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Effect of Silkworm Pupal Residue Protein (SPRP) and Silkworm Pupal Residue Extract (SPRE) Spray on Major and Micronutrients Status of Mulberry

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ABSTRACT

A field experiment was conducted to study the effect of foliar spray of silkworm pupal residue protein (SPRP) and silkworm pupal residue extract (SPRE) on major and micronutrients status of V_1 mulberry. The experiment was conducted with fourteen treatments and replicated thrice in randomized complete block design. The results of the study indicated that, recommended dose of fertilizers with foliar spray of SPRP @ 2% (T_6) recorded significantly higher nitrogen, phosphorous, potassium, calcium, magnesium, sulphur, iron, manganese, copper and zinc contents of 3.49%, 1.12%, 1.61%, 1.16%, 0.75%, 0.37%, 310.10 ppm, 55.10 ppm, 36.90 ppm and 45.00 ppm, respectively compared to all the other treatments. Results of the present investigation indicated that, application of SPRP at 2% concentration significantly increased both major and micronutrients status of V_1 mulberry leaves.

Keywords: *Silkworm pupal residue protein, Silkworm pupal residue extract, Major nutrients, Micronutrients, Mulberry.*

INTRODUCTION

Mulberry is deep rooted foliage yielding and fast growing perennial crop grown for its leaf and is the sole food for silkworm (*Bombyx mori* L.) rearing. Due to excessive use of synthetic chemical fertilizers a serious threat is caused not only to mulberry crop but also to the environment. So an alternative measure is necessary for enhancing mulberry production without causing any serious damage to the ecosystem. A foliar spray is generally used for increased crop production, yield and leaf quality effectively. Juyal et al. (2008) analyzed that the contribution of leaf quality alone is about 38.2% among the factors influencing the success of silkworm cocoon crop.

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The productivity of mulberry not only varies according to the different geographical area but also according to mineral potential of soil. Among the factors responsible for low yield, inadequate nutrient supply plays an important role. The quality of mulberry can be increased by adopting the physiological manipulations through the foliar sprays of nitrogen sources i.e., silkworm pupal residue protein and urea. Hence, the present study was undertaken to find out the effect of different concentrations of (0.5, 1 and 2%) silkworm pupal residue extract, silkworm pupal residue protein and urea to improve the major and micronutrients status of mulberry.

MATERIALS AND METHODS

A field experiment was conducted in an established irrigated V_1 mulberry garden planted at a spacing of 90X90 cm in order to study the effect of foliar application of silkworm pupal residue extract, silkworm pupal residue protein and urea on major and micronutrients status of mulberry in randomized complete block design with fourteen treatments and three replications at Department of Sericulture, UAS, GKVK, Bengaluru, Karnataka. All the cultural practices were followed as per the package of practices for irrigated mulberry garden (Dandin et al., 2010). Three foliar sprays of silkworm pupal residue extract, silkworm pupal residue protein and urea were given as per treatments at 30, 40 and 50 days after pruning (DAP) the mulberry garden. The recommended doses of farm yard manure (20MT/ha/year) and chemical fertilizers (350kg N: 140kg P: 140kg K/ha/yr were applied to all treatments.

The treatments were T_1= Silkworm pupal residue extract (SPRE) spray @ 0.5 % + $T_{14,}$ $T_{2=}$ SPRE spray @ 1 % + $T_{14,}$$T_{3=}$ SPRE spray @ 2 % + $T_{14,}$$T_4$= SPRP spray @ 0.5 % + $T_{14,}$ T_5= SPRP spray @ 1 % + $T_{14,}$ T_6= SPRP spray @ 2% + $T_{14,}$ $T_{7=}$ SPRE spray @ 0.5 % + SPRP spray @ 0.5 % + $T_{14,}$ $T_{8=}$ SPRE spray @ 1 % + SPRP spray @ 1 % + $T_{14,}$ $T_{9=}$ SPRE spray @ 2 % + SPRP spray @ 2 % + $T_{14,}$$T_{10}$= Urea spray @ 0.5% + $T_{14,}$ T_{11}= Urea spray @ 1% + $T_{14,}$ T_{12}= Urea spray @ 2% + $T_{14,}$ T_{13}= Aqueous extract + $T_{14,}$and T_{14}= Control (RDF+ 20MT FYM/ha/year).

