~~Analysis of~~ Genetic Variability, Correlation and Path Coefficient of yield components and ~~its attributing~~ other agronomic ~~traits for hastening improvement~~ of Kodo millet (*Paspalum scrobiculatum* L.)

Abstract

This field experiment was conducted in randomized block design with three replications during *Kharif* 2020 at experimental area of small millet project, instructional farm, Department of Plant Breeding & Genetics JNKVV, College of Agriculture Rewa (M.P). The data was recorded for 14 quantitative characters of 30 kodo millet (*Paspalum scrobiculatum L.)* genotypes to estimate the genetic variability, correlation and path coefficient. The analysis of variance demonstrate that genotypes differ significantly for all the characters included in the study. The coefficients of variation at phenotypic (PCV) and (GCV) levels was observed in harvest index, biological yield per plant and number of tillers per plant. High heritability accompanied with high genetic advance as percentage of mean were recorded for number of tillers per plant, flag leaf length, harvest index, biological yield per plant, peduncle length, flag leaf width, length of longest raceme, thumb raceme length and grain yield per plant. Correlation analysis revealed that grain yield had a strong positive and highly significant association ~~for~~ with ~~grain yield per plant was found at phenotypic level with~~ biological yield per plant followed by flag leaf length, harvest index, flag leaf width, plant height, 1000 grain weight *a*nd peduncle length. Path coefficient analysis at phenotypic level revealed the harvest index have the greatest positive direct effect on grain yield per plant followed by biological yield per plant, flag leaf length, 1000 grain weight, day to maturity, number of tillers per plant, plant height, flag leaf width, length of inflorescence and peduncle length whereas, negative direct effects on grain yield per plant was contributed by days to 50% flowering, thumb raceme length and length of longest raceme

Keywords: GCV, Genetic advance, Heritability, Kodo millet, PCV

Introduction

Kodo millet *(Paspalum scrobiculatum L.*) (2n=4x=40) is an indigenous cereal crop of India and it is cosmopolitan in tropics and sub tropics of the world. It is a traditional, extended period and drought resistant crop mainly grown for its grain and fodder. The kodo millet grain is calm of fiber (9%) and 8% protein, as against rice (0.2%) and wheat (1.2%) protein. Like some other millets, Kodo millet has 66.6 grammes of carbs and 353 calories per 100 grammes of grain. It also has a 1.4 percent fat content and 2.6 percent minerals. Iron levels range from 25.86 ppm to 39.60 ppm [1]. Among the millets, it has the smallest amount of phosphorous content [2].

Amongst small millets, kodo ranks second in area and production next to ragi in India and occupies an area of 1.96 lakh hectares with production and productivity of 0.84 lakh tonnes and 429 kg/ha respectively during the year 2015-16 [3]. Madhya Pradesh, Chhattisgarh, Tamil Nadu, Karnataka, Andhra Pradesh and Maharashtra are major Kodo millet growing states in India. In Madhya Pradesh it occupies an area of 132.109 thousand hectares and production of 68.696 thousand tonnes and productivity 520 kg/ha [4].

For any crop improvement programme knowing about genetic variability amongst the population may be prerequisite. Genetic improvement through traditional breeding approaches depends mainly on the supply of diverse germplasm and therefore the presence of variability. An insight into the nature and magnitude of genetic variability existing within the gene pool is of massive value for opening any systematic breeding programme because the occurrence of large genetic variability within the base material safeguards improved chances of growing wanted plant type. Hence, an effort was made to estimate the extent of variation for yield contributing traits within the germplasm accessions by studying PCV, GCV, Heritability and Genetic advance

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To formulate the choice criteria for the crop improvement in kodo millets, it is necessary to identify the yield contributing traits which is significantly positive correlation with grain yield and have direct and indirect effects toward grain yield for that the correlation and path coefficient analysis is required. The evaluations of correlation coefficients frequently specify the inter-relationships of the characters whereas path analysis permits the understanding of the cause and effect of related characters [5]. The path analysis reveals whether the association of characters with yield is thanks to their direct effect on yield or may be consequence of their indirect effects via other component characters. The phenotypic and genotypic correlation aids during a decent way to formulate selection approach to develop suitable genotypes by knowing the association between yield and its component traits. Path coefficient analysis by partitioning of those correlations in to direct and indirect effect.

