

## Evaluation of Pigeon Pea Germplasms Resistance to Wilt and Sterility Mosaic Disease in Telangana State

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### ABSTRACT

The pigeon pea germplasms were evaluated to identify the sources of resistance to *Fusarium* wilt and sterility mosaic disease (SMD). Screening was done at the wilt sick plot and SMD sick plot respectively at Regional Agricultural Research Station (RARS), Warangal, Telangana State, India. The experimental material consisted of 101 AICRP pigeon pea entries and 27 Warangal pigeon pea (PVT and AVT) entries with a check, which were screened against the wilt disease during *kharif*-2017 at RARS, Warangal. Ninety AICRP pigeon pea entries and 27 Warangal pigeon pea (PVT and AVT) entries with a check were tested against sterility mosaic disease. Out of 129 entries, five entries viz., LRG-208, CRG 2012-25, PUSA-151, IPA 2014-4A and WRP-1 were found resistant to wilt disease. Out of 118 entries, twenty three entries viz., BDN 2014-2, CO 6, RVSA 15-9, ASJ 1009, CRG 2012-25, PUSA 153, PUSA 151, MAL 48, MAL 13, PUSA 173, KA 16-5, IPA 2014-4A, IPA 20-14-2, IPA 15-2, IPA 15-19, GNP 2, SKNP 14-06, BRG 1, BRG 2, BRG 4, BSMR 853, ICP 8863 and WRP 1 were found resistant to sterility mosaic disease. These genotypes will be useful in crossing breeding

programs of pigeon pea against the resistance to wilt disease and sterility mosaic disease.

**Keywords** Germplasms, Pigeon pea, Resistant sources, Wilt disease, Sterility mosaic disease.

### INTRODUCTION

Pigeon pea (*Cajanus cajan* L.) is one of the most important pulse crops of semi-arid tropics and subtropics regions. Pigeon pea, also popularly known as red gram, tur and arhar, is primarily grown for its protein source. Pigeon pea is one of the important legume crops of India. Yield loss of pigeon pea is severely due to several biotic and abiotic stresses. The major biotic stresses are *Fusarium* wilt and sterility mosaic disease (SMD) and they cause severe economic yield loss. In Telangana state, it is cultivated in all districts but prominently grown in Warangal, Khammam, Medak, Mahaboobu nagar, Karimnagar, Siddipeta, Adilabad and Rangareddy districts. Among diseases, wilt disease caused by *Fusarium udum* is the most important soil borne disease with yield losses from 30–100% and the destruction causing in susceptible pigeon pea variety is up to 100% loss in grain yield. Sterility mosaic disease is caused by Sterility mosaic Virus and is transmitted by the vector, Eriophyid mite (*Aceria cajani*). These two diseases together appear in all growing seasons and they reported to cause even a complete yield loss i.e. up to 100% in susceptible pigeon pea genotypes (Saxena *et al.* 2021) during favorable conditions. The red gram crop in Telangana state is generally rain fed. Growing resistant varieties is one of the viable options of management to mini-

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**Table 1a.** Incidence of wilt disease in pigeon pea entries (received from IIPR, Kanpur). S-Susceptible, MR-Moderately Resistant, R-Resistant.

Sl. No.	Entry name	Mean percent wilt disease incidence	Reaction
1	IPA 17B-10	64.10	S
2	IPA 17B-11	59.58	S
3	LRG 208	9.50	R
4	TRG 87	56.86	S
5	NPNK 15-05	64.21	S
6	GJP 1601	53.57	S
7	GJP 1606	26.35	MR
8	CRG 2015-007	58.26	S
9	SKNP 1416	59.8	S
10	WRG 122	75.00	S
11	WRG 311	61.28	S
12	WRG 303	22.5	MR
13	TDRG 59	83.07	S
14	VRG 08-004	67.82	S
15	IBTDRG 1	58.59	S
16	IBTDRG 2	25.76	S
17	IBTDRG 3	25.96	MR
18	BAUPP 15-21	63.33	S
19	BAUPP 15-22	62.91	S
20	BDN 2	52	S
21	BDN 2014-2	75.37	S
22	PT 0723-1-2-3	55	S
23	CO 6	22.82	MR
24	RVSA 15-9	49.08	S
25	AL 1992	89.06	S
26	AL 2091	69.36	S
27	AL 1922	79.61	S
28	NPEK 15-14	43.33	S
29	CORG 2016-2	52.14	S
30	GNP 2	70.15	S
31	CORG 9701	63.65	S
32	LRG 133-33	27.91	MR
33	GRG 150	50.86	S
34	GRG 152	56.72	S
35	RKPV 527-01	60	S
36	MAL 45	61.45	S
37	WRG 93	50	S
38	RVSA 16-4	69.05	S
39	RVSA 16-1	28.58	MR
40	RVSA 16-2	49.49	S
41	TDRG 58	56.57	S
42	MPV 106	65	S
43	ASJ 1009	71.91	S
44	PA 414	75.83	S
45	PA 421	49.4	S
46	CRG 2012-25	9.5	R
47	PUSA 153	31.67	S
48	PUSA 151	9	R
49	PUSA 163	51.66	S
50	BDN 2	56.66	S
51	CO 6	71.67	S
52	MAL 48	58	S
53	MAL 49	74.66	S

