



Research Article

INFLUENCE OF SILKWORM PUPAL RESIDUE BIOCOMPOST (SPRB) ON GROWTH AND YIELD PARAMETERS OF MULBERRY

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Abstract: A field experiment was conducted to study the effect of soil application of silkworm pupal residue biocompost (SPRB) on growth and yield parameters of V1 mulberry at Department of Sericulture, UAS, GKV, Bengaluru. The experiment was conducted with seven treatments and four replications in randomized block design. The results of the study indicated that V1 mulberry raised with 50% N through Silkworm pupal residue bio compost (SPRB)+ 50% N through chemical fertilizer+ Recommended dose of P & K /ha/year through chemical fertilizer(T6) significantly increased the growth parameters viz., Plant height (70.60, 123.41 and 163.72 cm) and number of leaves per plant (123.33, 211.91 and 229.00) at 30th, 45th and 60th days after pruning compared to control. Significant improvement in leaf area (185.25dm²), leaf yield per plant (1005.37g) and leaf yield per hectare (62.05 tonnes) was recorded in T6 compared to all the other treatments. Results of the present investigation indicated that, application of 50% N through SPRB+50% N through chemical fertilizer+ Recommended dose of P&K/ha/year through chemical fertilizer significantly increased both growth and yield parameters of V1 mulberry.

Keywords: Mulberry, Pupal residue biocompost, Growth parameters, Yield parameters

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Introduction

Sericulture is one of the most important agro based industries which play a vital role in alleviating rural unemployment and improving the social-economic status of rural folk. Mulberry (*Morus* spp.) is the sole food source for the silkworm (*Bombyx mori* L.). The healthy growth of the silkworm and its economic traits are largely influenced by the nutritional status of mulberry leaves fed to silkworms. Massive use of high dosage of chemical fertilizers in mulberry cultivation leads to the depletion of nutrients and toxicity to the silkworms. Application of organic manures to mulberry not only increased growth, but also nutritional quality of the mulberry leaves which intern influences silkworm growth and its economic traits. Also, the frequent use of chemical fertilizers for a prolonged period deteriorates the soil characteristics and affects the availability and uptake of nutrients to the plants. Application of organic manure improved the physical, chemical and biological properties of soil with direct effect on moisture retention, root growth, nutrient conservation etc. The cost of the inorganic fertilizers can be reduced by using traditional application of organic manures which can be reduced by indigenous production by farmers themselves. Effective utilization of sericulture waste for the production of organic manure minimizes the environment pollution and serves as good alternative to restrict the use of inorganic fertilizers. Hence, the present investigation was carried out with the objective of assessing the effect of silkworm pupal residue biocompost on growth and yield of mulberry.

Materials and Methods

A field experiment was conducted in an established irrigated V1mulberry garden planted at a spacing of 90X90 cm in order to study the effect of soil application of SPRB on growth and yield parameters of mulberry in a randomized block design with seven treatments and four replications at Department of sericulture, UAS,

GKV, Bengaluru. All the cultural practices were followed as per the package of practices for irrigated mulberry garden [1,2].

Treatment details of field experiment

T₁: Recommended 20 tonnes of FYM/ ha/year+ Recommended N, P and K @ 350:140:140 kg/ha/year through biochemical fertilizers (control).

T₂:Recommended 20 tonnes of silkworm pupal residue biocompost (SPRB) / ha/year+ Recommended N,P and K @ 350:140:140 kg/ha/year through biochemical fertilizers(control).

T₃: Recommended N, P and K @ 350:140:140 kg/ha/year through biochemical fertilizers alone.

T₄: 100% N through SPRB + Recommended dose of P & K /ha/year through chemical fertilizer.

T₅: 75% N through SPRB + 25 % N through chemical fertilizer+ Recommended dose of P & K /ha/year through chemical fertilizer.

T₆: 50% N through SPRB + 50 % N through chemical fertilizer+ Recommended dose of P & K /ha/year through chemical fertilizer.

T₇: 25% N through SPRB + 75 % N through chemical fertilizer+ Recommended dose of P & K /ha/year through chemical fertilizer.

