International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(1): 409-411
© 2019 IJCS
Received: 14-11-2018
Accepted: 17-12-2018

AA Mehta
Assistant Professor, Department of Forest Products Utilization College of Forestry, Navsari Agricultural University, Navsari, Gujarat, India

LK Behera
Assistant Professor, Department of Silviculture and Agroforestry, College of Forestry, Navsari Agricultural University, Navsari, Gujarat, India

CA Dholariya
SRF, Department of Silviculture and Agroforestry, College of Forestry, Navsari Agricultural University, Navsari, Gujarat, India

MB Tandel
Assistant Professor, Department of Silviculture and Agroforestry, College of Forestry, Navsari Agricultural University, Navsari, Gujarat, India

DB Jadeja
Retd. Professor and head, Department of Silviculture and Agroforestry, College of Forestry, Navsari Agricultural University, Navsari, Gujarat, India

Correspondence
AA Mehta
Assistant Professor, Department of Forest Products Utilization College of Forestry, Navsari Agricultural University, Navsari, Gujarat, India

Genetic variability and correlation study for growth characters among the accessions of safed musli

AA Mehta, LK Behera, CA Dholariya, MB Tandel and DB Jadeja

Abstract
The present investigation was carried out in College of Forestry, Navsari Agricultural University, Navsari, Gujarat to study the genetic variability, heritability, genetic gain, genetic advance and correlation for growth traits among 10 accessions of safed musli (*Chlorophytum borivilianum* Sant. & Fernand). Among different growth parameters, low to medium values for PCV, GCV, ECV, heritability, genetic advance and genetic gain were recorded. Most of the genetic parameters showed comparatively higher values for number of tubers and this trait may be considered while selection of genotypes. Higher values of GCV (18.643%) and genetic gain (31.396 %) were obtained in number of tubers. Other parameters like leaf area and tuber yield also show higher GCV i.e. 18.197 and 15.756, respectively. Number of tubers showed maximum correlation with leaf area (0.870) followed by tuber yield (0.821). Hence, genotype(s) with maximum number of tubers could be used for genetic improvement programme of safed musli in South Gujarat condition.

Keywords: Safed musli, genetic variability, growth characters, heritability

Introduction
Safed musli (*Chlorophytum borivilianum)*, a medicinal plant is known for its use from ancient age. The Indian Pharmacopoeia (1966) has recognized safed musli as one of the 85 drug plants, whose ingredients are used in various pharmaceutical preparations. The National Medicinal Plants Board, set up by the Government of India has ranked safed musli as the 6th among the 28 selected priority medicinal plants, for cultivation and export (Purohit and Prajapathi, 2003; Gayathri and Uma, 2009) [14, 4]. The Board encourages mainstream cultivation of safed musli by farmers by extending a subsidy of 20% through National Horticultural board on project cost (Desale, 2013) [3]. Dried roots of *C. borivilianum*, popularly known as safed musli in trade in India, is considered as wonder drug in Indian system of medicine (Ayurveda, Unani and Siddha) due to its aphrodisiac and sex tonic properties. Because of great therapeutic importance, safed musli roots are the major constituents of more than 100 Ayurvedic formulations (Oudhia, 2000) [11]. Genetic variation is the basis for adaptation and survival of living organisms under changing environmental conditions. Present study was conducted to assess the genetic variability in 10 different accessions of safed musli and estimates the extent of correlations between different plant traits to build up the suitable selection criteria for achieving the desirable high root yielding genotypes of *C. borivilianum*.