**Table 1a.** Continued.

Sl. No.	Entry name	Mean percent wilt disease incidence	Reaction
54	MAL 6	72.82	S
55	MAL 13	22	MR
56	PUSA 171	60.71	S
57	PUSA 172	53.33	S
58	PUSA 173	75	S
59	KA 16-5	58.57	S
60	KA 16-1	77.38	S
61	PA 501	67.43	S
62	PT 0704-1-2	18.38	MR
63	IPA 2014-4A	9.31	R
64	IPA 20-14-2	57.4	S
65	IPA 15-2	66.11	S
66	IPA 15-19	50.66	S
67	BRG 1	43.33	S
68	BRG 2	54.74	S
69	BRG 3	50.55	S
70	BRG 4	79.66	S
71	BRG 5	65	S
72	BSMR 736	56.66	S
73	BSMR 853	22.5	MR
74	ICP 8863	50.69	S
75	KPL 44	64.75	S
76	KPL 43	63.59	S
77	IPA 204	49.2	S
78	IPA 15F	68.33	S
79	IPA 8F	44.76	S
80	BAHAR	71.67	S
81	WRP 1	9.5	R
82	ICPH 2431	23.61	MR
83	ICPH 3301	50	S
84	ICPH 2441	49.55	S
85	ICPH 2429	72.74	S
86	ICPH 7933	58.33	S
87	ICPH 2700	70.99	S
88	ICPH 3492	57.5	S
89	ICPH 3887	58.57	S
90	GRPH 3477	67.94	S
91	LRG 223	67.87	S
92	KRG 33	63.48	S
93	NPEK 15-25	59.16	S
94	SKNP 14-06	57.22	S
95	SKNP 14-08	50.81	S
96	AKTE 12-04	56.03	S
97	PA 535	73.33	S
98	RVSA 28-1	83.33	S
99	WRG 12	60.33	S
100	BDN 711	87.33	S
101	BDN 2014-1	80.33	S
102	ICPL-2376	90	S

mize economic losses. Therefore, the present study was carried out with an aim to screen the pigeon pea genotypes against wilt and sterility mosaic disease to

**Table 1b.** Screening of Warangal pigeon pea entries against wilt disease.

Sl. No.	Name of the entry	Mean percent wilt disease incidence	Reaction
1	WRG-359	25.25	MR
2	WRG-353	58.33	S
3	WRG-351	73.33	S
4	WRG-348	85.00	S
5	WRG-341	73.33	S
6	WRG-340	50.00	S
7	WRG-339	72.87	S
8	WRG-337	75.00	S
9	WRG-336	68.33	S
10	WRG-335	25.00	MR
11	WRG-330	60.24	S
12	WRG-327	80.00	S
13	WRG-323	57.7	S
14	WRG-322	78.33	S
15	WRG-321	8.75	R
16	WRG-319	27.5	MR
17	WRG-318	55.00	S
18	WRG-379	26.5	MR
19	WRG-377	66.66	S
20	WRG-374	40.19	S
21	WRG-373	82.98	S
22	WRG-369	22.25	MR
23	WRG-368	48.08	S
24	WRG-367	57.41	S
25	WRG-366	43.93	S
26	WRG-365	62.13	S
27	WRG-362	56.04	S
28	ICPL-2376 (Check)	89.64	S

identify the resistant sources.

## MATERIALS AND METHODS

Trial was conducted in a Randomized Block Design (RBD) with two replications during *kharif*-2017 at RARS, Warangal, Telangana state. Recommended agronomic practices were followed.

