Evaluation of mulberry germplasmfor growth and yield parameters during different seasons

Abstract

Evaluation of mulberry germplasm for growth and yield parameters was carried out during the rainy and winter seasons of 2019-2020in the Department of Sericulture, University of Agricultural Sciences, GKVK, Bengaluru-65. The experimental material for the present study comprised of Seventy-one mulberry accessions and two check varieties M5 and V1. Among Seventy-one mulberry accessions evaluated the leaf yield of different genotypes differed significantly among different seasons. Among the elite mulberry genotypes, no single genotype was superior in respect of all the traits in different seasons. However, during rainy and winter season MI-232 and MI-143 recorded highest leaf yield.

Key words: Mulberry, Germplasm, Growth, mulberry yield, Rainy season, Winter season

1. INTRODUCTION

Mulberry is the host plant of silkworm (*Bombyx mori* L.) and utilized on a large scale for silk production. It is a perennial plant belonging to the genus *Morus*, family Moraceae, division Magnoliophyta, class Magnoliopsida and comes under the order Urticales. The genesis of mulberry is Indochina and distributed in the lower slopes of Himalayan belt of Indochina up to an elevation of 2100 m above MSL, covering both temperate and subtropical regions of northern hemisphere. Silk production is directly correlated with production of high-quality mulberry leaves. Hence, development of improved mulberry varieties with high leaf productivity and quality is essential for horizontal and vertical growth of sericulture in the country. Breeding activities aiming towards increasing productivity can benefit from a thorough understanding the genetic variability and diversity within the germplasm. Germplasm is a store material for conserving variation among the collection of various accessions, pure lines, varieties *etc*. Biodiversity/germplasm acts as gold mine for plant breeders. Judicious utilization of germplasm resources leads to continous development of bio-resources. Mulberry improvement study has been started in 1960's. Since then, good number of mulberry varieties have been evolved and recommended for commercial cultivation in various sericulture regions of the country. The Genus *Morus* has 68 recognized species

available in different parts of the world. More than twenty species are recorded under the genus *Morus* with four species *viz*., *Morus alba, Morusserrata, Morus indica* and *Morus laevigata* are distributed in India. *Morus indica* L. and *Morus alba* L. are the two commercially cultivated species used for rearing of silkworm in India (Rangaswami *et al*.,1978). Whereas *Morus sinensis, Morus multicaulis, Morus phillippinensis* and *Morus nigra* are the exotic species in India (Sarkar *et al*.,1996). 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).

Mulberry leaf foliage is the only food for the silkworm (*Bombyx mori* L.) and is grown under varied climatic conditions, ranging from temperate to tropical. The present scenario of sericulture industry demands new varieties suitable for various agro climatic conditions. Suitable parent material needs to be identified from large number of germplasm accessions for the purpose (Terefe *et al*., 2018). Once the genotypes with probable contribution of maximum desirable traits are found or developed, testing the same in comparisons with the existing varieties form the second important step in improvement programmes which is termed as evaluation. Evaluation of any crop is a continuous process to evolve new varieties suitable for specific zones for commercial utilization. Three tier system of evaluation as suggested by Dandin (1986) could be used with required modification to suit the local or specific situation. With this background the present study was undertaken to evaluate elite the mulberry genotypes with an objective to study the growth and yield parameters of elite mulberry genotypes. In commercial sericulture, more than 60% of the total cost of cocoon production goes towards mulberry production alone. Hence, in recent years maximum attention has been given for the improvement of mulberry both in terms of quality and quantity. Evaluation is essential to know the genetic potentiality of the materials or the varieties. Evaluation is the most important aspects of germplasm conservation in order to identify parents for the development of improved varieties (Dandin and Giridar, 2010). Appropriate selection of the tropical cultivars based on the plant quality parameters and their effect on growth and cocoon yield parameters of *Bombyx mori* races in different agro-climatic conditions is essential to select and exploit promising cultivars for better sericulture practice(Hosseini *et al*., 2018). The main objective of evaluation of mulberry genetic resources is to promote utilization directly utilization by the breeders for the improvement of programme. In order to achieve such objectives, it is very essential to evaluate mulberry

genetic resources for growth and yield traits. Hence the present studies were undertaken to evaluation of mulberry (*Morus* spp.) accessionsin germplasmin different seasons.