Materials and Methods
The present experiment was carried at instructional farm of College of Forestry, Navsari Agricultural University, Navsari. For the study, 10 accessions collected from different parts of India were evaluated for variability in growth and yield parameters. 10 accessions of Safed musli (*Chlorophytum borivilianum*) are C_1- Kalamkhet (Dang, Gujarat), C_2- Melghat (Maharashtra), C_3- JNKVV (Jabalpur, Madhya Pradesh), C_4- Satpuda (Maharastra), C_5- Sahyadri (Maharashtra), C_6- Bhuvadi (Dang, Gujarat), C_7- Rambhas chikar (Dang, Gujarat), C_8- Pratapgarh (Rajasthan), C_9- SFRI (Madhya Pradesh) and C_{10}- Dhar (Madhya Pradesh) were selected for the present study. Before the receipt of monsoon showers, raised beds of 15 cm height and 2 m length and 2 m width were prepared. Different accessions of safed musli fingers (tubers) were planted on raised beds at the spacing of 30cm X 15 cm. Two experiments in sequential year were replicated three times in a randomized block design. Genetic parameters were measured from the mean data of the two year field experiment of safed musli. The different components of variances (genotypic, phenotypic and environmental correlation coefficients) were worked out as per the method given by Singh and Chaudhary (1985) [15].

Coefficient of variation was worked out as suggested by Burton and De-vane (1953) [1] and Pillai and Sinha (1968). Broad sense heritability was calculated as suggested by Burton and De-Vane (1953) [1] and Johnson *et al*. (1955) [6]. Genetic advance was calculated by the formula suggested by Lush (1940) and further used by Burton and De-Vane (1953) [1] and Johnson *et al.* (1955) [6]. Genetic gain was worked out following the method suggested by Johnson *et al.* (1955) [6].

Results and Discussion

In the present study, low to medium values for PCV, GCV, ECV, heritability, genetic advance and genetic gain were recorded among different growth parameters (Table 1). The lower values of ECV than that of both GCV and PCV in important tuber parameters indicate less influence of environment in expression of the trait. It is evident from the table that the estimates of PCV were greater than the GCV for all the traits. The values of GCV were very close to their corresponding PCV values for all the important tuber traits studied which also indicates least influence of environment in the expression of these characters. Most of the genetic parameters showed comparatively higher values for number of tubers (GCV -18.643) and this trait may be considered while selection of genotypes. Other parameters like leaf area and tuber yield also show higher GCV i.e. 18.197 and 15.756, respectively. In case of genetic gain and heritability based on traits with higher values were considered for further selection. Kumar *et al*. (2007) [8] reported values of PCV (23.99), GCV (18.22), heritability (57.7) and genetic advance (2.79) for number of tubers per plant in *safed musli* which is in line with present findings. Jat and Sharma (1996) [5] found that the estimates of the genetic coefficient of variation (GCV), heritability and expected genetic gain were high for all the characters studied on 24 cultures of safed musli. Kothari and Singh (2001) [7] evaluated 10 accessions collected from Maharashtra and Madhya Pradesh states and recorded a wide range of variability in growth and yield-attributing characters. Kumar *et al*. (2007) [8] studied the correlation and path coefficient analysis in *C. borivilianum* and found that for all the characters, phenotypic coefficient of variation (PCV) was equal or slightly greater than genotypic coefficient of variation (GCV) indicating equal role of genotypic as well as environmental effects on the expression of characters. Similar result was obtained by Parveen *et al*. (2011) [12] in 20 seed source of *Asparagus racemosus.* The findings of present study provides sound basis for formulating effective selection strategy while developing high yielding varieties of *C. borivilianum*.