### Evaluation for for *Fusarium* wilts resistance

129 red gram genotypes were evaluated for *Fusarium* wilt resistance at the pigeon pea wilt sick plot under artificial epiphytotic conditions during *kharif* 2017. Each genotype was planted in two rows of 4 meter length with row spacing of 120 cm and 20 cm between plants. The trial was laid out in RBD with two replications. Susceptible check (ICPL-2376) for wilt was included after every 5 test rows for comparison. The

**Table 2a.** Screening of pigeon pea entries against sterility mosaic disease. (AVT, Genetic stock, Elite and National released entries). S-Susceptible, MR-Moderately Resistant, R-Resistant.

Sl. No.	Name of the entry	Mean percent sterility mosaic disease	Reaction
1	IPA 17B-10	16	MR
2	IPA 17B-11	44.44	S
3	LRG 208	22.22	MR
4	TRG 87	58.33	S
5	NPNK 15-05	44.44	S
6	GJP 1601	25	MR
7	GJP 1606	75	S
8	CRG 2015-007	25	MR
9	SKNP 1416	80	S
10	WRG 122	71.43	S
11	WRG 311	60	S
12	WRG 303	47.37	S
13	TDRG 59	27.78	MR
14	VRG 08-004	47.37	S
15	IBTDRG 1	22.73	MR
16	IBTDRG 2	40	S
17	IBTDRG 3	23	MR
18	BAUPP 15-21	43.75	S
19	BAUPP 15-22	22.73	MR
20	BDN 2	40	S
21	BDN 2014-2	8.33	R
22	PT 0723-1-2-3	29.17	MR
23	CO 6	8.69	R
24	RVSA 15-9	10	R
25	LRG 133-33	31.82	S
26	GRG 150	28.57	MR
27	GRG 152	38.46	S
28	RKPV 527-01	58.33	S
29	MAL 45	28.57	MR
30	WRG 93	30	MR
31	RVSA 16-4	27.72	MR
32	RVSA 16-1	23.08	MR
33	RVSA 16-2	36.84	S
34	TDRG 58	43.48	S
35	MPV 106	27.77	MR
36	ASJ 1009	8.69	R
37	PA 414	17.86	MR
38	PA 421	40	S
39	CRG 2012-25	8.33	R
40	PUSA 153	8.0	R
41	PUSA 151	9.09	R
42	PUSA 163	18.75	MR
43	BDN 2	33.33	S
44	CO 6	28	MR
45	MAL 48	7.14	R
46	MAL 49	15.38	MR
47	MAL 6	11.11	MR
48	MAL 13	9.09	R
49	PUSA 171	17.81	MR
50	PUSA 172	10.34	MR
51	PUSA 173	7.14	R
52	KA 16-5	5.0	R

**Table 2a.** Continued.

Sl. No.	Name of the entry	Mean percent sterility mosaic disease	Reaction
53	KA 16-1	16.67	MR
54	PA 501	14.29	MR
55	IPA 2014-4A	5.56	R
56	IPA 20-14-2	6.45	R
57	IPA 15-2	6.25	R
58	IPA 15-19	3.85	R
59	AL 1992	25	MR
60	AL 2091	17.28	MR
61	AL 1922	25	MR
62	NPEK 15-14	75	S
63	CORG 2016-2	86.88	S
64	GNP 2	9.68	R
65	CORG 9701	16.67	MR
66	LRG 223	100	S
67	KRG 33	100	S
68	NPEK 15-25	80	S
69	SKNP 14-06	0	R
70	SKNP 14-08	17.33	MR
71	AKTE 12-04	27.27	MR
72	PA 535	25	MR
73	RVSA 28-1	50	S
74	WRG 12	29.62	MR
75	BDN 711	18.18	MR
76	BDN 2014-1	25	MR
77	BRG 1	0	R
78	BRG 2	0	R
79	BRG 3	16.67	MR
80	BRG 4	0	R
81	BRG 5	11.11	MR
82	BSMR 736	12.5	MR
83	BSMR 853	4.55	R
84	ICP 8863	9.09	R
85	KPL 44	30.17	S
86	IPA 204	12.5	MR
87	IPA 15F	33.33	S
88	IPA 8F	30	S
89	BAHAR	27.78	MR
90	WRP 1	0	R
91	Maruthi (Check)	100	S

wilt incidence score was taken by counting healthy plants (without wilt symptoms) from flowering to pod formation stages and wilt diseased plants based on the disease incidence.

$$\text{Percent Disease Incidence (PDI)} = \frac{\text{Number of plants wilted}}{\text{Total number of plants}} \times 100$$