2. MATERIALS AND METHODS

2.1 Experimental Site

The experiment was conducted at Department of Sericulture, University of Agricultural Sciences, GKVK, Bengaluru-65. The experimental site is located between 13°08' N Latitude and 77°58' E Longitude at an altitude of 930 m above mean sea level (MSL) in 2019-2020.

2.2 Genetic Materials

The experimental material for the present study comprised of seventy-one mulberry accessions and two check varieties (M5 and V1) were used.Each accession was planted in one row with four plants with spacing of 2.4 x 2.5 m. The evaluation for growth and yield parameters was conducted during two seasons *viz.*, rainy and winter seasons of the 2019-20. The experimental plot was maintained as per the recommended package of practices for rain-fed mulberry (Dandin and Giridar, 2014). The accessions were evaluated after 45th, 6oth and 70th day after pruning for growth and yield parameters during different seasons.The accessions were evaluated after 45th, 6oth and 70th day after pruning for growth and yield parameters during different seasons.

2.3 Traits Recorded

1. **Plant height (cm)**

The main shoot height was measured using meter scale from the base of the plant to its tip and the average plant height was worked out and expressed in cm.

2. **Number of branches per tree**

The number of shoots were counted from five randomly selected tree under treatment in three replications and the mean was worked out.

3. **Single leaf area (cm^2)**

Leaf area was estimated by measuring the length and breadth of individual leaf from different genotypes and multiplied with factor and expressed in cm^2.

$$SLA = L \times B \times 0.69$$

Where, SLA = Single Leaf Area
L = Length (cm^2)

B = Breadth (cm^2)
0.69 = Correction factorLeaf moisture content (%)

4. Leaf moisture content (%)

Fresh leaf weight and dry leaf weights was taken and the moisture content of leaf was calculated by using the following formula and it is expressed in percentage.

$$\text{Moisture content of leaf} = \frac{\text{Fresh wt (g)} - \text{Dry wt (g)}}{\text{Fresh wt (g)}} \text{X } 100$$

5. Leaf yield per tree (g)

Leaves harvested from different tree mulberry genotypes and their weight was recorded. The average leaf yield per tree was estimated and expressed in grams per tree.

2.4 Statistical Analysis

The accessions were evaluated after 45^{th}, $6o^{th}$ and 70^{th} day after pruning for growth and yield parameters during different seasons. The mean data of each genotype for each season were subjected to statistical analysis (ANOVA).

3. RESULTS AND DISCUSSION

The growthand leaf yield parameters of different elite mulberry genotypes differed significantly during rainy season and winter seasons.No single genotype was superior in respect of all the traits studied.

3.1 Plant height (cm)

Among 71 accessions evaluated, C-776 recorded highest plant height (239.80, 273.70 & 312.06 cm) followed by Srinagar local (234.16, 263.96 & 311.7 cm). The MI-556 recorded lowest plant height of 115.20, 132.53 & 164.5 cm at 45^{th}, 60^{th} and 75^{th} day after pruning respectively during rainy season (Table 1). Whereas during winter season - 1635 recorded highest plant height at 45^{th} and 60^{th} DAP of 193.30 and 236.21 cm respectively, at 75^{th} DAP C-776 (263.30 cm) followed by MI-11 (191.73 cm), V-1 (225.43 cm) and MR-2 (250.56 cm) at 45^{th}, 60^{th} and 75^{th} DAP. At 45^{th}, 60^{th} DAP ME-08 (96.30, 111.83 cm) and 75^{th} DAP Assambola (139.46 cm) recorded lowest plant height (Table 2).

The present results are line with the earlier studies of Mangammal, 2012 who reported among 80 accessions V-1 recorded maximum plant height of 341.00 cm followed by ME-95 (334.67 cm) and S-46 recorded lowest plant height of 174.67 cm.

These results are also agreement with Ahalya *et al*. (2020) evaluated fifteen genotypes among them ME-224 recorded highest plant height (247.50 cm).

3.2 Number of branches per tree

Among 71 accessions evaluated more number of branches per plant were recorded in Srinagar local (79.66) followed by MI-79 (75.66) and MR-2 (65.66). Whereas ME-06 recorded lowest (8.66) number of branches per plantduring rainy season(Table 1).During winter season, more number of branches per plant were observed in C-763 (47.33) followed by ME-224 (43.66) and MR-2 (43.33). Whereas ME-01 recorded less number of branches per plant (5.66)(Table 2).

