Original Research Article

Genetic variability formulberry fruit traitsin different mulberry accessions (*Morus* spp.)

Abstract

The present study comprised of thirty- seven mulberry accessions. There are large differences were observed between the minimum and maximum range during rainy season and winter season. Phenotypic coefficient of variation (PCV %) was found to be higher than the respective genotypic coefficient of variation (GCV %) for all the characters denoting variability among genotypes in both the seasons. Estimates of phenotypic and genotypic coefficient of variations were high for fruit weight105.64, 105.60%) and (70.09, 69.98 %) followed by number of seeds per fruits (58.47, 55.86%) and no. of fruits per fruits (38.45, 38.31%) in rainy season respectively. Maximum heritability was observed for fruit weight (99.92) during rainy season and in winter season P^H of mulberry fruit juicerecorded maximum heritability (99.93 %). Highest genetic advance was recorded for number of fruits per plant (898.09) and (790.28) during rainy and winter respectively.High heritability coupled with high genetic advance as percent of mean in respect of No. of days required for fruit formation, fruit length(cm), fruit width(cm), No. of fruits/plant, No. of fruits/plant, P^H of mulberry fruit juice, Number of seeds per fruits and germination per cent of seed per fruit was observed in rainy and winter seasons.

Key words: Mulberry, Accessions, Genetic variability, Rainy, Winter season.

1. Introduction

"The mulberry, *Morus* spp. (Urticales: Moraceae), a deciduous and perennial plant is cultivated as a primary host plant for rearing domesticated silkworm, *Bombyx mori* L. (Lepidoptera: Bombycidae) for the production of mulberry silk which contributes to about 80 per cent of all the types of silk being produced in India. India is the second largest producer of raw silk (35,468 MT) out of which 25,345 MT is being contributed by mulberry silk" (Anon.,2018). "Karnataka is considered as pioneering state contributing about 65 per cent with an area of 1,04578 ha under mulberry cultivation"(Anon., 2018)."Though mulberry is primarily grown for the purpose of rearing silkworms to produce silk, however some value-added products such as mulberry fruit.Mulberry fruit is known for its delicious taste and medicinal properties. It is consumed fresh as well as in dry state and has unique nutritional value among the fruits"(Anonymous, 2001)."These fruits provide proteins, carbohydrates, vitamins and mineral nutrients. Mulberry fruits are rich in sugar, glucose, sucrose, carotenes, tartaric acid *etc.*, and are used for curing sore throat, fever, dyspepsia and melancholia"(Singh, 1992, Giusti, 2003)."It can also provide cardio-vascular protection, immune enhancement, antiviral, anti-inflammatory activity and stress reduction as potential health benefits"(Kumaresan *et al*., 2008).**"**Fresh mulberries are an excellent source of vitamin C (36.4 mg/100 g, about 61 per cent of RDI), which is also a powerful natural antioxidant. In addition, anthocyanin pigment can be extracted from the berries for use as a natural dye and as a food colourant in food industry thereby preventing the hazardous health effect of chemicals. Since, mulberry is grown for its foliage, breeding work related to fruit yield and its quality is limited. Mulberry fruit has been increasingly evaluated as desirable trait for use in fresh and processed food and industry. Further, mulberry varieties suited to mulberry fruit production remains to be addressed" (Kumaresan et al., 2008). The genetic improvement of any fruit species depends on the availability of genetic variability in germplasm. Selection of suitable genotypes from gene pool requires a thorough knowledge on fruit characters of different genotypes for utilizing them in hybridization studies.Hence, the present investigation was carried out to generate information on fruits of different mulberry accessions.

2. Material and methods

2.1 Experimental site and environment

The study was conducted during rainy season and winter seasonof 2019- 2020 at the Department of Sericulture, UAS, Gandhi Krishi Vignana Kendra, Bangalore. The type of soil is clay loam. The field is located at a latitude of 13˚08' north, the longitude of 78˚08'east and at an altitude of 918 m above mean sea level in the Eastern Dry Zone (Zone-5) of Karnataka.

