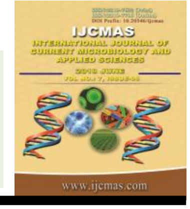
Int.J.Curr.Microbiol.App.Sci (2018) *7*(6): 2712-2725



International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 7 Number 06 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.706.320

Genetic Variability Study in Little Millet (*Panicum miliare* L.) Genotypes in Relation to Yield and Quality Traits

Savankumar N. Patel[1*], Harshal E. Patil[2], Harshalkumar M. Modi[1] and Th. Joydeep Singh[1]

[1]*Department of Genetics and Plant Breeding, N. M. College of Agriculture, Navsari Agricultural University, Navsari-396 450, Gujarat, India*
[2]*Associate Research Scientist (PB), Hill Millet Research Station, Navsari Agricultural University, Waghi (The Dangs)-394 730, India*

**Corresponding author*

Keywords

Little millet, Genetic variability, Heritability, Genetic advance as % of mean

Article Info

Accepted:
20 May 2018
Available Online:
10 June 2018

A B S T R A C T

The extent of genetic variability present in any base population is most important for the success of breeding programme. Greater the variation in the material, better is the chance for selecting promising and desired types. Hence, thirty two genotypes of little millet were studied for genetic variability study at Hill Millet Research Station in randomized block design for different morphological and biochemical traits *viz*., days to 50 % flowering, days to maturity, zinc content (mg), plant height at maturity (cm), 1000 seed weight (g), fiber content (%), number of productive tillers per plant, Protein content (%), number of branches per panicle, ash content (%), panicle length (cm), fat content (%), grain yield per plant(g), calcium content (mg), straw yield per plant (g), iron content (mg). The results of the present study indicated all the sixteen characters had a wide range of variability in the different little millet genotypes. High estimates of genotypic and phenotypic variance were observed for days to 50% percent flowering, plant height at maturity, panicle length, straw yield per plant, days to maturity and calcium content. High genotypic and phenotypic coefficient of variation found in number of productive tillers per plant, grain yield and straw yield per plant. In the present study the high heritability coupled with high genetic advance was observed for number of productive tillers per plant, grain yield per plant, straw yield per plant, 1000 seed weight, protein content, ash content, fat content, calcium content, iron content and fiber content which, indicated that these characters are largely governed by additive genes and selection for improvement of such characters could be rewarding.

Introduction

Little millet belongs to the family Poaceae, sub-family Panicoideae and the tribe Paniceae (Rachie, 1975). Little millet was domesticated in the Eastern Ghats of India occupying a major portion of diet amongst the tribal people and spread to Sri Lanka, Nepal, and Myanmar (De Wet *et al.*,). Little millet (*Panicum miliare* L.) is grown in India under various agro-ecological situations and commonly known as samai, samo, moraio, vari, kutki. India is well known for its rich agro-biodiversity and prime contributor with 473 accessions (Upadhyaya *et al.*, 2016) In India, little millet having 1.42 lakh tones of production. In Gujarat, little millet is cultivated in an area of 10,634 hectares with 9,526 tonnes of production having the productivity of 896 kg/ha (Anonymous, 2015). The area under this crop is mainly concentrated in the districts of The Dangs, Valsad, Navsari of South Gujarat and Panchmahal of middle Gujarat.

Little millet is a hardy crop which can withstand drought better than most of other cereal crops and water logging to a certain degree, also. Besides India, it is cultivated in Nepal and Western Burma. The potentiality of little millet has not been exploited in India and the yield levels are very low there by indicating a greater scope for exploitation of this millet under Indian condition. In India, little millet growing states are Karnataka, Tamil Nadu, Odisha, Madhya Pradesh, Chattisgarh, Jharkhand, Andhra Pradesh, Uttarakhand, Maharashtra and Gujarat. In Gujarat, generally little millet crop is grown in hilly tract of The Dangs and Valsad district and locally known as “Vari or Moraio”. The productivity of little millet is low due to poor soil fertility and age-old cultivation methods.

The existence of variability is essential for resistance to biotic and abiotic factors as well as for wider adaptability in different set of environment. Variability refers to the presence of differences among the individuals of plant population. Variability results due to differences either in the genetic constitution of the individuals of a population or in the environment in which they are grown. Selection is also effective when there is presence of ample genetic variability among the individuals in a population. Hence, insight into the magnitude of genetic variability present in a population is of paramount importance to a plant breeder for starting a judicious breeding programme. Greater the variation in the material, better is the chance for selecting promising and desired types. The genetic variability is calculated from phenotypic observations, which are the results of interaction of genotypes and environment.

The yield potential of little millet is low and plagued with a number of genetical and morphological reasons. Though, the crop has been important over centuries, more concentrated research efforts are geared in recent years to evolve improved varieties and develop production technology.

Hence, the present study conducted on thirty two little millet genotypes to harness the information related to genetic variability, heritability and genetic advance for different traits.

Materials and Methods

The experiment was conducted at Hill Millet Research Station, Navsari Agricultural University, Waghai (The Dangs) using 32 genotypes of little millets in randomized block design with three replications. The gross plot is divided into three blocks which were taken as a replications while the blocks are further divided into equal 32 plots. Five randomly selected plants from each genotypes in each replications were used to record observations for morphological characters. Data were recorded on total 16 morphological and biochemical traits *viz.*, days to 50 % flowering, days to maturity, zinc content (mg), plant height at maturity (cm), 1000 seed weight (g), fiber content (%), number of productive tillers per plant, Protein content (%), number of branches per panicle, ash content (%), Panicle length (cm), fat content (%), grain yield per plant(g), calcium content (mg), straw yield per plant (g), iron content (mg). The mean of five plants was subjected to statistical analysis, to estimate analysis of variance as suggested by Panse and Sukhatme (1967). Genotypic and phenotypic coefficient of variability were computed according to the method suggested by Burton (1952). Heritability in broad sense was calculated as per the formula given by Allard (1960). Range of heritability was categorized as suggested by Robinson *et al.,* (1949). Genetic advance was expressed as per cent of mean by using the formula expounded by Johnson *et al.,* (1955). Traits were classified as having high, moderate or low genetic advance as per the method suggested by Johnson *et al.,* (1955).

