

Leaf Growth Parameters and Leaf Biochemical Composition of 17 Elite Mulberry (*Morus* spp.) Genotypes

Hanamant Guled, Anusha H. G., Chikkalingaiah

Received 19 August 2017; Accepted 21 September 2017; Published on 10 October 2017

Abstract Nutritional value of mulberry leaf is a key factor besides environment and technology adaptation for better silkworm cocoon crop. It is a fact that leaf quality differs among mulberry varieties. Quality and quantity of mulberry leaves is highly influenced by varieties, cultivation practices, preservation techniques and age. Nutritional requirement of silkworm larvae vary with maturity of leaves. Since the evaluation of 17 elite mulberry genotypes was carried out V1 and Mysore local varieties were used as check. No single genotype was superior in respect of all the traits studied during rainy seasons. Leaf yield/plant was recorded maximum in Surat local during rainy (3213.06g/plant). Significant positive associations at both phenotypic and genotypic levels were recorded for leaf yield/plant and also for most of the yield contributing traits. The 17 genotypes were studied for leaf biochemical analysis. In rainy season, MR-2 recorded higher moisture content (74.59%), moisture retention capacity of 70.63, 66.35 and 58.64% at 6, 12 and 24 h after harvest, higher crude protein (24.03%), total carbohydrates (22.70%), sugar (14.24%), starch

(11.66%) and total chlorophyll content (3.19 mg/g) compared to other genotypes. Further, lowest biochemical parameters observed in the genotype of MI-524.

Keywords Growth parameters, Mulberry, Genotypes, Leaf biochemical.

Introduction

Mulberry (*Morus* spp.) is the indispensable food for mulberry silkworm *Bombyx mori* L. and is known for its luxuriant growth and development. The improvement in leaf quality and quantity has been directly influence on the cocoon crop and silk quality. Sericulture is mainly depends on mulberry cultivation and silkworm rearing. It is reported that more than 50% of the cost of production of silk is attributed to mulberry leaf production itself. So that cultivation of high yielding quality varieties with high moisture content and higher leaf biochemical composition is very essential to get bumper cocoon yield as well as to develop sericulture industries. It can be achieved by continues research on varieties and screening of genotypes. For developing mulberry varieties, a large number of germplasm have to be characterized and evaluated. Characterization based on qualitative characters is useful in establishing the taxonomic identity. Phenotypic characterization is the first step in the description and classification of the germplasm. Hence the present study was undertaken to know the significance of leaf growth, moisture and biochemical com-

Hanamant Guled*, Anusha H. G., Chikkalingaiah
Department of Sericulture, UAS, GKVK, Bangalore 65,
India
e-mail : guledhanamant89@gmail.com
*Correspondence

Table 1. Performance of different elite mulberry genotypes for different growth and yield parameters during rainy season. **-Significant at 1%, SLA-Single leaf area.

Sl. No.	Genotypes	SLA (cm ²)	100 fresh leaf weight (g)	Leaf yield/plant (g)
1	ME-18	247.13	306.27	1323.33
2	ME-52	348.87	512.77	1441.33
3	Surat local	104.43	202.67	3213.06
4	C-776	225.73	479.83	3121.00
5	Karanahalli	307.47	439.67	2413.67
6	MI-79	143.73	224.13	1567.00
7	MI-0142	160.30	209.50	1765.00
8	C-763	98.40	143.47	1354.00
9	<i>Morus indica</i>	366.73	537.63	3064.00
10	C-20	167.77	302.93	1243.00
11	China white	143.00	241.83	1163.67
12	MR-2	155.70	303.40	1660.00
13	MI-139	152.77	226.73	1182.33
14	MI-524	108.47	215.83	1363.33
15	MI-506	130.97	211.83	1275.00
16	V-1 (Check)	257.60	373.00	1857.33
17	Mysore local	214.93	252.90	1121.67
	<i>F</i> -test	**	**	**
	CD at 5%	5.15	3.62	21.65
	CD at 1%	6.92	4.86	29.10
	SEm ±	1.73	1.21	7.28
	CV%	1.58	0.71	0.73

position of 17 elite mulberry germplasm accessions.