The present results are line with the earlier studies of Ahalya *et al*. (2020) evaluated fifteen genotypes among them ME-224 was superior in number of branches per plant (62.75). These results are also agreement with Mehraj *et al.* (2023) studied 10 genotypes and the result showed that highest number of shootlets (65.00) was recorded in Goshoerami in winter season.Bhat *et al*. (2023) evaluated forty mulberry accessions the highest number of shoots/ plants was recorded in MI-0845 (27.40).

3.3 Single leaf area (cm^2)

Among 71 accessions evaluatedduring rainy season ME-95 recorded maximum single leaf area of 215.96, 222.26, 273.23 cm^2 at 45^{th}, 60^{th}, 75^{th} DAP respectively, followed by ME-27 (201.80, 210.30, 218.26 cm^2). On other hand C-763 recorded lowest single leaf area of 28.73 cm^2 at 45^{th} DAP and *M. alba* recorded lowest single leaf area of 38.30, 50.36 cm^2 at 60^{th} and 75^{th} DAP, respectively(Table 1).During winter season, ME-27 registered maximum single leaf area (183.63 cm^2, 231.61 cm^2, 246.23 cm^2 at 45^{th}, 60^{th}, 75^{th} DAP, respectively) followed by ME-67 (189.66 cm^2, 211.13 cm^2). Whereas ME-107 recorded minimum single leaf area (22.16 cm^2, 26.65 cm^2, 34.71 cm^2 at 45^{th} 60^{th} 75^{th} DAP respectively(Table 2).

The present results are line with the earlier studies of Ahalya *et al*. (2020) evaluated fifteen genotypes among them MI-143 was superior for single leaf area (292.07cm^2). These results are also agreement with Mehraj *et al.* (2023) studied 10 mulberry genotypes and the result showed significant seasonal variation in single leaf area, Goshoerami recorded highest leaf area (343.65 cm^2) in winter season.Bhat *et al*. (2023) evaluated forty mulberry accessions the maximum leaf area was recorded in MI-0477 (321.51cm^2).

3.4 Leaf moisture content (%)

Among 71 accessions evaluated during rainy season V1 recorded highest leaf moisture content (78.51%) followed by MI-240 (76.06%), C-763 (73.03%), whereas least leaf moisture content was recorded in MI-07 (52.37%)(Table 1).During winter season, MI-169 recorded high leaf moisture content of (72.50%) followed by ME-27 (72.35%), MI-556 (67.78%), whereas less leaf moisture per cent was recorded in ME-185 (15.28%)(Table 2).

These results are also agreement with Vijayashekara 2009, who reported maximum moisture content (79.83%) in V1. Sastry *et al*. **(**1988).This may infer that considerable improvement in mulberry could be achieved through selection based on these parameters.

3.5 Leaf yield per tree (g)

Among 71 accessions evaluated during rainy season MI-232 recorded maximum leaf yield (2975.61g) per plant followed by MI-517 (2752.18g), V1 variety (2408.46g), While ME-08 accession registered lowest leaf yield per plant 235.90g (Table 1). During winter season, MI-143 recorded maximum leaf yield (2908.89g) per plant followed by MI-232 (2267.94 g). Whereas *M. alba* registered least leaf yield per plant (95.46g) (Table 2).

The present results are line with the earlier studies of Ahalya *et al*. (2020) evaluated fifteen genotypes among them the genotype ME-224 was recorded highest leaf yield per plant (2689.3 g) during both rainy and winter seasons. These results are also agreement with Mehraj *et al.* (2023) studied 10 mulberry genotypes and the result showed that Goshoerami was superior in respect of leaf yield per plant (6.75 kg) in winter season.Mangammal**,** 2012 who reported among 80 accessions SB-21 recorded maximum leaf yield (3452.44 g/per).Sori and Gebreselassie, 2016 recorded statistical differences in growth, leaf yield and quality attributes among the genotypes. Generally, Kumbi and M4 genotypes were superior in their growth and yield parameters *viz.*, maximum shoot length, number of leaves and branches, leaf area, internodes length.Thriveni *et al*. (2022) recorded the accessions MI-0946, MI-0945, MI-0953, MI-0948, MI-0935, MI-0948, MI-0936 and MI-0952 were identified as top performers for growth and yield parameters. These accessions may serve as potential parents for the future breeding program.