Correlation provides information on the degree and direction of relationship between two or more variables. Selection for yield improvement will be effective if the relationships between the various traits are well established. In a genetic improvement programme, attempts have been made to establish relationship among the traits of economic importance. Correlation among different growth attributes and steroidal saponin in *Safed musli* accessions is given in table 2. Number of tubers showed strong and positive correlation with all the growth and yield parameter whereas it showed positive association with tuber width. It showed maximum correlation with leaf area (0.870) followed by tuber yield (0.821). Therefore from the present finding, it is clear that number of tuber is directly associated with the tuber yield. As leaf area increases it increase positively. This may be due to the increase of photosynthetic area which lead to higher food production and finally more storage in the underground part and thus increase the tuber yield. Tuber yield showed strong and positive correlation with all the growth traits. It did not show any significant relation with the saponin content. Result shows strong association of tuber yield with leaf area and number of tubers. Strong and positive correlation among the traits are worthwhile for indirect selection. Kumar *et al.* (2007) [8] found similar trend of results in tuber yield and other growth parameters of *safed musli*. Kumar *et al*. (2007) [8] further revealed that the partitioning of genetic correlation of fresh root yield with component traits through the path coefficient analysis that the magnitude of direct effects of number of fingers (0.566) and numbers of leaves (0.401) were high and positive towards fresh yield. Therefore they suggested that breeding attention should be paid on these traits. In the present study also these traits were found more effective for tuber yield. Traits under selection are often associated with each other in a very complex way. Correlations between characters have been studied to identify those which are easy to measurement for indirect selection for yield. Various scientist studied the correlation among the important traits of different tuberous plants viz *Coleus forskohlii* by Velmurugan *et al.* (2009) [16], *Gloriosa superba* by Chitra and Rajamani (2010) [16], *Allium cepa* by Marey *et al*. (2012) [10].

Table 1: Estimation of genetic variation in growth attributes among accessions of safed musli

Growth Traits	Genetic parameters					
	ECV (%)	GCV (%)	PCV (%)	Heritability	Genetic Advance	Genetic Gain (%)
PH	12.070	4.231	12.790	0.190	0.910	2.884
CD	9.543	7.280	12.003	0.368	1.248	9.096
NF	10.495	6.301	12.242	0.256	1.172	6.682
FWL	18.985	12.658	22.818	0.308	2.759	14.465
DWL	18.146	8.509	20.041	0.180	0.339	7.442
LA	15.589	18.197	23.961	0.577	11.537	28.468
TL	8.061	8.377	11.626	0.519	9.745	12.436
TW	7.046	3.972	8.089	0.241	0.251	4.018
NT	13.135	18.643	22.805	0.668	3.259	31.396
FWST	5.343	8.368	9.929	0.710	0.235	14.530
DWST	6.647	7.568	10.073	0.565	0.048	11.714
SS	5.718	3.199	6.552	0.238	0.026	3.218
Y	11.828	15.756	19.702	0.640	2.514	25.957

PCV = Phenotypic Coefficient of Variability, ECV = Environment Coefficient of Variability, GCV = Genotypic Coefficient of Variability

PH: Plant height (cm), CD: Collar diameter (mm), NF: Number of leaves per plant, FWL: Fresh weight of leaves (g/ plant), DWL: Dry weight of leaves (g/plant), LA: Leaf area (cm^2), TL: Tuber (finger) length (mm), TW: Tuber (finger) width, NT: Number of tubers (fingers) per plant, FWST : Fresh weight of single tuber, DWST: Dry weight of single tuber, SS : Steroidal Saponin,Y: Tuber yield (g/plant)

Table 2: Correlation among different growth attributes of Safed musli accessions

TRAITS	PH	CD	NL	FWL	DWL	LA	TL	TW	NT	SS	Y
PH	1.000										
CD	0.548**	1.000									
NL	0.387**	0.542**	1.000								
FWL	0.630**	0.674**	0.598**	1.000							
DWL	0.522**	0.680**	0.557**	0.803**	1.000						
LA	0.684**	0.762**	0.587**	0.830**	0.726**	1.000					
TL	0.507**	0.619**	0.298*	0.620**	0.575**	0.731**	1.000				
TW	0.289*	0.264*	0.294*	0.326**	0.412**	0.223	0.017	1.000			
NT	0.583**	0.769**	0.513**	0.705**	0.678**	0.870**	0.630**	0.256*	1.000		
SS	0.055	0.062	0.174	0.005	-0.101	0.043	-0.021	-0.014	-0.008	1.000	
Y	0.595**	0.732**	0.400**	0.595**	0.578**	0.839**	0.691**	0.040	0.821**	-0.018	1.000

