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Development of New Variety in Cluster Bean (*Cyamopsis tetragonoloba*)

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ABSTRACT

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Nine local and 63 exotic collections of Cluster bean (*Cyamopsis tetragonoloba*) were collected from different geographical locations of India and evaluated their performance for identification and selection suitable genotype for Tamil Nadu rain fed cultivation. Significant differences among accessions were found for all the traits studied. Results indicated that the Acc IC 28269, IC 421808, IC 402293, and Virudhunagar local recorded maximum height of the plant and Thadayampatti local, IC11354, IC 421350 and IC 432117 recorded medium height. Maximum number of branches were recorded in IC10350, IC11704, IC 134956 followed by IC432117, IC 402293 and IC 11354. The yield parameters viz., number of fruits per plant, average individual fruit weight and yield per plant with long fruits and maximum girth of the fruit was recorded in IC 432117, Virudhunagar local and Thadayampatti local. The above genotypes were identified as promising genotypes suitable for grown under rainfed condition of Tamil Nadu.

Introduction

Cluster bean (*Cyamopsis tetragonoloba*) is an important leguminous crop, highly adopted to arid and semi-arid parts of the requiring low inputs and care. It is cultivated mainly in rainy season as rain fed crop in arid zones. India various parts of the world (Pathak *et al.*, 2009). In India the crop is mainly grown in the dry habitats of Rajasthan, Haryana, Gujarat and Punjab. In Tamil Nadu the total area of cultivation of cluster bean is 600ha and major cultivating districts are Thoothukudi (180ha), Madurai (100ha), Namakkal (44ha), Coimbatore (19ha), Cuddalore (17ha) and Virudhunagar (11ha). Since it is relatively tolerant to salt and drought and gives high yield under adverse conditions and needs less fertilization it is suitable for the small farmers and marginal farmers and also suitable to

cultivate under problematic soil condition. The crop is known for its exceptionally high adaptation towards poor and erratic rains multiuse in cropping system and in industrial uses in many ways besides other social and dietary uses. These qualities have made it must be favored crop of marginal farmers in arid areas. In Tamil Nadu there is no specific variety available and farmers are used to cultivate the local types. The one early introduction "Pusa Naubahar" from IARI, New Delhi has made a good spread in the area in Tamil Nadu. However the yield potential has substantially go down. Hence, identification of suitable genotypes with better yield as well as pod quality is the need of the hour. Hence, collection of genotypes from wide geographical area would serve as a

gene pool not only for selection one among them for better adaptability but it would also serve as a basic breeding material for hybridization and selection of progenies with better recombination of desirable traits Therefore the study was undertaken with major objectives of to develop short duration, determinate, high pod yielding with vegetable traits like tenderness, fibreless, attractive green color and seasonal adoptability

Materials and Methods

An investigation was carried out in cluster bean (*Cyamopsis tetragonoloba*) to develop a variety suitable for southern districts of Tamil Nadu. Totally seventy two genotypes were collected from different parts of India, it includes NBPGR, New Delhi, CAZRI, Jodhpur, Rajasthan, CIAH (ICAR), Bechwel, Bikener, GAU, Gujarat, HAU, Hissar and from different parts of Tamil Nadu were collected and evaluated. The experiment was conducted at Dept of Horticulture, Agricultural College and Research Institute, Madurai from 2010- 2011 during Kharif and Rabi season in randomized block design with three replications The spacing adopted was 60x30 cm following the agronomic practices recommended by TNAU Observations on Plant height (cm), number of branches per plant, days to 50% flowering, individual fruit weight (g), yield per plant (kg) fruit length (cm) and fruit girth(cm) were recorded from 10 randomly selected plants from each plot The data was subjected to the statistical analysis