Materials and Methods

The experimental material for the present study comprised of 17 elite mulberry genotypes maintained at Department of Sericulture, USA, GKVK, Bangalore. V1 and Mysore local varieties used as check. All the normal cultural practices like weeding, fertilizer application and pruning were followed as per package of practices for rain fed mulberry genotypes [1]. Pruning was done at four feet height from the ground level. The leaf parameters viz., single leaf area (cm²) leaf yield per plant (g), fresh leaf weight (g), leaf moisture content (%), leaf moisture retention capacity (%) were recorded. The leaves which were harvested after 60 days used for the bio-chemical estimations viz., crude protein (%), total carbohydrates (%), starch (%), sugar (%), chlorophyll a, b (mg/g) and total chlorophyll content (mg/g). The experimental data was statistically analyzed by RCBD for field experiments and CRD for laboratory experiments. Studies on present topic were conducted in rainy season.

Table 2. Moisture content (%) and moisture retention capacity (%) of different elite mulberry genotypes during rainy season. *-Significant at 5%.

Sl. No.	Genotypes	Moisture content (%)	Moisture retention capacity (%) at		
			6h	12h	24h
1	ME-18	64.29	56.13	50.13	43.13
2	ME-52	72.37	63.61	61.46	54.61
3	Surat local	72.15	54.92	41.26	21.46
4	C-776	67.50	56.32	53.15	43.18
5	Karanahalli	68.64	58.43	54.65	41.32
6	MI-79	73.73	68.65	64.35	55.42
7	MI-0142	72.65	64.25	58.95	54.95
8	C-763	70.73	66.46	62.35	52.55
9	<i>Morus indica</i>	73.85	68.54	65.48	60.46
10	C-20	71.32	65.26	46.48	38.64
11	China white	70.74	64.86	60.29	53.64
12	MR-2	74.59	70.63	66.35	58.42
13	MI-139	71.56	66.45	59.48	51.52
14	MI-524	62.24	54.64	48.22	38.24
15	MI-506	63.53	55.63	50.78	44.26
16	V-1 (Check)	76.32	71.43	68.68	62.73
17	Mysore local	69.71	54.62	52.62	43.26
	<i>F</i> -test	*	*	*	*
	SEm ±	1.22	0.97	0.88	0.88
	CD at 5%	0.43	2.79	2.53	2.53
	CV%	1.05	2.70	2.68	3.16

Results and Discussion

The mean growth, leaf parameters of 17 elite mulberry genotypes influenced during rainy season are briefly presented. Among 17 genotypes, *Morus indica* and ME-52 recorded maximum single leaf area of 366.73 cm² and 348.87 cm² respectively, compare to check V1 (257.60 cm²). On the other hand, C-763 recorded lowest single leaf area (98.40 cm²). However, maximum 100 fresh leaf weight of 537.63 g and 512.77 g was recorded in *Morus indica* and ME-52 compare to check V1 (373.00) in addition C-763 recorded least 100 fresh leaf weight (143.47g). Further, Surat local was recorded maximum leaf yield (3213.06 g/per plant) followed by C-776 (3121.00g), *Morus indica* (3064.00g), compared to check V-1 variety (1857.33g/plant). While Mysore local was yielded least leaf yield of 1121.67g/plant. All the 17 genotypes show significant variation in all the growth parameters and agreement with the earlier findings [2—4] (Table 1).

The field data collected on 17 elite mulberry genotypes revealed, significant variation in leaf moisture

Table 3. Biochemical composition of different elite mulberry genotypes during rainy season. *-Significant at 5%.