Results and Discussion

Analysis of variance

The genotypic differences were highly significant for all the sixteen characters indicating considerable amount of genetic variability among the genotypes tested in the present study, suggesting ample scope for improvement of yield and various yield attributing characters.The genotypic mean square values were highly significant for all quantitative traits, implying that the genotypes tested were highly variable (Table 1.).

Similar results for most of the characters were also reported by Yadav and Shrivastava (1976), Reddy (1984), Chidambaram and Palanisamy (1996), Ananda *et al.*, (2015), Anuradha *et al.*, (2017) in little millet, while Satish *et al.*, (2003), Kebar *et al.*, (2006), Chemeda and Gemechu, (2010), Priyadharshini *et al.*, (2011), Luli *et al.*, (2012), Salini *et al.*, (2010), Subramanian *et al.*, (2010), Ganapathy *et al.*, (2011), Haradari *et al.*, (2012), Reddy *et al.*, (2013), Karad and Patil (2013), Dhanalakshmi *et al.*, (2013), Joshi (2013), Chaudhari *et al.*, (2013), Suryanarayana *et al.*, (2014), Saundaryakumari and Singh (2015), Vasadia (2015), Jyotsana (2016), Devaliya *et al.*, (2018) in remaining small millets.

Variability studies

Success of any crop improvement programme depends upon the variability in the material. A large amount of variation is necessary in a breeding population to enable the breeder to carry out effective selection.

The range, mean, genotypic, phenotypic and environmental variance, phenotypic and genotypic coefficients of variation, heritability and expected genetic advance as percentage of mean for sixteen characters are presented in Table 2 and 3.

High estimates of genotypic and phenotypic variance were observed for days to 50% percent flowering, plant height at maturity, panicle length, straw yield per plant, days to maturity and calcium content. Similar finding were also reported by Reddy (1984) for straw weight, panicle length; Vasadia (2015) for days to 50% percent flowering, straw yield, plant height in little millet, while in finger millet similar finding were also reported by Kebere *et al.,* (2006) for plant height, days to heading, days to maturity; Reddy *et al.*, (2013) for 50% flowering, plant height, ear head length, straw yield; Dhanalakshmi *et al.*, (2013) for 50% percent flowering, plant height; Suryanarayana *et al.*, (2014) for days to maturity, plant height; Devaliya *et al.*, (2018) for plant height, days to 50 % flowering, straw yield per plant and days to maturity.

Low estimates of genotypic and phenotypic variance were observed for number of productive tillers per plant, number branches per plant, grain yield per plant, 1000 seed weight, protein content, ash content, fat content, iron content, zinc content and fiber content. Similar results in finger millet were also obtained by John (2007) for number of productive tillers per plant, 1000 grain weight and grain yield per plant; Kebere *et al.*, (2006) for number of productive tillers per plant, grain yield per plant and 1000 grain weight; Suryanarayana *et al.,* (2014) for number of productive tillers per plant and seed yield per plant.

High genotypic and phenotypic coefficient of variation found in number of productive tillers per plant, grain yield, straw yield per plant. Similar results were also obtained by Reddy (1984) for straw weight, grain yield, number of tillers and Selvi *et al.,* (2014) grain yield per plant and number of basal tillers per plant in little millet, while Selvarani and Chandarasekaran (2000) number of productive tillers per plant; Keber and Patil (2006) for grain yield per plant; Nirmalakumari *et al.,* (2010) for grain yield and number of productive tillers per plant; Priyadarshini *et al.,* (2011) for number of productive tillers per plant; Ganapathy *et al.,* (2011) number of productive tillers per plant; Dhamdhere*et al.,* (2011) for productive tillers per plan; Lule *et al.,* (2012) for grain yield per plant; Chaudhari *et al.,* (2013) for number of productive tillers per plant; Suryanarayana *et al.,* (2014) for seed yield plant per plant, productive tillers per plant and Devaliya *et al.,* (2018) for grain yield per plant in remaining small millets.

The lower value of genotypic coefficient of variation and phenotypic coefficient of variation observed for days to 50 % flowering, plant height at maturity, days to maturity. Similar results were also obtained by Keber *et al.,* (2006) for days to maturity; Dhamdhere *et al.,* (2011) days to maturity; Lule *et al.,* (2012) days to 50 % flowering and days to maturity; Reddy *et al.,* (2013) for 50 % flowering, plant height and days to maturity; Suryanarayana *et al.,* (2014) for days to 50 % flowering and days to maturity; Ananda *et al.,* (2015) for days to heading; Jyotsna *et al.,* (2016) for days to maturity. The most probable reason could be the phenotypic plasticity occurring in those traits is the main source of variation than the genetic variance. Such result also indicated that selection is not effective for those traits because of the narrower genetic variability.

In the present study, the difference between PCV and GCV were lower for most of the characters suggesting negligible role of environment in the expression of traits, therefore improvement by phenotypic selection is possible. It is not possible to determine the amount of variability, which is heritable, with the help of genotypic coefficient of variation alone. Burton (1952) also suggested that GCV together with a heritability estimates would provide better insight for amount of genetic gain expected through phenotypic selection.

