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Correlation Studies in Horsegram Accessions for Fodder Yield and Quality

Asoontha and Dr. Arya K.
1. PhD scholar, College of Agriculture, Vellayani
2. Professor and Head, Department of Plant Breeding and genetics, College of Agriculture, Vellayani

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ABSTRACT
Correlation studies provides information on the extent of association between other associated characters. The present investigation was carried out in college of Agriculture, Vellayani during August 2021 to December 2021 with the objective to evaluate the character association horsegram for its fodder quality and yield. The study revealed that green fodder yield plant^{-1} and dry fodder yield plant^{-1} had highly significant positive phenotypic and genotypic correlation with dry fodder yield plant^{-1}, stem fresh weight plant^{-1}, leaf fresh weight plant^{-1}, leaf dry weight plant^{-1}, stem dry weight plant^{-1}, number of leaves plant^{-1} and leaf area index. Quality attributes viz., Crude protein content has and crude fibre content had highly significant positive phenotypic and genotypic correlation with each other.

I. INTRODUCTION

Horse gram scientifically known as Macrotyloma uniflorum (Lam.) Verdcourt can be grown as a pulse, fodder, green manure and medicinal crop. Its potential ability as a human food supplement has been researched in different ways but their fodder aspects were least explored.Among legumes fodder cowpea is a good supplement but it is susceptible to drought. Hence horsegram a drought tolerant leguminous crop is studied for their fodder value. Fourteen characters were evaluated and their character associations were studied.Yield and quality are quantitative traits and are influenced by many characters either in positive or negative direction. Hence, selection of these characters is facilitated by taking into account of other associated characters along with them. Correlation thus provides information on the extent of association between these characters.

II. MATERIALS AND METHODS

The present investigation was undertaken to study correlation and character association studies in fortygenotypes of horsegram in a Randomized Block Design with three replications. With the objective to evaluated horsegram accessions for fodder yield and quality and to study their correlation,40 accessions of horsegram collected from NBPGR Regional Station, Thrissur and AICRP, Mandya and were evaluated (Table 1). In a randomized block design with three replications the experiment was conducted from August 2021 at College of Agriculture, Vellayani. The observations analysed were plant height at harvest, number of primary branches plant^{-1}, number of leaves plant^{-1}, days to first flowering, days to fifty per cent flowering, leaf area index, green fodder yield plant^{-1}, dry fodder yield plant^{-1}, leaf fresh weight plant^{-1}, leaf dry weight plant^{-1}, stem fresh weight plant^{-1}, stem dry weight plant^{-1}, crude protein content and crude fibre content.
The phenotypic, genotypic and environmental correlation coefficients were estimated as follows

Genotypic correlation (r_{gxy}) $= \frac{\sigma_{gxy}}{\sigma_{gx} x \sigma_{gy}}$

Phenotypic correlation (r_{pxy}) $= \frac{\sigma_{pxy}}{\sigma_{px} x \sigma_{py}}$

Environmental correlation (r_{exy}) $= \frac{\sigma_{exy}}{\sigma_{ex} x \sigma_{ey}}$

To study the cause and effect relationship of yield and its component attributes, direct and indirect effects were analyzed using path coefficient analysis. The genotypic correlation between yield and selected component characters were subjected to path analysis and the direct effect of the character on yield as well as the indirect effect through other characters were estimated.

III. RESULT AND DISCUSSIONS

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For crop improvement programmes, selection of apt character combination with significant correlation is essential. Since, fodder yield and quality are complex characters, evaluation of its direct and indirect relationship with other characters is essential.

Green fodder yield plant^{-1} had highly significant positive phenotypic and genotypic correlation with dry fodder yield plant^{-1}, stem fresh weight plant^{-1}, leaf fresh weight plant^{-1}, leaf dry weight plant^{-1}, stem dry weight plant^{-1}, number of leaves plant^{-1} and leaf area index (Table 2 and Table 3). Plant height at harvest and number of primary branches plant^{-1} had significant positive genotypic and phenotypic correlation with green fodder yield plant^{-1}. Days to first flowering and days to fifty per cent flowering had no significant correlation, while crude protein content plant^{-1} had negative significant correlation with green fodder yield plant^{-1}.Path analysis with dependant variable green fodder yield plant^{-1}and component characters viz., plant height at harvest (cm), number of primary branches plant^{-1}, number of leaves plant^{-1}, leaf area index, leaf fresh weight plant^{-1} and stem fresh weight plant^{-1}. Path analysisrevealed that the residual effect obtained was 0.102 and indicated that 89.8 per cent of the variation in green fodder yield plant^{-1} was contributed by the characters selected for analysis (Table 4).