Sl. No.	Genotypes	Crude protein (%)	Total carbohydrates (%)	Sugar (%)	Starch (%)	Chlorophyll - a (mg/g tissue)	Chlorophyll - b (mg/g tissue)	Total chlorophyll (mg/g tissue)
1	ME-18	21.82	19.42	11.70	10.01	0.62	0.78	2.78
2	ME-52	22.24	22.02	13.13	10.33	0.57	0.77	2.69
3	Surat local	23.36	22.03	13.36	10.43	0.56	0.76	3.11
4	C-776	19.54	17.83	11.22	9.29	0.52	0.72	2.53
5	Karanahalli	20.61	18.67	11.33	9.55	0.55	0.77	3.09
6	MI-79	23.42	22.61	14.11	11.50	0.61	0.78	3.14
7	MI-0142	23.12	22.35	13.29	11.26	0.61	0.77	2.95
8	C-763	20.64	19.52	12.43	9.75	0.52	0.75	2.68
9	<i>Morus indica</i>	23.04	22.21	14.00	10.71	0.63	0.79	3.19
10	C-20	21.28	20.94	12.23	10.23	0.54	0.75	2.66
11	China white	20.83	20.39	12.22	10.21	0.52	0.77	2.76
12	MR-2	24.03	22.70	14.24	11.66	0.59	0.78	2.91
13	MI-139	22.34	21.24	12.74	10.09	0.56	0.73	2.84
14	MI-524	19.37	17.63	10.82	9.01	0.52	0.71	2.51
15	MI-506	21.73	19.72	12.02	9.92	0.53	0.74	2.58
16	V-1 (Check)	24.27	23.06	14.39	11.81	0.58	0.81	3.21
17	Mysore local	22.14	21.18	12.62	10.34	0.56	0.73	2.76
	<i>F</i> -test	*	*	*	*	*	*	*
	SEm $\pm$	0.32	0.25	0.20	0.11	0.01	0.02	0.08
	CD at 5%	0.91	0.71	0.58	0.32	0.02	0.04	0.22
	CV%	2.50	2.07	2.77	1.88	2.29	3.56	4.64

content, moisture retention at 6h, 12h and 24h of observations are briefly presented. The maximum leaf moisture content was recorded in V-1 (76.32%) and minimum in MI-524 (62.24%). The remaining genotypes after V-1 are recorded decreased moisture content viz., MR-2 (74.59%), *Morus indica* (73.85%) and MI-79 (73.73%). The maximum of 71.43, 68.68, 62.73% moisture retention after 6h, 12h and 24 h was recorded for V-1 variety in compare to 70.63, 66.35, 58.64% (MR-2) and 68.65, 64.35, 55.42% (MI-79). The minimum of 54.64, 48.22, 38.24 and 54.92, 41.26, 21.46% moisture retention was recorded in the genotypes MI-524 and Surat local respectively. These significant variations in leaf moisture content, moisture retention are in agreement with [5] (Table 2).

Biochemical constituents of leaf play a vital role in growth and development of silkworm because all the nutrients are supplied to silkworm through leaf. The biochemical composition of elite mulberry genotypes is influenced by rainy season and found significant. The crude protein content (24.27%), total carbohydrate (23.06 %), higher sugar (14.39%) and starch content (11.81%) was recorded significantly

maximum in leaves of check variety V-1. But the decreased trend was recorded in MR-2 (24.03%, 22.61%, 14.24% and 11.66%), MI-79 (23.42%, 22.61%, 14.11% and 11.50%). Whereas, MI-524 was recorded significantly minimum crude protein content (19.37%), total carbohydrate (17.63%), sugar (10.82%) and starch content (9.01%) (Table 3) (Fig. 1).

The chlorophyll-*a* content was found highest in *Morus indica* (0.63 mg/g), followed by ME-18 (0.62 mg/g), MI-79 (0.61 mg/g), MI-0142 (0.61 mg/g) compare to check V-1 (0.58 mg/g) and lowest chlorophyll-*a* content was found same (0.52 mg/g) in the genotypes like C-776, C-763, MI-524. The maximum (0.81 mg/g) and minimum (0.71 mg/g) chlorophyll-*b* content was recorded in the leaves of V-1 and MI-524 respectively. The remaining genotypes after V-1 are recorded decreased chlorophyll-*b* content viz., *Morus indica* (0.79 mg/g), ME-18 (0.78 mg/g), MI-79 (0.78 mg/g), MR-2 (0.78 mg/g).

