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ECONOMIC EVALUATION OF ORGANICS ON MULBERRY AND COCOON PRODUCTION – A STUDY

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ABSTRACT
A study was undertaken to work out the economics on the use of varied sources of organic manures (vermicompost, enriched vermicompost, farm yard manure - FYM, coir pith compost, urban solid waste compost and biodigested slurry) on irrigated mulberry (variety V-1) to meet nitrogen requirement (100%) and its impact was studied on silk cocoon production in two silkworm hybrids (PM x CSR-2 and PM x NB_4D_2) during 2004-05. The economics of mulberry production differed considerably when mulberry received nitrogen through varied sources of organic manures. The total cost of mulberry production was less when mulberry received the nitrogen through calcium ammonium nitrate (Rs. 51,873 / ha / year). The total cost was more with coir pith compost (Rs. 76,285). Similarly, B:C ratio was higher with recommended FYM and NPK (2.65:1) together with vermicompost and enriched vermicompost (1.96:1). The cost and returns from cocoon production differed notably when the silkworms (PM x CSR-2 and PM x NB_4D_2) nourished with mulberry obtained by applying different sources of organic manures. The total cost of cocoon production was less in recommended FYM and NPK (Rs. 3940 / 100 DFLs) along with vermicompost (100% N) + recommended P and K (Rs. 4270 / 100 DFLs) and enriched vermicompost (100% N) + recommended P and K (Rs. 4290 / 100 DFLs). Further, the trend was same with respect to B:C ratio for PM x CSR-2 (2.53:1, 2.51:1 and 2.46:1) and PM x NB_4D_2 (2.05:1, 1.96:1 and 1.84:1), respectively. The variations observed both in respect of total cost of cocoon production and B:C ratio might be attributed to the variations in cost of leaf production and quantity as well as price of cocoons.

KEY WORDS: Organics, Mulberry, Vermicompost, Cocoon production.

INTRODUCTION
Mulberry (*Morus* spp.) is the sole food plant of the silkworm, *Bombyx mori* L. In addition to monophagous nature, the silkworm requires specific quality of leaves during different phases of its growth and thus it reflects the importance of mulberry cultivation practices. As per Ganga and Sulochana Chetty (1991), the profitability of sericulture depends on the production of quality leaf and its conversion into quality cocoons at economic cost. The cultivation of mulberry to supply leaf as food for silkworm plays key role in the economics of commercial sericulture. It is estimated that about 60 per cent of the cost of cocoon production goes to mulberry leaf production. The National Council of Applied Economics Research indicated that weakness of sericulture industry is reflected in the cost of production of cocoons. The performance of silk industry is reflected by the cost of production of mulberry leaves, silk cocoon and silk yield and returns there from. Keeping this in view, the studies were undertaken to work out the benefit: cast ratio under varied sources of organics on mulberry and cocoon production and the results are reported in this article.

MATERIALS AND METHODS
Economics of mulberry and silk cocoon production were worked out on the efficacy of sources of organic manures (vermicompost, enriched vermicompost, farm yard manure - FYM, coir pith compost, urban solid waste compost and biodigested slurry) on established irrigated V-1 mulberry in the farmers field of Balagere village, Chintamani taluk, Kolar district based on the performance of silkworm. The plots of 5 x 4 m with planting space of 0.9 x 0.9 m with red sandy loam soil were selected for the study during 2004-05. The organic manures were applied to meet 100% nitrogen requirement, while phosphorus and potassium were applied through chemical sources viz., single super phosphate and muriate of potash, respectively @ 340:140:140 NPK kg/ha/year. Soil of the experimental site was subjected for chemical analysis as per the procedure of Jackson (1973). The pH of the soil was 6.68 and organic carbon, N, P and K contents were 0.52%, 242.75 kg/ha, 22.13 kg/ha and 132.46 kg/ha, respectively. The experiment was laid out in Randomized Complete Block Design with three replications. Silkworm feeding trials were conducted using cross breed (PM x CSR-2) silkworm. The leaves grown under different treatments were fed to silkworm from first day till spinning. Two hundred worms were maintained in each replication in individual treatment by adopting Complete Randomized Design. The package of practices for mulberry production and silkworm rearing were followed as per the methods described by Dandin *et al.* (2003).
To study the economics of mulberry and silk cocoon production under different sources of organic manures, information on market price of organic manures and inorganic fertilizers was considered in addition to the regular components of cost of cultivation. The cost of labour was considered as per prevailing wages. Gross

returns from mulberry and cocoons were calculated. Net returns and benefit – cost ratio were computed by using the formulae:

Net returns (Rs.) = Gross returns (Rs.) – Total expenditure (Rs.)
Benefit – cost ratio = Gross returns (Rs.) / Total expenditure (Rs.)