Table 1: Performance of mulberry accessions in germplasm for different growth and yield parameters during rainy season

Sl. No.	Accessions	Plant height(cm)			NOB	Single leaf area (cm^2)			Leaf moisture content (%)	Leaf yield/ Plant(g)
		45^{th} DAP	60^{th} DAP	75^{th} DAP		45^{th} DAP	60^{th} DAP	75^{th} DAP		
1	ME-O6	158.96	231.73	273.4	8.66	121.42	129.36	137.9	66.17	1355.5
2	ME-01	150.26	232.06	271.06	11.33	52.94	64.26	73.56	65.22	994.43
3	ME-84	184.23	223.03	256.76	25.66	133.32	141.23	155.07	66.27	1604.2
4	ME-27	195.86	215.96	258.90	50.66	201.80	210.3	218.26	69.40	1215.27
5	ME-67	200.46	225.66	255.56	29.33	128.92	134.95	143.36	64.32	1595.79
6	ME-18	186.90	223.06	253.60	34.33	89.70	94.66	108.23	63.91	434.09
7	ME-03	159.66	184.33	228.03	21.33	52.46	58.30	67.63	66.73	515.70
8	ME-52	177.30	211.13	248.56	27.33	125.03	136.26	153.73	65.24	534.92
9	ME-95	228.06	259.53	293.30	17.33	215.96	222.26	237.23	71.12	732.56
10	ME-107	169.60	199.93	231.36	39.33	63.30	70.36	82.66	58.74	552.46
11	ME-05	159.83	188.80	217.06	17.33	62.21	68.43	80.50	67.45	566.23
12	ME-65	200.30	222.60	250.50	27.33	146.03	152.7	158.9	65.24	951.49
13	ME-052	182.86	211.60	239.90	21.66	158.31	165.66	176.7	70.20	1008.16
14	ME-08	119.03	153.80	184.46	34.66	38.07	45.23	56.23	63.28	235.90
15	ME-182	152.06	206.23	227.90	10.33	168.91	176.36	188.34	70.32	458.66
16	ME-228	184.40	233.60	256.36	51.66	86.85	92.16	105.66	71.23	2108.61
17	ME-144	154.96	178.23	229.63	11.33	52.42	59.03	68.06	65.33	530.37
18	ME-224	195.56	234.90	268.20	60.33	53.33	59.3	70.06	65.07	2824.21
19	ME-185	135.90	163.70	189.86	30.33	55.56	61.23	74.73	58.39	422.63
20	MI-07	200.46	225.70	257.43	24.33	73.59	79.3	87.66	52.37	709.95

21	MI-169	154.45	197.80	239.66	9.33	138.87	145.43	162.36	68.52	621.56
22	MI-04	169.03	216.53	247.73	20.33	107.03	112.56	127.13	65.7	531.86
23	MI-11	214.70	252.83	289.43	27.66	125.65	194.60	217.3	66.29	518.2
24	MI-66	159.26	194.70	224.63	20.66	147.17	161.23	176.53	67.54	932.77
25	MI-240	190.00	234.93	258.73	37.66	153.41	160.40	172.23	76.06	1661.67
26	MI-012	185.40	222.86	253.20	38.33	80.88	88.23	108.2	68.04	2364.41
27	MI-79	173.16	236.06	267.53	75.66	68.766	73.70	87.23	67.07	2076.04
28	MI-143	206.40	229.36	254.96	49.33	158.57	165.75	178.43	59.13	666.9
29	MI-47	164.00	217.40	239.36	30.66	61.91	67.56	81.46	60.18	997.00
30	MI-139	173.30	206.13	236.23	46.66	49.29	56.23	68.20	60.57	991.66
31	MI-231	184.96	223.96	249.50	37.66	77.57	85.23	98.96	67.49	1293.73
32	MI-524	162.20	214.93	243.86	25.33	50.50	60.33	74.96	68.39	810.96
33	MI-516	172.40	219.86	250.03	41.66	65.97	72.66	86.76	63.24	1143.06
34	MI-517	192.60	232.81	268.73	52.33	77.66	85.81	151.88	71.34	2752.18
35	MI-506	176.63	244.06	274.36	37.33	63.01	68.20	79.60	70.41	923.08
36	MI-32	167.20	221.13	265.56	24.66	48.79	55.46	69.10	60.92	264.96
37	MI-491	175.60	202.13	242.73	37.33	43.25	50.33	62.93	59.49	1278.56