Results and Discussion

Evaluation of genotypes was accomplished based on their mean (*per se*) performance. The analysis of variance indicated that significant differences among the parents, which indicated that the genotypes are

generally diverse The genotype Virudhunagar local recorded the highest plant height of 112 cm followed by IC 402293, IC 421802, IC 28269 and HG 258 (95.2,94.3,93.8 and 90.0 cm) respectively Plant height is an important trait by which growth and vigor of the plants are measured The lowest plant height was recorded in IC 311438 (39.2cm), IC 373464 (43.4 cm), followed by IC 311440, IC 10339 and IC320936 (43.8, 45.8 and 46.6 cm) respectively, whereas plant height was maximum among the 72 genotype was. There existed variations in number branches per plant in genotypes studied An increase in the number of laterals per plant would facilitate production of more number of flower clusters leading to higher yield The study also showed that significant differences among the genotypes for number of branches per plant. Number of branches per plant among the genotype was 5-10 per plant The accessions *viz.*, IC432117, IC402293, IC1135 and IC 38-1 recorded 8.0, 8.2, 8, 4, 8.8 and 10.20 branches per plant Singh *et al.*, (1990) observed complementary gene action for branching and they suggested that in breeding program large population of segregating generations should be grown to recover enough regular cluster bearing plants. Gipson and Balakrishnan (1990) reported that estimated heritability was greater for pods per cluster followed by branches per plan Early flowering is one of the main attributes manifested in the hybrids The earliest genotype was IC 329062 (19 days) and IC 369838 (21 days). In cluster bean fruit length is one of the desirable character for vegetable purpose Among the 72 genotypes IC432117 has recorded pod length of 12.86 cm followed by Madurai local 2 (13.30 cm), Sattur local (13.98 cm), Pusa Naubahar, Thadayampatti local, and Virudhunagar local recorded the pod length of 11.76, 12.75 and 12.22 cm.

Table.1 Mean performance of cluster bean genotypes for growth and yield characters

S.No.	Genotypes	Plant height (cm)	Number of branches	Days to 50% flowering	Fruit length (cm)	Fruit girth (cm)	Number of fruits per plant	Individual fruit weight (g)	Fruit yield per plant (g)
1.	IC 258101	64.00*	5.00*	31.40*	6.60	3.10	71.80	1.97	142.10
2.	IC 285171	57.00*	2.70	32.20*	9.40	3.24	60.80	2.26*	145.41
3.	IC 311407	47.60*	2.40	31.80*	7.20	3.10	82.60	1.26	136.68
4.	IC 311438	39.20*	2.80	25.23*	6.06	3.10	115.20*	1.30	141.21
5.	IC 311440	43.80*	3.20	28.90*	4.86	2.94	64.80	2.87*	135.73
6.	IC 329036	46.60*	2.40	27.20*	3.70	3.20	44.00	2.30*	135.20
7.	IC 329062	87.20	7.20*	19.40*	6.20	3.00	129.80*	0.49	103.13
8.	IC 369838	64.60*	4.80*	21.00*	6.16	3.44	119.00*	1.36	105.19
9.	IC 370496	52.60*	6.60	34.60	5.40	1.98	145.80*	0.92	103.89
10.	IC 370509	47.20*	4.70	25.40*	4.50	3.30	55.60	1.15	148.51
11.	IC 373438	51.00*	3.80	25.00*	5.92	3.18	46.20	1.59	152.98
12.	IC 373464	43.40*	1.80	25.40*	5.10	2.42	60.20	3.27*	147.51
13.	IC 402293	95.20	5.40*	21.40*	6.08	2.94	113.20*	1.40	180.55
14.	IC 402296	69.40*	6.60*	23.40*	6.30	3.08	113.00*	2.76*	184.16
15.	IC 402298	76.40	6.00*	27.40*	6.54	3.16	139.40*	1.42	193.26
16.	IC 415106	55.40*	5.20*	27.00*	4.53	2.18	71.10	0.93	96.25
17.	IC 415108	58.00*	3.70	23.50*	4.72	3.08	109.20	1.25	101.77
18.	IC 415125	62.00*	3.90	24.50*	5.44	3.06	84.40	1.20	105.61
19.	IC 415140	48.00*	3.50	25.40*	6.12	3.08	147.40	1.20	62.17
20.	IC 421805	82.60	2.90	29.40*	5.72	2.98	195.40	0.96	67.03
21.	IC 421808	94.20	3.50	27.20*	4.93	3.10	63.70	1.42	61.61
22.	IC 421315	48.00*	4.20	26.90*	4.86	2.94	56.45	2.30*	159.27
23.	IC 421830	66.80*	3.20	25.90*	5.38	2.82	92.40	1.50	165.50
24.	IC 421851	63.80*	3.20	24.50*	5.86	3.14	119.40	1.30	160.56
25.	IC 421856	88.00	6.00*	28.80*	5.84	3.22	145.30	1.48	135.32
26.	IC 38 – 1	89.40	5.80*	39.40	10.76	3.32	92.80	1.48	140.24
27.	M – 33 Durga kanchan	57.00	4.70	24.50*	8.48	3.30	63.40	2.13*	126.96
28.	IC 3773	79.60	5.80*	43.60	9.78	3.30	8.50	2.70*	62.07
29.	IC 9007 / P2	71.40*	4.60	39.60	9.80	3.32	58.40*	2.40*	66.57
30.	IC 10327	49.80*	4.00	41.00	9.04	3.32	99.80	1.41	63.19
31.	IC 10339	45.80*	8.20*	28.00*	8.94	3.28	119.20*	2.32*	72.62
32.	IC 10345	58.60*	6.50*	26.40*	7.36	3.36	130.20*	2.01*	72.59
33.	IC 10350	66.40*	10.20*	29.80*	8.90	3.28	101.20*	2.17*	75.17
34.	IC 10356	58.80*	6.80*	30.60*	9.80	3.32	98.40	2.55*	200.52
35.	IC 11116	69.60	4.40	28.40*	9.74	3.38	123.20*	2.40*	199.37
36.	IC 11354	60.60*	5.60*	31.20*	9.90	3.32	104.80*	2.98*	190.64
37.	IC 11357	59.00*	6.00*	32.40*	9.50	3.34	91.40	2.41*	160.25