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Materials and Methods

During *Kharif* 2020, the field experiment ~~**"Genetic diversity, Correlation and Path analysis for yield and its attributing traits in Kodo millet (*Paspalum scrobiculatum* L.)"**~~ was carried out at the experimental area of the All India Coordinated Research Project on Small Millet, at the Department of Plant Breeding & Genetics JNKVV, College of Agriculture Rewa (M.P). The district of Rewa is situated at an altitude of 365.7 metres above mean sea level, with a latitude of 240.30' North and a longitude of 810.25' East. The current study's experimental materials include 30 genotypes of Kodo millet which were tested in randomized block design with three replications. The crop was shown on 26-07-2020 in plot size of 3.00 x 2.25 m^2 with 22.7 cm row to row distance and 7.5 cm plant to plant distance was maintained. Fertilizer dose of 40:20:0 NPK kg/ha was applied and the seeds are sown by line showing method. For crop production, all approved agronomical methods and need-based plant protection measures were adopted. Out of 14 quantitative characters, ~~for~~ 12 ~~characters data was~~were recorded from randomly selected five plants from each plot of each replication i.e. plant height, number of tillers per plant, length of inflorescence, peduncle length, thumb raceme length, length of longest raceme, flag leaf length, flag leaf width, biological yield per plant, harvest index, 1000 grain weight and grain yield per plant while, days to 50% flowering and days to maturity were taken on plot basis.

The phenotypic and genotypic coefficients of variability (PCV and GCV) were calculated using Burton's approach [6]. Heritability percentage in broad sense was estimated using the Lush [7] and Burton and Devane formulas [8]. Heritability values are categorized as low (0-30), moderate (30-60) and high (>60) [9]. Genetic advance as percentage of mean 5% were calculated using the formula proposed by Johnson et al [10] and it was classified as low (0-10), moderate (10-20) and high (>20).

Phenotypic and genotypic correlation coefficient between grain yield were calculated according to procedure given by Miller *et al*. [11]. The phenotypic correlation coefficient was partitioned in to direct and indirect effects with the help of path coefficient analysis. Yield was considered as dependent variable which is assumed to be influenced by the other characters called independent characters. The estimates of direct and indirect effects of quantitative traits on seed yield where calculated through path coefficient analysis suggested by Wright [5] and elaborated by Dewey and Lu. [12].

Table 1: List of 30 genotypes used in the present investigation

S. No.	Genotype name	S. No.	Genotype name	S. No.	Genotype name
1	KMV548	11	KMV567	21	RPS516
2	KMV551	12	KMV568	22	RPS666

3	KMV557	13	KMV569	23	RPS693
4	KMV558	14	KMV570	24	RPS695
5	KMV559	15	KMV571	25	RPS790
6	KMV560	16	TNAU86	26	RPS828
7	KMV561	17	RK390-22	27	RPS900
8	KMV562	18	LC JK137	28	RPS912
9	KMV565	19	LC RPS1007	29	RPS921
10	KMV566	20	LC JK155	30	RPS935

$$\text{Genotypic correlation co-efficient, (rg)} = \frac{\text{Cov x y (genotypic)}}{\sqrt{(Var\ x).(Var\ y)(genotypic)}}$$

$$\text{Genotypic variance} = \frac{\text{Treatment MS – Error MS}}{\text{Number of Replications}}$$

$$\text{Genotypic covariance} = \frac{\text{Treatment Cov – Error Cov}}{\text{Number of Replications}}$$

$$\text{Phenotypic correlation co-efficient, (rg)} = \frac{\text{Cov x y (phenotypic)}}{\sqrt{(Var\ x).(Var\ y)(phenotypic)}}$$

Result and Discussion

Analyses of variance (Table 2) performed on the 14 traits evaluated in the Kodo millet demonstrate that genotypes differ significantly for all of the characters, indicating a wide range of variability and potential for improvement. Data of phenotypic and genotypic coefficient of variation (GCV and PCV), heritability in broad sense and genetic advance as percentage of mean for all the 14 characters in 30 kodo millet are presented in the Table 4. The mean value of summary statistic is shown in Table 3 as well mean value of 14 quantitative characters of 30 kodo millet genotype included in study were presented in Table 5.