Table 1: cont…

Sl. No.	Accessions	Plant height(cm)			NOB	Single leaf area(cm^2)			Leaf moisture content (%)	Leaf yield/ Plant(g)
		45^{th} DAP	60^{th} DAP	75^{th} DAP		45^{th} DAP	60^{th} DAP	75^{th} DAP		
38	MI-494	186.83	227.70	256.13	34.66	50.82	57.69	70.36	61.64	572.10
39	MI-0573	170.36	200.16	240.66	18.33	146.07	151.73	165.56	69.32	431.93
40	MI-052	182.90	208.53	233.83	16.66	158.31	165.66	181.96	70.13	540.03
41	MI-556	115.20	132.53	164.50	16.33	129.75	136.70	152.56	67.62	988.97
42	MI-238	196.63	228.3	268.26	43.33	86.50	91.73	100.03	61.33	1593.22
43	MI-232	197.00	226.73	256.43	52.66	89.46	99.64	106.73	68.43	2975.61

44	MI-515	174.06	225.30	256.80	24.66	116.14	126.70	139.6	62.46	532.60
45	Assambola	126.83	153.73	211.73	10.33	47.10	56.63	72.9	45.16	1552.15
46	Srinagar local	234.16	263.96	308.73	79.66	66.56	73.75	85.43	67.18	651.85
47	*M. cathyana*	213.73	254.80	311.7	48.33	56.38	64.23	76.04	63.52	692.97
48	Surat local	182.13	214.83	244.8	15.66	58.39	66.39	76.53	51.86	334.14
49	*M laevigata*	205.03	236.16	269.06	52.33	56.02	66.03	78.66	59.97	851.6
50	*M. macrora*	170.93	202.06	239.80	51.66	74.84	82.53	89.33	61.29	688.43
51	Karanahalli	193.86	223.36	259.70	43.33	121.94	128.10	139.4	64.57	1530.46
52	*M.multicaulis*	183.30	224.30	254.60	41.66	66.57	73.63	89.33	61.29	1056.9
53	*M. alba*	170.10	211.56	244.46	28.33	29.36	38.30	50.36	59.34	577.03
54	*M. indica*	175.36	227.30	259.20	34.33	153.30	163.93	177.99	66.35	1552.82
55	China white	178.20	219.93	244.80	32.33	110.90	118.43	132.2	69.21	1506.06
56	Mysore local	206.30	226.43	265.73	34.33	68.75	126.09	140.4	50.47	1167.66
57	DD/Vishwa	193.46	231.93	259.20	48.33	144.27	152.90	165.5	65.42	2140.93
58	S-13	176.20	212.96	247.33	27.66	95.24	104.50	115.3	66.18	996.33
59	C-776	239.80	273.70	312.06	46.33	129.57	139.16	147.73	60.25	1795.8
60	S-1635	218.53	246.20	274.86	34.66	185.03	199.04	211.23	38.86	1733.33
61	S-54	164.93	228.83	254.66	24.66	99.61	109.37	122.3	61.18	1010.06
62	S-36	202.23	233.20	268.96	52.33	105.25	114.26	126.06	65.20	1227.4
63	DD-1	169.70	209.40	236.10	25.66	117.40	126.62	138.63	71.09	877.6
64	C-763	178.16	211.20	240.20	60.66	28.73	49.16	64.06	73.03	1755.72
65	RFS-135	171.66	222.63	253.4	32.66	70.40	152.64	167.1	66.16	1096.59
66	C-20	182.10	215.46	241.13	31.33	77.51	88.63	105.83	62.57	1305.10
67	S-34	149.60	184.16	239.70	22.33	42.66	71.80	83.30	65.54	1064.6
68	V-1(check)	214.90	247.63	287.66	33.33	90.52	97.53	122.14	78.51	2408.46
69	MR-2	227.90	264.93	305.43	65.66	112.18	120.63	134.93	66.24	976.96
70	M-5(check)	177.16	238.43	270.56	28.33	85.75	95.00	116.23	57.35	852.53
71	T-33	210.60	257.30	293.50	29.33	122.13	129.83	143.33	70.29	1227.18
Mean		181.10	219.43	253.35	33.93	96.19	106.53	120.17	64.41	1268.71
SEm		9.1	10.32	10.51	3.41	7.66	8.27	7.15	1.39	38.87
CD@5%		33.65	38.14	38.82	12.60	28.32	30.54	26.42	5.14	143.57
CV%		5.03	4.7	4.1	10.05	7.97	7.76	5.95	2.16	3.06

