2	7	27.5	916*
CTPL RJM 2021-36	54	160.8	<b>16</b>	9.7	6	19	309
CTPL RJM 2021-37	49	114.3	8	10.7	5	23	811*
CTPL RJM 2021-38	34	20.1	6	10.7	4	37.5	544*
CTPL RJM 2021-40	52	25.1	5	10.8	4	36.5	846*
CTPL RJM 2021-41	33	149.6	8	11.6	8	22.5	846*
CTPL RJM 2021-42	39	17.0	5	9.8	3	8.5	274
CTPL RJM 2021-44	36	16.0	5	9.9	4	33	150
CTPL RJM 2021-46	49	125.1	7	10.6	7	26	1313**
CTPL RJM 2021-47	47	124.7	10	10.8	6	21.5	185
CTPL RJM 2021-48	48	96.4	8	9.7	6	24	733*
CTPL RJM 2021-49	45	100.6	6	9.6	6	20.5	542*
CTPL RJM 2021-51	53	107.5	8	9.9	6	26	1118*
CTPL RJM 2021-52	35	19.0	6	9.8	4.2	28.5	364
CTPL RJM 2021-53	39	17.6	6	10.1	4	35	487*
CTPL RJM 2021-54	46	126.4	8	10.5	7	25.5	687*
CTPL RJM 2021-55	36	14.0	4	10.0	3	38.5	1124*
CTPL RJM 2021-56	45	63.5	7	10.7	6	25.5	1037*
CTPL RJM 2021-57	39	18.1	5	9.4	4	40.5	309
CTPL RJM 2021-58	34	32.5	5	12.3	5	51	518*
CTPL RJM 2021-59	36	32.4	5	10.0	4	39	281

Table 2: Continue...

**Table 2: Continue...**

CTPL RJM 2021-60	44	44.0	4	10.1	4	51	235
CTPL RJM 2021-61	<b>26</b>	16.0	5	9.5	4	33.5	746*
CTPL RJM 2021-62	49	119.8	6	10.5	8	23.5	822*
CTPL RJM 2021-63	42	14.0	5	9.0	5	31.5	176
CTPL RJM 2021-64	34	23.0	8	10.0	4	52	437*
CTPL RJM 2021-65	47	105.0	10	7.0	4	17	<b>1842***</b>
CTPL RJM 2021-66	38	19.0	3.5	9.4	3.5	38.5	570*
CTPL RJM 2021-67	45	123.4	5	7.0	6	23	448*
CTPL RJM 2021-68	44	84.5	6	9.8	4	24	852*
CTPL RJM 2021-69	42	78.3	9	11.3	6	25	317
CTPL RJM 2021-70	36	15.0	3	7.5	4	40.5	213
CHECK-1 (CTPL RED)	31	18.5	1	6.0	3.5	16.9	368
CHECK-2 (Jwala)	43	37.3	8	8.8	3	45.05	1477
CHECK-3 (Utkarsh)	39	19.3	7	8.7	4	29.75	1259
Mean	42	66.7	6	9.9	5	30	670
Min	26	12.9	1	6	3	8.5	109
Max	55	164.5	16	13.02	8	52	2146

\*Significant yield over local check CTPL Red; \*\*Significant yield over two checks CTPL red ad Utkarsh;

\*\*\*Significant over three checks CTPL Red, Utkarsh and Jwala.

**Fig 1:** Variability in seed colour and size in germplasm collections of Rajmash (*Phaseolus vulgaris* L.).



**Number of seeds per pod**

Recorded a range of variation from 3 (CTPL-RJM 2021-24, 42,55, Jwala) -8 (CTPL-RJM 2021-31) number of seeds with a mean of 5 seeds per pod. PCV (26.16%) and GCV (24.97%) is high. High heritability 91.12% with high (49.10%) genetic advance percent mean is observed indicating the operation of additive gene action.

**Test weight**

Showed a wide range of variation from 8.5 g (CTPL-RJM-2021-42) to 52 g (CTPL-RJM-2021-64) with a mean of 30 g. High PCV (29.48%) and high GCV (28.73%). High heritability (94.94%) recorded with high genetic advance as % mean (57.67%) shows additive gene action.

