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DETERMINATE COWPEA GENOTYPE PCP 1123 IS AN INNOVATIVE RESEARCH FOR IRRIGATED AND DRY LAND CONDITIONS

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ABSTRACT

A cowpea genotype, *PCP 1123* is a white seeded cowpea genotype derived through the pedigree selection method from a cross of RC 101 x Phule Vithai made during 2011. The selections were made in F_2 population during 2013-14 and evaluated for yield and disease resistance for subsequent generations during 2012-13 to 2017-18. It was evaluated in station trial for yield evaluation repeatedly during 2016-17 and 2017-18 and tested in University multilocation varietal trial during *Kharif* 2017-18, simultaneously; it was evaluated in All India Coordinated Initial Varietal Trial during 2017-18 at 10 locations for South zone. A genotype PCP 1123 consistently recorded higher seed yield than the checks PCP 306-1 (6.5 per cent), GC 3 (5.9 per cent) and TPTC (4.03) percent. The performance in station and University multilocation varietal trial, it gave higher yield than the check Phule Vithai (12.45%) and PCP -0306-1 (19.49%) Under protective irrigation condition at Pandharpur it recorded 18.22 percent higher yield over the check Phule vithai and 30.49 percent over National check PCP 0306-1. Similarly under rain fed condition at ARS, Mohol it recorded 3.26 percent than Phule vithai . A genotype early requires (71-75 DAS) to mature, Dwarf bushy, Determinate erect growth habit with synchronous maturity, complete non-viny, dark green leaves and bold (11.20 g) size and kidney shape seeds, moderately resistant YMV and CYMV and free from dry root rot, Minor incidence of Pests. Good bold grains of quality in respect of milling, cooking, rich in protein and amino acids having good yield potential under irrigate and rain fed condition. Therefore, the genotype "PCP 1123" is special type an early, dwarf, bushy and determinate with synchronous maturity performing under irrigation as well as rain fed conditions is an innovative research work for Dry land.

Key words : *PCP 1123, resistance, quality, cowpea, determinate.*

Cowpea is an important and popular nutritive food legume in India comprising four cultivated subspecies are recognized *Vigna unguiculata* subsp. *cylindrica* Catjang, *Vigna unguiculata* subsp. *dekindtiana*, *Vigna unguiculata* subsp. *sesquipedalis* Yardlong bean and *Vigna unguiculata* subsp. *unguiculata* Black-eyed pea. These cultivated species are indeterminate types early and long duration types.

Determinate : Determinate are called, Fixed, Shuttled, Specified type of plants they stop growing when fruit/pods are setting on the terminal or top bud and matures at the same time (2-3 week) then die.

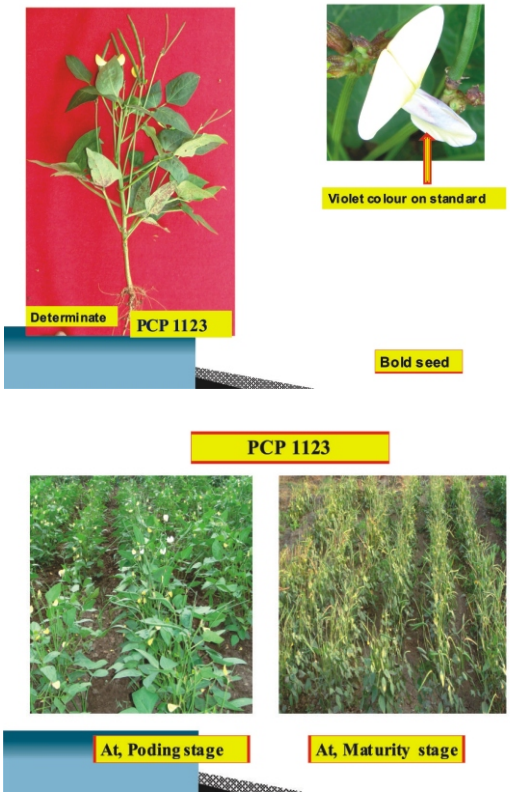
Indeterminate : Indeterminate are called Viney types plants they wii grow and produce fruit/pods until they killed by other natural calamities. They grow up to 6-7 ft. through the season (1).