DAP-days after pruning, NOB-number of branches

Table 2: Performance of mulberry accessions in germplasm for different growth and yield parameters during winter season

Sl. No.	Accessions	Plant height(cm)			NOB	Single leaf area(cm^2)			Leaf moisture content (%)	Leaf yield/ plant (g)
		45^{th} DAP	60^{th} DAP	75^{th} DAP		45^{th} DAP	60^{th} DAP	75^{th} DAP		
1	ME-O6	120.23	158.80	183.43	6.66	98.17	109.86	115.43	50.25	1007.95
2	ME-01	131.53	139.40	159.21	5.66	42.93	55.36	67.26	42.96	612.94
3	ME-84	124.73	135.83	158.66	26.66	106.86	118.63	126.3	62.80	1229.15
4	ME-27	139.66	154.46	178.91	33.33	183.63	231.61	246.23	72.35	838.35
5	ME-67	143.16	151.46	173.76	25.66	182.86	189. 66	211.13	56.93	1272.17

6	ME-18	156.03	168.10	173.46	22.66	79.31	88.82	101.83	52.39	625.21
7	ME-03	126.2	139.46	164.43	14.66	28.06	34.99	49.25	55.53	305.34
8	ME-52	134.5	153.36	161.10	12.66	92.3	101.86	113.73	55.63	447.52
9	ME-95	178.73	195.86	220.53	8.66	172.51	189.48	199.61	64.99	429.50
10	ME-107	140.63	153.36	168.20	20.33	22.16	26.65	34.71	58.11	307.71
11	ME-05	129.63	157.06	182.20	8.66	58.81	65.16	78.53	57.26	268.29
12	ME-65	140.36	159.26	173.90	14.33	109.53	115.46	121.90	52.26	525.75
13	ME-052	140.36	154.96	174.83	16.33	131.03	140.45	158.86	61.45	600.77
14	ME-08	96.30	111.83	139.50	21.66	25.23	34.9	48.6	42.06	343.28
15	ME-182	147.26	162.61	175.93	7.66	152.26	163.16	178.8	59.73	152.54
16	ME-228	145.4	175.93	197.61	25.33	68.83	73.42	81.86	57.84	268.1
17	ME-144	124.66	154.66	175.83	8.33	48.31	53.72	62.46	56.20	268.11
18	ME-224	166.56	188.91	218.56	43.66	50.63	59.51	67.9	43.10	2200.08
19	ME-185	111.46	134.73	167.16	15.33	29.26	38.76	44.76	15.28	101.503
20	MI-07	186.63	216.86	237.26	9.66	53.81	60.02	66.33	58.36	387.32
21	MI-169	138.73	161.70	194.41	19.33	116.16	123.21	128.73	72.50	390.41
22	MI-04	135.53	147.56	161.16	10.66	91.96	99.06	110.26	58.07	276.14
23	MI-11	191.73	220.33	245.23	36.33	109.06	115.61	121.96	49.33	1714.08
24	MI-66	131.4	161.06	186.21	12.66	111.5	117.56	125.26	67.54	614.31
25	MI-240	161.96	178.60	209.23	19.33	128.03	134.41	140.76	59.40	734.32
26	MI-012	156.3	178.96	209.33	27.33	73.63	79.43	86.86	63.31	1777.44
27	MI-79	132.73	155.86	189.4	34.33	59.06	64.03	70.3	53.75	1848.34
28	MI-143	184.06	216.96	231.41	15.66	124.76	131.41	139.26	57.94	2908.89
29	MI-47	129.16	148.33	175.13	13.66	54.16	61.11	70.71	40.17	669.31
30	MI-139	135.13	152.63	173.41	24.33	42.26	46.64	53.53	59.22	565.89
31	MI-231	138.76	160.90	182.53	13.66	73.83	80.84	108.41	65.47	990.93
32	MI-524	134.36	158.93	180.13	11.33	42.53	63.83	75.13	57.54	420.93
33	MI-516	141.56	158.20	171.71	28.33	54.03	61.58	69.61	54.18	735.30
34	MI-517	144.93	159.66	171.46	24.33	69.73	75.57	81.96	59.6	2208.97
35	MI-506	125.23	144.46	164.33	19.33	52.08	58.43	65.31	62.85	665.46
36	MI-32	130.26	156.76	170.9	11.33	40.13	48.53	55.63	57.09	94.43
37	MI-491	129.7	156.06	168.63	16.33	36.16	43.92	51.4	55.01	1332.17
38	MI-494	155.36	185.36	204.53	15.66	41.21	48.92	56.26	37.26	343.20