The characters days to 50 % flowering, plant height, number of productive tillers per plant, panicle length, grain yield per plant, straw yield per plant, days to maturity, 1000 seed weight, protein content, ash content, fat content, calcium content, iron content, zinc content, fiber content exhibited high heritability estimates which, indicated that these characters are largely governed by additive genes and selection for improvement of such characters could be rewarding. Similar results were also obtained by Yadav and Srivastava (1976) for days to flowering, days to maturity, plant height, number of tillers per plant, length of panicle, grain yield per plant, straw yield per plant and 100 seed weight; Reddy *et al.,*(1984) grain yield per plant, straw yield per plant, days to maturity, plant height; Selvi *et al.,* (2014) for 50 % flowering, plant height, number of productive tillers per plant, grain yield per plant, straw yield per plant,1000 seed weight; Ananda *et al.,* (2015) for grain yield, days to heading, panicle length, straw yield, 1000 grain weight, plant height and days to heading; Jyotsna *et al.,* (2016) for days to 50 % flowering, days to maturity, plant height and grain yield and Anuradha *et al.,* (2017) for 50 % flowering,

Table.1 Analysis of variance (Mean Sum of Square) for sixteen different characters of little millet

Source of variance	Degrees of freedom	DF	PH	NOT	NOB	PL	GY	SY	DM
Replication	2	33.87	61.94	0.34	0.36	7.70	0.29	2.52	0.59
Genotypes	31	237.59**	530.67**	7.78**	1.52**	51.81**	11.25**	60.11**	97.23**
Error	62	17.99	90.31	0.28	0.28	6.44	0.19	4.13	10.41
S. Em ±		2.44	5.48	0.30	0.30	1.46	0.25	1.17	1.86
C.D at 5%		6.92	15.51	0.87	0.87	4.41	0.72	3.32	5.26
C.V %		3.96	5.78	7.46	7.65	7.45	7.84	11.54	2.38

Source of variance	Degrees of freedom	TW	PR	ASH	FAT	Ca	Fe	Zn	FIB
Replication	2	0.01	0.34	0.04	0.025	198.81	0.08	0.03	0.20
Genotypes	31	0.36**	2.08**	0.80**	0.55**	3970.89**	1.95**	1.42**	7.41**
Error	62	0.008	0.15	0.02	0.01	63.48	0.11	0.04	0.15
S. Em ±		0.05	0.23	0.09	0.08	4.60	0.19	0.12	0.22
C.D at 5%		0.14	0.65	0.25	0.23	13.00	0.55	0.34	4.94
C.V %		5.08	7.81	5.59	4.09	3.57	5.09	3.07	4.94

* Significant at P = 0.05, ** Significant at P = 0.01

Where,

DF= Days to 50 % flowering	**GY= Grain yield per plant (g)**	**ASH= Ash content (%)**	**FIB= Fiber content (%)**
PH= Plant height at maturity (cm)	**SY= Straw yield per plant (g)**	**FAT= Fat content (%)**	
NOT= Number of productive tillers per plant	**DM= Days to maturity**	**Ca= Calcium content (mg)**	
NOB= Number of branches per panicle	**TW= 1000 seed weight (g)**	**Fe= Iron content (mg)**	
PL= Panicle length (cm)	**PR= Protein content (%)**	**Zn= Zinc content (mg)**	

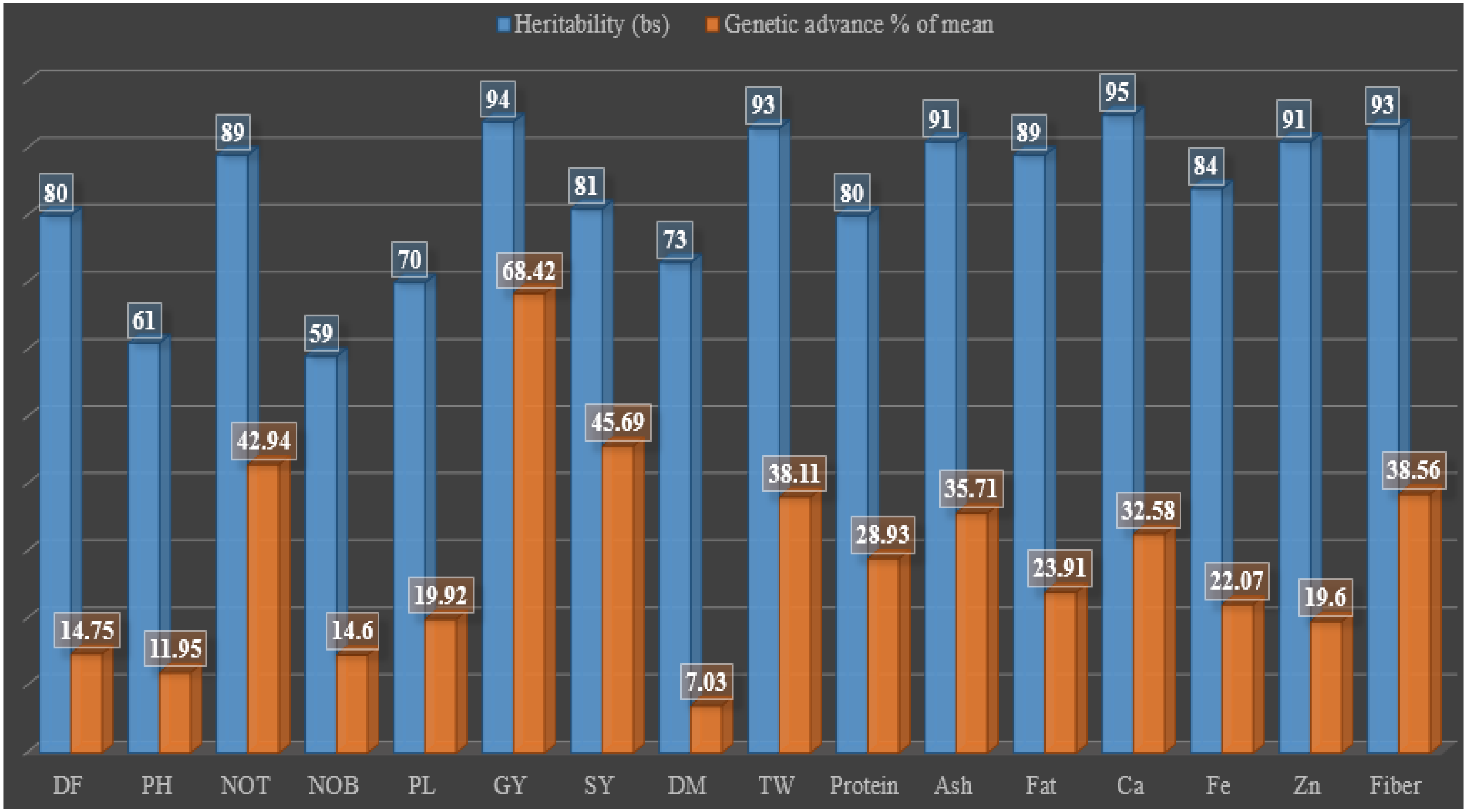
Table.2 Range, mean, component of variance for sixteen characters of little millet