After harvest of the crop the major micro nutrients status of mulberry like nitrogen, phosphorous, potassium, calcium, magnesium, sulphur, iron, manganese, copper and zinc contents was estimated by using standard procedures. The nitrogen estimation was carried out by microkjieldahl method (A.O.A.C.,1980). The phosphorous was estimated by the method outlined by Jackson (1973) and expressed on percentage dry weight basis. The di-acid digested sample was fed to the SYSTRONICS flame photometer and readings were recorded. Dilution was done when necessary and compared with the standard curve to determine percent potassium, calcium and magnesium were determined by the EDTA titration method or versenate-titration method. Sulphur content in the di-acid digested sample was estimated by turbidometric method as outlined by Jackson (1975). Estimation of micronutrients *viz*, zinc, Manganese, Iron and Copper by using Atomic absorption spectrophotometer (AAS) method.

RESULTS AND DISCUSSION

Mulberry raised with foliar application of SPP showed marked improvement in respect of macro and micronutrients content of mulberry leaf viz., N, P, K, Ca, Mg, S, Mn, Cu and Zn. Macro and micronutrient contents in V_1 leaves were significantly influenced by application of foliar spray through SPP (Table 1 and 2). The maximum leaf macro and micronutrients *viz.*, nitrogen, phosphorous, potassium, calcium, magnesium, sulphur, iron, manganese, copper and zinc contents of 3.49%, 1.12%, 1.61%, 1.16%, 0.75%, 0.37%, 310.10 ppm,55.10 ppm,36.90 ppm and 45.00 ppm, respectively was recorded when V_1 plots received foliar spray of 2% SPRP + RDF + 20MT FYM/ha/year (T_6), which was followed by T_8(SPRE spray @ 1 % + SPRP spray @ 1 % + RDF+ 20MT FYM/ha/year) recorded 3.42%, 1.10%, 1.58%, 1.11%, 0.71%, 0.32%, 304.20 ppm,53.40 ppm, 33.10 ppm and 43.30 ppm of N, P, K, Ca, Mg, S, Fe, Mn, Cu and Zn and

T_3(SPRE spray @ 2 % + RDF+ 20MT FYM/ha/year) recorded 3.40%, 1.10%, 1.57%, 1.09%, 0.70%, 0.31%, 302.60 ppm, 53.00 ppm, 33.00 ppm and 42.10 ppm of N, P, K, Ca, Mg, S, Fe, Mn, Cu and Zn, respectively and the least macro and micronutrients was found in T_{14} (RDF+ 20MT FYM/ha/year). Increased macro and micronutrients contents of leaf may be due to increased availability of the nutrients through the foliar application of silkworm pupal protein and extract as a source of macro and micro nutrients. Quadar et al. (1989) reported that, foliar spray of urea along with different doses of NPK fertilizers significantly increased the nutrients content of leaf. Lokanath and Shivakumar (1986) reported that, plant nutrients like magnesium, manganese, iron, zinc and boron are also used as foliar spray on mulberry crop enhanced the quality of leaf with higher composition of micro nutrients content.