2.2 Experimental material

The experimental material for the present study comprised of thirty- seven mulberry accessions which contains indigeneous, exotic and local species were used for to study fruit traits. These mulberry accessions maintained at Department of Sericulture, UAS, GKVK, Bangalore. Each mulberry accession was planted in one row with four plants with spacing of 2.4 x 2.5 m. These accessions were planted during 2006. The experiment was conducted in two seasons *viz.*, rainy and winter seasons of 2019 to 2020. These accessions are being maintained with all the recommended practices like weeding, fertilizer application is followed as per the package of practices for rain fed mulberry **(**Dandin and Giridhar, 2014).

2.3 Statistical analysis and estimation of genetic parameters

The analysis of variance for ninefruit characters was carried out using mean data to assess the genetic variability among different accessions as given by Sundara raj *et al.* (1972). The level of significance was tested at 5% and at 1% using F-test.The phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV) was estimated as suggested by Burton and De vane (1953). Heritability and genetic gain were calculated by following Lush *et al*., (1945) and Johnson *et al*., (1955) respectively.

2.4 Estimation of genetic variability parameters

The mean is the arithmetic average and is obtained when the sum of the values of individuals in the data is separated by the number of individuals in the data.

Variability The genotypic and phenotypic components of variance estimated by applying the formula by Cochran and Cox (1957).

Genotypic variance($\sigma^2 g$)$= \frac{\text{MSS (genotypes) - MSS (error)}}{\text{Number of replications}}$

Phenotypic variance($\sigma^2 p$) = Genotypic variance + MSS (error)

Where, $\sigma^2 g$ = Genotypic variance

$\sigma^2 p$ = phenotypic variance

MSS = Mean sum of squares

Me = Error mean square ($\sigma^2 e$)

However, the genotypic coefficient of variation (GCV) and phenotypic. coefficient of variation (PCV) in percentage was calculated according to Burton and De vane, 1953.

a. Genotypic coefficient of variability (GCV)

$$\text{GCV\%} = \frac{\sqrt{\text{Genotypic variance}}}{\text{Grand mean}} \times 100$$

b. Phenotypic coefficient of variability (PCV)

$$\text{PCV\%} = \frac{\sqrt{\text{Phenotypic variance}}}{\text{Grand mean}} \times 100$$

The estimates of GCV and PCV were classified as low, moderate, and high according to Robinson *et al*. (1949) and as shown below:

<10% -low 10-20%- moderate >20%- High

Heritability(h^2)

Heritability(h^2) estimates (Broad sense) for vegetative, reproductive and fruit components were calculated based on the ratio of genotypic variance to the phenotypic variance and was expressed in percentage. This was assessed by using the following formula given by Hanson *et al*. (1956).

$$h^2(\%) = \frac{\sigma^2 g}{\sigma^2 p} \times 100$$

Where, σ^2g and σ^2p are genotypic and phenotypic variance, respectively.

The broad sense heritability estimates were classified as low, moderate and high as follows:

0-30%- low   30-60%- moderate   >60%- High

Genetic advance (GA)

Genetic advance was estimated by using the method suggested by Johnson *et al.*,1955 and the formula is:

$$GA = h^2 \text{ x } k \text{ x } \sigma p$$

Where,GA =Genetic advance,

h^2 = heritability estimate

K= selection differential which is equal to 2.06 at 5% intensity of selection

σp= phenotypic standard deviation

Genetic advance as percentage over mean (GAM)

Genetic advance mean per genetic gain expressed as the per cent ratio of genetic advance and population mean was calculated by the method given by Johnson *et al.* (1955). GAM was reported as a percentage of mean and it was calculated as follows;

$$GAM = \frac{G.\ A}{\bar{X}} \times 100$$

The GAM was categorized according to Johnson *et al*. (1955)

0-10%-low;   10-20%-moderate;   20-30%-high

3. Results and discussion

3.1 Analysis of Variance and Genetic Variability Parameters for mulberry fruit Traits during Rainy Season

The mean sum of squares due to mulberry accessions for different fruit traits*viz*., fruit length, fruit width, fruit weight per five fruits, number of fruits per branch, number of fruits per plant, number of seeds per fruit, number of days required for fruit formation, germination per cent of seed per fruit, p^H of mulberry fruit juice showed highly significant differences among the accessions during rainy season except for the fruit length are represented in Table 1. This indicated the presence of adequate amount of variability in respect of all characters among the accessions studied.