Sr. No.	Characters	Range	Mean	Component of variance		
				Genotypic	Phenotypic	Environmental
1.	Days to 50% flowering	87.66-118.33	107.03	73.20	91.19	17.99
2.	Plant height at maturity (cm)	133.93 -189.2	164.24	146.78	237.102	90.31
3.	Number of productive tillers per plant	4.46 - 10.82	7.18	2.50	2.78	0.28
4.	Number of branches per panicle	5.53 - 7.77	6.96	0.41	0.69	0.28
5.	Panicle length (cm)	25.27 - 41.03	33.66	15.12	21.56	6.44
6.	Grain yield per plant (g)	2.33 - 8.55	5.63	3.68	3.88	0.19
7.	Straw yield per plant (g)	9.75 - 25.33	17.61	18.65	22.79	4.13
8.	Days to maturity	121.66 - 145.33	135.03	28.94	39.35	10.41
9.	1000 seed weight (g)	1.3 - 2.63	1.80	0.11	0.12	0.084
10.	Protein content (%)	3.5 - 6.73	5.10	0.64	0.80	0.15
11.	Ash content (%)	1.7 - 3.7	2.80	0.25	0.28	0.024
12.	Fat content (%)	2.23 - 4.37	3.44	0.17	0.19	0.01
13.	Ca content (mg)	157.88 - 291.57	222.79	1302.47	1365.95	63.48
14.	Fe content (mg)	4.53 - 7.73	6.70	0.61	0.73	0.11
15.	Zn content (mg)	4.31 - 7.76	6.80	0.45	0.50	0.04
16.	**Fiber content (%)**	**4.06 - 10**	**8.05**	**2.42**	**2.57**	**0.15**

Table.3 GCV%, PCV%, heritability, genetic advance and genetic advance as present of mean of sixteen characters in thirty two genotype of little millet

Sr. No.	Character	GCV%	PCV%	Heritability (broad sense %)	Genetic advance	Genetic advance % of mean
1.	Days to 50% flowering	7.99	8.92	80	15.79	14.75
2.	Plant height at maturity (cm)	7.37	9.73	61	19.63	11.95
3.	Number of productive tillers per plant	22.01	23.24	89	3.08	42.94
4.	Number of branches per panicle	9.21	11.97	59	1.01	14.60
5.	Panicle length (cm)	11.55	13.79	70	6.70	19.92
6.	Grain yield per plant (g)	34.08	34.97	94	3.85	68.42
7.	Straw yield per plant (g)	24.51	27.09	81	8.05	45.69
8.	Days to maturity	3.98	4.64	73	9.50	7.03
9.	1000 seed weight (g)	19.14	19.80	93	0.68	38.11
10.	Protein content (%)	15.69	17.53	80	1.47	28.93
11.	Ash content (%)	18.14	18.98	91	1.00	35.71
12.	Fat content (%)	12.24	12.90	89	0.82	23.91
13.	Ca content (mg)	16.19	16.58	95	72.59	32.58
14.	Fe content (mg)	11.69	12.75	84	1.48	22.07
15.	Zn content (mg)	9.95	10.42	91	1.33	19.60
16.	**Fiber content (%)**	**19.32**	**19.94**	**93**	**3.10**	**38.56**

Fig.1 Heritability (broad sense %) and genetic advance (% of mean) of various quantitative characters of little millet



DF= Days to 50 % flowering	GY= Grain yield per plant (g)	ASH= Ash content (%)	Fiber= Fiber content (%)
PH= Plant height at maturity (cm)	SY= Straw yield per plant (g)	FAT= Fat content (%)	
NOT= Number of productive tillers per plant	DM= Days to maturity	Ca= Calcium content (mg)	
NOB= Number of branches per panicle	TW= 1000 seed weight (g)	Fe= Iron content (mg)	
PL= Panicle length (cm)	Protein= Protein content (%)	Zn= Zinc content (mg)	

Fig.2 Different genotypes of little millet showing difference in panicle shape and size