The plant height was measured from the base of the plant to the tip of the fully opened leaf of all the shoots of five labelled plants and mean shoot height was calculated at 30th, 45th and 60th days after pruning. The leaves were counted from five labelled plants at 30th, 45th and 60th days after pruning and mean number of leaves per plant was calculated. Leaf area was calculated by measuring the length and breadth of leaf and multiply with 0.69 (correction factor) on the 60th day after pruning from five labelled plants.

Five labelled plants were maintained exclusively for estimation of leaf yield, were harvested individually plant wise and then leaf yield was recorded. The total leaf yield obtained from net plot was recorded as the leaf yield and expressed in g/plant and converted to the leaf yield in tonnes/ ha. Likewise, V1 mulberry leaf yield was also recorded on 60th day of each crop harvest.

Results and Discussion

Growth parameters of mulberry

Application of SPRB along with recommended dose of inorganic fertilizers to the soil showed significantly increased growth parameters of V1 mulberry [Table-1]. The maximum plant height (70.60, 123.41 and 163.72 cm) and more number of leaves per plant (123.33, 211.91 and 229.00) at 30th, 45th and 60th day after pruning was recorded in V1 mulberry grown with 50% N through SPRB + 50 % N through chemical fertilizer+ Recommended dose of P & K /ha/year through chemical fertilizer(T6). The next best treatment was application of 75% N through SPRB + 25 % N through chemical fertilizer+ Recommended dose of P & K /ha/year through chemical fertilizer(T5) (70.12, 121.30 and 158.34 cm) and (117.91, 205.08 and 220.75cm). However, a value for this trait was lowest when mulberry grown with application of recommended N, P and K @ 350:140:140 kg/ha/year through chemical fertilizers alone (T3) (67.00, 110.05 and 147.80 cm) and (110.75, 156.33 and 177.58 cm) on 30th, 45th and 60th day after pruning. The profound increased plant height may be due to addition of 50% nitrogen to the soil through biocompost an organic source and remaining 50% nitrogen with inorganic fertilizers. More number of leaves may be due to increased plant height. Similar type of findings was observed by the author [3] who reported that combined application of organic manures and inorganic fertilizers increased the plant height and also the number of leaves compared to control. These results are in line with findings of author [4] who reported that, significantly higher plant height and number of leaves per plant (S36) was recorded when mulberry garden supplemented with combined application of different sources of organic manures along with biofertilizers and inorganic fertilizers.

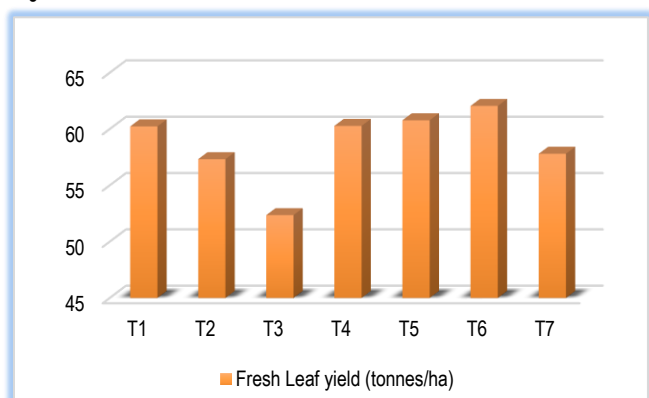


Fig-1 Influence of silkworm pupal biocompost (SPB) on leaf yield of V-1 on 60th day after pruning

Leaf yield parameters

Notable variation was registered with regard to leaf area, leaf yield per plant and leaf yield per hectare of mulberry among different treatments in V1 mulberry [Table-2] and [Fig-1]. Among the different treatments, significantly highest leaf area (185.25dm²), leaf yield per plant (1005.37 g) and leaf yield per hectare (62.05 tonnes) was recorded in T6 (50% N through SPRB + 50 % N through chemical fertilizer+ Recommended dose of P & K /ha/year through chemical fertilizer) followed by T5 (Leaf area of 171.48 dm², leaf yield of 984.69 g/plant and 60.77 tonnes /ha) and T4 (Leaf area of 169.58 dm², leaf yield of 976.48 g/plant and 60.27 tonnes /ha). The lowest leaf area (139.58 dm²) and fresh leaf yield (848.13 g/plant and 52.35 tonnes/ ha) was recorded in T3. The increased leaf area and leaf yield in T6 may be due to higher plant height and a greater number of leaves per plant. The positive influence of SPRB based nutrient management on leaf area and leaf yield in terms of fresh weight can also be attributed to the fact that conjunctive application of SPRB along with chemical fertilizer might have helped in