RESULTS AND DISCUSSION

The data pertaining to the economics of mulberry and cocoon production as influenced by the sources of organics on mulberry under irrigated condition and its influence on the performance of silkworm are tabulated in Tables 1 to 6 are discussed in the light of earlier works hereunder.

Cost of Mulberry Production

The cost of mulberry production excluding the application of different sources of organic manures was worked out to be Rs. 43,473. However, additional cost due to application of organic manures to mulberry to replenish nitrogen requirement varied much with least cost when mulberry received nitrogen in the form of chemical fertilizer i.e., calcium ammonium nitrate (Rs. 8,400). However, the cost was more with coir pith compost (Rs. 32,812) followed by enriched vermicompost (Rs. 32,082), vermicompost (Rs. 31,818), urban solid waste compost (Rs. 29,166), biodigested slurry (Rs. 27,999) and FYM (Rs. 26,250). Similarly, total cost of mulberry production was less with recommended FYM and NPK (Rs. 51,873) and was more with coir pith compost (100% N) + recommended P and K (Rs. 76,285). Further, it was observed that the cost per unit of leaf production was less when mulberry received nitrogen through chemical fertilizer (Rs. 0.94) and was more when coir pith compost was used as sources of nitrogen (1.53).

TABLE 1: Cost of mulberry (variety V-1) production under irrigated condition (per ha/ year)

Sl. No.	Particulars	Requirements	Rate (Rs.)	Amount (Rs.)
1.	Ploughing of land	25 Pairs	150 / Pair	3750
2.	Cleaning and making ridges and furrows	100 Mandays	75/ Manday	7500
3.	FYM	20 tonnes	600 / t	12,000
4.	Application of FYM	20 Mandays	75 / Manday	1500
5.	Fertilizers			
	a) Phosphorus @ 140 kg/ha/yr (SSP)	875 kg	3.25 / kg	2844
	b) Potassium @ 140 kg/ha/yr (MoP)	233 kg	4.25 / kg	991
6.	Application of fertilizers	10 Mandays	75 / Manday	750
7.	Irrigation charges	25 Mandays	75 / Manday	1875
8.	Electricity charges	-	-	2000
9.	Intercultivation			
	a) Bullock pairs	15 Pairs	150 / Pair	2250
	b) Labour charges	20 Mandays	75 / Manday	1500
10.	Non- recurring expenditure	-	-	2513
11.	Pruning – cum - harvesting	50 Mandays	75 / Manday	3750
12.	Land revenue	-	-	250
Total				43473

TABLE 2: Cost of organic manures / fertilizer used in the experiment

Sl. No.	Organic manures / fertilizer	N content (%)	Quantity required @ 350 kg N / ha/ year (kg)	Rate (Rs. / kg)	Total cost (Rs.)
1.	Vermicompost	2.2	15,909	2.0	31,818
2.	Enriched vermicompost	2.4	14,583	2.2	32,082
3.	FYM	0.8	43,750	0.6	26,250
4.	Coir pith compost	1.6	21,875	1.5	32,812
5.	Urban solid waste compost	1.8	19,444	1.5	29,166
6.	Biodigested slurry	1.5	23,333	1.2	27,999
7.	Calcium ammonium nitrate	25	1,400	6.0	8,400

TABLE 3: Cost of cocoon production (100 DFLs)

Sl. No.	Particulars	Cost (Rs.)
1.	Disease free layings	250
2.	Paraffin paper, foam rubber, etc.	100
3.	Disinfectants	100
4.	Depreciation on rearing house	100
5.	Non-recurring expenditure on rearing equipments	100
6.	Labour charges (30 Mandays @ Rs. 75 / Manday)	2250
7.	Transportation and marketing of cocoons	100
	Total	3000

