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Multi-location Trails for Stability of Growth Parameters of Horsegram Mutants

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Abstract: ***Multi-location trials for growth parameters such as plant height (cm), primary branches per plant, days for first flower and days for maturity in horsegram [(Macrotyloma uniflorum (Lam.) Verdc] mutants are important for evaluation of genotype by environment interaction and identification of superior genotypes in the final selection cycles. The objective of this study was to evaluate stability and adaptability of growth parameters of horsegram mutants. Multilocation trails of horsegram mutants were conducted at different localities of five districts such as 1. Pokhari (Tal-Ashti, Dist-Beed), Chinchpur, Tal-Paranda, Dist-Osmanabad), 3. Hulgewadi (Tal- Karmala, Dist- Solapur), 4. Kuldharan (Tal- Karjat, Dist- Ahmednagar) and Pimpalwadi, (Tal-Kankavali, Dist- Sindhudurg). The stability of growth parameters in M_4, M_5 and M_6 generations was investigated. Almost all mutants like early dwarf, early semi dwarf, late and high yielding showed stability in all generations at five localities in five districts of Maharashtra.***

Keywords: Horsegram, growth parameters, generations, stability.

I. INTRODUCTION

Horsegram [(*Microtyloma uniflorum* (Lam.)Verdc.] is an important drought tolerant, rainfed minor pulse crop. It is a leguminous crop which improves soil fertility by fixing atmospheric nitrogen hence it is used as a green manure and cover crop. Horsegram has medicinal properties for treatment of kidney diseases and urinary problems (Bolbhat and Kamble, 2015).

It is underutilized legumes of tropics, which grows luxuriantly even under conditions of minimal rain fall, and is capable of drought to an extraordinary extent (Shambulingappa and Viswanatha, 1990). It is a nutritious forage crop for cattle and nutritious grain with high protein content (Salini et al., 2014). Horsegram is resistance to pests and insects due to presence of metabolic compounds such as terpens, phenolics, tannins, alkaloids, enzyme inhibitors, hemogluttanins and non-protein amino acids. (Kessler and Baldwin, 2002 and Ferry et al., 2004). Growth parameters are an important criteria in crop improvement programmee. Many mutants showed good growth parameters like plant height (cm), primary branches per plant, days for first flower and days for maturity. But inhibitory effects on growth parameters by mutagens have also been reported by Bolbhat and Dhumal in horsegram (2009). Bolbhat et. el., (2020) recorded the growth parameters of field pea, when seeds subjected to SA, EMS and GR was less than those of their control counterparts. It is clearly indicated that the mutagens have exerted an inhibitory effect on growth parameters. Therefore the present investigation was undertaken to study the stability of growth parameters of horsegram mutants at different localities in different districts of Maharashtra.

II. MATERIALS AND METHODS

Multilocation trails were conducted to study the stability of growth parameters such as plant height (cm), primary branches per plant, days for first flower and days for maturity of horsegram mutants at different localities. The seeds of horsegram mutants such as early dwarf, early semi dwarf, late and high yielding were obtained from Department of Botany, Rayat Shikshan Sanstha's Dada Patil Mahavidyalaya Karjat, Dist- Ahmednagar- 414402 (MS). The seeds of each mutant (675) were sown in a field at a spacing of 30 x 15cm in randomized block design (RBD) replicated thrice with control for rising M_4 generation during *Kharif*. The field experiment was conducted at different localities of Maharashtra like 1. Pokhari (Tal-Ashti, Dist-Beed), Chinchpur, Tal-Paranda, Dist- Osmanabad), 3. Hulgewadi (Tal- Karmala, Dist- Solapur), 4. Kuldharan (Tal- Karjat, Dist- Ahmednagar) and Pimpalwadi, (Tal-Kankavali, Dist- Sindhudurg). Along with this, field trials were also conducted at Department of Botany, Dr. B. S. K. K. Vidyapeeth Dapoli, Dist- Ratnagiri, Department of Botany, Savitribai Phule Pune University, Pune and Department of Botany, Annasaheb Awate College Manchar (Dist-Pune). M_4 Populations were observed for growth parameters such as plant height (cm), primary branches per plant, days for first flower and days for maturity. Mean values of growth parameters were recorded in the table. All the M_4 mutant plants were harvested individually. Seeds obtained in M_4 generation were used to raise M_5 followed by M_6 generations in following rainy seasons at same localities.