Cowpeas are an important source of protein in developing countries, especially where they are eaten in a variety of ways (2). A number of studies have been directed toward improving traditional cowpea Products and processes for making them (3), including a major effort in this department (4). Likewise, research has been applied to developing new food ingredients and products made from cowpeas and other starchy legumes (5). Extrusion cooking is one of the most versatile and efficient techniques for producing ingredients and novel foods (6), although its application to starchy legumes has been limited. Several authors have studied the effects of extrusion on either nutritive quality (7) or on texture (8) of grain legumes including cowpea. However, with few exceptions (9), studies on both textural and nutritional properties of the same products have not been presented. Cowpeas are also processed into paste for the preparation of various traditional foods, such as Akara (fried cowpea paste and Moinmoin, steamed cowpea paste) (10). Attempts to expand utilization of cowpea include investigation on processing into flour (4) and investigation into fungal fermentation of cowpeas (11). Cowpea (*Vigna unguiculata*) is an important source of plant protein crop. Cowpea is starch-protein seeds offering a wider pattern of utilization than any other legume (10). Because of its special features and great demand, there was an urgent need to develop wider adaptable early dwarf high yielding, determinate with synchronous maturity white seeded cowpea. Hence, efforts are being made to develop and modify the cowpea genotype to a determinate with better yield.

MATERIALS AND METHODS

A cross between RC 101 and Phule Vithai was carried out at Pulses and Oilseed Crop Research and Training Centre, Pandharpur during the year 2011-12. The F_2 population was grown in the year 2013-14. The selections were made in F_2 as well as further segregating

: A Determinate Cowpea genotype PCP 1123:



populations till 2015-16 when F_5 generation stage was achieved. At this stage the population was homogeneous. Among the several selections made in segregating populations, a strain PCP 1123 appeared early, dwarf, bushy, determinate with synchronous maturity to be most promising (Fig.-1). The experiment was laid in randomized block design with three replications having plot size of 1.80 x 4.0 m with spacing of 45 cm between rows and 15 cm between plants with 14 genotypes. It was therefore tested in yield evaluation trial along with check Phule vithai at Pulses and Oilseed Crop Research and Training Center, Pandharpur, Dist.: Solapur under protective irrigated condition in the year 2017-18 and at Agril. Research station Mohol in the year 2017-18 under rain fed condition. On account of the promising performance, this strain was tested in reformed station trial during 2016-17 and promoted to University Multilocation Trials conducted at Rahuri, Pandharpur, Solapur, Mohol, Karad, K. Digraj, ARS Dhule, ARS Chas, ARS Badnapur and Sr. Scientist, Pulse Improvement Project, Akola under rain fed and Irrigated condition1 during 2017 -18. In UML Trails it was tested under ARS, Pandharpur (Irrigated) and Mohol (rainfed) for yield ancillary characters and disease reactions.

Due its superior performance the genotype was tested in Initial Varietal Trial during 2017-18. The performance of this genotype was consistently superior to the check varieties.

RESULTS AND DISCUSSION

Performance of PCP 1123 in different trials : In station trial conducted during 2016-17 at Pandharpur the yield differences due to genotypes were statistically significant. The genotype PCP 1123 gave yield of (1158 kg ha^{-1}) (Table 1) which was 8.63 and 22.02 per cent higher than the check Phule vithai (1058 kg ha^{-1}) and Phule rukmini 306-1 (929 kg ha^{-1}). In University Multilocation trial during the year 2017-18 , The genotype PCP 1123 (1594 kg ha^{-1}) recorded 30.17 and 40.65 per cent higher yield over check variety Phule Vithai (1113 kg ha^{-1}) and Phule rukmini (946 kg ha^{-1}) under protective irrigated conditions. The genotype PCP 1123 (907 kg ha^{-1}) recorded 7.71 per cent higher yield over the best check variety Phule vithai (837 kg ha^{-1}) under rain fed

On the basis of it's better performance, under protective irrigation and rain fed conditions this genotype was tested repeatedly in UMLT and IVT during 2017-18 .