Dry fodder yield plant^{-1} had high positive phenotypic and genotypic correlation with leaf area index, green fodder yield plant^{-1}, stem dry weight plant^{-1}, leaf dry weight plant^{-1}, number of leaves plant^{-1} and stem fresh weight (Table 2 and 3). Leaf fresh weight and number of primary branches plant^{-1} had significant positive phenotypic and genotypic correlation with dry fodder yield plant^{-1}. Other characters viz., plant height, days to first flowering, days to fifty per cent flowering, crude protein content and crude fibre content. Path analysis with dependant variable dry fodder yield plant^{-1}and component characters viz., leaf area index, number of primary branches plant^{-1}, leaf dry weight plant^{-1}, stem dry weight plant^{-1} and number of leaves plant^{-1} revealed that the residual effect obtained was 0.11 indicated that 89.0 per cent of the variation in dry fodder yield plant^{-1} was contributed by the characters taken in the present analysis (Table 5).

Quality attributes viz., Crude protein content has and crude fibre content had highly significant positive phenotypic and genotypic correlation with each other (Table 2 and 3). Crude protein content had significant positive correlation with leaf fresh weight plant$^{-1.}$ It had highly significant negative correlation with stem fresh weight plant^{-1}. It had significant negative correlation with green fodder yield plant^{-1}, days to fifty per cent flowering and leaf area index. While crude fibre content had no significant correlation with any of the other characters except for crude fibre content.

Similar results were obtained by Radhika (2003), Nath and Tajne (2014), Sunil et al. (2017), Praveena (2019) in cowpea and Christy (2019) in fodder horsegram. A contradiction to the present finding was reported by Sharma et al. (1988) that states the positive and significant correlation of green fodder yield with days to first flowering and plant height.

IV. CONCLUSION

Correlation study for fodder yield and quality in 40 horsegram accessions revealed that green fodder yield plant^{-1} and dry fodder yield plant^{-1} had highly significant positive phenotypic and genotypic correlation with dry fodder yield plant^{-1}, stem fresh weight plant^{-1}, leaf fresh weight plant^{-1}, leaf dry weight plant^{-1}, stem dry weight plant^{-1}, number of leaves plant^{-1} and leaf area index. Quality attributes viz., Crude protein content has and crude fibre content had highly significant positive phenotypic and genotypic correlation with each other.Path analysisfor green fodder yield plant-^{1} revealed that the residual effect obtained was 0.102 and for dry fodder yield plant^{-1} the residual effect obtained was 0.11.

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Science and Biotechnology. 6(1): 166- 171Praveena (2019)

Table 1. List of horsegram accessions used to evaluate correlation for yield and quality

Sl No	Germplasm	Place
1	IC 71775	AICRP on Forage Crops and Utilisation, Mandya
2	IC 121640	AICRP on Forage Crops and Utilisation, Mandya
3	IC341261	AICRP on Forage Crops and Utilisation, Mandya
4	I 344193	AICRP on Forage Crops and Utilisation, Mandya
5	IC 550265	AICRP on Forage Crops and Utilisation, Mandya
6	IC 47132	AICRP on Forage Crops and Utilisation, Mandya
7	IC 123033	AICRP on Forage Crops and Utilisation, Mandya
8	IC 74746	AICRP on Forage Crops and Utilisation, Mandya
9	IC 49552	AICRP on Forage Crops and Utilisation, Mandya
10	IC 139545	AICRP on Forage Crops and Utilisation, Mandya
11	IC 321300	AICRP on Forage Crops and Utilisation, Mandya
12	IC 139331	AICRP on Forage Crops and Utilisation, Mandya
13	IC 1230322	AICRP on Forage Crops and Utilisation, Mandya
14	IC 139544	AICRP on Forage Crops and Utilisation, Mandya
15	IC 68494	AICRP on Forage Crops and Utilisation, Mandya
16	IC 71809	AICRP on Forage Crops and Utilisation, Mandya
17	IC 202781	AICRP on Forage Crops and Utilisation, Mandya
18	IC 264704	AICRP on Forage Crops and Utilisation, Mandya
19	IC 139412	AICRP on Forage Crops and Utilisation, Mandya
20	IC 347182	AICRP on Forage Crops and Utilisation, Mandya
21	IC 45455	AICRP on Forage Crops and Utilisation, Mandya
22	IC 139518	AICRP on Forage Crops and Utilisation, Mandya
23	IC 26141	AICRP on Forage Crops and Utilisation, Mandya
24	IC 71743	AICRP on Forage Crops and Utilisation, Mandya
25	IC 277630	AICRP on Forage Crops and Utilisation, Mandya
26	IC 56132	AICRP on Forage Crops and Utilisation, Mandya
27	IC 71814	AICRP on Forage Crops and Utilisation, Mandya
28	IC 19433	ICAR-NBPGR Regional Station, Trissur
29	IC 19435	ICAR-NBPGR Regional Station, Trissur
30	IC 19437	ICAR-NBPGR Regional Station, Trissur
31	IC 71792	ICAR-NBPGR Regional Station, Trissur
32	IC 89004	ICAR-NBPGR Regional Station, Trissur
33	IC 89005	ICAR-NBPGR Regional Station, Trissur
34	IC 89019	ICAR-NBPGR Regional Station, Trissur
35	IC 89030	ICAR-NBPGR Regional Station, Trissur
36	IC 89035	ICAR-NBPGR Regional Station, Trissur
37	IC 89037	ICAR-NBPGR Regional Station, Trissur
38	IC 89038	ICAR-NBPGR Regional Station, Trissur
39	IC 15775	ICAR-NBPGR Regional Station, Trissur
40	IC 47114	ICAR-NBPGR Regional Station, Trissur

