RESEARCH PAPER

Influence of vermicompost on improved mulberry varieties of nutrient status of leaf maturity levels

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The performance of two mulberry varieties namely, M_5 and V_1 was studied under irrigated cultivation during harvests after the single application of vermicompost, @ 8 tonnes/ha without supplementation of any other organic manure and fertilizer so as to study the sustainability 'vermicomposting' in mulberry cultivation under tropical conditions. Six harvests taken after the first time application of vermicompost was followed by second time application 6 tones/ha and four harvests were taken. The leaf protein, sugar and leaf moisture contents of tender, medium, coarse and mulberry maturity levels of the five harvests along with leaf micro nutrient content (Fe, Zn, Cu, Mn and S) at different maturity levels of 1st and V th harvests were computed in respect of varietal performance. The significantly parameters showed high in tender, medium and coarse leaf V_1 variety compared with M_5 variety. The results were statically analyzed and discussed.

Key words **:** Leaf quality, Micronutrients, Mulberry varieties, Vermicompost

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INTRODUCTION

The use of chemical fertilizer and farm yard manure in mulberry cultivation is very essential to get optimum leaf yield and quality. The use vermicompost has become one of the alternatives for different crops plants (Kulkarni *et al.,* 1996). It has been extensively used for last two decades for the growth and high yield in sericulture and agriculture crops. In recent years, FYM and chemical fertilizers have become more expensive and scarce materials, therefore, the use of vermicompost has become one of the alternatives for different crops plants (Kulkarni *et al.,* 1998). Vermicompost is of combined product activity of earth worm like, *Eudrilus eugeniae* and *Eisenia foetida* which play important role to produce more vemicasts and increase various soil microorganism (Kale *et al.,* 1994). This results into significant increase in mulberry production, proper utilization of raw material as organic manure (Rachappaji, 1996) can substantially bring down the expenditure of chemical fertilizer. Through vermicompt technology, there is rapid conversion of organic waste into vermicast, of that compost contains rich nutrients that are applied to mulberry garden to bring down the cost of cultivation as to improve the soil health and mulberry leaf quality. Keeping this aspect in view in present study, an attempt has been made to improve the yield status of the mulberry plant. In view of the importance of soil organic matter contents and higher rates of its depletions especially in the tropics (Tissen *et al*., 1994), studies on the sustainability of organics, managing with two improved verities with different maturity levels were undertaken.

Cocoon crop performance of the silkworm (*Bombyx mori* L.) are influenced by the varietal differences and nutritional quality of mulberry (*Morus* spp.) leaf used as silkworm feed (Bongale and Chaluvachari, 1955; Krishnaswami *et al.,* 1970; Pain, 1961) and by the schedules of manure and fertilizer applications. Review of literature available on the varietal differences and agronomical inputs reveal the need for comprehensive studies concurrently involving chemo and bioassay.

Evaluation of mulberry varieties with varied status of maturity level leaf nutrient is extremely scanty (Purohit and Pava Kumar, 1996). Keeping in view the importance of soil organic matter contents and higher rates of its depletions especially in the tropics (Tissen *et al*., 1994), studies on the sustainability of organic, managing with four improved verities

with different maturity levels were undertaken.

RESEARCH METHODOLOGY

The trial was conducted during August 2009 to October 2010 at Bangalore University, Bangalore at Jnanabharthi Germplasm bank. The sericulture waste from the mulberry garden as well as rearing house was collected and stored in prepared pits, maintaining required 40 to 45 per cent moisture content. After 15 days the partial decomposed material was transferred in to vermicompost pit and two species of earthworm namely, *Eudrilus eugeniae* and *Eisenia foetida,* were realized into pits. After two months, the vermicompost was collected and applied to plants.

A twelve year old field plantation with two high yielding mulberry varieties namely V_1, and M_5 (with two replicate plots each under the RBD) at plant spacing of 90 cm x 90 cm was maintained under general practices of irrigated cultivation (Choudhry and Giridhar, 1947) with annual five harvest schedule. Basal pruning at 30 cm height from the ground was given twice a year (for I, IV, V and VI harvests) under the study with leaf picking method of harvest. The vermicompost was applied at the rate of 8 tonnes/ ha without additional supplementation of nutrients through any manures and fertilizer (as against the recommended dose of 20 tonnes FYM with 300: 120: 120 kg NPK/ha/year). Six harvests were consequently taken and the vermicompost @ 6 tonnes was again added three more harvests were taken as earlier without addition of any other manure or fertilizer.