The estimates of genetic parameters for different traits revealed that the range in mean values does not reflect the total variance in the traits studied amongst all the genotypes. There are large differences were observed between the minimum and maximum range. Hence, actual variance has to be estimated for the characters to know the extent of existing variability. The genotypic variance measures the magnitude of genetic variability present in the crop and phenotypic variance indicates the amount of variation which is due to the phenotypic values (Table2).

Phenotypic variations were high as compared to genotypic variation for all traits studied. Genotypic variance was maximum in number of fruits per plant (5240.21) followed by fruit weight (244.28), germination per cent of seed per fruit (204.09), number of seeds per fruit (45.8), number of fruits per branch (5.15), number of days required for fruit formation (5.03), fruit width (0.49) and p^H of mulberry fruit juice (0.26), while fruit length (0.13) showed least genotypic variance.Phenotypic variance was maximum in number of fruits per plant (5279.67) followed by fruit weight (244.47), germination per cent of seed per fruit (285.49), number of seeds per fruit (52.34), number of days required for fruit formation (6.62), number of fruits per branch (6.54), fruit width (0.54) and p^H of mulberry fruit juice (0.26), while fruit length (0.18) showed least genotypic variance.Genetic analysis of genotypes suggested greater phenotypic and genotypic variability among the accessions and sensitiveness of the attributes for making future improvement through selection. PCV was higher than the respective GCV for all the characters denoting environmental factors influencing their expression to some degree or other.The present results are line with earlier studies ofMishra *et al*. (2015).

Estimates of genotypic and phenotypic coefficient of variation were high for fruit weight (105.60, 105.64%) followed by number of fruits per plant (38.31, 38.45%), number of seeds per fruit (33.68, 36.01%), number of fruits per branch (29.47, 33.21%), germination per cent of seed per fruit (28.73, 33.98%) and fruit width (27.59, 28.95%). Moderate genotypic and phenotypic coefficient of variation were estimated for number of days required for fruit formation (11.26, 12.92%) and fruit length (13.68, 16.26%). Whereas lowest genotypic and phenotypic coefficient of variation were estimates for p^H of mulberry fruit juice (9.57, 9.59%).

High heritability percentage was observed for number of days required for fruit formation, fruit length, fruit width,number of fruits per branch, number of fruits per plantfruit weight, p^H of mulberry fruit juice,number of seeds per fruit, germination per cent of seed per fruitdue to major role of genetic constitution in the expression of the character.

High genetic advance was recorded in number of fruits per plant (898.09) followed by germination per cent of seed per fruit (208.84), fruit weight (193.25), number of seeds per fruit (89.42), number of fruits per branch (31.60), number of days required for fruit formation (25.15), fruit width (9.12), pH of mulberry fruit juice (6.35) and fruit length (5.36) were observed. High heritability coupled with high genetic advance as percent of mean in respect of number of days required for fruit formation, fruit length, fruit width, number of fruits per branch, number of fruits per plant, fruit weight, pH of mulberry fruit juice, number of seeds per fruits and germination per cent of seed per fruit was observed this may be due to additive gene action. Rai *et al*. (2016) estimated genetic variability among 56 genotypes of tomato. Analysis of coefficient of variation revealed that, the magnitude of phenotypic coefficient of variation was slightly higher than the genotypic coefficient of variation for all the studied traits. Further, high estimates of heritability and genetic gain were recorded for number of fruits per plant, average fruit weight, fruit yield per plant. Thereby, suggesting that straight selection for these traits may bring worthwhile improvement in identifying superior genotypes.

