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Research Article

Study on Variability in Moisture Content and Relative Water Content in Mulberry Lines

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ABSTRACT

Silkworm is monophagus insect and solely depends on mulberry leaf for nutrition. Quality of mulberry has a direct influence on the physiology and growth of the silkworm. Quality of mulberry leaves as single factor contributes about 40 % for the success of silkworm crop. Mulberry leaf moisture content is one of the key constituents determining the quality of the feed. The study conducted on thirty-seven mulberry genotypes for variability in moisture percentage and relative water content in the leaves. Relative water content maximum in MI 516 (98.7 %) and ME-0142 (98.1%) germplasm lines compare to all other lines. To maintain higher RWC levels helps in better cell wall strength and the ability to minimize mechanical damage to the cells. Moisture content in fresh leaf was maximum in ME-143 and MI-494 (77.28%) which were significantly higher than the remaining genotypes including V1 variety. Higher moisture content in mulberry leaves increase digestion ability of the silkworm.

Keywords: *Silkworm, Mulberry leaf, Germplasm, Genotypes*

INTRODUCTION

Mulberry is cultivated either as a bush or a tree for the commercial production of its leaves which are the sole food of silkworms, *Bombyx mori* L (Sengupata & Dandin, 1989). Mulberry plays an important role in the quantity and quality of silk production, and quality of mulberry leaves as single factor contributes about 38.2 to 40 % % for the success of silkworm crop (Miyashita, 1986).The quality of mulberry leaf is influenced by several factors such as variety, agronomic practices, biotic and abiotic components (Krishnaswami et al., 1970). The productivity and profitability of sericulture depends upon healthy and hygienic rearing includes quality leaves, and optimum environmental conditions. The quality of the cocoon harvested depends mainly on the quality of leaves fed during their five stages of larval period. Feeding must satisfy both the appetite of the larvae and its nutritional requirement. Leaf moisture content and moisture retention are reported to have positive influence on the growth of silkworm larvae (Narayana Prakash et al., 1985; Chaluvachari & Bongale, 1995).

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As young silkworms feed on the surface of the mulberry leaves, they require tender, soft and succulent leaves with around 80% moisture and high nutritive value. The late age silkworms require relatively less moisture in leaves, but the leaves should be nutritious. High leaf moisture content of the mulberry genotypes have a positive influence on the growth and development of silkworm. With this background, a study was conducted for the estimation of Relative water content and Moisture content in few lines of mulberry.

MATERIALS AND METHODS

A total of 37 mulberry germplasm collections *viz*., four genotypes, 12 cultivated varieties and 21 germplasm lines collected from CSGRC, Hosur were selected for analysis (Table1). All the accessions were transplanted in a root structure constructed at Department of Crop physiology UAS Bangalore (Fig 1). The spatial dimension of the root structure was designed at 60 feet long, 10 feet wide and 5 feet tall to provide near natural conditions along with irrigation facilities. The crops were grown under prescribed field practices for five to six months and screened for variability in relative water content and Moisture percentage of the leaves.

Relative Water Content: Relative water content (RWC) of leaf discs is quantified according to Barrs and Weatherly (1962). Fresh weight of leaf discs, in triplicates, is recorded from leaf samples and the leaf discs are floated in 10 ml of water for 6 hours and allowed to gain turgidity. Turgid weights are recorded and dried in hot air oven at 80^{o}C to a constant weight to record dry weight. RWC is estimated and expressed in percent using the following formula:

RWC = (Fresh weight – Dry weight)/ (Turgid weight – Dry weight) X 100

Leaf moisture content (%)

Collect the mulberry leaf samples from garden by plucking the lateral branches as a whole. Separate the individual types of leaves record the initial weight of the leaves (Fresh weight) same mulberry leaves in an oven at 100 ºC for 2-3 hours or until complete drying of mulberry leaves. After drying, record the weight of dried mulberry leaves (Dry weight) as final weight. From this observations calculate the per cent age of water in mulberry leaves.

Moisture content (%) = (Fresh weight - Dry weight)/ Fresh weight x 100

Table1: A list if the cultivated varieties and the contrasting germplasm lines to be used for the study

Mulberry varieties	Genotypes	
V1	DW	MI-0158
M5	UP	MI-0510
ML	HL	ME-169
RFS175	MS3	MI-240
DD	**Germplasm lines**	ME-0142
MR2	ME-05	ME-143
S-36	ME-01	MI-233
S-34	ME-27	MI-139
S-41	ME-03	MI -231
AR-12	ME-95	MI-516
S-30	ME-107	MI-32
S-13	MI-494	MI-565
	ME-65	MI-491

Fig. 1: Cultivated varieties and the contrasting germplasm lines in the root structure

RESULTS AND DISCUSSION

Relative water content of leaves were measured and most of the lines recorded more than 90%, ranged between 84.4 in V1 variety to 98.7 % in MI 516 and ME-0142 (98.1%). (Table 2). Normal values of RWC range between 98% in fully turgid transpiring leaves to about 30-40% in severely desiccated and dying leaves, depending on plant species. Since these plants were grown in well-watered conditions, plants were able to maintain significantly higher relative water content in germplasm lines in compare to cultivated popular mulberry varieties and genotypes (Fig 2). The ability of cultivars to maintain RWC levels for longer periods of time may be the result of higher cell wall strengh or the ability to minimize mechanical damage to the cells (Irigoyen, Emerich & Sanchez-Diaz, 1992). It may also indicate a higher level of osmoregulating capacity (Rodriguez-Maribona et al., 1992). Changes in the RWC of leaves are considered a sensitive indicator of drought stress (Henson et al., 1981 van der Mescht, 1989).