**Table 2b.** Screening of Warangal pigeon pea entries against sterility mosaic disease.

Sl. No.	Name	Mean percent sterility mosaic disease incidence	Reaction
1	WRG-379	16.67	MR
2	WRG-377	11.11	MR
3	WRG-374	18.18	MR
4	WRG-373	13.64	MR
5	WRG-369	23.81	MR
6	WRG-368	17.24	MR
7	WRG-367	16.28	MR
8	WRG-366	12.77	MR
9	WRG-365	27.27	MR
10	WRG-362	22.22	MR
11	WRG-359	50	S
12	WRG-353	27.78	MR
13	WRG-351	50	S
14	WRG-348	31.25	MR
15	WRG-341	15.91	MR
16	WRG-340	40	S
17	WRG-339	29.41	MR
18	WRG-337	25	MR
19	WRG-336	26.92	MR
20	WRG-335	30	MR
21	WRG-330	29.63	MR
22	WRG-27	27.27	MR
23	WRG-23	15.15	MR
24	WRG-22	16.67	MR
25	WRG-21	47.62	S
26	WRG-19	15.15	MR
27	WRG-18	27.03	MR
28	Maruthi (Check)	100	S

Based on the disease incidence, genotypes were categorized for their reaction to wilt according to the scale of AICRP on pigeon pea :

Reaction	Per cent wilt disease incidence
Resistant	<10
Moderately resistant	10.1 - 30
Susceptible	>31

#### Evaluation for sterility mosaic disease (SMD) resistance

One hundred eighteen pigeon pea entries were evaluated for SMD at pigeon pea sterility mosaic sick plot during *kharij*-2017 at RARS, Warangal. Genotypes were planted in two rows of 4 meter length with row spacing of 120 cm and 20 cm between plants. Trial

was laid out in RBD with two replications. SMD check (Maruthi) was included after every 5 test rows. At two leaf stage, every plant of test entries was inoculated with SMD infested leaves using the leaf staple technique. SMD infected leaflet maintained on the susceptible cultivar Maruthi at isolated pigeon pea sterility mosaic disease sick plot at RARS was taken and folded on the primary leaf in such a way that its lower surface comes in contact with a primary leaf of the test seedling and then stapled with a stapler for successful SMD infection. Susceptible check Maruthi was planted at the sick plot one month in advance of the regular planting time to serve as an infector row in order to have a good source of virus inoculums. Genotypes found resistant to SMD under field conditions for using leaf staple technique. Per cent disease incidence (PDI) was calculated for each genotype and susceptible check.

$$\text{PDI} = \frac{\text{Number of SMD plants}}{\text{Total number of plants}} \times 100$$

Based on the disease incidence, genotypes are categorized for their reaction to sterility mosaic disease as per scale of AICRP on pigeon pea :

Reaction	Per cent sterility mosaic disease
Resistant	<10
Moderately resistant	10.1 – 30
Susceptible	>31

## RESULTS AND DISCUSSION

### *Fusarium* wilt resistance

*Fusarium* wilt incidence in 129 red gram germplasm lines was from 9 to 90%. Out of 101 AICRP entries based on the mean disease incidence of both replications during *kharif*-2017, five entries viz., LRG-208, CRG 2012-25, PUSA-151, IPA 2014-4A and WRP-1 were found resistant to wilt disease, eleven entries viz., GJP 1606, WRG 303, IBTDRG 2, IBTDRG 3, CO 6, LRG 133-33, RVSA 16-1, MAL 13, PT 0704-1-2, BSMR 853 and ICPH 2431 were moderately resistant to wilt disease and remaining entries

were susceptible to wilt disease. Per cent wilt mean incidence of check (ICPL-2376) was 90 (Table-1a).

Out of screened 27 Warangal red gram entries against wilt disease at the sick plot, one entry WRG-321 was found resistant, five entries viz., WRG-359, WRG-335, WRG-319, WRG-379 and WRG-369 were moderately resistant to wilt disease and balance entries were susceptible to wilt disease (Table 1b).