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Characters	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}
X_1	1													
X_2	0.162	1												
X_3	0.212	0.525**	1											
X_4	-0.186	-0.084	0.113	1										
X_5	-0.186	-0.084	0.113	0.899**	1									
X_6	0.221	0.144	0.4716**	0.005	0.0051	1								
X_7	0.261*	0.265*	0.471**	0.005	0.168	0.456**	1							
X_8	0.218	0.256*	0.440**	-0.033	-0.033	0.888**	0.868**	1						
X_9	0.219	0.144	0.471**	0.004	0.004	0.782**	0.884**	0.345*	1					
X_{10}	0.223	0.146	0.472**	0.005	0.005	0.884**	0.874**	0.365**	0.465**	1				
X_{11}	0.218	0.134	0.441**	-0.033	-0.033	0.680**	0.684**	0.582**	0.265*	0.828**	1			
X_{12}	0.218	0.135	0.440**	-0.033	-0.033	0.678**	0.687**	0.585**	0.681**	0.788**	0.844**	1		
X_{13}	0.030	-0.133	-0.156	-0.108	-0.258*	-0.256*	-0.261*	-0.209	0.271*	-0.428**	-0.210	-0.209	1	
X_{14}	-0.005	0.077	0.154	0.024	0.024	-0.178	-0.179	-0.193	-0.178	-0.178	-0.191	-0.193	0.455**	1

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}
X_1	1													
X_2	0.231	1												
X_3	0.118	0.458**	1											
X_4	-0.137	-0.028	0.121	1										
X_5	-0.008	-0.181	0.131	0.799**	1									
X_6	0.182	0.124	0.424**	0.015	0.042	1								
X_7	0.251*	0.291*	0.438**	0.018	0.181	0.468**	1							
X_8	0.182	0.288*	0.318*	-0.042	-0.018	0.958**	0.766**	1						
X_9	0.198	0.114	0.512**	0.014	0.019	0.821**	0.648**	0.335*	1					
X_{10}	0.224	0.241	0.462**	0.025	0.020	0.782**	0.722**	0.385**	0.545**	1				
X_{11}	0.182	0.181	0.438**	-0.034	-0.038	0.682**	0.634**	0.622**	0.295*	0.782**	1			
X_{12}	0.208	0.131	0.445**	-0.018	-0.042	0.634**	0.597**	0.615**	0.631*	0.638**	0.644**	1		
X_{13}	0.048	-0.112	-0.181	-0.118	-0.282*	-0.284*	-0.259*	-0.109	0.258*	-0.348*	-0.198	-0.189	1	
X_{14}	-0.078	0.017	0.161	0.034	0.098	0.181	0.168	0.143	0.168	0.158	-0.181	-0.169	0.395**	1

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Characters	Plant height at harvest (cm)	Number of Primary branches plant^{-1}	Number of leaves plant^{-1}	Leaf Area Index	Leaf fresh weight plant^{-1} (g)	Stem fresh weight plant^{-1}(g)	Total genotypic correlation
Plant height at harvest (cm)	**0.112**	-0.071	0.147	0.148	-0.22	0.135	0.251
Number of Primary branches plant^{-1}	0.171	**0.238**	-0.195	-0.168	0.102	0.142	0.29
Number of leaves plant^{-1}	0.109	-0.111	**0.107**	0.763	-0.217	-0.214	0.437
Leaf Area Index	0.024	0.004	0.236	**0.245**	0.193	-0.234	0.468
Leaf fresh weight Plant^{-1}(g)	-0.313	0.232	0.182	0.285	**0.451**	-0.189	0.648
Stem fresh weight Plant^{-1}(g)	-0.008	0.214	0.052	0.052	0.083	**0.327**	0.72

Table 4. Direct and indirect effects of green fodder yield components in horsegram

Residual effect=0.11
The diagonal values given in bold indicate the direct effects of dry fodder yield components in horsegram

Table 5. Direct and indirect effects of dry fodder yield components in horsegram

Characters	Number of Primary branches plant^{-1}	Number of leaves plant^{-1}	Leaf Area Index	Leaf dry weight plant^{-1} (g)	Stem dry weight plant^{-1}(g)	Total genotypic correlation
Number of Primary branches plant^{-1}	**0.283**	0.166	-0.105	-0.167	0.111	0.288
Number of leaves plant^{-1}	-0.144	**0.125**	0.205	-0.102	0.234	0.318
Leaf Area Index	0.108	0.255	**0.367**	-0.025	0.253	0.958
Leaf dry weight Plant^{-1}(g)	-0.007	0.233	0.179	**0.228**	-0.011	0.622
Stem dry weight Plant^{-1}(g)	0.111	0.158	0.353	-0.23	**0.223**	0.615

Residual effect=0.11
The diagonal values given in bold indicate the direct effects of dry fodder yield components in horsegram