** significant at 1% p level , * significant at 5% p level

PH: Plant height (cm), CD: Collar diameter (mm), NF: Number of leaves per plant, FWL: Fresh weight of leaves (g/ plant), DWL: Dry weight of leaves (g/plant), LA: Leaf area (cm^2), TL: Tuber (finger) length (mm), TW: Tuber (finger) width, NT: Number of tubers (fingers) per plant, SS : Steroidal Saponin, Y: Tuber yield (g/plant)

Conclusion

In general result indicates that among different genetic variability, number of tubers was found maximum in GCV, heritability and genetic gain. Similarly significant and positive correlation of number of tubers with leaf area and tuber yield was observed. From the study, it is evident that number of tubers was with maximum genetic variability and showed positive correlation with all the remaining growth characters. Hence, accession(s) with maximum number of tubers could be used for safed musli improvement programme in South Gujarat condition.

Reference

1. Burton GW, De-Vane EW. Estimating heritability in tall Fescue (*Festuca aruandinacea*) from replicated clonal material. Agronomy Journal. 1953; 1:78-81.
2. Chitra R, Rajamiani K. Character association and path analysis in glory lily (*Gloriosa superba* L.). Biometry and Crop Sci. 2010; 5(2):78-82.
3. Desale P. Safed Musli: Herbal Viagra for Male Impotence. Journal of Medicinal Plants Studies. 2013; 1(3):91-97.
4. Gayathri P, Uma D. Enzymic Levels and Its Biological Significance of *Chlorophytum borivillianum*. Madras Agric. J. 2009; 96(1-6):47-49.
5. Jat RD, Sharma GS. Genetic variability and correlation in Safed musli (*Chlorophytum borivilianum*). Journal of Medicinal and Aromatic Plant Sciences. 1996; 18:496-498.
6. Johnson HW, Robinson HF, Comstock RE. Estimates of genetic an environmental variability in soybeans. Agronomy Journal. 1955; 47:314-318.
7. Kothari SK, Singh K. Evaluation of Safed musli (*Chlorophytum borivilianum* Santapau and Fernandes) germplasm. Journal of Spices and Aromatic Crops. 2001; 10:147-149.
8. Kumar B, Verma AK, Singh HP, Mishra HO, Karla A. Correlation and path coefficients analysis in *Chlorophytum borivilianum*. J Trop. Med. Plants. 2007; 8(2):286-290
9. Lush JC. Intersire correlation and regression of offspring on damsana method of estimating heritability character. Proceedings of Amercian Society on Animal Production. 1940; 33:293-301.
10. Marey RA, Abo-Dahab AMA, Karam SS, Geries LSM. Phenotypic correlation and path coefficient analysis in some onion genotypes grown in upper Egypt. J Agric. Res. Kafer El-Sheikh Univ. 2012; 38(1):154.
11. Oudhia P. Problems perceived by safed musli (*Chlorophytum borivilianum*) growers of Chhattisgarh (India) region: A study. J Med. Arom. Plant Sci. 2000; 22(4A)&23(1A):396-399.
12. Parveen, Kumar A, Ginwal HS. Genetic evaluation of twenty seed sources of Asparagus racemosus. Journal of Forestry Research. 2011; 22(1):39-42
13. Pillai SK, Sinha HC. Statistical methods for biological workers. Ram Prasad and Sons, Agra. 1968, 241-245.
14. Purohit SS, Prajapati ND. Agro's Colour Atlas of Medicinal Plants, Agrobios publications, Jodhpur, 2003, 43.
15. Singh RK, Chaudhary BD. Biometrical Methods in Quantitative Genetic Analysis. Kalyani Publisher, New Delhi, 1985, 310.
16. Velmurugan M, Rajamani K, Paramaguru P, Gnanam R, Bapu JRK. Studies on correlation and path analysis in mutants of Coleus (*Coleus forskohlii* Briq.) for yield and forskolin content in V2M1 generation. J Hort. Sci. 2009; 4(1):63-67.