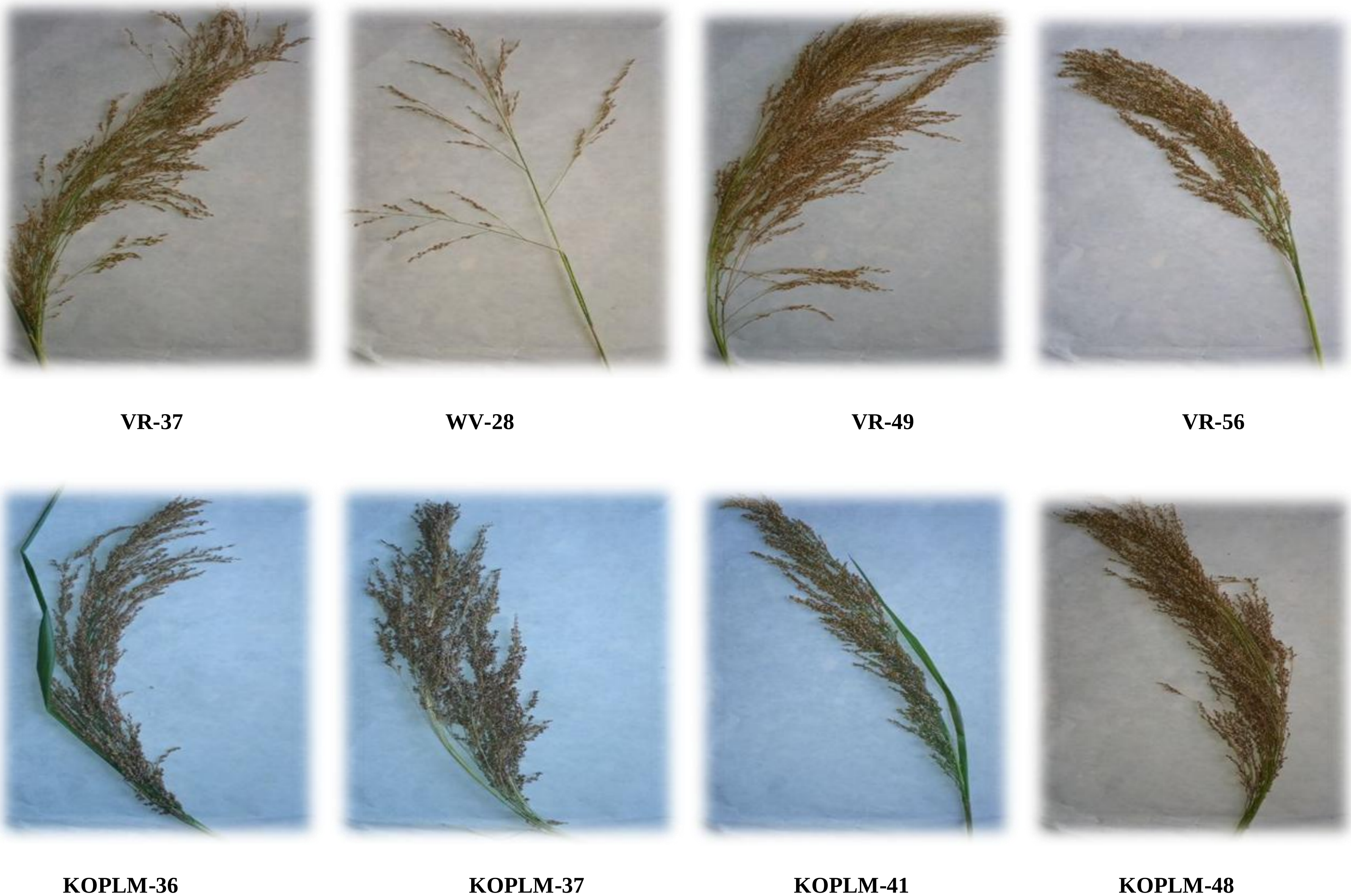
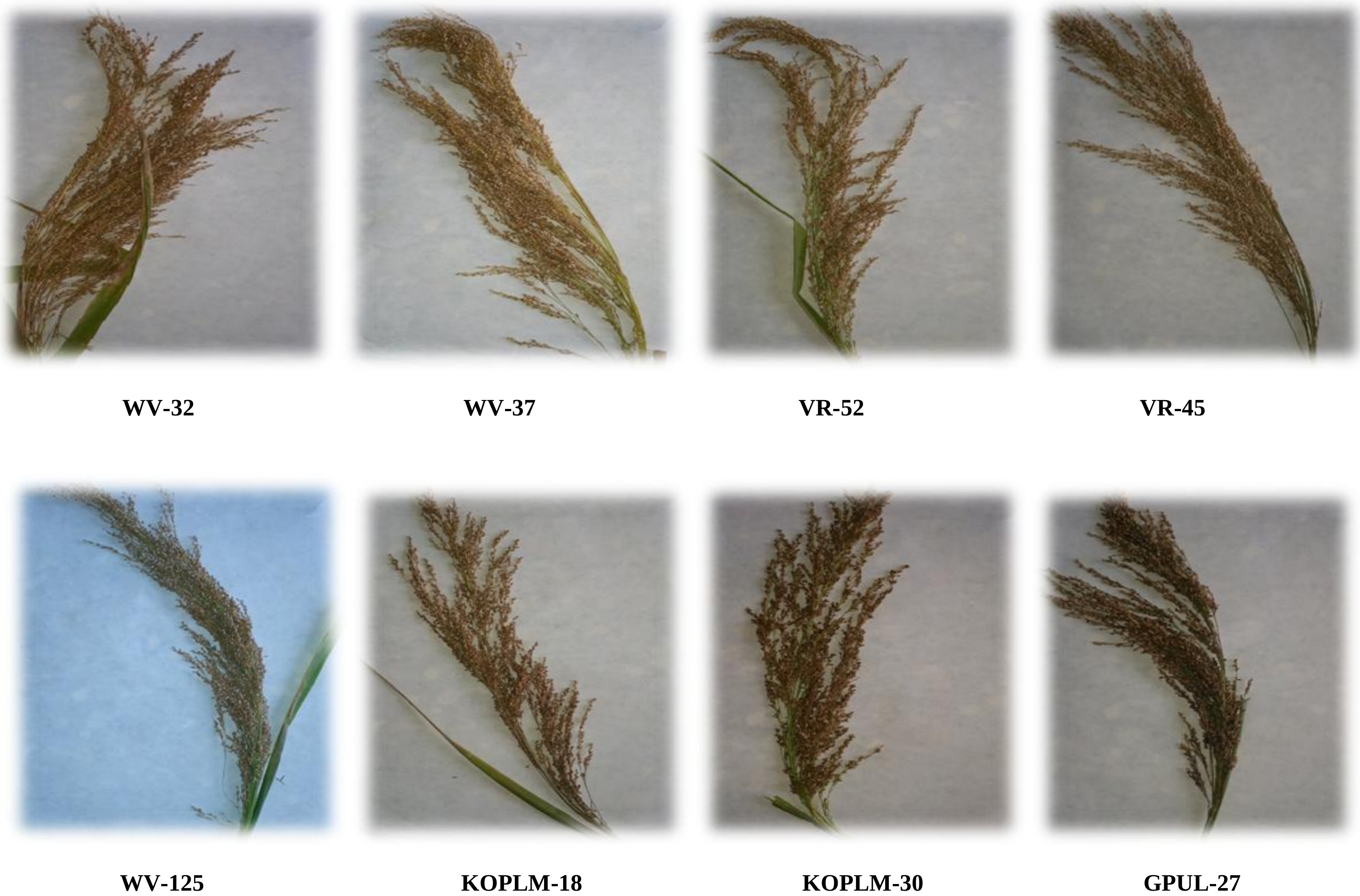