In general, PCV was higher than GCV for all the characters studied. The value of phenotypic coefficient of variation ranged from days to maturity (6.441%) to harvest index (28.596%). Genotypic coefficient of variation ranged from days to maturity (4.051%) to harvest index (26.931%). The coefficients of variation at phenotypic (PCV) and (GCV) levels were high for harvest. Higher PCV and GCV were observed in harvest index, biological yield per plant and number of tillers per plant. Moderate PCV and GCV were recorded in flag leaf length, grain yield per plant, peduncle length, thumb raceme length, 1000 grain weight, length of longest raceme, length of inflorescence, flag leaf width, Low PCV and GCV were found in days to maturity, 50% flowering, and plant height recorded moderate PCV but low GCV. Similar findings in kodo millet were reported by Sasamala *et* al. [13], Anuradha *et al.* [14], in kodo millet, Devaliya *et* al. [15] in finger millet.

Heritability estimates along with genetic advance are more helpful in predicting the gain under selection than heritability estimates alone. However, it is not necessary that a character showing high heritability will always exhibit high genetic advance [10]. High heritability accompanied with high genetic advance as percentage of mean were recorded for number of tillers per plant, flag leaf length, harvest index, biological yield per plant, peduncle length, flag leaf width, length of longest raceme, thumb raceme length and grain yield per plant. It indicates that most likely the heritability is due to additive gene effects and selection may be effective for these traits. It is concluded that the genetic variability present in the population is mostly employed to improve the varietal diversity of future breeding programmes. These findings were like the results recorded earlier by Priyadharshini *et al*. [16] for number of tillers per plant, harvest index in finger millet, Subramanian *et al.* [17] in kodo millet except for thumb raceme length, harvest index, peduncle length Nirubana *et al.* [18] in kodo millet except for length of longest raceme, harvest index.

Moderate heritability coupled with moderate genetic advance as percentage of mean were recorded for length of inflorescence, 1000 grain weight and plant height, suggesting that both additive and non-additive gene activity is present in the transmission of these traits. Bezaweletaw *et al*. [19] in Ethiopian finger millet except for length of inflorescence, Basavaraj *et al*. [20] in pearl millet except for 1000 grain weight, Anuradha *et al*. [14], Patel *et al.* [21] in little millet except for 1000 grain weight.

Similarly high heritability accompanied with moderated genetic advance as percentage of mean were recorded for days to 50% flowering suggests the presence of both additive and non-additive gene activity. Reddy *et al.* [22] reported similar finding in foxtail millet, Chavan *et al*. [23] in finger millet, Anuradha *et al*. [24] in finger millet.

Genotype RPS900, RPS921, RPS828, RPS963, RPS693, KMV565, KMV559 has been verified as high yielding varieties. Hence these genotypes might be utilized for future breeding program in kodo millet.

In this study for most of the characteristics, the magnitude of phenotypic correlations was found to be greater than the magnitude of genotypic correlations (Table 6), which could be attributed to the greater effect of environment on character expression. A very strong significant positive association for grain yield per plant was found at phenotypic level with biological yield per plant followed by flag leaf length, harvest index, flag leaf width, plant height, 1000 grain weight and peduncle length. Thus, selection of genotype with higher biological yield per plant, flag leaf length, harvest index, flag leaf width, plant height, 1000 grain weight and peduncle length would outcome yield improvement in kodo millet. Similar findings were also reported by Gupta *et al*. [25] in barnyard except for harvest index, Tyagi *et* al. [26] except for peduncle length and 1000 grain weight in foxtail millet, Jadhav *et al*. [27] for peduncle length, plant height in finger millet, Sreeja *et al.* [28] for 1000 grain weight and plant height in kodo millet, Negi *et al.* [29] for 1000 grain weight, harvest index and biological yield per plant in finger millet, Renganathan *et al.* [30] except for peduncle length, biological yield per plant and peduncle length, Amarnath *et al*. [31] except for harvest index and biological yield per plant in foxtail millet, Sao *et al.* [32] for biological yield per plant**,** Nirubana *et al*. [33] for peduncle length, plant height in kodo millet.