Over all mean performance (Table-1) of the genotype under protective irrigation and rain fed condition at three locations, PCP 1123 (1220 kg ha^{-1}) recorded 17.87 and 26.71 per cent higher yield over the best checks Phule Vithai (1003 kg ha^{-1}) and Phule rukmini (952 kg ha^{-1}) in UMLT. Similarly in coordinated trial IVT 2017-18 South zone PCP 1123 (1108 kg ha^{-1}) recorded 6.5,5.9 and 4.03 percent higher seed yield than PCP 0306-1(1040 kg ha^{-1}),GC 3(1046 kg ha^{-1}) and TPTC (1065 kg ha^{-1}) respectively.

Diseases and Pest : The cowpea genotypes showed Moderately resistant (MR) reaction to yellow vein Mosaic and CYMV diseases under Natural conditions and it is free from dry rot to during 2017-18. (Table-2) There was a minimum incidence of pests viz., Leaf hopers,White fly and pod borerand Aphids as compare to checks (Table-3)

Morphological characters : The data on ancillary characters recorded at POCRTC, Pandharpur and ARS, Mohol UMLT and during *Kharif*, 2017 under protective irrigated and rain fed conditions and IVT 2017-18 revealed that, the genotype PCP 1123 requires 39-41 days to 50% flowering, 71-75 days to mature it was4-6 days earlier than checks. This genotype is Dwarf medium plant height (40.0 cm) and number of branches $plant^{-1}$ (5.0), pods per plant (17.0), seeds per pod (12.0), pod length (16.0 cm) and 100 seed weight (11.20 g) (Table-4).

CONCLUSION

Over all mean performance of genotype PCP 1123 is Early, Dwarf, Determinate, Erect growing, high yield potential under protective irrigation and rain fed condition moderately resistance to pest and diseases and also fetches higher market price than ruling varieties white seeded cowpea Determinate cowpea genotype PCP

Table-1 : Performance of PCP 1123 in Station trial, University Multilocation Trials (UMLT) and IVT 2017-18 trials.

Sr. No	Name of Trial	Year & No. of locations	Seed Yield (kg ha^{-1})				% increase over		
			PCP 1123	Phule vithai (Ch_1)	Phule Rukmini (Ch_2)		Ch_1	Ch_2	
1	Station trial	2016-17 (1)	1158	1058	929		8.63	22.02	
2	UMLT (Irri.)	2017-18 (1)	1594	1113	946		30.17	40.65	
3	UMLT (rain fed)	2017-18 (1)	907	837	981		7.71	(-)7.54	
	Overall mean	2016-18 (03)	1220	1003	952		17.87	26.71	
1	IVT 2017-18	2017-18(10)		PCP-0306-1	GC 3	TPTC 29	Ch_1	Ch_2	Ch_3
				Ch_1	Ch_2	Ch_3			
	Mean		1108	1040	1046	1065	6.5	5.9	4.03
		Annual report 2017-18 Arid legumes, ICAR-IIPR, Kanpur							

Table-2 : Screening for Important Diseases and their reactions (K-IVT 2017-18)

Sr. No.	Locations	Diseases	Genotype			
			PCP 1123	PCP 0306-1 Ch_1	GC 03 Ch_2	TPTC -29 Ch_3
1.	Bikaner	Root rot/web blight	2.5 (HR)	0.00 (Free)	10.0	10.0
2.	Gwalior	Alternaria Blight (DI%)	18	23	42	32
3.		Anthracnose (DI%)	20	04	10	10
4.		Dry root rot (DI%)	00	00	00	00
5.	Durgapura	Viral Diseases (CYMV) (DI%)	6.03	24.23	12.50	6.97
6.	S.K.Ngar	Natural Condition (CYMD DI%)	2.00	1.33	2.00	2.00
7.	Hissar	Natural Condition (CYMD DI%)	4.60(MR)	4.40 (R)	8.40 (S)	5.80 (S)
8.	Pittambi	Anthracnose (DI%)	76.66 (HS)	10.0 (R)	63.33 (HS)	53.33(HS)