TABLE 4: Economics of mulberry production in different sources of organic manures under irrigated condition (per ha / year)

Treatments	Costs (Rs.)				Returns (Rs.)		
	Cost excluding treatments*	Additional cost due to treatments*	Total cost	Cost / kg of leaf	Gross profit**	Net profit	B:C ratio
T_1 = Vermicompost (100% N) + Recommended P and K	43,473	31,818	75,291	1.27	1,47,843	72,552	1.96:1
T_2 = Enriched vermicompost (100% N) + Recommended P and K	43,473	32,082	75,555	1.29	1,46,378	70,823	1.96:1
T_3 = FYM (100% N) + Recommended P and K	43,473	26,250	69,723	1.30	1,34,063	64,340	1.92:1
T_4 = Coir pith compost (100% N) + Recommended P and K	43,473	32,812	76,285	1.53	1,24,513	48,228	1.63:1
T_5 = Urban solid waste compost (100% N) + Recommended P and K	43,473	29,166	72,639	1.35	1,33,795	61,156	1.84:1
T_6 = Biodigested slurry (100% N) + Recommended P and K	43,473	27,999	71,473	1.34	1,33,145	71,251	1.86:1
T_7 = Recommended FYM and NPK	43,473	8,400	51,873	0.94	1,37,695	85,822	2.65:1

* Details are depicted in Tables 1 and 2
** Price of leaf @ Rs. 2.5 / kg

TABLE 5: Economics of cocoon production (PM x CSR-2) as influenced by different sources of organic manures applied to irrigated mulberry (per 100 DFLs)

Treatments	Costs (Rs.)			Returns (Rs.)		
	Cost excluding leaf *	Leaf cost**	Total cost	Gross profit***	Net profit	B:C ratio
T_1 = Vermicompost (100% N) + Recommended P and K	3000	1270	4270	10,730	6460	2.51:1
T_2 = Enriched vermicompost (100% N) + Recommended P and K	3000	1290	4290	10,566	6276	2.46:1
T_3 = FYM (100% N) + Recommended P and K	3000	1300	4300	9,654	5354	2.25:1
T_4 = Coir pith compost (100% N) + Recommended P and K	3000	1530	4530	9,221	4691	2.04:1
T_5 = Urban solid waste compost (100% N) + Recommended P and K	3000	1350	4350	9,946	5596	2.29:1
T_6 = Biodigested slurry (100% N) + Recommended P and K	3000	1340	4340	9,755	5415	2.25:1
T_7 = Recommended FYM and NPK	3000	940	3940	9,963	6023	2.53:1

* Details are depicted in Table 3
**Leaf quantity @ 1000 kg / 100 DFLs
*** Price of cocoons @ Rs. 160 / kg

TABLE 6: Economics of cocoon production (PM x NB_4D_2) as influenced by different sources of organic manures applied to irrigated mulberry (per 100 DFLs)

Treatments	Costs (Rs.)			Returns (Rs.)		
	Cost excluding leaf *	Leaf cost**	Total cost	Gross profit***	Net profit	B:C ratio
T_1 = Vermicompost (100% N) + Recommended P and K	3000	1270	4270	8355	4085	1.96:1
T_2 = Enriched vermicompost (100% N) + Recommended P and K	3000	1290	4290	7892	3602	1.84:1
T_3 = FYM (100% N) + Recommended P and K	3000	1300	4300	7564	3262	1.76:1
T_4 = Coir pith compost (100% N) + Recommended P and K	3000	1530	4530	7242	2712	1.60:1
T_5 = Urban solid waste compost (100% N) + Recommended P and K	3000	1350	4350	7395	3045	1.70:1
T_6 = Biodigested slurry (100% N) + Recommended P and K	3000	1340	4340	7477	3137	1.72:1
T_7 = Recommended FYM and NPK	3000	940	3940	8061	4121	2.05:1

