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Combining ability studies in cowpea for dual purpose types

K. Sridhar*, Vinod Kumar, N. S. Kulkarni and G. Sahay
Indian Grassland and Fodder Research Institute, Regional Research Station, Dharwad, India
*Corresponding author e-mail: srikalakunta@gmail.com

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Introduction

Cowpea (*Vigna unguiculata* (L) Walp.) is widely grown all over India more particularly in central and peninsular regions. Grains are consumed as food and the haulms are fed to livestock as a nutritious fodder. Cowpea is is equally important as nutritious fodder for livestock. The use of cowpea as a dual-purpose crop is attractive in mixed crop/livestock systems where land and feed are becoming increasingly scarce (Tarawali *et al*., 1997) especially in the dry season. Efforts at global level (IITA & ILRI) focused to develop medium-maturing (85-95 days), semi-erect, dual-purpose varieties with higher grain and fodder yields and with enhanced fodder quality.

Materials and Methods

Eight parents suitable for dual purpose were selected and crossed in a partial diallel fashion. Twenty eight crosses along with their parents were evaluated in randomized block design with two replications. All the recommended package of practices was followed. Observations were recorded on five randomly selected plants for different characters *viz*., plant height (cm), days to first flowering, number of primary branches and number of secondary branches. At first flowering ten plants were cut leaving three nodes from the base followed by fertilizer application and irrigation allowing for regeneration. From the regenerated plants, grain yield (GY)/ plant was recorded. The other observations *viz*., days to maturity (from date of sowing), pods per plant, pod length (cm), seeds per pod, test weight (g), GY/ plant (g), GFY (kg / meter row length) at first flowering, leaf to stem (L/S) ratio and per cent dry matter (DM) content were recorded. Days to 50% flowering was recorded from five plants left uncut per replication. The partial diallel analysis was carried out as suggested by Kempthorne and Curnow (1961).

Results and Discussion

Estimation of *gca* effects of eight parents for the fourteen characters showed MFC-09-12, BL-2, UPC-622 and EC-4216 were best general combiners for most of the characters besides GY/ plant (g) and GFY (kg / m row length) (Table 1). MFC-09-12 was good general combiner for plant height (cm), number of primary branches, number of secondary branches, pods per plant, seeds per pod, test weight (g), GY per plant (g), leaf to stem ratio and per cent dry matter content. BL-2 and UPC-622 were good general combiner for number of primary branches, number of pods per plant, number of seeds per pod, GY per plant(g), GFY (kg/m row length) and leaf to stem ratio. EC-4216 was good general combiner for pod length (cm), number of seeds per pod, GY / plant (g), GFY (kg/ m row length) and per cent dry matter content. The estimates of *sca* effects of twenty eight crosses for the fourteen characters are presented in Table 2. The crosses *viz*., SWAD X UPC-622, SWAD X EC-4216, SWAD X UPC-5286, MFC-09-12 X BL -2, UPC-9202 X UPC-5286 and UPC-622 X EC-4216 showed the best specific combining ability for GY / plant (g), GFY (kg/m row length) and other characters which are indirectly contributing to yield components. Out of six crosses which are mentioned above, the crosses *viz*., MFC-09-12 X BL-2 and UPC-622 X EC-4216 were found to have potential to recover superior segregants for dual purpose types in further generations.

Table 1: General combining effects of parents for different forage and grain yiled related characters in cowpea

Parents	Plant height	Days to first flowering	Days to 50% flowering	No. of primary branches	No. of secondary branches	Days to maturity	No. of pods / plant	No. of seeds / pod	Pod length	Test weight	GY / plant	GFY
0.01	0.02	-0.18	-0.17	-0.04	0.29	0.15	-2.93	-0.70	-0.63	-0.33	-2.03	-0.09
0.13	0.72	-0.89	-1.58	0.10	0.08	-2.85	3.79	1.02	-0.15	0.08	5.17	-0.14
-0.12	0.39	5.83	5.83	0.06	0.21	5.31	-2.93	-0.59	0.94	1.02	-5.81	0.05
-0.09	0.28	1.44	1.83	-0.24	0.02	1.40	2.27	0.30	-0.18	-0.07	-2.47	-0.14
0.21	-0.18	-5.20	-5.00	0.39	-0.13	-4.60	3.87	0.26	-0.058	-0.56	5.29	0.02
-0.04	-0.50	1.71	1.50	-0.16	-0.28	3.23	0.25	0.07	-0.04	-0.28	2.48	0.14
-0.11	0.40	-0.68	-0.25	-0.35	-0.20	-1.10	-2.52	0.17	0.11	-0.13	2.22	0.20
0.01	-1.13	-2.03	-2.17	0.26	0.09	-1.52	-1.79	-0.53	0.01	0.27	-4.80	-0.05

* - significant at 5 per cent probability ** - significant at 1 per cent probability

Table 2: Specific combining ability effects of twenty eight crosses for different fodder and grain yield characters in cowpea