**Grain yield (kg/ha)**

In rajmash germplasm accessions shown a wide range of variation minimum of 109 g (CTPL RJM 2021-04) to 2146 g (CTPL-RJM-2021-07) with a mean grain yield of

670 g. High GCV (63.94%) and high PCV (64.34%) is recorded with high heritability (98.76%) and high genetic advance of per cent mean (130.92%) showing additive gene action. The character may be improved by simple selection. Similar results are coded by Ahmed, (2011); Iqbal *et al.* (2011); Nimbalkar *et al.* (2002); Chaudhary *et al.* (2001); Singh and Sharma (2014). The germplasm accessions are evaluated with three checks (CTPL red, Jwala and Utkarsh). The germplasm accessions CTPL-RJM-2021-65 (1842 kg/ha) and CTPL-RJM-2021-07 (2146kg/ha) recorded significant highest grain yield when compared with the best check Jwala (1477 kg/ha). Forty genotypes recorded highest significant grain yield kg/ha when compared with the local check CTPL Red (368 kg/ha). These accessions may be utilized in the breeding programmes to improve grain yields. All the germplasm lines are conserved for future breeding programme. The genotypes are also further studied for important characters and submitted to national repository for further utilization.

**Table 3:** Analysis of variance of Rajmash (*Phaseolus vulgaris* L.) germplasm collections.

	DF	Days to flowering	Plant height (cm)	No. of pods/plant	Pod length (cm)	No. of seeds/pod	Test weight (g)	Grain yield kg/ha
Block (ignoring treatments)	1	32.061	1940.663*	3.802	2.924	5.338*	45.501	439.560
Treatment (eliminating blocks)	62	45.544	2422.592*	5.487	1.939	2.122	91.486*	208057.40**
Checks	2	81.500*	224.802	27.167*	4.952	0.500	397.212**	690279.60**
Checks+Var vs. Var.	60	44.345	2495.851*	4.764	1.839	2.176	81.295*	191983.30*
Error	2	4.166	39.182	1.167	0.292	0.167	3.901	2064.050
Block (eliminating check+var.)	1	0.167	2.261	4.167	1.042	0.167	0.428	6663.075
Entries (ignoring blocks)	62	46.058	2453.856*	5.481	1.970	2.206	92.213*	207957.00 **
Checks	2	81.500*	224.802	27.167*	4.952	0.500	397.212**	690279.600**
Varieties	59	43.610	2400.499*	4.718	1.411	2.022	83.382*	180252.200*
Checks vs. varieties	1	119.638*	10060.060**	7.164	28.984**	16.460**	3.262	877897.300**
Error	2	4.166	39.182	1.167	0.292	0.167	3.901	2064.050
Ci - Cj	1	8.782	26.933	4.647	2.324	1.757	8.498	195.477
BiVi - BiVj	1	12.420	38.088	6.572	3.286	2.484	12.018	276.446
BiVi - BjVj	1	14.342	43.981	7.589	3.795	2.868	13.878	319.212
Ci - Vi	1	12.420	38.088	6.572	3.286	2.484	12.018	276.446

**Table 4:** Heritability, PCV, GCV and genetic advance as per cent mean of Rajmash (*Phaseolus vulgaris* L.).

Character	Mean	Range		Coefficient of variation		Heritability	Genetic advance as % mean (5% level)
		Min	Max	PCV	GCV	% (broad sense)	
Days to 50% flowering	42	26	55	15.092	14.295	89.72	27.89
Plant height	66.7	12.9	164.5	69.266	68.651	98.23	140.164
No. of pods per plant	6	1	16	33.38	28.66	73.72	50.69
Pod length (cm)	9.90	6	13.02	11.36	10.03	77.96	18.85
No. of seeds per pod	5	3	8	26.16	24.97	91.12	49.1
Test weight (g)	30	8.5	52	29.48	28.73	94.94	57.67
Grain yield kg/ha	670	109	2146	64.35	63.95	98.76	130.92

## CONCLUSION

The biodiverse rajmash folk germplasm accessions were collected from the eastern ghats of Andhra Pradesh and evaluated for important yield attributing characters, heritability and genetic advance as percent mean. A wide range of variability observed in seed colour, size, seed yield, test weight. High heritability is also observed for all the characters. Among all the germplasm accessions germplasm accessions CTPL-RJM-2021-07 (2146 kg/ha) and CTPL-RJM-2021-65 (1842 kg/ha) recorded significant highest grain yield when compared with the best check Jwala (1477 kg/ha). These accessions may be utilized in the breeding programme for further development of the varieties in rajmash. Forty genotypes recorded highest significant grain yield kg/ha when compared with the local check CTPL Red (368 kg/ha). The collected germplasm is further evaluated and submitted for the national germplasm repository for further conservation.

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## Disclaimers

The views and conclusions expressed in this article are solely those of the authors and do not necessarily represent the views of their affiliated institutions. The authors are responsible for the accuracy and completeness of the information provided, but do not accept any liability for any direct or indirect losses resulting from the use of this content.

## Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article. No funding or sponsorship influenced the design of the study, data collection, analysis, decision to publish, or preparation of the manuscript.

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