Path coefficient analysis at phenotypic level revealed the harvest index used to have the greatest positive direct effect on grain yield per plant followed by biological yield per plant, flag leaf length, 1000 grain weight, day to maturity, number of tillers per plant, plant height, flag leaf width, length of inflorescence and peduncle length. The results are in harmony with Suryanarayana *et al.* [34] for plant height in finger millet, Sreeja *et al*. [28] for 1000 grain weight, plant height in kodo millet, Negi *et al*. [29] except for flag leaf length, flag leaf width days to maturity, in finger millet, Amarnath *et al.* [31] except for harvest index, biological yield per plant in foxtail millet, Sao *et al.* [32] for number of tillers per plant, plant height, biological yield per plant, days to maturity in kodo millet, Nirubana *et al.* [33], length of inflorescence flag, flag leaf length, number of tillers per plant, plant height in kodo millet. while negative direct effects on grain yield per plant was contributed by days to 50% flowering, thumb raceme length and length of longest raceme. Sreeja *et al*. [28] for days to 50% flowering in kodo millet, Sao *et al.* [32] for days to 50% flowering in kodo millet, Nirubana *et al.* [33] expect for length of longest raceme in kodo millet.

Table 2: Analysis of variance for 14 characters in Kodo millet

Source of Variation	Df	Mean Squares													
		Days to 50 % flowering	Days to 50 % flowering	Plant height	No of tillers per plant	Length of inflorescence	Length of longest raceme	Peduncle length	Thumb raceme length	Flag leaf length	Flag Leaf width	Biological yield per plant	1000 grain weight	Harvest Index	Grain yield per plant
Replications	2	1.30	3.3980	2.8360	0.3580	0.130	0.5350	0.170	0.310	9.4210	0.0060	24.1330	0.1440	0.3580	0.7990
Treatments	29	91.899**	64.5*	127.819**	6.839**	6.421**	5.763**	3.39**	3.142**	205.999**	0.062**	524.726**	1.11**	11.362**	159.469**
Error	58	14.715	31.578	30.061	0.247	1.177	0.505	0.505	0.434	7.993	0.006	28.166	0.259	2.402	7.743

Table 3: Summary statistic of 30 kodo millet genotypes

Mean	63.87	93.17	61.57	6.38	11.75	8.67	7.32	7.76	43.49	1.17	50.53	4.63	12.65	26.5
CV	6.01	6.03	8.91	7.8	9.24	8.2	9.7	8.49	6.5	6.8	10.5	11.01	12.25	10.5
CD at 5%	6.27	9.18	8.96	0.81	1.77	1.16	1.16	1.08	4.62	0.13	8.67	0.83	2.53	4.55
CD at 1%	8.34	12.22	11.92	1.08	2.36	1.55	1.55	1.43	6.15	0.17	11.54	1.11	3.37	6.05
Minimum	53.67	84.67	50.17	4.12	9.31	6.27	5.85	6.28	24.15	0.88	30.33	3.51	7.95	13.54
Maximum	71.67	103.33	78.49	11	14.58	12.96	9.63	10.13	58.63	1.5	85	5.74	15.66	42.79

Table 4: Genetic parameters of 30 kodo millet genotypes

	DTW50%	DTM	PH (cm)	NTPP	LOI (cm)	PL (cm)	TRL (cm)	LLR (cm)	FLL (cm)	FLW (cm)	BYPP (g)	1000 GW (g)	GYPP (g)	HI (%)
GCV	7.942	3.556	9.272	23.252	11.256	15.273	13.392	12.245	18.681	11.618	25.459	11.506	13.66	26.84
PCV	9.957	7.002	12.856	24.524	14.561	17.336	16.537	14.9	19.78	13.46	27.54	15.922	18.348	28.822
h2 (Broad Sense)	63.615	25.79	52.015	89.896	59.761	77.623	65.576	67.531	89.198	74.498	85.458	52.224	55.43	86.723

Gen.Adv as % of Mean 5%	13.049	3.72	13.775	45.414	17.925	27.72	22.34	20.729	36.344	20.657	48.483	17.129	20.951	51.49

Table 5: Mean performance of kodo millet 30 genotypes for grain yield and its attributing traits.