slow and steady release of nutrients in addition to supply of important macro and micro- nutrients. The lowest leaf area and leaf yield in application of recommended N,P and K @ 350:140:140 kg/ha/year through chemical fertilizers alone (T3) may be due to lowest number of leaves per plant and shorter plant height and in turn these may be due to insufficient availability of macro and micronutrients in the root zone of mulberry plants to be absorbed by the roots. The present findings are comparable to results of author [3] who reported that, the application of SLPW(Silkworm litter pupal waste) + vermicompost recorded significantly higher leaf yield in mulberry. Instead of applying rapid nutrient releasing and effective fertilizers, it is better to apply organic manures as they support better growth of mulberry [1]. The vermicompost application has increased the photosynthetic rate and yield in mulberry (Singhal et al., 2000). Application of 50 per cent recommended N through vermicompost registered significantly higher leaf area and leaf yield in S36 mulberry [6]. Similarly, application of different organic manures and combination of organic manures + inorganic fertilizers recorded significantly higher leaf yield per plant as compared to NPK alone through fertilizers in S36[4]. Similar results have also been reported by the author [5-7].

Table-1 Influence of silkworm pupal biocompost (SPB) on plant height and number of leaves per plant of V1 at different days after pruning

Treatments	Plant height (cm)			No. of leaves / plant		
	30 DAP	45 DAP	60 DAP	30 DAP	45 DAP	60 DAP
T ₁	69.20	113.16	154.11	114.50	176	199
T ₂	69.14	114.20	151.02	119.50	172.41	191.08
T ₃	67	110.05	147.80	110.75	156.33	177.58
T ₄	69.38	116.26	154.79	113.08	195	213.41
T ₅	70.12	121.30	158.34	117.91	205.08	220.75
T ₆	70.60	123.41	163.72	123.33	211.91	229
T ₇	68.47	118.43	154.05	112.58	185.5	204.5
F – Test	*	*	*	*	*	*
S. Em ±	1.30	2.95	1.90	4.02	1.51	3.68
C.D @ 5%	3.96	8.9	5.78	12.09	4.48	11.07

Note: * - Significant, DAP- Days after pruning

Table-2 Influence of silkworm pupal biocompost (SPB) on leaf area and yield of V1 on 60th day after pruning

Treatments	Leaf area (dm ²)	Fresh Leaf yield	
		(g/plant)	(tonnes/ha)
T ₁	151.16	975.915	60.23
T ₂	154.25	928.68	57.32
T ₃	139.58	848.125	52.35
T ₄	169.58	976.48	60.27
T ₅	171.48	984.69	60.77
T ₆	185.25	1005.37	62.05
T ₇	159.33	936.43	57.80
F – Test	*	*	*
S. Em ±	1.44	6.18	0.25
C.D @ 5%	4.30	18.55	0.78

Note: * - Significant, DAP-Days after pruning

Conclusion

Thus, from the present findings, it is concluded that application of 50% N through SPRB + 50 % N through chemical fertilizer+ Recommended dose of P & K /ha/year through chemical fertilizer significantly increased both growth and yield parameters of mulberry. It is highly beneficial for mulberry cultivation and is much effective than conventional use of FYM and other organic manures. Further research is needed to study the effect on mulberry leaves growth and quality with silkworm pupal residue biocompost on silkworm growth and economic traits.

Application of research: The point of concern as soil scientists is the wastage of organic matter, protein and plant nutrients in Sericulture which could be recovered by appropriate technology adopting bio conversion and protein extraction from silkworm pupae. In view of this, to achieve the same this research has been planned.

Research Category: Sericulture

Abbreviations: N: Nitrogen, P: Phosphorus, K: Potassium, SLPW: Silkworm litter pupal waste, SPRB: silkworm pupal residue biocompost

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University: University of Agricultural Sciences, GKVK, Bengaluru, 560065, India
Research project name or number: PhD Thesis - Bioresponses of mulberry (*Morus* spp.) and silkworm (*Bombyx mori* L.) to silkworm pupal protein and compost

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Study area / Sample Collection: Department of Sericulture, UAS, Bengaluru

Cultivar / Variety / Breed name: Mulberry variety V-1

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

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