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Role of Integrated Use of Organic Manures and Inorganic Fertilizers on Mulberry and its Impact on Cocoon Parameters of Silkworm (*Bombyx mori* L.)

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A B S T R A C T

An research experiment was carried out at Main Research Station, UAS, Hebbal, Bangalore to study the role of organic and inorganic fertilizers applied to mulberry on the cocoon parameters of silkworm. The cocoon weight (1.40 g and 1.50 g), shell weight (0.299 g and 0.325 g), shell ratio (21.44 and 21.70 %), silk productivity (4.46 and 5.23 cg/day) and cocoon yield (48.19 and 53.96 kg/ 100 DFLs) were significant maximum when chawki worms fed with S_{36} and late age worm with M5 leaves and worms fed with leaves raised through application of recommended 20 tones compost + 300: 120: 120 kg N, P and K/ha/year through fertilizer.

Introduction

Mulberry being the perennial crop requires a continuous and adequate supply of nutrients to get sustained yield. Due to continuous cultivation of mulberry, the soil moisture gets depleted. The yield of mulberry depends on the soil type, available plant nutrients in the soil and other agro-climatic factors. However, native soil fertility alone cannot be relied upon for quality and quantity of mulberry leaf productivity unless the soil is replenished with external nutrient sources through fertilizers. Dasgupta (1961) stated that cocoon characters were dependent on the nutritive value of leaves. Hence, package of manurial schedule for mulberry and feeding schedules for silkworm plays a vital role for obtaining a good cocoon crop.

Materials and Methods

The experiment was carried out to study the role of organic manures and inorganic fertilizers, which are applied to mulberry on pre-cocoon parameters of silkworm. Silkworm feeding trails of four feeding schedules with two different mulberry varieties (S_{36} and M_5) with thirteen treatment combination along with three replication were followed. One hundred worms were maintained in each replication of every

treatment. Feeding schedules (FS) viz., FS_1 (chawki worms fed with S_{36} leaf + late age worms fed with S_{36} leaf), FS_2 (chawki worms fed with S_{36} leaf + late age worms fed with M_5 leaf), FS_3 (chawki worms fed with M_5 leaf + late age worms fed with S_{36} leaf) and FS_4 (chawki worms fed with M_5 leaf + late age worms fed with M_5 leaf) respectively.

The leaves of two different mulberry varieties grown with different treatments fed to bivoltine silkworm breed, CSR_2. The packages of practices for silkworm rearing were carried out as per the recommendations (Dandin *et al.*, 2014). The observations on cocoon weight, shell weight, shell ratio, silk productivity and cocoon yield were recorded treatment wise, feeding schedule wise. The data were analyzed statistically by adopting two way factorial RCBD as outlined by Cochron and Cox (2000).

Treatment details

T1: 100 % recommended N through Compost

T2: 50 % recommended N through Compost + 50 % recommended N and remaining P, K through fertilizer

T3: 100 % recommended N through Green manure (*Glyricidia maculata*)

T4: 50 % recommended N through Green manure + 50 % recommended N and remaining P, K through Fertilizer

T5: 100 % recommended N through Castor oil cake

T6: 50 % recommended N through Castor oil cake + 50 % recommended N and remaining P, K through Fertilizer

T7: 35 % recommended N through Compost + 30 % recommended N through Castor oil cake + 35 % recommended N through Green manure

T8: 100 % recommended N through Vermicompost

T9: 50 % recommended N through Vermicompost + 50 % recommended N and remaining P, K through Fertilizer

T10: Bio-fertilizers 10 kg each of *Azospirillum* + *Aspergillus awamori*/ha/yr + 25% recommended N through each of Compost, Green manure, Castor oil cake and vermicompost

T11: Bio-fertilizers 10 kg each of *Azospirillum* + *Aspergillus awamori*/ha/yr + 20 % recommended N through each of Compost, Green manure, Castor oil cake, vermicompost and fertilizer + remaining P, K through fertilizer

T12 (control): Recommended 20 tones compost + 300: 120: 120 kg N, P and K / ha / year through fertilizer

T13 (control): Only fertilizer 300: 120: 120 kg of N, P and K / ha / year

Results and Discussion

The data on the results of the present study are presented in Table 1 and 2.