Table 1:Analysis of variance for fruit traits of 37 female mulberry accessions during rainy season

Mean sum of squares								
Source of variation	**d.f.**	**No. of days required for fruit formation**	**Fruit length (cm)**	**Fruit width (cm)**	**No. of fruits/branch**	**No. of fruits/plant**	**Fruit weight (g)**	**Fruit yield/plant (g)**
Replications	2	8.54955**	0.031441**	0.078919**	1.162162**	11.46847**	0.10688**	406428.2
Accessions	36	26.76176**	0.817132 NS	1.042382**	16.29229**	10519.89**	488.752**	514972282.4**
Error	72	1.595846	0.055886	0.054012	1.393644	39.46847	0.19767	16301969.56

Table 1: Contd…

Mean sum of squares				
Source of variation	**d.f**	**P^H of mulberry fruit juice**	**Number of seeds/fruits**	**Germination per cent of seed per fruit**
Replications	2	0.017601**	2.54955**	2.702703**
Accessions	36	1.325208**	98.14565**	489.5896**
Error	72	0.00172	6.54955	81.40641

**Significant at P= 0.05%

Table 2: Mean and genetic variability parameters for fruit traits of mulberry accessions during rainy season

Characters	Mean	Range		GV	PV	EV	GCV (%)	PCV (%)	Heritability (BS) (%)	Genetic advance	GA as % mean
		Min	Max								
No. of days required for fruit formation	19.92	13.33	25.66	5.03	6.62	1.60	11.26	12.92	75.92	25.15	159.75
Fruit length(cm)	2.67	1.71	3.83	0.13	0.18	0.06	13.68	16.26	70.82	5.36	200.98
Fruit width (cm)	2.55	1.71	3.81	0.49	0.54	0.05	27.59	28.95	90.82	9.12	357.82
No. of Fruits/branch	7.7	4.66	12.66	5.15	6.54	1.39	29.47	33.21	78.74	31.60	410.50
No. of Fruits/plant	188.93	82.66	329.33	5240.21	5279.67	39.46	38.31	38.45	99.25	898.09	475.35
Fruit weight (g)	14.8	2.00	45.72	244.28	244.470	0.19	105.60	105.64	99.92	193.25	1305.77
P^H of mulberry fruit juice	5.36	4.16	6.98	0.26	0.26	0.00	9.57	9.59	99.62	6.35	118.63
Number of seeds /fruits	20.09	9.66	35.66	45.8	52.34	6.54	33.68	36.01	87.50	89.42	445.09
Germination per cent of Seed per fruit	49.72	23.66	76.66	204.09	285.49	81.40	28.73	33.98	71.48	208.84	420.03

3.2 Analysis of Variance and Genetic Variability Parameters for mulberry fruit Traits during winter season

The mean sum of squares due to accessions for different fruit parameters *viz*., number of days required for fruit formation, fruit length, fruit width, fruit weight, number of fruits per branch, number of fruits per plant, fruit yield per plant, number of seeds per fruit, germination per cent of seed per fruit, p^H of mulberry fruit juice showed highly significant differences among the accessions during winter season are presented in Table 3. This indicating the presence of adequate amount of variability in respect of all characters among the accessions studied.

It is indicated sufficient variability existed for all these characters and which provide the potential for selection of suitable genotypes having desirable traits for further crop improvement. However, analysis of variance by itself is not enough and conclusive to explain all the inherent genotypic variance in the genotype.

During winter season there are large differences observed between the minimum and maximum range. Hence, actual variance has to be estimated for the characters to know the extent of existing variability. The genotypic variance measures the magnitude of genetic variability present in the crop and phenotypic variance indicates the amount of variation which is due to the phenotypic values presented in Table 4**.** Genotypic variance was maximum in number of fruits per plant (4015.46) followed by fruit weight (101.84), number of seeds per fruit (71.53), germination per cent of seed per fruit (49.85), number of fruits per branch (2.03), number of days required for fruit formation (1.74), p^H of mulberry fruit juice (0.79) and fruit length (0.57). Whereas fruit width (0.24) showed least genotypic variance.Phenotypic variance was maximum in number of fruits per plant (4088.15) followed by fruit weight (102.17), germination per cent of seed per fruit (93.69), number of seeds per fruit (78.38), number of days required for fruit formation (3.21), number of fruits per branch (3.15), p^H of mulberry fruit juice (0.79), and fruit length (0.57), while fruit width (0.28) showed least genotypic variance.Genetic analysis of genotypes suggested greater phenotypic and genotypic variability among the accessions and sensitiveness of the attributes for making future improvement through selection. PCV was higher than the respective GCV for all the characters denoting environmental factors influencing their expression to some degree or other.The present results are line with earlier studies ofMishra *et al*. (2015).