A. Statistical Analysis

The data were summarized as the means of three replicates with standard deviation as the measures of variability. One-way ANOVA test was performed to determine significant differences due to various treatments. Fisher's LSD (Least significant difference) was used as post hoc test to as certain significant differences among treatments at p= 0.05. Statistical analysis and graphical data presentations were carried out by using Sigma stat (ver.25).

III. RESULTS AND DISCUSSION

Horsegram mutants such as early dwarf, early semi dwarf, late and high yielding were planted at different places of five districts of Maharashtra. Data obtained on mean growth parameters like plant height (cm), primary branches per plant, days for first flower and days for maturity of all mutants and control presented in Table. It clearly indicates that the growth parameters were stable with minor variation in all the mutants and at all localities.

A. Early Dwarf Mutant

In M_4 generation the range of plant height (cm), at all places was 18.13 to 23.95cm, while in M_5 generation 19.20 to 24.27cm and in M_6 generation 13.31 to 21.49cm was recorded. Maximum plant height (cm) was recorded 24.27cm at Pimplewadi in M_5 generation. The range of primary branches per plant, at all places in M_4 generation was 4.55 to 6.45, in M_5 generation 4.60 to 6.55 and in M_6 generation 4.12 to 6.13 was recorded. In M_5 generation maximum primary branches per plant was noted (6.55) at Pimplewadi. 29.15 to 31.56, 30.65 to 32.90 and 30.17 to 32.21 were the range of days for first flower at all localities in M_4, M_5 and M_6 generations respectively. At Pimplewadi maximum days for first flower was recorded (32.90) in M_5 generation. In M_4, M_5 and M_6 generations the range of days for maturity, at all places was 64.13 to 68.19, 65.11 to 67.47 and 64.03 to 66.81 were recorded respectively. Maximum days for maturity was noted 68.19 in M_5 generation at Pimpalwadi. Statistically analyzed data (Table-1) revealed significant differences with respect to the growth parameters in M_4 to M_6 generations at all localities indicating the stability in growth parameters among the cultivars.

B. Early Semi Dwarf Mutant

Plant height of early semi dwarf mutant at all localities in M_4, M_5 and M_6 generations was ranged in between 25.43 to 34.67cm, 26.10 to 36.16cm and 22.16 to 32.25cm respectively. In M_4 generation the range of primary branches per plant, at all places was 4.95 to 6.89, while in M_5 generation 5.24 to 6.70 and in M_6 generation 4.95 to 6.21. In M_4 generation at Pimplewadi, maximum primary branches per plant (6.89) was recorded. At all localities, days for first flower in M_4, M_5 and M_6 generations were ranged in between 30.16 to 31.63, 30.27 to 32.90 and 30.11 to 31.03 respectively. Highest days for first flower was 32.90 at Pokhari in M_5 generation. 64.11 to 67.25, 65.03 to 68.92 and 64.21 to 67.31 was the range of days for maturity in M_4, M_5 and M_6 generations at all places. Maximum (68.92) days for maturity was recorded in M_5 generation at Pokhari. The stimulatory as well as inhibitory effect on growth parameters directly proportional to the localities and environmental conditions (Table). Almost all mutants in all generations and at all places showed stability with respect to growth parameters.

C. Late Mutant

The results of present study (Table) have clearly shown that late mutant was sensitive to growth parameters at all localities. Almost at all localities and in all generations late mutant showed increased growth parameters over control. Maximum plant height was recorded in M_6 generation at Pimpalwadi (65.92cm). The range of plant height (cm), at all localities was (50.78 to 51.70cm, 52.55 to 65.92cm and 44.54 to 58.73cm) in M_4, M_5 and M_6 generations. In M_4 generation the range of primary branches per plant, at all places like 7.15 to 9.15, while in M_5 generation 7.07 to 8.61 and in M_6 generation 6.09 to 7.95 was recorded. At Pimplewadi maximum primary branches per plant was noted in M_4 generation (9.15). At all localities the range of days for first flower were noted such as 64.58 to 66.48, 63.41 to 67.12 and 62.79 to 64.53 in M_4, M_5 and M_6 generations. 108.50 to 111.22, 102.39 to 110.35 and 101.72 to 108.19 were the range of days for maturity, at all places were recorded. Maximum days for maturity was recorded 108.19 in M_6 generation at Pimpalwadi. The minor difference in growth parameters was caused by environmental factors like soil type, topography, soil nutrients, temperature, rainfall directly affect on growth parameters.