Fig.3 Different genotypes of little millet showing difference in panicle shape and size



Plant height, number of productive tillers per plant, panicle length, grain yield per plant, days to maturity in little millet, while Selvarani and Chandirasekaran (2000) for days to 50 % flowering, plant height, number of productive tillers per plant, grain yield per plant and ear head length; Kebere *et al.,* (2006) days to flowering and finger length; Nirmalakumari *et al.,* (2010) for grain yield per plant; Subramanian *et al.,* (2010) for grain and dry fodder yield per plant; Salini *et al.,* (2010) for days to 50 % flowering, plant height, number of productive tillers per plant, panicle length, grain yield per plant and 1000 seed weight; Ganapathy *et al.,* (2011) for productive tillers per plant and seed yield per plant; Priyadarshini *et al.,* (2011) for plant height, number of productive tillers, seed protein content and grain yield per plant; Dhamdhere *et al.,* (2011) for number of productive tillers per plant, seed yield per plant, days to 50 % flowering, plant height, finger length; Luli *et al.,*(2012) for finger length, days to heading, plant height, 1000 seed weight; Hardari *et al.,* (2012) plant height, finger length and days to 50% flowering; Wolie *et al.,* (2013) for number of productive tillers per plant, 1000 grain weight number of tillers per plant, finger length, days to 50 % flowering; Karad and Patil (2013) for fodder yield per plant, days to 50 % flowering, days to maturity and plant height; Suryanarayana *et al.,* (2014) seed yield plant per plant and main ear head length; Saundaryakumari and Singh (2015) for grain yield per plant, number of tillers per plant, panicle length, days to 50 % flowering, and 1000 grain weight, Das *et al.,* (2017) for grain yield, protein content and calcium content and Devaliya *et al.,* (2018) grain yield per plant, number of productive tillers per plant, straw yield per plant, main ear head length in remaining small millets.

In the present study the high heritability coupled with high genetic advance was observed for number of productive tillers per plant, grain yield per plant, straw yield per plant, 1000 seed weight, protein content, ash content, fat content, calcium content, iron content and fiber content.

It forces to conclude that these characters are governed by additive gene action. Similar results were also obtained by Yadav and Srivastava (1976) for number of tillers per plant, grain yield per plant, straw yield per plant and 100 seed weight; Reddy *et al.,* (1984) for grain yield per plant and straw yield per plant; Selvi *et al.,* (2014) for number of productive tillers per plant, grain yield per plant, straw yield per plant, 1000 seed weight; Ananda *et al.,* (2015) for grain yield; Jyotsna *et al.,* (2016) for grain yield and Anuradha *et al.,*(2017) for number of productive tillers per plant, grain yield per plant in little millet,

While Selvarani and Chandirasekaran (2000) for number of productive tillers per plant, grain yield per plant; Kebere *et al.,* (2006) for days to flowering, finger length; Nirmalakumari *et al.,* (2010) for grain yield per plant; Luli *et al.,* (2012) for grain yield and 1000 grain weight; Salini *et al.,* (2010) for number of productive tillers per plant, grain yield per plant and 1000 seed weight;

Subramanian *et al.,* (2010) for grain yield; Chemda and Gemechu (2010) for productive tillers per plant; Subramanian *et al.,* (2010) for grain and dry fodder yield per plant; Priyadarshini *et al.,* (2011) for number of productive tillers per plant, seed protein content, and single plant grain yield; Ganapathy *et al.,* (2011) for productive tillers per plant and seed yield per plant; Dhamdhere *et al.,* (2011) for number of productive tillers per plant and seed yield per plant; Ulaganathan and Nirmalakumari (2011) for single plant grain yield, productive tillers per plant and 1000 seed weight; Hardari *et al.,* (2012) for grain yield; Wolie *et al.,* (2013) for number of productive tillers per plant and 1000 grain weight; Karad and Patil (2013) for fodder yield per plant; Suryanarayana *et al.*, (2014) for seed yield plant per plant; Saundaryakumari and Singh (2015) for grain yield per plant, number of tillers per plant and 1000 grain weight; Vasadia (2015) for number of productive tillers per plant, straw yield per plant and 1000 seed weight; Das *et al.*, (2017) for grain yield, protein content and calcium content and Devaliya *et al.*, (2018) for grain yield per plant, number of productive tillers per plant, straw yield per plant in remaining small millets.