Among different treatments, T_{12} Recommended 20 tones compost + 300: 120: 120 kg N, P and K / ha / year through fertilizer exhibited higher cocoon weight (1.50 g) followed by T_{11} Bio-fertilizers 10 kg each of *Azospirillum* + *Aspergillus awamori*/ha/yr + 20 % recommended N through each of Compost, Green manure, Castor oil cake, vermicompost and fertilizer + remaining P, K through fertilizer (1.44 g). Whereas, T_1 100 % recommended N through

Compost (1.3.5 g), T_2 50 % recommended N through Compost + 50 % recommended N and remaining P, K through fertilizer (1.34 g), T_3 100 % recommended N through Green manure (*Glyricidia maculata*) (1.34 g), T_7 35 % recommended N through Compost + 30 % recommended N through Castor oil cake + 35 % recommended N through Green manure (1.37 g) and T_8 100 % recommended N through Vermicompost (1.33 g) were on par with each other. The shell weight was influenced by feeding of leaves obtained through application of different sources of organic manures and inorganic fertilizers, which differed significantly in all the treatments.

Among the treatments, highest shell weight was recorded in T_{12} (0.325 g) followed by T_{11} (0.312 g) and T_{10} Bio-fertilizers 10 kg each of *Azospirillum* + *Aspergillus awamori*/ha/yr + 25% recommended N through each of Compost, Green manure, Castor oil cake and vermicompost (0.308 g). Significant influence was registered in shell ratio by T_{10} (21.87 %) followed by T_{12} (21.7 %) and T_{11} (21.51 %).

The cocoon weight, shell weight and shell ratio were increased significantly in T_{12} as well as T_{11}. Similar results have been obtained by Umesh (1999), who reported that the use of biofertilizers (*Azotobactor*) with 50 per cent recommended 'N' has improved the quality of cocoons and silk parameters.

Silk productivity was found to be influenced by the application of different sources of organic manures and inorganic fertilizers. Among different treatment combinations T_{12} (5.23 cg/day) expressed maximum silk productivity compared to T_{13}. Only fertilizer 300: 120: 120 kg of N, P and K / ha / year (3.15 cg/day). Whereas, T_1 (3.78 cg/day) and T_2 (3.80 cg/day) were on par with each other with respect to silk productivity. These results are agreement with those of Shankar and Shivashankar (1994); Rajanna *et al.,* (2000a), who observed that combined application of sericulture by-products along with fertilizers registered highest silk productivity. Maximum cocoon yield was obtained in T_{12} (53.96 kg) followed by T_{11} (51.76 kg). But, other treatments such as T_1 (43.52 kg), T_5 100 % recommended N through Castor oil cake (43.95 kg) and T_7 (43.91 kg) were on par with each other with respect to cocoon yield.

Increase in these parameters were influenced by different sources of organic manures and inorganic fertilizers which were applied to mulberry might have increased the crude protein content in leaves which in turn influenced the silk productivity and cocoon yield.

The feeding schedule (FS_2) ranked first for majority of the pre-cocoon parameters viz., single cocoon weight (1.40 g), single shell weight (0.299 g), shell ratio (21.44 %), silk productivity (4.46 cg/day) and cocoon yield (48.19 kg/100 DFLs). Feeding of chawki worms with S_{36} leaf and late age worms with M_5 mulberry leaf resulted in desirable pre-cocoon parameters. This might be due to suitability of S_{36} leaf to chawki and M_5 leaf to late age worms. Scanning of available literature revealed that, there is no such on these lines. Hence, comparisons are not made.

However, Basavanna *et al.,* (1974) reported that variety, spacing and nitrogen levels have influenced chemical composition of mulberry leaves. In view of this it may be opined that, nitrogen supplied through different sources of organic manures and inorganic fertilizer might have influenced the cocoon parameters.

Similarly, Venugopal Pillai *et al.,* (1987) reported that, application of 900 kg of N/ha/yr improved the feeding quality of the leaves and also to great extent increased the growth rate and cocoon yield.