* Details are depicted in Table – 3

**Leaf quantity @ 1000 kg / 100 DFLs

*** Price of cocoons @ Rs. 140 / kg

Returns from Mulberry Production

The sources of organic manures when applied to irrigated mulberry to meet the nitrogen requirement yielded higher monetary returns. The gross profit obtained was more when mulberry received nitrogen through vermicompost (Rs. 1,47,843) together with enriched vermicompost (Rs. 1,46,378). However, it was less with coir pith compost (Rs. 1,24,513). Further, net profit and B:C ratio were more when mulberry received nitrogen in the form of chemical fertilizer (Rs. 85,822 and 2.65:1) in association with vermicompost (Rs. 72,552 and 1.96:1) and enriched vermicompost (Rs. 70,873 and 1.96:1). However, these were less when coir pith compost was applied to mulberry (Rs. 48,228 and 1.63:1).

The present study is in conformity with the earlier studies made by Ravikumar (2003). Studies indicated that vermicompost application reduced the cost of cultivation in irrigated condition by 20 per cent and increased the produce by 25 per cent. Subsequently a survey on the effect of vermicompost in drought conditions showed that average yield and profitability increased significantly than that with conventional systems of manurial application (Jayakumar *et al.,* 2005).

Cost of Cocoon Production

The cost of cocoon production excluding the leaf cost was worked out to be Rs. 3000 / 100 DFLs. The cost of leaf for rearing of 100 DFLs of silkworms (PM x CSR-2 and PM x NB_4D_2) was less when mulberry received nitrogen through chemical fertilizer (Rs. 940). On the other hand, it was more with coir pith compost (Rs. 1530) followed by urban solid waste compost (Rs. 1350), biodigested slurry (Rs. 1340), FYM (Rs. 1300), enriched vermicompost (Rs. 1290) and vermicompost (Rs. 1270). Further, the total cost of cocoon production was less with control (Rs. 3940). Silkworms received mulberry obtained by application of nitrogen through coir pith compost registered more total cost of cocoon production (Rs. 4530).

Returns from Cocoon Production (PM x CSR-2)

Silkworms nourished with mulberry grown by the application of vermicompost recorded more gross profit (Rs. 10,730) and net profit (Rs. 6460) together with enriched vermicompost (Rs. 10,566 and Rs. 6276) and control (Rs. 9963 and Rs. 6023). However, these were less when coir pith compost was used as a nitrogen source to mulberry (Rs. 9221 and Rs. 4691). However, B:C ratio was more with the batches of silkworms received mulberry raised using chemical fertilizer (2.53:1) along with vermicompost (2.51:1) and enriched vermicompost (2.46:1). On the other hand, B:C ratio was less in the group of silkworms which received mulberry raised by the application of coir pith compost (Rs. 2.04:1).

Returns from Cocoon Production (PM x NB_4D_2)

The cocoons produced by different batches of silkworms nourished with mulberry obtained by the application of varied sources of organic manures to meet the nitrogen requirement revealed notable difference in terms of monetary benefits. Higher gross profit was obtained with vermicompost (R. 8355) followed by control (Rs. 8061), enriched vermicompost (Rs. 7892). However, net profit and B:C ratio were more in recommended FYM and NPK (Rs. 4121 and 2.05:1) followed by vermicompost (Rs. 4085 and 1.96:1) and enriched vermicompost (Rs. 3602 and 1.84:1).

The variations observed both in respect of total cost of cocoon production and B:C ratio might be attributed to the variations in cost of leaf production and quantity as well as price of cocoons. Similar observations were made by Pasha (2001). The total cost of mulberry production was higher when supplied with 75 per cent N through castor cake + 25 per cent N through urea and was least with 75 per cent N through green leaf manure + 25 per cent N through urea. However, the net profit was higher due to application of recommended dose of FYM + fertilizer. Similarly, the B: C ratio was higher in case of silkworms (CSR-2 x CSR-4 and PM x NB4D2) reared on the mulberry leaves raised with application of 50 per cent N through castor cake + 50 per cent N through urea and was least with 100 per cent N through urea (Ravikumar, 2003).

The present study revealed that the nitrogen requirement of mulberry could be met from organic sources. From the economic point of view, there is a need to explore the possibilities of combining different organic, inorganic and biosources of nutrients to optimize mulberry and cocoon production.

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