Table 2: Cont…

Sl. No.	Accessions	Plant height(cm)			NOB	Single leaf area(cm^2)			Leaf moisture content (%)	Leaf yield/ plant (g)
		45^{th} DAP	60^{th} DAP	75^{th} DAP		45^{th} DAP	60^{th} DAP	75^{th} DAP		
39	MI-0573	129.4	153.73	174.76	12.33	120.53	134.12	146.51	46.50	220.67
40	MI-052	140.36	161.46	187.61	16.33	108.7	116.03	122.33	61.45	277.13
41	MI-556	97.43	126.40	155.33	9.33	122.33	130.23	138.03	67.78	586.56
42	MI-238	163.6	180.30	223.33	18.33	63.43	68.86	76.61	60.82	1023.24

43	MI-232	161.93	182.33	222.61	37.33	79.53	82.61	88.96	41.48	2267.94
44	MI-515	173.93	195.53	233.26	14.66	101.13	116.67	124.91	59.47	231.35
45	Assambola	104.43	124.26	139.46	6.66	26.33	34.98	42.66	44.96	1219.1
46	Srinagar local	184.43	205.31	218.66	42.33	51.61	58.99	65.46	64.09	373.47
47	*M. cathyana*	183.36	209.53	227.21	34.33	41.51	49.33	57.36	44.20	332.21
48	Surat local	141.43	166.13	185.53	8.66	46.81	54.29	61.23	47.99	108.07
49	*M. laevigata*	164.96	190.73	227.71	32.33	45.73	56.02	63.41	47.61	452.86
50	*M. macrora*	124.96	141.06	156.21	32.66	63.56	68.86	75.41	48.42	360.46
51	Karanahalli	160.33	193.91	217.06	13.33	99.43	108.84	115.96	59.58	1271.40
52	*M. multicaulis*	124.96	165.51	180.51	22.66	59.26	67.59	74.73	56.15	774.10
53	*M. alba*	131.76	162.73	178.16	12.33	29.96	34.81	40.45	48.57	95.46
54	*M. indica*	135.96	157.06	174.66	23.33	137.83	145.56	153.41	54.29	1141.95
55	China white	141.40	162.03	183.83	21.66	95.90	116.25	126.13	58.41	1235.24
56	Mysore local	173.33	194.10	213.76	20.33	58.80	66.50	72.41	45.98	892.46
57	DD/Vishwa	149.06	165.86	180.06	24.66	138.53	145.93	152.63	61.26	1764.19
58	S-13	130.80	199.61	227.71	14.66	85.53	91.16	97.71	61.23	1330.53
59	C-776	191.36	223.83	263.30	20.66	120.66	129.31	137.71	60.48	1520.43
60	S-1635	193.30	236.21	256.23	15.66	140.91	156.71	169.93	60.63	1393.02
61	S-54	129.83	157.11	170.03	12.66	91.56	97.88	106.73	55.28	852.7
62	S-36	147.93	168.53	190.03	27.33	97.46	110.12	212.11	57.38	481.31
63	DD-1	139.53	165.56	178.13	13.33	108.76	113.43	122.93	53.83	524.60
64	C-763	139.26	169.83	185.21	47.33	20.63	29.95	36.91	52.01	1333.98
65	RFS-135	133.73	163.73	184.40	22.33	64.53	71.34	76.33	56.27	710.83
66	C-20	134.6	159.31	182.66	18.66	69.06	75.93	84.63	53.53	1112.90
67	S-34	126.4	145.66	169.81	10.66	59.86	66.5	73.71	56.43	1039.20
68	V-1(check)	185.43	225.43	256.70	21.33	80.53	86.86	98.93	59.41	2121.80
69	MR-2	187.36	223.51	250.56	43.33	102.73	113.81	120.73	60.64	475.95
70	M-5(check)	136.73	162.73	186.70	9.33	49.76	57.6	65.76	62.26	1524.68
71	T-33	185.33	228.43	253.5	19.66	114.26	126.96	138.51	60.58	1653.21
Mean		145.71	169.52	191.23	19.75	81.05	89.98	99.04	55.42	872.21
SEm		5.25	7.02	8.85	0.99	7.83	6.47	6.90	1.32	17.11
CD@5%		19.41	25.94	32.70	3.65	28.91	23.89	25.48	4.88	63.18