Table.1 Cocoon weight (g), shell weight (g) and shell ratio (%) as influenced by feeding of leaf obtained by application of N through different sources of organic manures and inorganic fertilizers

Treatments (T)	Cocoon weight (g), Shell weight (g) and Shell ratio (%)												Mean (T)		
	Feeding Schedules (FS)														
	FS_1			FS_2			FS_3			FS_4					
	CW	SW	SR	CW	SW	SR	CW	SW	SR	CW	SW	SR	CW	SW	SR
T_1	1.35	0.273	20.36	1.37	0.283	20.79	1.33	0.263	19.91	1.31	0.260	19.84	1.35	0.270	20.23
T_2	1.35	0.280	20.73	1.37	0.283	20.72	1.29	0.260	20.15	1.34	0.270	20.14	1.34	0.273	20.43
T_3	1.37	0.280	20.35	1.35	0.293	21.60	1.29	0.263	19.92	1.35	0.273	20.46	1.34	0.277	20.58
T_4	1.37	0.283	20.79	1.39	0.293	21.42	1.33	0.263	19.92	1.33	0.263	19.91	1.36	0.275	20.51
T_5	1.33	0.273	20.67	1.32	0.273	20.82	1.29	0.260	20.15	1.29	0.260	20.15	1.30	0.266	20.42
T_6	1.36	0.280	20.58	1.41	0.310	21.98	1.35	0.273	20.36	1.35	0.293	21.21	1.37	0.289	21.03
T_7	1.31	0.263	20.22	1.38	0.283	20.58	1.31	0.260	19.85	1.33	0.263	19.91	1.33	0.267	20.14
T_8	1.33	0.270	20.29	1.39	0.293	21.21	1.32	0.260	20.15	1.31	0.260	19.85	1.33	0.270	20.37
T_9	1.41	0.303	21.29	1.42	0.320	22.53	1.37	0.283	20.79	1.35	0.273	20.37	1.38	0.295	21.24
T_{10}	1.41	0.320	22.61	1.43	0.320	22.37	1.41	0.300	21.27	1.39	0.293	21.22	1.41	0.308	21.87
T_{11}	1.43	0.320	22.10	1.49	0.323	21.59	1.42	0.303	21.30	1.45	0.303	21.05	1.44	0.312	21.51
T_{12}	1.48	0.323	21.96	1.55	0.343	21.92	1.47	0.313	21.42	1.51	0.323	21.52	1.50	0.325	21.70
T_{13}	1.29	0.263	20.46	1.33	0.273	21.26	1.29	0.243	18.99	1.26	0.256	19.36	1.29	0.256	20.02
Mean (S)	1.37	0.287	20.95	1.40	0.299	21.44	1.34	0.272	20.32	1.35	0.275	20.38			

	Feeding Schedules (FS)			Treatments (T)			Interactions (FS × T)		
	CW	SW	SR	CW	SW	SR	CW	SW	SR
F-Test	*	*	*	*	*	*	*	*	*
SEm ±	0.0032	0.0008	0.058	0.0057	0.0015	0.105	0.011	0.0030	0.210
CD at 5 %	0.0088	0.0023	0.016	0.0159	0.0041	0.292	0.031	0.0082	0.584

CW = Cocoon weight, SW = Shell weight, SR = Shell ratio

Note: FS_1 : Chawki worms fed with S_{36} leaf + Late age worms fed with S_{36} leaf
FS_2 : Chawki worms fed with S_{36} leaf + Late age worms fed with M_5 leaf
FS_3 : Chawki worms fed with M_5 leaf + Late age worms fed with S_{36} leaf
FS_4: Chawki worms fed with M_5 leaf + Late age worms fed with M_5 leaf

Table.2 Silk productivity (cg/day) and cocoon yield (kg/100 DFL's) as influenced by feeding of leaf obtained by application of N through different sources of organic manures and inorganic fertilizers

Treatments (T)	Silk productivity (cg/day) and Cocoon yield (kg/100 DFL's)								Mean (T)	
	Feeding Schedules (FS)									
	FS_1		FS_2		FS_3		FS_4			
	SP	CY	SP	CY	SP	CY	SP	CY	SP	CY
T_1	3.83	43.19	3.98	45.30	3.69	44.15	3.61	42.44	3.78	43.52
T_2	3.88	46.35	3.96	48.13	3.63	42.82	3.75	44.50	3.80	45.45
T_3	3.13	45.37	4.20	45.45	3.74	44.16	3.62	44.82	3.87	44.93
T_4	4.31	46.11	4.13	47.75	3.70	45.22	3.71	46.29	3.96	46.34
T_5	3.82	44.22	3.83	44.41	3.62	43.85	3.63	43.34	3.72	43.95
T_6	3.98	47.59	4.97	47.95	3.87	46.98	4.52	50.60	4.33	48.28
T_7	3.69	43.22	3.99	44.78	3.64	42.44	3.70	45.22	3.75	43.91
T_8	3.76	44.77	4.12	45.87	3.63	44.88	3.62	43.41	3.78	44.75
T_9	4.90	48.41	5.20	50.64	4.59	45.48	4.43	45.90	4.78	47.61
T_{10}	5.14	50.46	5.21	51.00	4.83	50.19	4.75	49.48	4.98	50.28
T_{11}	5.24	51.45	5.34	55.12	4.91	47.71	4.91	52.77	5.10	51.76
T_{12}	5.24	53.77	5.74	58.38	5.07	51.16	4.89	52.55	5.23	53.96
T_{13}	3.23	41.01	3.39	42.73	2.99	40.76	2.99	39.97	3.15	41.11
Mean (S)	4.23	46.61	4.46	48.19	3.99	44.37	4.01	46.26		