Moisture content in fresh leaf was maximum in germplasm lines *viz,* ME-143 (77.28%) , MI-494 (77.28%) followed by MI-516 (77.20%) were significantly higher than the remaining genotypes and popular cultivated variety such as V1 which has of around 72% . whereas, least was observed in case of Mysore local 66.28% (Table 2 and Fig 3). Kurtz (1950) found that the formation of wax, which has been considered to play an important role in the water economy of plants, was proportional to the thickness of the cuticle. Higher moisture content in mulberry leaves is known to increase the amount of ingestion and digestion ability of silkworm as moisture acts as olfactory and gustatory stimulant (Ito, 1963). As indicated by Sujathamma and Dandin (2000), leaves with high moisture remained fresh and acceptable to worms for longer time. For successful rearing the maintenance/retention of sufficient moisture content in the leaves for prolonged periods is of immense importance (Hamamura et al., 1962, Mandal & Krishnaswami 1965).

Table 2: Leaf Moisture and relative water content of Mulberry lines

Genotype	Relative water content (%)	Moisture content (%)
V1	84.40	71.25
M5	87.34	68.16
ML	89.08	66.28
RFS175	91.50	66.65
DD	95.58	71.91
MR2	96.21	67.33
S-36	92.21	70.33
S-34	91.05	71.13
S-41	88.10	70.40
AR-12	90.55	69.40
S-30	92.57	69.33
S-13	86.77	68.86
DW	89.73	68.50
UP	89.10	69.28
HL	94.34	69.08
MS3	84.96	67.76
ME-05	94.93	72.00
ME-01	94.28	69.63
ME-27	95.54	72.94
ME-03	93.54	73.31
ME-95	95.90	72.55
ME-107	95.35	73.13
MI-494	95.33	77.28
ME-65	96.48	73.54
MI-0158	97.49	75.00
MI-0510	96.90	74.16
ME 169	94.50	72.86
MI-240	95.64	75.18
ME-0142	98.10	75.26
ME-143	97.00	77.28
MI-233	96.68	75.34
MI-139	94.34	72.93
MI-231	95.28	76.87
MI-516	98.70	77.20
MI-32	96.83	76.59
MI-565	96.66	76.19
MI-491	95.70	72.69

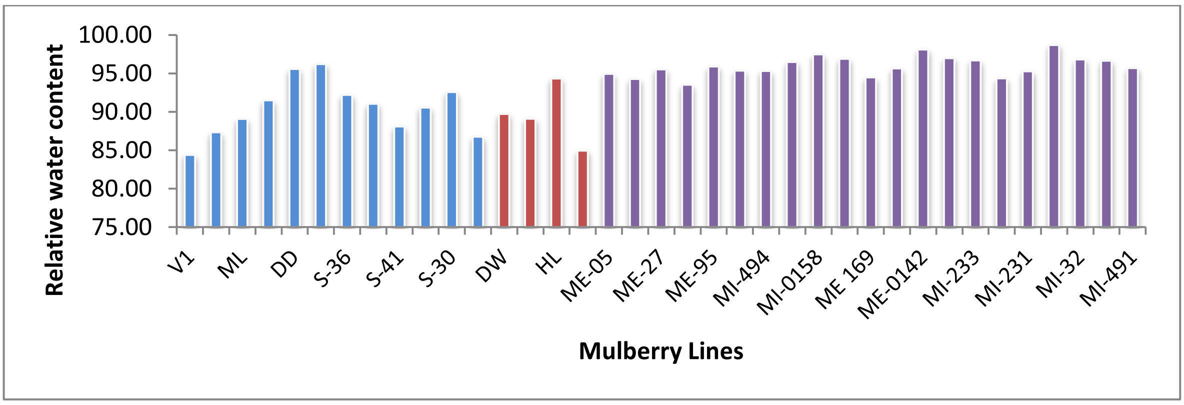

Fig. 2: Relative water content of different lines of mulberry

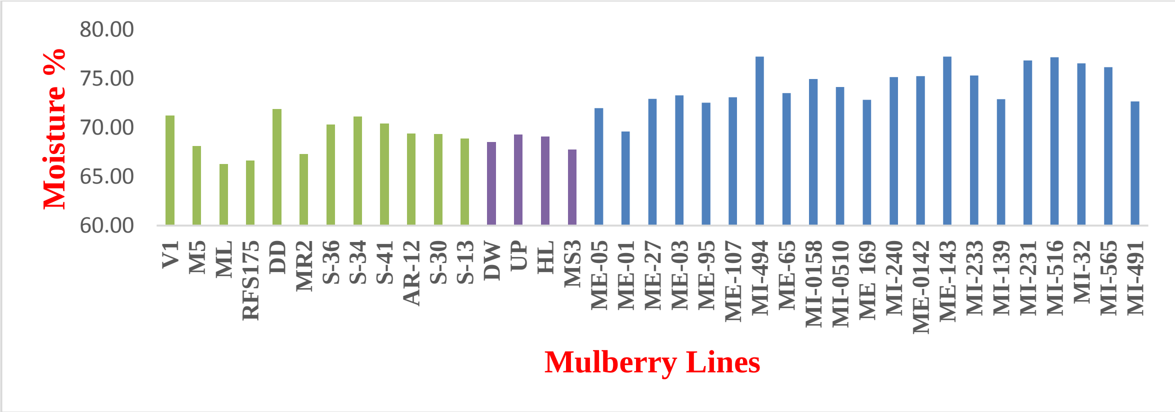

Fig. 3: Moisture content of different lines of mulberry

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