Genotypes	Days to 50% flowering	Days to maturity	Plant height (cm)	No. of Tillers per plant	Length of inflorescence (cm)	Peduncle Length (cm)	Thumb raceme length (cm)	Length of longest raceme (cm)	Flag leaf length (cm)	Flag leaf width (cm)	Bio logical yield per plant (g)	1000 Grain weight (g)	Harvest index %	Grain yield per plant (g)
KMV548	68.33	96.667	60.53	5.6	11.603	7.327	6.767	6.973	37.333	1.013	37.333	4.5	33.62	12.56
KMV551	66	96.667	64.31	8.467	13.58	9.433	7.607	8.183	42.293	1	44	4.033	31.017	13.543
KMV557	69.66	103.333	70.43	8.033	13.52	8.433	9.147	9.617	41.984	1.266	67.667	3.9	19.407	13.13
KMV558	70.33	103	71.147	7.934	14.577	10.26	9.56	10.127	39.203	1.307	46	5.254	29.842	13.677
KMV559	67.66	94.333	62.644	11	12.32	9.127	6.84	7.893	37.49	1.093	50	5.133	27.982	13.99
KMV560	65.33	96.334	71.833	7.187	11.72	8.537	7.05	7.37	37.613	1.187	46.667	4.747	29.061	14.28
KMV561	66	96	63.027	6.8	10.867	7.803	6.1	6.607	42.787	1.133	55.667	4.717	23.278	12.924
KMV562	62	91.667	64.944	8.803	9.31	8.366	6.586	6.763	47.72	1.2	41.667	4.247	33.338	13.884
KMV565	58.33	88.667	60.553	5.533	11.953	8.55	6.6	7.03	36.906	1.083	36.333	5.086	40.045	14.564
KMV566	60.66	92.333	62.214	5.7	14.08	8.613	9.634	9.923	36.463	1.127	53.667	4.743	20.737	11.14
KMV567	62.33	92	64.026	5.9	11.827	6.61	6.943	7.147	38.524	1.003	30.333	4.247	41.156	12.48
KMV568	71.66	99.667	54.17	6.4	13.727	9.22	8.873	9.153	27.967	1.4	57.667	4.837	13.775	7.95
KMV569	68	96.667	65.473	8.433	14.153	9.643	9.44	9.787	40.54	1.09	70.667	4.124	13.544	9.547
KMV570	53.66	84.666	54.45	6.6	12.037	8.327	7.03	7.467	32.713	1.187	37	3.583	26.466	9.8
KMV571	57.33	86.333	62.55	6.653	11.32	8.033	7.593	8.05	45.383	1.186	32.667	4.893	42.79	13.967
TNAU86	61.66	91	62.98	6.52	10.257	8.44	6.047	6.283	24.147	0.95	58.333	3.767	15.822	9.237
RK390-25	70	91.667	63.187	4.5	10.84	8.463	6.227	7.347	50.33	1.187	37.667	3.507	26.01	9.8
LC JK137	70	94	62.187	6.8	11.48	8.977	5.847	6.893	51.84	1.273	46.667	5.21	29.121	13.573
LCRPS1007	56.33	88.334	57.02	5.867	10.07	7.49	6.943	7.398	46.557	1.07	37.667	4.326	28.225	10.657
JK155	61	93	58.977	5.343	13.147	8.354	8.02	8.267	58.627	1.333	57.667	5.287	23.238	13.4
RPS516	69.66	97	56.51	5.467	10.067	12.96	6.513	7.06	54.753	0.883	48.667	4.603	26.815	13.063
RPS666	59.66	90.33	61.61	4.117	12.984	9.94	6.787	7.153	49.077	1.2	51.667	5.25	26.602	13.74
RPS693	56.666	87.667	50.173	4.663	11.643	10.79	6.873	7.28	48.983	1.213	59.667	5.743	24.513	14.643
RPS695	55	86.667	50.7	4.567	11.353	6.813	7	7.524	49.283	1.087	55.666	4.603	23.623	13.136
RPS790	70	93	60.417	6.663	9.37	6.667	7.767	8.034	34.463	1.367	61	4.3	22.09	13.49
RPS828	68.667	92.334	50.313	5.633	10.27	10.357	6.793	7.146	55.9	1.5	85	5.62	17.26	14.66