38.	IC 11388	66.40*	7.60*	31.40*	9.54	3.36	129.80*	2.37*	160.11
39.	IC 11704	73.40	8.80*	37.20	9.72	3.38	155.80*	1.85	155.07
40.	IC 13496	76.00	8.40*	41.20	9.82	3.46	99.40	2.50*	316.91
41.	IC 28269	93.80	6.80*	36.80	10.10	3.42	146.20*	2.72*	310.54
42.	IC 40021	72.60	6.20*	40.80	9.40	3.40	88.40	2.90*	307.75
43.	IC 40040	56.00*	7.20*	35.80	6.16	3.38	96.00	2.17*	198.10
44.	IC 51063	69.60	6.20*	33.40*	5.50	3.34	44.30	1.76	196.32
45.	IC 421350	61.00*	2.00	29.60*	7.16	3.26	159.70*	1.50	199.44
46.	IC 421855	70.80	3.00	36.40	6.14	3.24	88.95	0.91	67.94
47.	IC 421858	73.60	6.00*	34.40	8.56	3.20	104.60*	1.63	63.42
48.	IC 421860	53.60*	3.50	36.60	6.20	3.28	115.60*	1.07	67.02
49.	IC 432117	65.40*	5.30*	43.80	12.86*	3.90*	73.40	4.00	128.87
50.	Pusa Naubahar	51.00*	8.00*	41.40	11.70	4.78*	72.00	2.89*	140.27
51.	Thar Bhadavi	68.60	2.00	42.80	7.78	4.78*	90.40	1.61	140.45
52.	GAURI, 1	47.40*	2.50	25.00*	10.60	3.60	56.90	1.50	99.19
53.	HG – 182	71.80	5.00*	36.00	6.10	3.18	191.80*	1.32	101.40
54.	HG – 2 – 20	51.00*	2.40	33.00*	6.36	3.28	143.74*	1.58	103.00
55.	HG – 75	61.80*	2.80	38.00	6.14	3.10	28.80	2.00*	174.72
56.	HG – 875	67.00*	5.00*	36.00	6.10	3.10	126.80*	1.80	178.45
57.	HG – 2 – 30	61.60*	3.00	39.00	8.34	3.40	92.00	1.50	177.41
58.	HG – 563	57.20*	1.60	34.60	6.14	3.28	10.14	1.30	176.50
59.	HG – 258	90.00	2.50	38.20	5.94	3.16	150.40*	1.20	193.61
60.	FS – 277	68.80	7.00*	37.20	6.24	3.16	99.80*	1.43	192.67
61.	HG – 870	48.60*	7.40	36.40	6.54	3.26	140.00*	1.90	93.53
62.	HG – 884	77.60	4.60	31.50*	2.42	3.16	67.90	1.98	86.88
63.	HFG -119	79.00	6.00*	40.00	5.76	3.14	156.80*	1.50	91.00
64.	Madurai Local 1	71.80	2.40	35.00	11.02	3.50	90.60	3.30*	130.12
65.	Madurai Local 2	55.40*	1.80	35.00	13.30*	3.26	11.02	3.48*	135.31
66.	Sathur Local 1	57.80*	1.80	38.00	13.98*	3.78	15.34	2.60*	124.18
67.	Thadayampatti Local 1	60.20*	2.50	32.00*	11.76	3.38	95.90	2.38*	144.96
68.	Thadayampatti Local 2	70.60	2.00	32.00*	12.75*	3.48	84.75	3.38*	133.07
69.	Perumalpatti Local1	70.40	2.50	33.00*	12.22	3.62	15.42	2.94*	137.87
70.	Ramanaickanpatti Local	88.62	3.10	37.00	10.46	3.14	35.60	1.63	156.59
71.	Chidamparapuram Local	73.42	3.50	40.00	6.40	3.12	25.40	1.71	149.52
72.	Virudhunagar Local	112.00	2.70	41.00	10.92	3.08	51.00	2.55*	159.44
Mean		64.89	4.59	32.32	9.38	3.25	98.36	1.94	182.00
SEd		1.33	0.10	0.70	2.06	0.29	0.07	0.04	3.58
CD		2.62	0.19	1.39	3.07	0.57	0.14	0.08	7.08