	Feeding Schedules (FS)		Treatments (T)		Interactions (FS × T)	
	SP	CY	SP	CY	SP	CY
F-Test	*	*	*	*	*	*
SEm ±	0.027	0.096	0.049	0.173	0.098	0.346
CD at 5 %	0.075	0.266	0.136	0.480	0.272	0.960

SP = Silk productivity
CY = Cocoon yield

Note: FS_1 : Chawki worms fed with S_{36} leaf + Late age worms fed with S_{36} leaf
FS_2 : Chawki worms fed with S_{36} leaf + Late age worms fed with M_5 leaf
FS_3 : Chawki worms fed with M_5 leaf + Late age worms fed with S_{36} leaf
FS_4: Chawki worms fed with M_5 leaf + Late age worms fed with M_5 leaf

Narayanan *et al.*, (1966) reported that, application of nitrogen to mulberry significantly influenced the cocoon production, since it has profound influence on larval, cocoon and shell weights, shell percentage and cocoon yield as nitrogen promotes protein content in mulberry leaf. However, interaction effect in FS_2T_{12} was superior in respect of cocoon weight (1.55 g), shell weight (0.343 g), silk productivity (5.74 cg/ day) and cocoon yield (58.38 kg/ 100 DFLs).

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References

Basavanna, H. M., Srinivasan, E. B. and Kodanandaram, M. M., 1974. Studies on the quality of mulberry leaves with different varieties and fertilizers. *Ann. Rep.*, CSR&TI, Mysore, pp. 114-116.

Cochran and Cox, 2000. *Experimental Design Procedures for the Behavioural Sciences*, Cole Publishing Company, pp. 319-380.

Dandin, S. B., Jayant Jayaswal and Giridhar, K., 2014. *Handbook of Sericulture Technologies*, CSB, Bangalore, pp.346-373.

Dasgupta, K., 1961. Feeding mulberry to silkworm: a comparitive analytical study on the effect of feeding with different types of mulberry leaves obtained by different methods of cultivation on silkworm (*Bombyx mori* L.), *Indian silk*, 1: 4.

Narayanan, E. S., Kasiviswanathan, K. and Iyengar, M. N. S., 1966. Effect of varietal feeding, irrigation levels and nitrogen fertilization on the larval development and cocoon characters of *Bombyx mori* L. *Indian J. Seric*., 5: 13-17.

Rajanna, B. H., Chinnaswamy, K. P., Govindan, R., Sannappa, B. and Sundar Raj, S., 2000a. Effect of sericulture by-products and other organic manures on leaf yield and elemental composition of mulberry. *Bull. Ind. Acad. Seric*., 4: 70-74.

Shankar, M. A. and Shivashankar, K., 1994. Effect of sources of nitrogen on filament length, cocoon yield and silk quality. *Mysore J. Agri. Sci*., 28: 157-164.

Umesh, M. P., 1999. Response of RFS-175 and M_5 mulberry varieties to *Azotobactor* inoculation in relation to growth, yield of mulberry and cocoon production under dry land alfisols. *M.Sc. (Seri.) Thesis*, UAS, Bangalore. P. 98.

Venugopal Pillai, S., Krishnaswami, S. and Kasiviswanathan, K., 1987. Growth studies in silkworm, *Bombyx mori* L. under tropical conditions. Influence of agronomical methods of mulberry on the growth, cocoon and fecundity of silkworm. *Indian J. Seric*., 26: 32-45.

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