RPS900	56.333	87.667	56.043	6.367	12.233	7.933	6.667	7.077	50.446	1.33	62.333	5.197	25.117	15.66
RPS912	62	92.333	57.947	5.7	9.817	9.573	6.773	7.09	51.627	1.033	36.333	3.81	29.156	10.61
RPS921	70.333	98	78.493	5.133	10.975	8.737	7.967	8.2	50.85	1.333	72.333	5.307	20.417	14.77
RPS935	61.333	93.667	68.153	4.867	11.267	6.267	7.7	7.933	42.88	1.1	38	4.247	30.815	11.673

Table 6: Phenotypic and Genotypic correlation between grain yield and its components in Kodo Millet

S. N	Characters		Days to 50% flowering	Days to maturity	Plant height	Number of tillers per plant	Length Of Inflorescences	Peduncle length	Thumb raceme length	Length Of longest raceme	Flag leaf length	Flag Leaf width	Bio-logical yield per plant	1000 grain weight	Harvest Index	Grain yield per plant
1	Days to 50% flowering	P	1	0.785**	0.474**	0.327*	0.219*	0.324*	0.299*	0.352**	0.03	0.280*	0.349**	0.063	-0.260*	0.0899
		G	1	0.910	0.368	0.289*	-0.0111	0.252	0.1837	0.262	-0.108	0.192	0.302	-0.038	-0.353	-0.1727
2	Days to maturity	P		1	0.570**	0.366**	0.392**	0.298*	0.452**	0.474**	-0.028	0.1807	0.303*	0.0182	-0.217*	0.116
		G		1	0.580	0.385	0.366	0.228	0.554	0.578	-0.224	0.0728	0.268	-0.0101	-0.364	-0.195
3	Plant height	P			1	0.341*	0.320*	0.008	0.393**	0.391**	-0.04	0.1072	0.0573	0.0238	0.1214	0.261*
		G			1	0.299	0.085	-0.283	0.259	0.269	-0.257	-0.14	-0.1393	-0.291	0.1262	0.004
4	Number of tillers per plant	P				1	0.272*	0.125	0.255*	0.315*	-0.272*	0.0394	0.0818	-0.0681	0.021	0.147
		G				1	0.199	0.031	0.188	0.261	-0.375	-0.0654	0.0123	-0.1726	-0.0093	0.024
5	Length of inflorescences	P					1	0.263*	0.684**	0.727**	-0.095	0.210*	0.209*	0.227*	-0.1205	0.119
		G					1	0.068	0.710	0.752	-0.330	0.0834	0.0787	0.1491	-0.1995	-0.250
6	Peduncle length	P						1	0.153	0.186	0.321*	0.084	0.319*	0.301*	-0.201	0.210*
		G						1	-0.032	0.037	0.276	-0.0686	0.247	0.326	-0.255	0.009
7	Thumb raceme length	P							1	0.948**	-0.105	0.322*	0.325*	0.1085	-0.232*	0.036
		G							1	0.992	-0.325	0.250	0.262	-0.041	-0.388	-0.366
8	Length of longest raceme	P								1	-0.069	0.339*	0.301*	0.1019	-0.223*	0.034
		G								1	-0.285	0.245	0.238	-0.0279	-0.382	-0.356
9	Flag leaf length	P									1	0.230*	0.1964	0.353**	0.1022	0.495**
		G									1	0.1769	0.1407	0.368	0.0738	0.449
10	Flag leaf width	P										1	0.532**	0.447**	-0.288*	0.330*
		G										1	0.557	0.519	-0.394	0.218
11	Biological yield per plant	P											1	0.357**	-0.764**	0.249*
		G											1	0.407	-0.838	0.13