D. High Yielding Mutant

Data obtained on mean plant height was increased at all places and in all the generations as compared to control. Highest plant height (64.75cm) in M_5 generation was recorded at Pimpalwadi. In M_4 generation the range of plant height (cm), at all places was 51.83 to53.27cm, while in M_5 generation 53.11 to 64.75cm and in M_6 generation 45.41 to 59.41cm.

The range of primary branches per plant, at all trial plots were recorded such as 7.46 to 9.12, 7.32 to 9.35 and 7.03 to 8.63 in M_4, M_5 and M_6 generations. Highest primary branches per plant was 9.35 in M_5 generation at Pimplewadi. At all localities, the range of days for first flower was recorded in M_4, M_5 and M_6 generations such as 61.42 to 63.89, 60.22 to 64.10 and 58.52 to 62.86 respectively. At Kuldharan, in M_5 generation maximum days for first flower was (64.10). 107.59 to 109.69, 107.12 to 110.30 and 105.43 to 108.20 were the range of days for maturity at all places in M_4, M_5 and M_6 generations, while the maximum days for maturity was 110.30 in M_5 generation at Pimpalwadi. All mutants showed significant changes in growth parameters in all generations and all localities. There were minor variations in growth parameters. It was mainly due to change in climatic conditions.

IV. CONCLUSION

Almost all mutants showed stability in growth parameters such as plant height (cm), primary branches per plant, days for first flower and days for maturity at all locations over control. There were minor variations in growth parameters at all places in M_4, M_5 and M_6 generations. It was mainly due to change in climatic conditions. Thus multilocation trails provide an effective overview of average performance and environmental stability useful for identifying locations that optimized cultivar performance and for making better use of limited resources available for the testing programme. All these mutants will be used for sowing in all five districts of Maharashtra. It is beneficial to farmers as well as plant breeders.

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Table: 1a Stability of growth parameters in M_4 generation of horsegram mutants
Place- Pokhari, Tal- Ashti, Dist. Beed (MS)

Mutants	Plant height (cm)	Pri. branches/ plant	DAS for first flower	DAS for maturity
Control	45.56±6.38	5.20±0.73	60.27±8.44	100.34±14.05
Early dwarf	18.13±1.45	4.80±0.38	30.15±2.41	64.13±5.13
Early Semi dwarf	25.43±2.80	4.95±0.54	32.37±3.56	66.59±7.32
Late	50.78±6.60	7.15±0.93	64.58±8.40	108.50±14.11
High yielding	51.83±7.26	7.67±1.07	61.42±8.60	107.6±15.06
SEM ±	4.42	0.63	5.59	9.68
F-value	24.62	9.13	18.47	10.53
P-value	0.01	0.01	0.01	0.01
LSD 0.05	9.63	1.37	12.18	21.09

Data are means of three replicates ± standard deviation. Significant difference due to treatments was assessed by Fisher's LSD as a post-hoc test.

Table: 1b Stability of growth parameters in M_4 generation of horsegram mutants
Place- Chinchpur, Tal- Paranda, Dist- Osmanabad (MS)

Mutants	Plant height (cm)	Pri. branches/ plant	DAS for first flower	DAS for maturity
Control	47.56±6.66	5.70±0.80	61.12±8.56	101.17±14.16
Early dwarf	20.30±1.62	4.97±0.40	31.11±2.49	65.31±5.22
Early Semi dwarf	27.60±3.04	5.15±0.57	32.20±3.54	67.25±7.40
Late	51.95±6.75	7.67±1.00	65.29±8.49	108.95±14.16
High yielding	54.65±7.65	7.96±1.11	62.38±8.73	108.13±15.14
SEM ±	4.62	6.69	5.56	9.75
F-value	22.35	9.04	18.47	10.21
P-value	0.01	0.01	0.01	0.01
LSD 0.05	10.07	14.58	12.12	21.25

Data are means of three replicates ± standard deviation. Significant difference due to treatments was assessed by Fisher's LSD as a post-hoc test.