Choudhary and Nadarajan (2011) found BDN 1, BDN 2, C 11, ICPL 87119, BSMR 736, TS 3, WRP 1 and DA 11 entries were resistant to wilt disease. Sharma *et al.* (2012) noticed that ICP 6739, ICP 8860, ICP 11015, ICP 13304, ICP 14638 and ICP 14819 were wilt resistant accessions after screening a pigeon pea mini- core collection. Jaggal *et al.* (2014) observed that 39 accessions were resistant to wilt disease. Pawar *et al.* (2015) reported that germplasm lines viz., ICP7088 and ICP-8863 were found resistant to wilt. Out of 60 entries, two entries (ICPL-87119 and IPAC-68) were found resistant to wilt disease (Vijaya Bhaskar 2016). Ten genotypes of pigeon pea namely SKNP 1004, SKNP1406, SKNP1217, GJP1303, GJP1406, AAFVT13-35, BP11-04, SKNPCH1308, SKNPCH 1407 and SKNPCH 1214) were identified as resistant to *Fusarium* wilt disease in Gujarat out of thirty four evaluated pigeon pea entries (Singh *et al.* 2021). Six entries viz., GRG-152, ICP9174, ICP-8858, IPA14-4A, GJP1606 and MAL-45 were found resistant to wilt for four *kharif* seasons as against evaluated fifty pigeon pea entries (Deepak Reddy *et al.* 2022).

### Sterility mosaic disease (SMD) resistance

Out of 90 AICRP entries, twenty three entries viz., BDN 2014-2, CO 6, RVSA 15-9, ASJ 1009, CRG 2012-25, PUSA 153, PUSA 151, MAL 48, MAL 13, PUSA 173, KA 16-5, IPA 2014-4A, IPA 20-14-2, IPA 15-2, IPA 15-19, GNP 2, SKNP 14-06, BRG- 1, BRG- 2, BRG- 4, BSMR- 853, ICP- 8863 and WRP- 1 were found resistant (0 to 10%), thirty nine entries viz., IPA 17B-10, LRG 208, GJP 1601, CRG 2015-007, TDRG 59, IBTDRG 1, IBTDRG 3, BAUPP 15-22, PT 0723-1-2-3, GRG 150, MAL 45, WRG 93, RVSA 16-4, RVSA 16-1, MPV 106, PA 414, PUSA 163, MAL 49, MAL 6, PUSA 171,

PUSA 172, KA 16-1, PA 501, AL 1992, AL 2091, AL 1922, CORG 9701, SKNP 14-08, AKTE 12-04, PA 535, WRG 12, BDN 711, BDN 2014-1, BRG 3, BRG 5, BSMR 736, IPA 204, IPA 8F and BAHAR showed moderate resistance to SMD (>10 to 30%) and balance twenty eight entries were susceptible to Sterility mosaic disease. Check (Maruthi) per cent SMD was 100 (Table 2a).

Twenty seven Warangal pigeon pea entries were screened against the sterility mosaic disease. None of them are resistant. Twenty three entries viz., WRG-379, WRG-377, WRG-374, WRG-373, WRG-369, WRG-368, WRG-367, WRG-366, WRG-365, WRG-362, WRG-353, WRG-341, WRG-339, WRG-337, WRG-336, WRG-335, WRG-330, WRG-27, WRG-23, WRG-22, WRG-19 and WRG-18 were moderately resistant and remaining entries were found susceptible to sterility mosaic disease (Table 2b).

Sharma *et al.* 2012 reported that eleven entries viz., ICPs 3576, 7869, 9045, 11015, 11059, 11230, 11281, 11910, 14819, 14976 and 15049 had sterility mosaic disease resistant accessions after screening a pigeon pea mini- core collection. Jaggal *et al.* (2014) noticed that 92 accessions were found resistant to sterility mosaic disease. Vijaya Bhaskar (2016) reported that eight entries viz., ICPL-87119, ICPL-2376, BDN-2, PT-4-307, CORG-9701, BSMR-736, GRG-811 and BSMR-853 were found resistant to sterility mosaic disease on evaluation of sixty entries. Out of 55 entries, one entry RKPV-405-10 showed resistant reaction and out of 61 ICRISAT entries, two entries namely ICPL 99095 and ICP-7035 showed resistant reaction to SMD (Prabhavathi and Ramappa 2018). On screening of ninety four genotypes, five genotypes viz., DPP 2-89, DPP 3-182, IC 22557, ICP 3666 and ICP 13264 showed highly resistant reaction with 0% PDI and three genotypes viz., IC 525411 (8%), ICP 12327 (5%) and ICP 14040 (5%) were found to be resistant to SMD (Tharageshwari *et al.* 2019). Ten genotypes of pigeon pea SKNP 1004, SKNP1406, SKNP1217, GJP1303, GJP1406, AAFVT13-35, BP11-04, SKNPCH1308, SKNPCH 1407 and SKNPCH 1214) were identified resistance to sterility mosaic disease in Gujarat on evaluation of thirty four pigeon pea entries (Singh *et al.* 2021).