In general present results indicated that high heritability coupled with high genetic advance as % of mean and moderate to high GCV and PCV were observed for the traits number of tillers per plant, grain yield per plant, straw yield per plant, 1000 seed weight, protein content, ash content, fat content, calcium content, iron content, fiber content indicating these characters are under the control of additive gene effect (Panse, 1957).

Therefore, for further improvement in these traits, mass selection or progeny selection would be worthwhile.

Similar results were reported by Yadav and Srivastava (1976) for straw yield per plant and 100 seed weight; Ananda *et al.*, (2015) for grain yield; Jyotsna *et al.*, (2016) for grain yield; Anuradha *et al.*, (2017) for number of tillers per plant and grain yield per plant and Selvi *et al.*, (2014) for number of tillers per plant, grain yield per plant, straw yield per plant and 1000 seed weight in little millet, while Selvarani and Chandirasekaran (2000) for grain yield per plant; Nirmalakukari *et al.*, (2010) for number of productive tillers per plant, grain yield per plant, panicle length and plant height; Salini *et al.*, (2010) for number of productive tillers per plant, grain yield per plant and 100 seed weight and Das *et al.*, (2017) for grain yield in remaining small millets.

References

Allard, R. W. 1960. "*Principle of Plant Breeding*" John Willey and Sons. New York.

Ananda, C. S., Sahoo, L. P., Mohapatra, K. C. and Patra, C. 2015. Genetic variability and character association in little millet (*Panicum sumatrense*) germplasm collections of (Odisha, India). *Advances in Applied Agricultural Sciences*, 3(1): 40-50.

Anuradha, N., Patro, T. S. S. K., Divya, M., Sandhya, Y. R. and Triveni, U. 2017. Genetic variability, heritability and correlation of quantitative traits in little millet genotypes. *Journal of pharmacognosy and phytochemistry*, 6(6): 489-492.

Burton, G. W. 1952. Quantitative inheritance in grasses. Proc. 6th Int. Grassland Cong.1: 227-287.

Chaudhari, D. R. 2013. Genetic variability, correlation and path analysis in finger millet. M.Sc. Thesis submitted to Navsari Agricultural University, Navsari.

Chemeda, D. and Gemechu, K. 2010. Morpho-agronomic classification of some native and exotic finger millet (*Eleusine corcana* L.) germplasm accessions in Ethiopia. *East African Journal of Sciencies*, 4(1): 20-26.

Chidambaram, S. and Palanisamy, S. 1996. Dry matter production and harvest index in samai (Little millet). *Madras Agric. J.*, 83(11): 15-17.

Das, R., Pandravada, S. R. and Harikrishnan, P. J. 2017. Estimation of grain nutrient and their association with grain yield in finger millet (*Eleusine corcana* (L.) Gaertn). *Plant Achrives*, 17(1): 241-146.

De Wet, J. M. J., Rao, K. E. P., Mengesha, M. H. and Brink, D. E. 1983. Diversity in kodo millet, *Paspalum scrobiculatum*. *Econ. Bot.*, 37: 159–163.

Devaliya, S. D., Singh, M., Intawala, C. G. and Bhagora R. N. 2018. Genetic variability studies in finger millet (*Eleusine coracana* (L.) Gaertn.). *International Journal of Pure and Applied Biosciences*, 6(11): 2319-7706.

Dhamdhere, D. H., Pandey, P. K. and Shrotria, P. K. 2011. Genetic variability, heritability and genetic advance of yield components and mineral nutrients in finger millet (*Eleusine coracana* L. Gaertn). *Pantnagar Journal of Research,* 9: 46-48.

Dhanalakshmi, T. N., Ramesh, S., Ravishankar, C. R., Upadhyaya, H. D. and Mohan Rao, A. 2013. Genetic variability for morpho-agronomic traits in core germplasm collections of finger millet (*Eleusine coracana* Gaertn. (L.) *Global J. of Biology, Agri and health science,* 2(2): 83-85.

Ganapathy, S., Nirmalakumari, A. and Muthiah, A. R. 2011. Genetic variability and interrelationship analysis for economic traits in finger millet germplasm. *World J. Agric. Sci.,* 7(2): 185-188.

Haradari, C., Ugalat. J. and Nagabhushan 2012. A study on Character association, genetic variability and yield components of finger millet (*Eleusine coracana* (L.) *Journal of Crop and Weed*, 8(2): 32-35.

John, K. 2007. Estimates of genetic parameters and character association in fingermillet (*Eleusine coracana* (L.) Gaertin). *Agricultural Sciences Digest*, 27(2): 95-98.

Johnson, H. W., Robinson, H. F. and Comstock, R. E. 1955. Estimates of genetic and environmental variability in soybean. *Agron. J.*, 47: 314-318.

Joshi, V. 2013. Assessment of Genetic Variability and Identification of Genotypes for Different traits in Barnyard millet (*Echinochola spp*.). *International Journal of Agriculture and Food Science Technology*, 4(2): 2249-3050.