Table: 1c Stability of growth parameters in M_4 generation of horsegram mutants
Place- Hulgewadi, Tal- Karmala, Dist- Solapur (MS)

Mutants	Plant height (cm)	Pri. branches/ plant	DAS for first flower	DAS for maturity
Control	46.16±6.46	5.50±0.77	61.90±8.67	101.13±14.16
Early dwarf	19.12±1.53	4.55±0.36	31.81±2.54	64.80±5.18
Early Semi dwarf	26.31±2.89	5.23±0.58	31.63±3.48	64.11±7.05
Late	51.70±6.72	7.18±0.93	64.73±8.41	108.70±14.13
High yielding	53.27±7.46	7.46±1.04	61.82±8.65	107.59±15.06
SEM ±	4.52	0.95	5.65	9.69
F-value	27.78	8.04	18.26	11.12
P-value	0.01	0.01	0.01	0.01
LSD0.05	9.85	2.07	12.31	21.11

Data are means of three replicates ± standard deviation. Significant difference due to treatments was assessed by Fisher's LSD as a post-hoc test.

Table: 1d Stability of growth parameters in M_4 generation of horsegram mutants
Place- Kuldharan, Tal- Karjat, Dist - Ahmednagar (MS)

Mutants	Plant height (cm)	Pri. branches/ plant	DAS for first flower	DAS for maturity
Control	55.67±7.79	6.25±0.88	60.90±8.53	102.11±14.30
Early dwarf	23.73±1.90	5.34±0.43	29.15±2.33	65.17±5.21
Early Semi dwarf	30.41±3.35	5.67±0.62	30.16±3.32	65.12±7.16
Late	59.79±7.77	8.15±1.06	65.13±8.47	110.10±14.31
High yielding	58.32±8.16	8.19±1.15	62.17±8.70	109.35±15.31
SEM ±	5.19	0.71	5.62	9.81
F-value	21.72	7.39	20.97	11.22
P-value	0.01	0.01	0.01	0.01
LSD0.05	11.31	1.55	12.25	21.38

Data are means of three replicates ± standard deviation. Significant difference due to treatments was assessed by Fisher's LSD as a post-hoc test.

Table: 1e Stability of growth parameters in M_4 generation of horsegram mutants
Place- Pimpalwadi, Tal- Kankavali, Dist - Sindhudurg (MS)

Mutants	Plant height (cm)	Pri. branches/ plant	DAS for first flower	DAS for maturity
Control	58.31±8.16	7.11±1.00	62.72±8.78	105.18±14.73
Early dwarf	23.95±1.92	6.45±0.52	31.56±2.52	68.19±5.46
Early Semi dwarf	34.67±3.81	6.89±0.76	31.21±6.73	67.18±7.39
Late	64.78±8.42	9.15±1.19	66.48±8.64	111.22±14.46
High yielding	63.47±8.89	9.12±1.28	63.89±8.94	109.69±15.36
SEM ±	5.59	0.81	6.15	9.97
F-value	22.01	5.13	11.04	10.25
P-value	0.01	0.02	0.01	0.01
LSD0.05	12.18	1.76	13.40	21.72

Data are means of three replicates ± standard deviation. Significant difference due to treatments was assessed by Fisher's LSD as a post-hoc test.

Table: 1a Stability of growth parameters in M_5 generation of horsegram mutants
Place- Pokhari, Tal- Ashti, DistBeed (MS)

Mutants	Plant height (cm)	Pri. branches/ plant	DAS for first flower	DAS for maturity
Control	49.27±6.90	6.31±0.88	58.19±8.15	102.64±14.37
Early dwarf	22.57±1.81	5.60±0.45	31.23±2.50	65.49±5.24
Early Semi dwarf	31.52±3.47	6.43±0.71	32.90±3.62	68.92±7.58
Late	57.36±7.46	7.95±1.03	65.15±8.47	102.39±13.31
High yielding	55.39±7.75	8.15±1.14	62.21±8.71	108.72±15.22
SEM ±	4.88	0.72	5.58	9.66
F-value	19.90	4.79	17.53	9.15
P-value	0.01	0.02	0.01	0.01
LSD0.05	10.63	1.57	12.16	21.05

Data are means of three replicates ± standard deviation. Significant difference due to treatments was assessed by Fisher's LSD as a post-hoc test.