Estimates of genotypic and phenotypic coefficient of variation were high for fruit weight (69.98, 70.09 %) followed bynumber of fruits per plant (48.67, 49.11 %),germination per cent of seed per fruit (55.86, 58.47 %), number of seeds per fruit (33.68, 36.01%), fruit length (31.73, 32.75 %). number of fruits per branch (29.47, 33.21%), and fruit width (26.87, 28.98 %). Moderate genotypic and phenotypic coefficient of variation were estimated for p^H of mulberry fruit juice (17.07, 17.07 %). Whereas lowest genotypic and phenotypic coefficient of variation were estimates for number of days required for fruit formation (4.80, 6.70 %).Similar results were reported byRai *et al*. (2016)high phenotypic and genotypic coefficient of variability were recorded for number of fruits per plant (42.81% and 42.41%), average fruit weight (47.99% and 47.85%), yield per plant (44.62% and 44.12%).

High heritability percentage was observed for fruit length, fruit width, number of fruits per branch, number of fruits per plant, fruit weight,p^H of mulberry fruit juice, number of seeds per fruits. Whereas moderate heritability percentage was recorded for both number of days required for fruit formation and germination per cent of seed per fruit due to major role of genetic constitution in the expression of the character.The present results are line with earlier studies ofMishra *et al*. (2015) the highest estimate of broad sense heritability (H^2) was observed for length of fruit (98.61) fruit yield (98.44) and High heritability estimated was recorded for number of fruits per plant (98.12%), average fruit weight (99.43%).

High genetic advance was recorded in number of fruits per plant (790.28) followed by fruit weight (124.93), germination per cent of seed per fruit (119.63), number of seeds per fruit (109.42), number of days required for fruit formation (22.16), number of fruits per branch (21.95), pH of mulberry fruit juice (11.00), fruit length (9.35) andfruit width (6.59) were observed. The present results are agreement with earlier studies of Mishra *et al*. (2015) and Rai *et al*. (2016)genetic advance was high for number of fruits per plant (86.53%), average fruit weight (98.30%). GAM% was observed highest for dry fruit weight (84.09), followed by volume of fruit (83.39) and fresh fruit weight (79.39).High heritability coupled with high genetic advance as percent of mean in respect fruit length, fruit width, number of fruits per branch, number of fruits per plant, fruit weight, pH of mulberry fruit juiceand number of seeds per fruits was observed this may be due to additive gene action.The results are in line with Rahaman *et al*. (2012), Manna and Paul (2012), Kumar *et al*. (2013), Patel *et al*. (2013), Chadha and Bhusan (2013), Sidhva *et al*. (2014), Khapte and Jansirani (2014), Kumar (2014), Kumar *et al*. (2014) and Prajapati *et al*. (2015), Singh *et al.* (2018), Kumari *et al*. (2020), Akhter *et al*. (2021),and Sahoo*et al*. (2022),