Total chlorophyll content was significantly found maximum in leaves of V-1 (3.21 mg/g) followed by *Morus indica* (3.19 mg/g), MI-79 (3.14 mg/g) and Surat

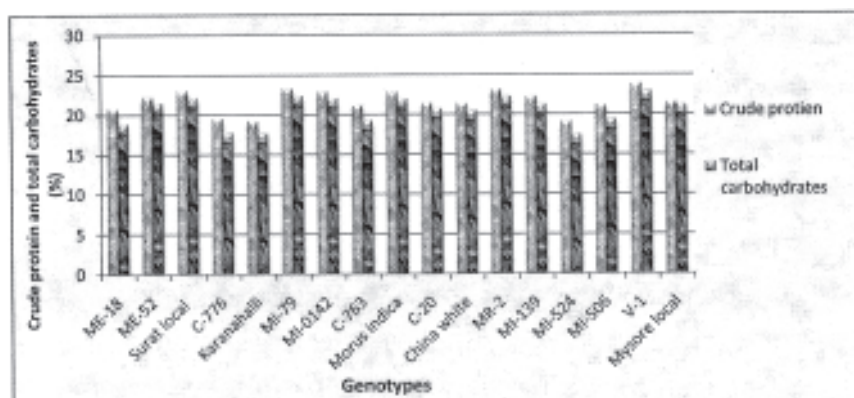


Fig. 1. Crude protein and total carbohydrate content (%) of different elite mulberry genotypes during rainy season.

local (3.11 mg/g), However, it was significantly minimum in leaves of MI-524 (2.51 mg/g) and the next best ones were C-776 (2.53 mg/g) and C-763 (2.68 mg/g). Significant variation in the levels of leaf biochemical constituents may be attributed to age of the leaf, agronomic practices followed, climate, rain fall and leaf lamina as it is reflected in the data. These significant variations in leaf biochemical composition results are in agreement with the earlier findings [6].

Conclusion

Study of growth and yield parameters revealed that during rainy season, Surat local, C-776, *M. indica*, Karanahalli, V-1, MR-2, MI-0142 and MI-79 were found to be superior with respect to leaf yield per plant among the 17 genotypes and V-1, MI-79, MR-2, *M. indica* and MI-0142 maximum leaf moisture content, moisture retention capacity. The 17 elite mulberry genotypes were evaluated through biochemical analysis, the genotypes viz., MI-79, MR-2, *M. indica*, MI-0142 and Surat local had maximum leaf biochemical compositions which are essential for growth and development of silkworm and cocoon production. When these genotypes were compare with commercial check variety V-1, showed minimum leaf biochemical com-

position but give nearest value to the V-1 genotype. Finally it is conclude that, check variety V-1 and other top most genotypes MI-79, MR-2, *M. indica* and MI-0142 were superior for leaf moisture content, moisture retention and leaf biochemical composition.

References

1. Anonymous (2010) www.csb.in
2. Chikkalingaiah, Chinnaswamy KP, Geetha devi T, Venkatesh M (2008) Evaluation of mulberry germplasm for different growth parameters in *Morus indica*. Int conf on trends in Seribiotechnol, Mar 27-29, Ananthapur, pp 4.
3. Ramachandra YL, Padmalatha rai S, Sudeep HV, Sujaganapathy PS, Kavitha BT, Krishna Nurthi NB (2008) Evaluation of leaf quality at different growth stages and maturity levels of selected mulberry varieties. Environ Ecol 26 : 272—276.
4. Vijayashekara YB (2009) Genetic variation and character association in different accessions of mulberry, *Morus* sp. MSc Seri thesis. UAS, Bangalore, India.
5. Mamrutha HM, Mogili T, Jhansi lakshmi K, Rama N, Kosma D, Uday kumar M, Jenks MA, Nataraja KN (2010) Leaf cuticular wax amount and crystal morphology regulate post-harvest water loss in mulberry *Morus* species. Pl Physiol and Biochem 48 : 690—696.
6. Jalaja KS, Ram rao DM (2008) Characterization of seven mulberry genotypes for their leaf quality and bioassay with silkworm *Bombyx mori* L. Sericologia 48 : 85—93.