Table 1: Influence of silkworm pupal residue protein (SPRP) and silkworm pupal residue Extract (SPRE) spray on nitrogen, phosphorus, potassium, calcium, magnesium and sulphur contents of V_1 at 60th day after pruning (DAP)

Treatments		Nitrogen (%)	Phosphorus (%)	Potassium (%)	Calcium (%)	Magnesium (%)	Sulphur (%)
T_1	SPRE @ 0.5 % + T_{14}	3.24	0.98	1.44	0.97	0.62	0.27
T_2	SPRE @ 1 % + T_{14}	3.26	1.06	1.50	1.00	0.66	0.28
T_3	SPRE @ 2 % + T_{14}	3.40	1.10	1.57	1.09	0.70	0.31
T_4	SPRP @ 0.5 % + T_{14}	3.25	1.06	1.49	1.03	0.65	0.27
T_5	SPRP @ 1 % + T_{14}	3.29	1.01	1.52	1.06	0.69	0.29
T_6	SPRP @ 2 % + T_{14}	3.49	1.12	1.61	1.16	0.75	0.37
T_7	SPRE @ 0.5 % + SPRP @ 0.5 % + T_{14}	3.30	1.04	1.48	1.08	0.66	0.29
T_8	SPRE @ 1 % + SPRP @ 1 %+ T_{14}	3.42	1.10	1.58	1.11	0.71	0.32
T_9	SPRE @ 2 % + SPRP @ 2 % + T_{14}	3.33	1.09	1.54	1.08	0.69	0.30
T10	Urea spray @ 0.5 %+ T_{14}	3.26	0.78	1.30	0.91	0.59	0.30
T11	Urea spray @ 1 %+ T_{14}	3.31	0.80	1.33	0.96	0.65	0.29
T12	Urea spray @ 2 %+ T_{14}	3.34	0.86	1.40	1.03	0.68	0.26
T13	Water spray + T_{14}	3.22	0.81	1.28	0.89	0.57	0.23
T14	RDF + 20 MT FYM/ha/ year	3.17	0.74	1.15	0.76	0.53	0.21
F – Test		*	*	*	*	*	*
S. Em ±		0.01	0.02	0.04	0.01	0.01	0.01
C.D @ 5%		0.03	0.06	0.11	0.03	0.03	0.03

Note: *-Significant

Table 2: Influence of silkworm pupal residue protein (SPRP) and silkworm pupal residue Extract (SPRE) spray on iron, manganese, copper and zinc contents of V_1 at 60th day after pruning

Treatments		Iron (ppm)	Manganese (ppm)	Copper (ppm)	Zinc (ppm)
T_1	SPRE @ 0.5 % + T_{14}	278.90	51.20	30.60	38.90
T_2	SPRE @ 1 % + T_{14}	285.00	52.40	31.20	39.40
T_3	SPRE @ 2 % + T_{14}	302.60	53.00	33.00	42.10
T_4	SPRP @ 0.5 % + T_{14}	291.50	47.10	31.20	39.30
T_5	SPRP @ 1 % + T_{14}	301.00	48.00	32.50	41.80
T_6	SPRP @ 2 % + T_{14}	310.10	55.10	36.90	45.00
T_7	SPRE @ 0.5 % + SPRP @ 0.5 % + T_{14}	279.30	50.80	32.60	42.00
T_8	SPRE @ 1 % + SPRP @ 1 %+ T_{14}	304.20	53.40	33.10	43.30
T_9	SPRE @ 2 % + SPRP @ 2 % + T_{14}	290.00	51.20	31.20	42.90
T10	Urea spray @ 0.5 %+ T_{14}	192.90	51.70	28.50	40.00
T11	Urea spray @ 1 %+ T_{14}	198.60	50.90	29.10	40.60
T12	Urea spray @ 2 %+ T_{14}	200.40	49.60	29.30	41.20
T13	Aqueous extract + T_{14}	190.00	46.80	28.00	38.00
T14	RDF + 20 MT FYM/ha/ year	170.40	41.50	26.10	35.60
F – Test		*	*	*	*
S. Em ±		1.40	1.06	1.26	1.46
C.D @ 5%		4.18	3.20	3.75	4.40

CONCLUSION

The evaluation of silkworm pupal protein as a plant growth stimulator for mulberry under field conditions showed that the application of Silkworm pupal residue protein (SPRP) @ 2% along with recommended dose of NPK + FYM has significantly increased the major and micro nutrients status of mulberry (V_1).

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