After 60th day of pruning tender, medium, coarse and over mature leaf, samples were collected separately for the estimation of leaf bio-chemical components. Leaf samples were analyzed for leaf moisture content on fresh weight basis, while total nitrogen (Jackson, 1973), soluble protein (Lowry *et al.,* 1951), sugar (Dubios *et al.,* 1956) were estimated on dry weight basis. Leaf moisture, nitrogen, protein and sugar contents at different maturity levels and the micronutrients are presented in Tables.

RESEARCH FINDINGS AND ANALYSIS

Influence of vermicompost in mulberry varieties was significant observed on different levels which of nutrient in mulberry leaves are presented in Tables 1, 2, 3, 4, 5 and 6 were discussed accordingly.

Table 1: Leaf moisture contents (pooled data of 5 harvests)

Mulberry variety	Leaf moisture content			
	Tender	Medium	Coarse	Over matured
V1	78.73	73.10	72.70	69.61
M5	73.83	71.95	70.68	67.55

Moisture contents:

The moisture content in mulberry leaves in different mulberry varieties vermicompost application revealed Significant differences in V-1 verity. Tender (78.73), medium (73.10), coarse (72.70) and over mature (69.61) comparing with M-5 veriety of tender (73.83), medium (71.83), coarse (70.68) and over mature (67.55) mulberry leaves (Table 1).

Nitrogen contents:

Vermicompost treated mulberry V-1 variety, recorded significantly higher amount of nitrogen in tender (4.60), medium (4.24), coarse (3.98) and over mature (3.28) compared with M-5 verity, in tender (4.48), medium (4.21), coarse(3.81) and over mature (3.38) mulberry leaves (Table 2).

Table 2 : Leaf nitrogen (%) contents (pooled data of 5 harvests)

Mulberry variety	Nitrogen (%) content			
	Tender	Medium	Coarse	Over matured
V1	4.60	4.24	3.98	3.28
M5	4.48	4.21	3.81	3.38

Protein contents:

Vermicompost treated mulberry V-1 variety recorded significantly higher amount of protein content in tender (25.86) medium (23.81), coarse (22.81) and over mature (18.85) compared to M-5 verity, in tender (24.75), medium (20.02), coarse (22.11) and over mature (18.15) mulberry leaves (Table 3).

Table 3 : Leaf protein (%) contents (pooled data of 5 harvests)

Mulberry variety	Leaf protein (%) content			
	Tender	Medium	Coarse	Over matured
V1	25.86	23.81	22.81	18.85
M5	24.75	20.02	22.11	18.15

Sugars contents:

Vermicompost treated mulberry, V-1 variety recorded significantly higher amount of sugars content in tender (12.69), medium (10.84), coarse (10.16) and over mature (9.27) compared to M-5 verity in tender (11.69), medium (10.67), coarse (9.99) and over mature (9.14) mulberry leaves (Table 4).

Table 4 : Leaf sugar (%) contents (pooled data of 5 harvests)

Mulberry variety	Leaf sugar (%) contents			
	Tender	Medium	Coarse	Over matured
V1	12.69	10.84	10.16	9.27
M5	11.69	10.67	9.99	9.14

Nutrients contents (1st harvest):

In vermicompost treated mulberry varieties, Zn, Fe, Cu, Mn and S recorded significantly higher amount of nutrients

Table 5 : Leaf nutrient contents (1st harvest)

Mulberry variety	Tender leaf					Medium leaf					Course leaf				
	Zn	Fe	Cu	Mn	S	Zn	Fe	Cu	Mn	S	Zn	Fe	Cu	Mn	S
V1	33.3	596.3	34.8	53.3	0.12	37.5	610	33.8	76.5	0.11	41.6	470	11.3	61.5	0.09
M5	32.3	531.3	30.0	41.0	0.08	27.8	563	32.5	54.5	0.10	36.2	314	10.0	450.	0.07

(Table 5). V-1 variety, Zn content in tender (33.3), medium (37.5) and coarse (41.6.) and compared with M-5 verity tender (32.3), medium (27.8) and coarse (36.2), nutrient Fe content V-1 variety tender (596.3), medium (610) and coarse (470) and compare with M-5 verity tender (531.3), medium (563) and coarse (314) nutrient Cu content V-1 variety tender (34.8), medium (33.8) and coarse (11.3)and compared with M-5 verity tender (30.0), medium (32.5) and coarse (10.0). Nutrient Mn content of V-1 variety tender (53.3), medium (76.5) and coarse (61.5) compared with M-5 verity tender (41.0), medium (54.5) and coarse (45.0), nutrient S content V-1 variety tender (0.12), medium (0.11) and coarse (0.09) and compared with M-5 verity tender (0.08), medium (0.10) and coarse (0.07) of mulberry leaves.