On evaluation of fifty pigeon pea entries, seven entries viz., TJT-501, BDN711, IPA-203, Bahar, BDN1, MAL-6 and ICPL2376 were found resistant to SMD for four *kharif* seasons (Deepak Reddy *et al.* 2022). On evaluation of twenty pigeon pea advanced breeding lines, two lines namely, ICPL-16086 and ICPL-16087 showed resistance SMD reactions for two consecutive years at in ICRISAT, India (Sayiprathap *et al.* 2022).

## CONCLUSION

The present studies revealed that six entries viz., LRG-208, CRG 2012-25, PUSA-151, IPA 2014-4A, WRG-321 and WRP-1 were found resistant to wilt disease during *kharif*-2017 at RARS, Warangal and twenty three entries viz., BDN 2014-2, CO 6, RVSA 15-9, ASJ 1009, CRG 2012-25, PUSA 153, PUSA 151, MAL 48, MAL 13, PUSA 173, KA 16-5, IPA 2014-4A, IPA 20-14-2, IPA 15-2, IPA 15-19, GNP 2, SKNP 14-06, BRG 1, BRG- 2, BRG 4, BSMR 853, ICP 8863 and WRP 1 were found resistant to sterility mosaic disease.

With regard to *Fusarium* wilt and sterility mosaic diseases jointly, four entries viz., CRG 2012-25, PUSA-151, IPA 2014-4A and WRP-1 were found resistant, three entries (GJP-1601, IBTDRG-3 and RVSA-16-1) were found moderately resistant and remaining entries were susceptible.

## REFERENCES

- Choudhary AN, Nadarajan N (2011) Breeding improved cultivars of pigeon pea in India. IIPR, Kanpur.
- Deepak Reddy B, Kumar B, Sai Reddy MS, Sai Krishna K, Somala Karthik, Kumar Rajeev (2022) Identification of Elite Pigeon-pea Genotypes against *Fusarium* wilt and Sterility Mosaic Disease through AMMI and GGE Biplot Analysis. Legume Research, March, pp 1—8.
- Jaggal LG, Patil BR, Salimath PM, Madhusudhan K, Patil MS, Udikeri SS (2014) Evaluation of minicore accessions of pigeon pea against sterility mosaic disease and *Fusarium* wilt. *Karnataka J Agric* 27 (3) : 337—339.
- Pawar SV, Deshpande GD, Dey Utpal (2015) Field resistance of pigeon pea germplasm lines to *Fusarium* wilt disease in India. *Legume Res* 38 (5) : 658—668.
- Prabhavathi HK, Ramappa (2018) Field evaluation of pigeon-pea genotypes against pigeonpea sterility mosaic virus (PPSMV). *Int J Pure Appl Biosci* 6 (5) : 57—61.
- Sayiprathap BR, Patibanda AK, Prasanna Kumari V, Jayalali-

- tha K, Ramappa HK, Rajeswari E, Karthiba L, Saratbabu K, Sharma Mamta, Sudini HK, (2022) Salient findings on host range, resistance nce screening and molecular studies on sterility mosaic disease of pigeonpea induced by pigeonpea sterility mosaic viruses (PPSMV-I and PPSMV-II). *Front Microbiol* 13 : 1—13.
- Saxena RK, Hake A, Bohra A, Resaerch KAW, Hingane A, Sultana R, Singh IP, Naik SS, Varshney RK (2021) A diagnostic marker kit for *Fusarium* wilt and sterility mosaic diseases resistance in pigeonpea. *Theor Appl Genet* 134 : 367—379.
- Sharma M, Rathore A, Mangala UN, Ghosh R, Sharma S, Upadhyaya HD, Pande S (2012) New sources of resistance to *Fusarium* wilt and sterility mosaic disease in a mini-core collection of pigeon pea germplasm. *Europ J Pl Path* 707—714.
- Singh Narendra, Patel Rakesh R, Patel Ashwin M (2021) Ascertain sources of resistance against *Fusarium* wilt and sterility mosaic disease of pigeonpea, *Pl Dis Res* 36 : 74—79.
- Tharageshwari LM, Thanga Hemavathy A, Jayamani P, Karthiba L (2019) Evaluation of pigeonpea (*Cajanus cajan*) genotypes against pigeonpea sterility mosaic disease. *Elect J Pl Breed* 10 (2) : 727—731.
- Vijaya Bhaskar A (2016) Screening of pigeonpea genotypes against wilt and sterility mosaic disease in Telangana state, India. *Ind J Agric Res* 50 (2) : 172—176.