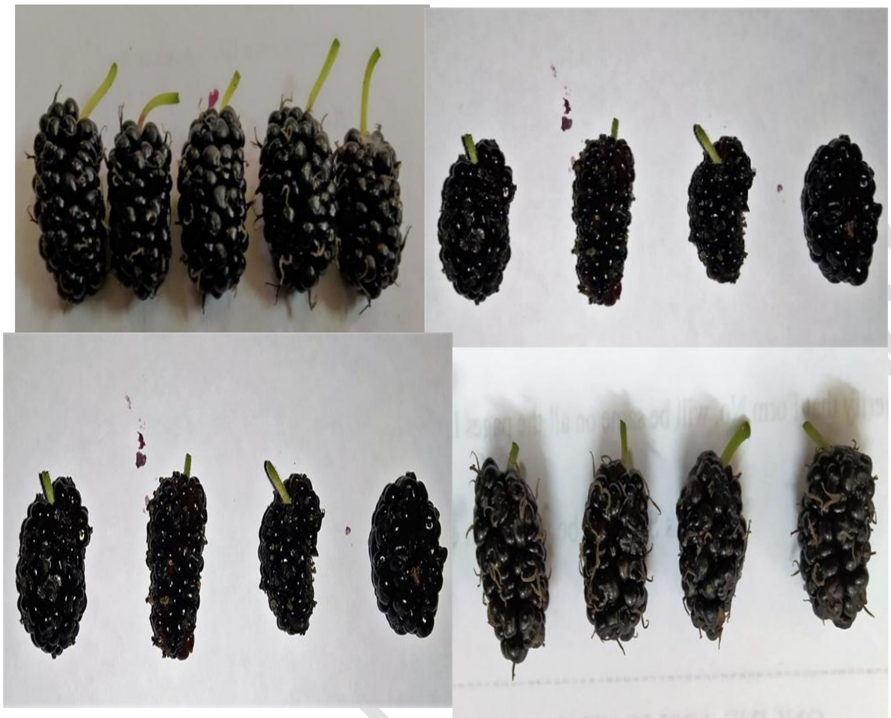

Plate 1: Variation in fruit length and width among 37 mulberry accessions

Table 3: Analysis of variance for fruit traits of 37 female mulberry accessions during winter season

Source of variation	d.f	No. of days required for fruit formation	Fruit length (cm)	Fruit width (cm)	No. of fruits/branch	No. of fruits/plant	Fruit weight (g)	Fruit yield/plant (g)
Replications	2	1.36036**	0.078979**	0.089009**	1.954955**	103.216**	2.372758**	11305.80
Accessions	36	10.1952**	1.110115**	0.535781**	5.195195**	8103.62**	509.5428**	22364553.30
Error	72	1.47147	0.035956	0.041787	1.121622	72.69	0.332331	19893.60

Table 3: Contd…

Mean sum of squares				
Source of variation	**d.f**	**$_P{}^H$ of mulberry fruit juice**	**Number of seeds/fruits**	**Germination per cent of seed per fruit**
Replication	2	0.012684**	0.387387**	54.95495**
Accessions	36	1.585547**	149.9174**	143.5435**
Error	72	0.00275	6.85961	43.84384

**Significant at P= 0.05%

Table 4: Mean and genetic variability parameters for fruit traits for mulberry accessions during winter season

Characters	Mean	Range		GV	PV	EV	GCV (%)	PCV (%)	Heritability (BS) (%)	Genetic advance	GA as % mean
		Min	Max								
No. of days required for fruit formation	26.52	13.33	25.66	1.74	3.21	1.47	4.80	6.70	54.27	22.16	83.56
Fruit length(cm)	2.31	1.33	3.63	0.53	0.57	0.03	31.73	32.75	93.88	9.35	404.85
Fruit width (cm)	1.84	1.03	2.60	0.24	0.28	0.04	26.87	28.98	85.94	6.59	358.29
No. of Fruits/branch	4.14	1.33	6.33	2.03	3.15	1.12	34.45	42.90	64.50	21.95	530.29
No. of Fruits/plant	130.18	23.66	259.66	4015.46	4088.15	72.69	48.67	49.11	98.22	790.28	607.06
Fruit weight (g)	14.42	1.95	48.64	101.84	102.17	0.33	69.98	70.09	99.67	124.93	866.40
P^H of mulberry fruit juice	5.21	3.95	6.61	0.79	0.79	0.00	17.07	17.07	99.93	11.00	211.03
Number of seeds /fruits	15.14	6.66	33.66	71.53	78.38	6.85	55.86	58.47	91.26	109.42	722.76
Germination per cent of Seed per fruit	22.79	13.33	33.33	49.85	93.69	43.84	30.98	42.47	53.20	119.63	524.95