The girth of the fruit was maximum in the genotype Pusa Naubahar and Thar Bhadavi (4.78 cm) followed by IC 432117 (3.90 cm), Thadayampatti local 2 (3.78 cm) Perumalpatti local (3.62 cm) whereas minimum pod girth was recorded in the genotype was IC 370496 (1.98), IC 415106 (2.18 cm). The number of fruits per plant has considerable on total yield of fruits pod yield is determined by the fruit weight and number of fruits per plant therefore yield is complex character and it is dependent on its component traits and their inheritance any change in these would reflect on total yield The following accessions namely IC 432117, IC 311407, IC 415125, Thadayampatti local, IC40021 and IC 421855 recorded 73.4, 82.6, 84.4, 84.6, 88.4 and 88.9 fruits per plant. IC 11357, HG-2-30, IC 421830, IC 38-1 and Sattur local 1 were recorded IC11357, Hg-2-30, IC421830, IC 38-1 and Sattur local 1 were recorded 90.4, 90.6, 92.0, 92.4 and 92.8 per plant; IC10350, IC421858, IC11354 and IC415108 recorded 101.2, 104.6, 104.8 and 109.2 fruits per plant Among the 72 genotypes IC9007/p2 recorded highest number of fruits per plant (458.4 fruits /plant) and HG -258, IC11704, HFG 119, IC 421350, HG 182 and IC 421805 recorded 150.4, 155.8, 159.7, 191.8 and 195.4 fruits per plant Average individual fruit weight was maximum in IC432117 (4.0 g) followed by Madurai local, Thadayampatti local Madurai local 1 and IC373464 (3.48,3.38,3.30 and 3.27 g/fruit) respectively The yield per plant was maximum in IC 9007/P2 (1100g) IC 28269 (1020 g) and IC 373464 (643.73g) followed by IC 432117, IC 402296, IC11354 and IC 11388 (342.53, 312.43, 312.38 and 308.27 g/plant) Whereas IC 329062, IC370509, IC 415106 recorded minimum fruit yield of 63.67, 64.15 and 66.53 g/plant (Table 1).

Lohesha and Shiv Shankar (1990) reported that pod weight and total yield was strongly associated with plant dry weight, number of leaves and number of cluster Singh *et al.*, (1990) observed that complementary gene action for number of branches and duplicate gene action for pod clustering pattern Estimated *per se* performance, heritability and genetic gain were high for pods per plants and pod weight (Taneja *et al.*, 1995) and these characters were used for selection in breeding program.

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