Crosses	Plant height	Days to first flowering	Days to 50% flowering	No. of prim. branches	No. of sec. branches	Days to maturity	No. of pods / plant	No. of seeds / pod	Pod length	Test weight	GY / plant	GFY	L / S ratio	Dry matter content
SWAD X MFC-09-12	-4.31	3.01	3.68	0.20	-0.12	6.48*	-7.09	-0.14	-0.27	-0.23	-3.79	0.10	-0.23	0.31
SWAD X UPC-9202	-12.79	-0.12	0.76	-0.27	0.14	-3.27	-3.58	-1.01	0.41	0.55	-3.49	0.10	0.40**	-0.13
SWAD X BL – 2	-26.34*	-8.28*	-9.91**	-0.10	0.09	-4.27	12.79**	0.93	1.44*	0.01	5.98*	-0.33	0.29*	0.17
SWAD X UPC-622	11.37	0.40	0.60	-0.45	-0.46	-0.61	-0.42	-0.99	-1.13	-0.10	2.15	0.02	-0.16	-1.07
SWAD X UPC-5286	16.79	5.85	6.26	0.23	0.17	5.64*	-4.18	0.92	0.78	1.09*	0.59	0.15	-0.26*	-1.75*
MFC-09-12 X UPC-8705	15.84	7.70*	8.18*	-0.01	0.24	4.31	3.82	0.26	0.76	1.37**	2.58	-0.03	0.01	-1.10
MFC-09-12 X UPC-9202	13.59	-4.60	-4.82	0.25	-0.32	-1.27	13.42**	0.67	1.08	0.25	7.97**	-0.03	-0.25	0.44
MFC-09-12 X BL -2	-16.85	6.09	5.51	0.37	0.53	-3.27	2.53	0.51	0.71	0.40	3.11	0.67*	0.02	1.30
MFC-09-12 X UPC-622	-7.59	-6.48	-5.99	0.22	0.68*	-5.61*	2.39	-2.10*	-1.31*	-0.57	0.13	-0.29	0.25	-0.16
MFC-09-12 X EC-4216	20.85	-0.28	-1.74	-0.42	-0.71*	1.23	-6.97	0.30	-0.36	-0.30	-1.10	-0.18	-0.14	-0.66
MFC-09-12 X UPC-5286	-21.53	-5.44	-4.82	-0.60*	-0.29	-1.86	-8.02	0.18	0.65	-0.93*	-7.99**	-0.24	0.35**	-0.14
UPC-8705 X BL -2	3.84	-2.89	-1.91	-1.10**	-0.71*	0.06	-3.66	-0.23	-0.68	0.41	-3.19	0.28	-0.16	-2.47*
UPC-8705 X UPC-622	12.52	3.99	6.10	-0.15	-0.46	-4.27	4.43	0.21	-0.62	-0.62	-3.82	0.41*	-0.07	0.93
UPC-8705 X EC-4216	-33.42**	-1.36	-2.66	0.34	0.66*	-0.44	2.82	1.11*	0.05	-0.09	-0.31	0.12	0.25	1.29
UPC-8705 X UPC-5286	10.18	-10.76**	-10.24**	0.59*	0.38	2.98	-7.63	-1.29*	1.35*	-0.53	8.26**	-0.48*	0.07	1.08
UPC-9202 X BL -2	27.13*	2.55	4.10	-0.20	0.49	-0.02	-0.82	-0.79	-1.16	-0.12	-6.50*	-0.10	-0.12	-0.13
UPC-9202 X UPC-622	3.27	6.59	7.10	0.05	0.24	7.64**	-4.21	-0.48	-0.78	-0.44	2.60	-0.13	-0.05	1.09
UPC-9202 X EC-4216	-15.36	-1.01	-0.16	-0.26	-0.35	-2.52	8.96*	0.42	0.68	-0.18	-1.57	-0.12	-0.04	-2.45*
UPC-9202 X UPC-5286	-9.82	-6.07	-7.74*	0.53	-0.13	1.89	0.99	1.02	0.95	0.17	-1.38	-0.46*	0.18	0.88
BL -2 X EC-4216	12.15	2.53	3.68	0.61*	0.30	9.48**	-5.48	-0.54	-0.95	-0.95*	-0.60	0.04	-0.25	-0.97
UPC-622 X EC-4216	-2.69	-2.99	-3.32	0.31	-0.15	0.14	0.88	0.75	1.13	0.629	1.91	0.14	-0.02	-2.09*
EC-4216 X UPC-5286	-10.37	7.09*	8.17*	0.37	-0.46	4.31	-5.38	-0.53	-0.61	-0.88*	-1.52	-0.28	-0.11	0.41

* - significant at 5 per cent probability ** - significant at 1 per cent probability

Conclusion

Developing improved dual purpose types in cowpea with higher grain and fodder yield potential with diverse plant types and times of maturity would fit into different cropping systems and ecological niches.

References

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