3.3 Correlation studies

3.3.1 Correlation for fruit traits of 71 mulberry accessions during rainy season

During rainy season fruit length is significantly correlated with fruit width (0.85), fruit weight (0.85), number of seeds (0.74), fruit per branch (0.33) and fruit per plant (0.33). Fruit width is significantly correlated with fruit weight (0.76) and fruit weight is significantly correlated with number of seeds (0.38) and fruit per branch (0.38) at 0.05% significant level. Fruit width and fruit weight is negatively correlated with fruit yield. Germination per cent of seed per fruit negatively correlated with Number of seeds per fruit and Number of fruits per branch among different accessions present in the germplasm (Table 5).

Table 5: Correlation for fruit traits of 71 mulberry accessions during rainy season

	X_1	X_2	X_3	X_4	X_5	X_6	X_7
X_1	1.00						
X_2	0.85**	1.00					
X_3	0.74**	0.76**	1.00				
X_4	0.10	0.20	0.26	1.00			
X_5	0.33**	0.30	0.38**	-0.08	1.00		
X_6	0.33**	0.30	0.38**	-0.08	0.06	1.00	
X_7	0.23	-0.01	-0.09	0.26	0.06	0.06	1.00

**significant level at 0.05%

$X_{1=}$ Fruit length, $X_{2=}$ Fruit width, $X_{3=}$ Fruit weight, $X_{4=}$ Germination per cent of seed per fruit, $X_{5=}$ Number of seeds per fruit, $X_{6=}$ No. of Fruits/branch,$X_{7=}$ No. of Fruits/plant

3.3.2 Correlation for fruit traits of 71 mulberry accessions during winter season

During winter season fruit length is significantly correlated with fruit width (0.83), fruit weight (0.80). Fruit width is significantly correlated with fruit weight (0.73). Fruit weight is correlated with Number of seeds per fruits (0.85). Germination per cent is correlated with Number of fruits per plant (0.41). Number of fruits per branch is correlated with number of fruits per plant (0.21) at 0.05% significant level. Fruit length negatively correlated with number of fruits per branch and number of fruits per plant. fruit weight is negatively correlated with fruit yield. Germination per cent of seed per fruit negatively correlated with Number of fruits per branch and Number of fruits per branch among different accessions present in the germplasm (Table 6).

Table 6: Correlation for fruit traits of 71 mulberry accessions during winter season

	X_1	X_2	X_3	X_4	X_5	X_6	X_7
X_1	1.00						
X_2	0.83**	1.00					
X_3	0.80**	0.73**	1.00				
X_4	0.23	0.31	0.22	1.00			
X_5	0.29	0.21	0.41**	0.10	1.00		
X_6	-0.12	0.10	0.05	-0.00	0.06	1.00	
X_7	-0.14	0.06	-0.02	0.21**	0.09	0.32**	1.00

**significant level at 0.05%

$X_{1=}$ Fruit length, $X_{2=}$ Fruit width, $X_{3=}$ Fruit weight, $X_{4=}$ Germination per cent of seed per fruit, $X_{5=}$ Number of seeds per fruit, $X_{6=\text{ No.}}$ of Fruits/branch, $X_{7=}$ No. of Fruits/plant

The above results are supported by the research work of Nisha *et al*. (2018), Fulgence *et al*., (2019) Nasab *et al*. (2020), Mohosina*et al*. (2020),Bhagyalekshmi*et al*. (2020),

Conclusion

The present study indicated that there is adequate genetic variability present in the accessions studied. Based on the studies on genetic variability parameters (broad sense heritability and genetic advance) fruit length, fruit width, number of fruits per branch, number of fruits per plant, fruit weight most important components. fruit length is significantly correlated with fruit width, fruit weight, number of seeds, fruit per branch and fruit per plant. Fruit width is significantly correlated with fruit weight and fruit weight is significantly correlated with number of seeds and fruit per branch. A wide spectrum of genetic variability among the accessions indicated the possibilities of improvement in fruit yield through successful breeding programmes.

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