HR = Highly resistant, HS = Highly susceptible MR = Moderately Resistant and R = Resistant

Note : At Gwalior genotype PCP 1123 is free from dry root rot, At Durgapura it showed Moderately resistant to CYMV At Hissar it showed Moderately resistant reaction to YMV

Table-3 : Screening for Important Pests and their reactions (K-IVT 2017-18)

Sr. No.	Locations	Diseases	Genotype			
			PCP 1123	PCP 0306-1 Ch_1	GC 03 Ch_2	TPTC -29 Ch_3
1	Bikaner	Leaf hoppers/Leaf	1.9	1.6	2.0	1.8
		Whitefly/leaf	1.9	1.8	1.8	2.0
		Pod borer	15.0	10.6	11.3	7.4
6	S.K.Ngar	Leaf hoppers/Leaf	1.46 (1.13)	1.63 (1.67)	1.59 (1.53)	1.60 (1.57)
		Whitefly/leaf	1.41(1.00)	1.53(1.37)	1.57(1.50)	1.47(1.17)
		Spotted pod borer (%) damage	15.52 (7.23)	16.80 (8.51)	26.18(19.65)	31.35(27.27)
8	Pittambi	Aphid Incidence/leaf	50	30	50	10

Table-4 : Mean Ancillary data (IVT, 2017-18 South)

Sr. No.	Locations	Genotype			
	Particulars	PCP 1123	PCP 0306-1 Ch_1	GC 03 Ch_2	TPTC -29 Ch_3
1.	Days to 50% flowering	41	44	46	47
2.	Days to maturity	75	79	80	81
3.	Plant height (cm)	40	46	42	42
4.	No .of Branches per plant	5	5	5	5
5.	Pod length (cm)	16	14	14	16
6.	Pods per plant	17	19	18	15
7.	Seeds per pod	12	12	12	13
8.	100 seed weight (g)	11.20	10.10	9.5	12.6

Table-5 : Description of cowpea Genotype PCP 1123.

Characters	PCP 1123	PCP-0306-1	GC 3
Hypocotyls pigment	Absent	Absent	Absent
Growth Habit	Erect	Erect	Erect
Plant habit	Determinate	Indeterminate	Indeterminate
Twining habit	Non-viny	Non-viny	viny
Stem colour	Dark green	Dark green	Pale green
Stem pubescence	Absent	Absent	Absent
Leaf colour	Dark Green	Dark Green	Pale green
Leaf size	Medium	Medium	Medium
Flower colour	White with Marker of purple colour on Slandered of flower (fig.-1)	Margin purple	Dark Purpale
Pod colour (premature)	Pale green	Pale green	Pale green
Pod colour (Mature)	Light Brown	Light Brown	Light Brown
Plant height	40 cm	61-71 cm	54-60 cm
Mature pod length	15-17 cm	15-17 cm	11-13 cm
Days to 50% flowering	41	35-43	40-47
Days to maturity	75	75-80	75-85
Seed colour	Pearly white with red eye	Pearly white brown eye	Off white
Seed coat lusture	Shiny	Shiny	Shiny
Seed shape	Kidney	Kidney	Kidney
Grain size	Bold	Medium	Medium
100 seed weight	11.20 gm	9.0 10.0 gm	9-12 gm
Reaction to diseases Dry root rot /web blight	Free from dry root rot	Moderately resistant to Cercospora , collar rot, leaf spot	Moderately resistant to Cercospora , collar rot, leaf spot
Yellow mosaic virus	Moderately Resistant	Moderately Resistant	Moderately Resistant
CYMV	Resistant		
Reaction to pests	Minimum incidence of Jassids and Aphids	Minimum incidence of Jassids	

1123 is a new specific determinate type (Fig.-1) dry land and irrigated conditions .

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