Jyotsna, S., Patro, T. S. S. K., Sandh, R. Y., Neeraja, B., Ashok, S. and Triveni, U. 2016. Studies on genetic parameters, character association and path analysis of yield and its components in little millet (*Panicum sumatrense*). *International Journal of Agriculture Sciences,* 8(5): 1018-1020.

Karad, S. R. and Patil, J. V. 2013. Assessment of genetic diversity among finger millet (*Eleusine coracana* L.) genotypes. *International journal of integrative sciences, innovation and technology*, 2(4): 37-43s.

Kebere, B., Prapa, S., Wasana, W. and Vipa, H. 2006. Genetic variation, heritability and path-analysis in Ethiopian finger millet landraces. *Nat. Sci.*, 40: 322-334.

Lule, D., Tesfaye K., Fetene, M. and De, V. S. 2012. Inheritance and association of quantitative traits in finger millet. *International Journal of Genetics*, 2(2): 12-21.

Nirmalakumari, A., Salini, K. and Veerabadhiran, P. 2010. Morphological characterizitation and evaluation of little millet germplasm. *Electronic Journal of Plant Breeding*, 1 (2): 148-155.

Panse, V. G. 1957. Genetic's of quantitative characters in relation to plant breeding, Indian J. of Genetic's. 17:318-328.

Panse, V. G. and Sukhatme, P. V. 1985. Statistical Methods for Agricultural Workers (Second edition), ICAR, New Delhi.

Priyadharshini, C., Nirmalakumari, A., Jhon, J. A., and Raveendran, M. 2011. Genetic variability and trait relationships in finger millet hybrids. *Madras Agric. J.*, 98 (1-3):18-21.

Rachie, K. O. 1975. The millets. Importance, utilization and outlook. *Int. Crops Res. Inst. Semi-Arid Tropics* (ICRISAT publication). Hyderabad, India.

Reddy, H. D., Seetharam, A. and Mallikarjunaradhya, K. 1984. Genetic variability and path analysis in 225 accessions of lettle millet germplasm. *Indian Journal of Agricultural Sciences*, 54(5): 365-369.

Reddy, M. C. V., Reddy, P. V. R. M., Munirathnam, P., Gowada, J. 2013.

Studies of Genetic variability in yield and yield attributing traits of finger millet (*Eleusine coracana* (L.) Gaertn.). *Indian Journal of Agriculture Reaearch*, 47(6): 459-552.

Robinson, H. F., Comstock, R. E. and Harvery, V. H. 1949. Estimates of heritability and degree of dominance in corn. Agronomy Journal, 41: 353-359 Salini, K., Nirmalakumari, A., Muthiah, A. R. and Senthil, N. 2010. Evaluation of proso millet germplasm collections. *Electronic Journal of Plant Breeding*, 1(4): 489-499.

Satish, D., Shanthakumar, G., Salimath, P. M. and Gangaprasad, S. 2003. Character association and path coefficient analysis of grain yield components in finger millet (*Eleusine coracana* (L.) Gaertn.). M. Sc. (Agri.) *Thesis*, University of Agricultural Sciences, Dharwad.

Saundaryakumari and Singh, S. K. 2015. Assessment of genetic diversity in promising finger millet (*Eleusine coracana* L.) genotypes. *The Bioscan*, 10 (2): 825-830.

Selvarani, M. and Chandirasekaran, V. M. 2000. Genetic divergence and variability in barnyard millet (*Echinochloa frumentacea* L.). *Annals of Agricultural Research*, 21(2), 212-215.

Selvi, V. M., Nirmalakumari, A. and Subramanian, A. 2014. Genetics and interrelationships of yield traits for enhancing productivity of little millet. *Electronic Journal of Plant Breeding*, 5(1): 82-86.

Subramanian, A., Nirmalakumari, A. and Veerabadhiran 2010. Trait basedselection of superior kodo millet (*Paspalum scrobiculatum* L.) genotypes. *Electronic Journal of Plant Breeding*, 1(4): 852-855.

Suryanarayana, L., Sekhar, D. and Rao, V. D. 2014. Genetic variability and divergence studies in finger millet (*Eleusine coracana* (L.) Gaertn.). *International Journal of Current Microbiology and Applied Sciences*, 3 (4): 931-936.

Ulaganathan, V. and Nirmalakumari, A. 2011. Genetic variability for yield and yield related traits in finger millet (*Eleusine coracana* (L.) Gaertn) Genotypes. Department of Millets, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore, India.

Upadhyaya, H. D., Vetriventhan, M., Dwivedi, S. L., Pattanashetti, S. K., and Singh, S. K. 2016. “Proso, barnyard, little, and kodo millets,” in Genetic and Genomic Resources for Grain Cereals Improvement. *Frontiers in plant science*, 321-343.

Vasadia, A. H. 2015. Assessment of Genetic Diversity in little millet. (*Panicum miliare* (L.) M.Sc. Thesis submitted to Navsari Agricultural University, Navsari.

Wolieandualem and Dessalegntadesse 2013. Heritability, variance components and genetic advance of some yield and yield related traits in Ethiopian collections of finger millet (*Eleusine corcana* L.) genotypes. *African J. Biotech.*, 12 (36): 5529-5534.

Yadav, A. and Srivastava, D. P. 1976. Genotypic and phenotypic variability in *Panicum miliare* Lam. *Mysore Journal of Agricultural Sciences*, 10: 185-189.

How to cite this article:

Savankumar N. Patel, Harshal E. Patil, Harshalkumar M. Modi and Joydeep Singh Th. 2018. Genetic Variability Study in Little Millet (*Panicum miliare* L.) Genotypes in Relation to Yield and Quality Traits. *Int.J.Curr.Microbiol.App.Sci.* 7(06): 2712-2725.
doi: https://doi.org/10.20546/ijcmas.2018.706.320