DAP-days after pruning, NOB-number of branches

4. CONCLUSION

From the present investigation, it is concluded that during rainy season C-776 recorded highest plant height, Srinagar local recorded more number of branches, ME-95 recorded maximum leaf area, V1 recorded maximum leaf moisture content, MI-232 recorded highest leaf yield. In winter season S-1635 recorded plant height, C-763 recorded number of branches, ME-27 registered maximum single leaf area, MI-169 recorded highest leaf moisture content, MI-143 recorded highest leaf yield.

REFERENCES

Ahalya BN, Chikkalingaiah, Mudalagiriyappa, Murali K. Evaluation of elite mulberry genotypes for growth and yield parameters in different seasons. J. Entomol. Zool Stud. 2020; 8(4): 1253-1256.

Anonymous, Central Sericultural Research and Training Institute. 2018; pp.55-72.

Bhat MR, Manimegalai S, Ulaganathan V, Mangammal P, Priyadharshini P, Radha P. Evaluation of mulberry (*Morus*sp) accessions for morphological, growth and yield traits. AATCC Review. 2023; 328-334.

Dandin SB.Mulberry breeding for tropics. In "Lectures on Sericulture". Suriamya publishers, Bangalore. 1986;pp.243.

Dandin SB, GiridharK.Handbook of sericulture technologies, CSB publications. 2010; pp.13.

Hosseini AS, Akramian M, Khadivi A, Arjmand HS. Phenotypic and chemical variation of black mulberry (*Morus nigra*) genotypes. Indian J. Crops Prod. 2018; 117:260–271.

MangammalP. Evaluation of mulberry germplasm for morphological characters and silkworm (*Bombyx mori* L.) rearing parameters. Ph.D. (Seri.) Thesis, UAS, Bangalore. 2012; pp.1-99.

Mehraj S, Mir MR, Ganie NA, Mir SA, Khan FA, Ara S. Evaluation of various mulberry genotypes for yield and yield attributing characters in different seasons under Kashmir climatic conditions. J. Pharma. Innovation. 2023; 12(7): 3103-3105.

RangaswamiG, NarasimhannaMN, Kasiviswanathan K, Sastry CR, Jolly MS. Manual of Sericulture Vol. 1 Mulberry Cultivation, FAO, Rome. 1978; pp.50.

Sarkar A, RekhaM, Kesavacharyulu K. Variability in relative growth rate in mulberry varieties. Ind. J. Plant Physiol. 1996; 9(1): 54-58.

Sastry CR, RajuR, Ravidran S, SusheelammaBN,BongaleUD. Evaluation of improved varieties. Ann. Rept., CSR & TI, Mysore. 1988; pp. 4-1

Sori and Gebreselassie. Evaluation of mulberry (*Morus* spp.) genotypes for growth, leaf yield and quality traits under Southwest Ethiopian condition. 2016; 15 (4): 173-178.

Terefe M, Shifa K, Tilahun A, Ibrahim A, Biratu K, BogaleA.Performance of different mulberry/ *Morus*sp/ genotypes and their effect on mulberry silkworm, *Bombyx mori* (Lepidoptera: Bombycidae), Open Access Journal Agricultural Research. 2018; 3(11):1-7.

Thriveni MC, Deepa S, Thanavendan G, Ravikumar, Sreenivasa BT. Characterization and evaluation of mulberry genetic resources for the identification of promising accessions. Indian J. Plant Genet. Res. 2022; 36(1) 85-95.

VijayashekaraYB, Genetic variation and character association in different accessions of mulberry (*Morus* spp.). M.Sc. (Seri) Thesis, UAS, Bangalore. 2009; pp. 1-57.