Table: 1b Stability of growth parameters in M_5 generation of horsegram mutants
Place- Chinchpur, Tal- Paranda, Dist- Osmanabad (MS)

Mutants	Plant height (cm)	Pri. branches/ plant	DAS for first flower	DAS for maturity
Control	48.19±6.75	5.15±0.72	59.81±8.37	102.73±14.38
Early dwarf	19.20±1.54	4.60±0.37	30.72±2.46	67.47±5.40
Early Semi dwarf	26.35±2.90	5.30±0.58	31.43±3.46	68.12±7.49
Late	52.61±6.84	7.11±0.92	64.17±8.34	109.16±14.19
High yielding	53.11±7.44	7.32±1.02	60.22±8.43	109.72±15.36
SEM ±	4.59	0.62	5.52	9.86
F-value	24.08	7.88	18.28	9.74
P-value	0.01	0.01	0.01	0.01
LSD0.05	10.00	1.35	12.03	21.48

Data are means of three replicates ± standard deviation. Significant difference due to treatments was assessed by Fisher's LSD as a post-hoc test.

Table: 1c Stability of growth parameters in M_5 generation of horsegram mutants
Place- Hulgewadi, Tal- Karmala, Dist- Solapur (MS)

Mutants	Plant height (cm)	Pri. branches/ plant	DAS for first flower	DAS for maturity
Control	47.25±6.62	5.70±0.80	60.52±8.47	102.24±14.31
Early dwarf	19.93±1.59	4.92±0.39	30.65±2.45	65.36±5.23
Early Semi dwarf	27.50±3.03	5.61±0.62	30.69±3.38	65.78±7.24
Late	53.95±7.01	7.53±0.98	63.41±8.24	108.15±14.06
High yielding	55.62±7.79	7.83±1.10	60.61±8.49	109.79±15.37
SEM ±	4.69	0.67	5.53	9.79
F-value	23.75	7.42	18.77	10.77
P-value	0.01	0.01	0.01	0.01
LSD0.05	10.22	1.46	12.05	21.33

Data are means of three replicates ± standard deviation. Significant difference due to treatments was assessed by Fisher's LSD as a post-hoc test.

Table: 1d Stability of growth parameters in M_5 generation of horsegram mutants
Place- Kuldharan, Tal- Karjat, Dist - Ahmednagar (MS)

Mutants	Plant height (cm)	Pri. branches/ plant	DAS for first flower	DAS for maturity
Control	49.20±6.89	6.11±0.86	57.62±14.24	100.02±14.00
Early dwarf	20.37±1.63	5.05±0.40	31.12±5.29	65.11±5.21
Early Semi dwarf	26.10±2.87	5.24±0.58	30.27±7.17	65.03±7.15
Late	52.55±6.83	7.07±0.92	65.73±14.26	108.25±14.07
High yielding	53.75±7.53	7.95±1.11	64.10±15.13	107.12±15.00
SEM ±	4.64	0.66	9.76	9.64
F-value	23.41	6.84	10.71	10.57
P-value	0.01	0.01	0.01	0.01
LSD0.05	10.11	1.44	21.27	21.01

Data are means of three replicates ± standard deviation. Significant difference due to treatments was assessed by Fisher's LSD as a post-hoc test.

Table: 1e Stability of growth parameters in M_5 generation of horsegram mutants
Place- Pimpalwadi, Tal- Kankavali, Dist - Sindhudurg (MS)

Mutants	Plant height (cm)	Pri. branches/ plant	DAS for first flower	DAS for maturity
Control	57.12±8.00	7.20±1.01	61.79±8.65	106.29±14.88
Early dwarf	24.27±1.94	6.55±0.52	32.90±2.63	67.23±5.38
Early Semi dwarf	36.16±3.98	6.70±0.74	31.34±3.45	67.70±7.45
Late	65.92±8.57	8.61±1.12	67.12±8.73	110.35±14.35
High yielding	64.75±9.07	9.35±1.31	62.60±8.76	110.30±15.44
SEM ±	5.65	0.80	5.73	10.00
F-value	21.56	4.78	18.63	10.39
P-value	0.01	0.02	0.01	0.01
LSD0.05	12.31	1.72	12.49	21.79

Data are means of three replicates ± standard deviation. Significant difference due to treatments was assessed by Fisher's LSD as a post-hoc test.