Nutrients contents (5th harvest):

In vermicompost treated mulberry varieties, Zn, Fe, Cu, Mn and S recorded significantly higher amount of nutrients (Table 6). Zn content of V-1 variety tender (37.8), medium (26.6), and coarse (43.5) and compared with M-5 verity tender (34.5), medium (25.0) and coarse (27.1), nutrient Fe content V-1 variety tender (348), medium (245) and coarse (400) and compared with M-5 verity tender (348), medium (233) and coarse (244), nutrient Cu content V-1 variety tender (18.8), medium (20.0) and coarse (20.0) and compared with M-5 verity tender (11.3), medium (16.3) and coarse (11.3) nutrient Mn content V-1 variety tender (70.5), medium (58.0) and coarse (92.0) and compared with M-5 verity tender (44.5), medium (43.0) and coarse(59.5) , nutrient S content V-1 variety tender (0.15), medium (0.11) and coarse (0.22) and compared with M-5 verity tender (0.12), medium (0.11) and coarse (0.14) of mulberry leaves.

The study revealed that sustainable mulberry production is possible through the application of nutrient rich compost and vermicompost produced out of sericulture farm waste. This further indicates that the sericulture compost is rich in nutrients and helps in enriching soil, thus resulting in high yield and growth. Jadhav *et al.* (1997) reported that application of 2.5-3.5MT/ha of vermicompost, 20-50 per cent of chemical fertilizer could be curtailed, besides getting mulberry yield at par full dose of chemical fertilizer. Significant increase in vermicompost application is conformation with Kale *et al.* (1992) who reported increase in metabolic activity of microbes in the vermicompost. Genotypic differences among mulberry varieties for the leaf quality have been recorded in respect of V-1 and M-5 being superior varieties (Narayan *et al.,* 1966, Krishnaswami *et al.,* 1970, Sengupta *et al.,* 1973, Sarkar *et al.,* 1992). These studies pertain to optimum input levels while in the present study, soil fertility stress was induced with one time applicant of vermicompost alone without supplementation of fertilizers, and delaying the second time application of the vermicmpost for over six harvests with a view to examine the genotype responses. In the present study, the V-1 variety which recorded highest rates of nitrogen contents of tender, medium, coarse and mature levels rate of 8 tonnes/ha. Horie (1980) recorded the optimum levels of dietary protein contents in tender to coarse leaves (25.92 to 20.02%) while, the over mature leaves recorded the values of less than 20 per cent in all the two varieties. Differential rates of depletions in the values of leaf protein contents (being minimum in the M-5 and maximum in V-1 variety) particularly at medium to coarse levels of leaf maturity could be of special values to the silkworm.

Similar leaf differences (among the genotypes) were also recorded with respect to the leaf micronutrient (Zn, Fe, Cu and Mn) and sulphur contents at different maturity levels in the 1st and Vth harvests after the application of 'vermicompost' Since these nutrients play an important role in silkworm nutrition (Sridhar and Bhatt, 1966; Singh *et al*., 1984). Significantly lower values of leaf iron contents in coarse leaf V-1 variety (as also significantly higher values of Mn and S contents in tender leaf) compared to other varities, might also signify the importance of V-1 variety in the context of reported chlorosis of M-5 variety at farmer's field (Bongale, 1985; Bongale *et al*., 1996), and the importance of Fe/Mn rations (higher ratio favouring the chlorosis) reported by Izuka (1985), influence cocoon crop performance which are known to exhibit greater variability with respect to different agro-climatic

Table 6 : Leaf nutrient contents (5th harvest)

Mulberry variety	Tender leaf					Medium leaf					Course leaf				
	Zn	Fe	Cu	Mn	S	Zn	Fe	Cu	Mn	S	Zn	Fe	Cu	Mn	S
V1	37.8	358	18.8	70.5	0.15	26.6	245	20.0	58.0	0.11	43.5	400	20.0	92.0	0.22
M5	34.5	348	11.3	44.5	0.12	25.0	233	16.3	43.0	0.11	27.1	244	11.3	59.5	0.14

regions in Karnataka (Bongale *et al*., 1993). These observations are significant in the performances of the genotypes with respects to leaf quality and rearing.

Conclusion:

It is concluded that in the present study, two varieties (V-1 and M-5) recorded differential performance in respect of leaf quality and bioassay parameters *viz.,* leaf moisture, protein, nitrogen, sugar and nutrients in tender medium, and coarse leaf. InV-1 variety showed higher significantly values compared to M-5 variety. In the overall inference, it is suggested that the 'Vermicompost' could be applied at least once in a year.

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