12	1000 grain weight	P												1	0.024	0.568**
		G												1	-0.018	0.730
13	Harvest index	P													1	366**
		G													1	370*
14	Grain yield per plant	P														1
		G														1

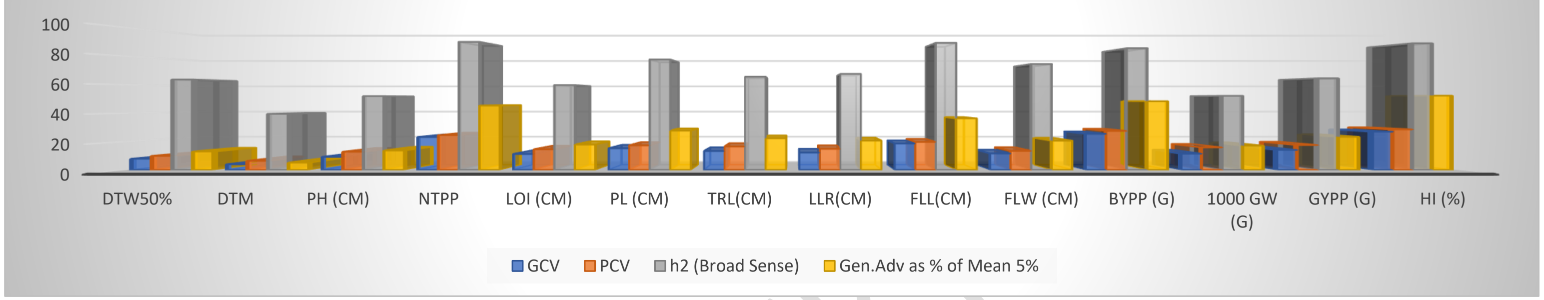
P = Phenotypic G = Genotypic

Table 7: Path coefficient analysis for various grain yield and attributing traits in 30 kodo millet genotypes.

S.No	Character	Days to 50% flowering	Days to maturity	Plant height	Number of basal tillers per plant	Length of inflores cence	Peduncle length	Thumb raceme length	Length of longest raceme	Flag leaf length	Flag leaf width	1000 grain weight	Biological yield per plant	Harvest Index	Grain yield per plant
1	Days to 50% flowering	-0.1246	-0.0978	-0.059	-0.0408	-0.0272	-0.0404	-0.0373	-0.0439	-0.0037	-0.0349	-0.0435	-0.0078	0.0324	0.0899
2	Days to maturity	0.0736	0.0938	0.0534	0.0343	0.0367	0.0279	0.0424	0.0444	-0.0026	0.0169	0.0284	0.0017	-0.0203	0.116
3	Plant height	0.0412	0.0496	0.0871	0.0297	0.0279	0.0007	0.0342	0.034	-0.0035	0.0093	0.005	0.0021	0.0106	0.261*
4	No of basal tillers per plant	0.0281	0.0314	0.0292	0.0857	0.0234	0.0107	0.0219	0.027	-0.0234	0.0034	0.007	-0.0058	0.0018	0.147
5	Length of inflorescence	0.0148	0.0265	0.0216	0.0184	0.0676	0.0178	0.0463	0.0492	-0.0064	0.0142	0.0141	0.0153	-0.0081	0.119
6	Peduncle length	0.0122	0.0112	0.0003	0.0047	0.0099	0.0376	0.0057	0.007	0.0121	0.0032	0.012	0.0113	-0.0076	0.210*
7	Thumb raceme length	-0.0304	-0.0459	-0.0399	-0.0259	-0.0695	-0.0155	-0.1016	-0.0963	0.0107	-0.0327	-0.033	-0.011	0.0236	0.036
8	Length of longest raceme	-0.0264	-0.0355	-0.0293	-0.0236	-0.0545	-0.0139	-0.071	-0.075	0.0052	-0.0254	-0.0226	-0.0076	0.0167	0.034
9	Flag leaf length	0.0042	-0.004	-0.0057	-0.0388	-0.0135	0.0457	-0.015	-0.0098	0.1424	0.0328	0.028	0.0503	0.0145	0.495**