Table: 1a Stability of growth parameters in M_6 generation of horsegram mutants
Place- Pokhari, Tal- Ashti, DistBeed (MS)

Mutants	Plant height (cm)	Pri. branches/ plant	DAS for first flower	DAS for maturity
Control	41.30±5.78	5.03±0.70	57.31±8.02	100.13±14.02
Early dwarf	20.37±1.63	5.10±0.41	30.38±2.43	64.20±5.14
Early semi dwarf	27.42±3.02	6.01±0.66	31.62±3.48	67.31±7.40
Late	51.65±6.71	7.23±0.94	64.53±8.39	101.72±13.22
High yielding	52.87±7.40	7.33±1.03	61.39±8.59	105.43±14.76
SEM±	4.39	0.64	5.49	9.45
F-value	21.68	6.10	18.41	9.14
P-value	0.01	0.01	0.01	0.01
LSD0.05	9.57	1.40	11.97	20.60

Data are means of three replicates ± standard deviation. Significant difference due to treatments was assessed by Fisher's LSD as a post-hoc test.

Table: 1b Stability of growth parameters in M_6 generation of horsegram mutants
Place- Chinchpur, Tal- Paranda, Dist- Osmanabad (MS)

Mutants	Plant height (cm)	Pri. branches/ plant	DAS for first flower	DAS for maturity
Control	43.26±6.06	4.71±0.66	58.67±8.21	101.61±14.23
Early dwarf	13.31±1.06	4.13±0.33	30.17±2.41	65.19±5.22
Early semi dwarf	23.36±2.57	4.95±0.54	30.22±3.32	66.27±7.29
Late	44.54±5.79	6.57±0.85	63.41±8.24	107.12±13.93
High yielding	45.41±6.36	7.02±0.98	58.52±8.19	105.65±14.79
SEM±	3.97	0.58	5.41	9.63
F-value	27.51	9.25	18.73	9.97
P-value	0.01	0.01	0.01	0.01
LSD0.05	8.65	1.26	11.79	20.99

Data are means of three replicates ± standard deviation. Significant difference due to treatments was assessed by Fisher's LSD as a post-hoc test.

Table: 1c Stability of growth parameters in M_6 generation of horsegram mutants
Place- Hulgewadi, Tal- Karmala, Dist- Solapur (MS)

Mutants	Plant height(cm)	Pri. Branches/ plant	DAS for first flower	DAS for maturity
Control	45.12±6.32	5.03±0.70	58.31±8.16	101.70±14.24
Early dwarf	16.23±1.30	4.12±0.33	30.27±2.42	64.03±5.12
Early semi dwarf	22.23±2.45	5.16±0.57	30.11±3.31	64.21±7.06
Late	46.61±6.06	6.09±0.79	62.79±8.16	106.19±13.80
High yielding	49.42±6.92	7.03±0.98	59.18±8.29	108.20±15.15
SEM±	4.20	0.58	5.40	9.65
F-value	27.14	7.33	18.59	11.07
P-value	0.01	0.01	0.01	0.01
LSD0.05	9.16	1.26	11.77	21.04

Data are means of three replicates ± standard deviation. Significant difference due to treatments was assessed by Fisher's LSD as a post-hoc test.

Table: 1d Stability of growth parameters in M_6 generation of horsegram mutants
Place- Kuldharan, Tal- Karjat, Dist - Ahmednagar (MS)

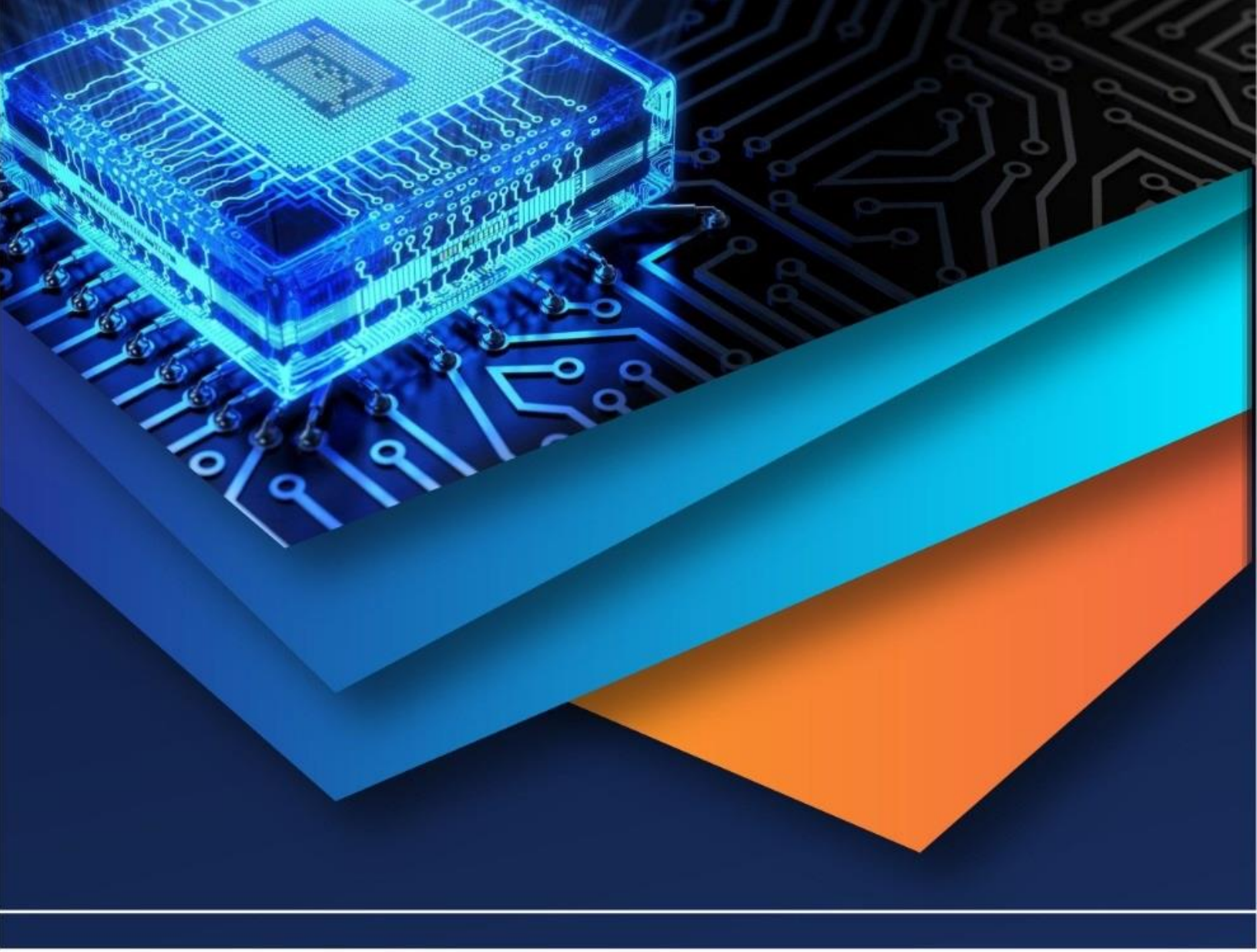
Mutants	Plant height (cm)	Pri. branches/ plant	DAS for first flower	DAS for maturity
Control	45.72±45.72	5.08±5.08	56.33±56.33	99.21±99.21
Early dwarf	17.24±17.24	4.65±4.65	31.12±31.12	64.87±64.87
Early semi dwarf	22.16±22.16	5.06±5.06	30.27±30.27	65.14±65.14
Late	47.42±47.42	6.92±6.92	64.22±64.22	104.52±104.52
High yielding	47.42±47.42	7.03±7.03	62.86±62.86	106.34±106.34
SEM±	4.17	0.60	5.50	9.50
F-value	25.75	7.06	19.00	9.92
P-value	0.01	0.01	0.01	0.01
LSD0.05	9.09	1.31	11.99	20.71

Data are means of three replicates ± standard deviation. Significant difference due to treatments was assessed by Fisher's LSD as a post-hoc test.

Table: 1e Stability of growth parameters in M_6 generation of horsegram mutants
Place- Pimpalwadi, Tal- Kankavali, Dist - Sindhudurg (MS)

Mutants	Plant height (cm)	Pri. branches/ plant	DAS for first flower	DAS for maturity
Control	52.78±7.39	7.10±0.99	58.31±8.16	104.59±14.64
Early dwarf	21.49±1.72	6.13±0.49	32.21±2.58	66.81±5.34
Early semi dwarf	32.25±3.55	6.21±0.68	31.03±3.41	67.11±7.38
Late	58.73±7.63	7.95±1.03	64.38±8.37	108.19±14.06
High yielding	59.41±8.32	8.63±1.21	60.57±8.48	106.66±14.93
SEM±	5.13	0.75	5.50	9.79
F-value	22.24	4.21	17.54	9.82
P-value	0.01	0.03	0.01	0.01
LSD0.05	11.18	1.64	11.99	21.34

Data are means of three replicates ± standard deviation. Significant difference due to treatments was assessed by Fisher's LSD as a post-hoc test.



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