10	Flag leaf width	0.0206	0.0133	0.0079	0.0029	0.0155	0.0062	0.0236	0.0249	0.0169	0.0735	0.0391	0.0329	-0.0211	0.330*
11	1000 grain	0.3571	0.3105	0.0587	0.0838	0.2142	0.327	0.3323	0.3084	0.201	0.545	1.0237	0.3655	-0.7819	0.249*
12	Biological yield per plant	0.0059	0.0017	0.0022	-0.0064	0.0213	0.0283	0.0102	0.0096	0.0332	0.0421	0.0336	0.0941	0.0023	0.568**
13	Harvest index	-0.2865	-0.239	0.134	0.0232	-0.1329	-0.2217	-0.2562	-0.2455	0.1127	-0.3174	-0.8425	0.0267	1.103	0.366**
14	Grain yield per plant	0.0899	0.116	0.261*	0.147	0.119	0.210*	0.036	0.034	0.495**	0.330*	0.249*	0.568**	0.366**	1
15	Partial R2	-0.0112	0.0109	0.0227	0.0126	0.008	0.0079	-0.0036	-0.0025	0.0704	0.0242	0.2553	0.0534	0.4034	

Fig 1 PCV, GCV, Heritability (broad sense) and genetic advance as % of mean 5% for 14 quantitative traits in kodo millet.



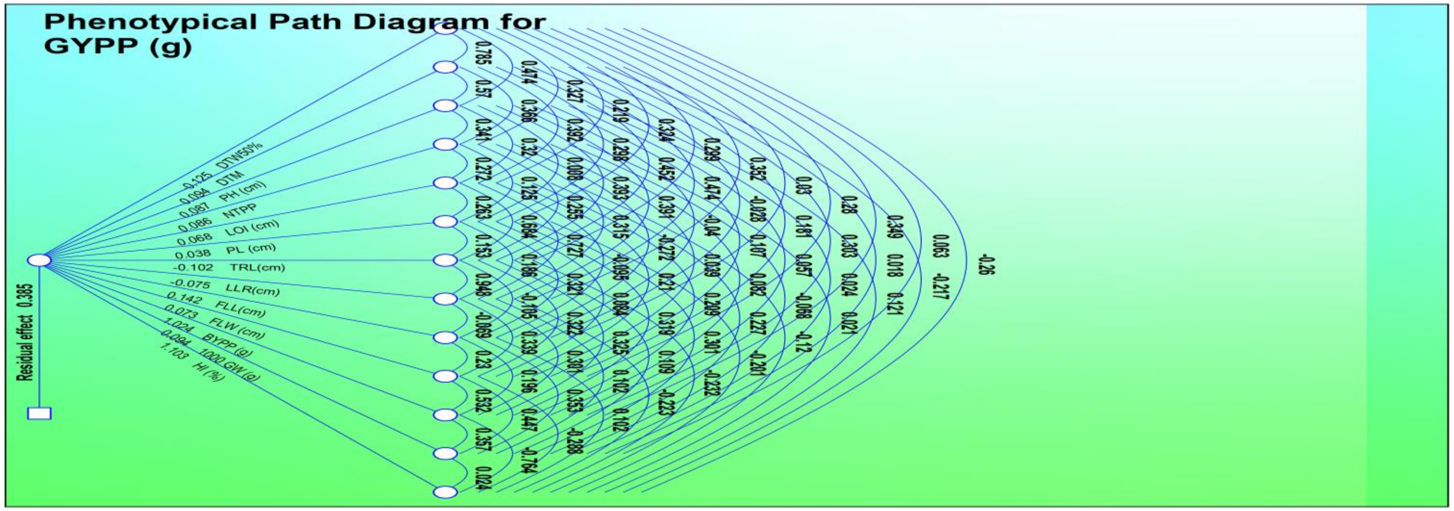


Fig 2: Phenotypic path diagram for GYPP (g)

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