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Influence of customized fertilizers on bio-chemical composition of V_1 Mulberry

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Abstract

An experiment was conducted to know the impact of different levels of customized fertilizers on V_1 mulberry under irrigated condition. Pooled data of two crops revealed that mulberry raised with 150 per cent nutrients through customized fertilizers recorded significantly increased leaf moisture content (81.75%), chlorophyll 'a', (1.78 mg/g,), chlorophyll 'b' (0.81 mg/g,), carbohydrates (25.26 %), soluble protein (10.04%), soluble sugar (12.97 %) and reducing sugar (2.02 %) content of the mulberry leaf on 75th day after pruning. However, these constituents were lowest in control plots leaf moisture content (66.61%), chlorophyll 'a', (1.53 mg/g,), chlorophyll 'b' (0.54 mg/g,), carbohydrates (20.33 %), soluble protein (8.28%), soluble sugar (11.36 %) and reducing sugar (1.75 %) on 75th day after pruning.

Keywords: Customized fertilizers, V_1 mulberry variety.

Introduction

Mulberry leaf quality plays a predominant role in healthy growth of silkworm and the leaf composition depends on various factors *viz*., mulberry variety, season, irrigation, beside, temperature, length of sunshine hours, nature and type of soil profile, water table, pruning, maturity of leaf, method of leaf harvesting *etc*. (Narayanan *et al*., 1976). It is realized that the native soil fertility alone cannot be relied upon for the improvement in mulberry leaf yield and quality unless the nutrients are replenished with external sources through customized fertilizers which acts quickly in improving the leaf composition. Leaf quality and quantity not only influence the silkworm growth and development, but also the cocoon production and quality of raw silk. Nearly 70 per cent of silk protein produced by silkworm is derived directly from proteins of mulberry leaves (Miyashita, 1986). Hence, an experiment was conducted during 2011 on this line using application customized of fertilizers which forms important inputs for increasing the leaf yield and quality.

Materials and Methods

A field experiment was carried out during 2010-11 at the College of Sericulture Chintamani, University of Agricultural Sciences, Bangalore in established irrigated V_1 mulberry garden with a spacing of 90×90 cm. The experiment was laid out in a Randomized Complete Block Design (RCBD) with 7 treatments of 3 replications each. The mulberry cultivation practices were followed as per the package of practices for irrigated mulberry. The different levels of customized fertilizers were applied in one dose. The treatments were as follows,

T1	Without chemical fertilizer application.
T2	50 % nutrients through customized fertilizers
T3	75 % nutrients through customized fertilizers.
T4	100 % nutrients through customized fertilizers.
T5	125 % nutrients through customized fertilizers.
T6	150 % nutrients through customized fertilizers.
T7	Recommended dose of fertilizers (RDF as per UAS package) 300:140:140 kg/ha/year

Based on the treatment, FYM (20 tones/ha) was applied at the beginning of the experiment and the recommended dose of customized fertilizers (375: 140: 140 NPK kg/ha) were applied as per the package of practices for irrigated mulberry for all treatments in common. Fifteen days after application of FYM, was applied the 'N', 'P' and 'K' nutrients supplied in the form of Urea, Single Super Phosphate (SSP) and Muriate of Potash (MoP), respectively for all treatments. And 15 days after applying NPK, micronutrients (Zn 2.5 kg/ha as Zinc sulphate, Fe 5 kg/ha as Ferrous sulphate, Bo 1.25 kg/ha as Borax, Cu 1.25 kg/ha as copper sulphate, Mn 1.25 kg/ha as Manganese and Mo 50 g/ha as Sodium molybdate (500 lit fluid) were applied as foliar spray. The experimental plots were irrigated by drip method.

The observations on the biochemical constituents were recorded at 45 and 75 days intervals and leaf yield was recorded on 75th day after pruning. The data were analyzed statistically by using simple RCBD as outlined by Cochran and Cox (2000).

Results and Discussion

The pooled data of two crops on the growth and yield parameters of V_1 mulberry variety (Table 1 and 2) as influenced by application of different levels of customized fertilizers showed significant increase in growth and yield parameters.

Quality parameters of V_1 mulberry such as leaf moisture content (81.75%), chlorophyll 'a', (1.78 mg/g,), chlorophyll 'b' (0.81 mg/g,), carbohydrates (25.26 %), soluble protein (10.04%), soluble sugar (12.97 %) and reducing sugar (2.02 %) contents were recorded in V_1 mulberry grown with 150 per cent nutrients through customized fertilizers T_6. the next best treatment were application of 125 per cent nutrients through customized fertilizers (T_5) leaf moisture content (78.26%), chlorophyll 'a', (1.75 mg/g,), chlorophyll 'b' (0.76 mg/g,), carbohydrates (24.43 %), soluble protein (9.69%), soluble sugar (12.65 %) and reducing sugar (1.93 %) and 100 per cent nutrients through customized fertilizers (T_4) existing the reported parameters as 77.60 per cent, 1.72 mg/g, 0.70 mg/g, 23.38 per cent, 9.00%, 12.58 per cent and 1.88 per cent respectively.

The increase in leaf moisture content may be due to water retention capacity of inorganic fertilizers which steadily supply the moisture and by their increased the moisture content in leaf and fresh leaf weight. This corroboration with (Yokoyama, 1974) moisture content which varies from 64-83 per cent in mulberry leaves.

The increase in chlorophyll content may be due to adequate supply of nutrients to the plants through varied levels of customized fertilizers. These observations are in agreement with finding of Singhal *et al.* (2000) where, nitrogen helped in harvesting of solar energy through chlorophyll synthesis, as it is an essential constituent of chlorophyll. The increased amount of chlorophyll content in leaves indicates the photosynthetic efficiency, thus it can be used as one of the criteria for quantifying photosynthetic rate in mulberry (Sujathamma and Dandin, 2000**).**

Shivakumar *et al.* (2000) revealed that, the organic manure (FYM) supplemented with varied levels of inorganic fertilizers caused increase in chlorophyll content of leaves in mulberry. The improvement in chlorophyll content might be due to synergistic interaction of both biofertilizers in (VAM, BBF, and 50 % cut in both N and P fertilizers) reduced dose of chemical fertilizers, can be manipulated by the addition of both nitrogenous and phosphorous biofertilizers **(**Ram Rao *et al*., 2007**).**

The increase in protein content may be due to the availability of sufficient quantity of nitrogen to the plants. Similarly, the present results are in close conformity with the findings of Shivakumar *et al.* (2000b) was opined that organic manures either through FYM or enriched compost supplemented with varied levels of inorganic fertilizers for the betterment of yield and quality in terms of crude protein, soluble carbohydrates, total sugars etc.

Table 1: Moisture and Chlorophyll contents of V_1 mulberry leaf as influenced by customized fertilizers on 75th day after pruning.

Treatments	Moisture content (%)	Chlorophyll 'a' (mg/g)	Chlorophyll 'b' (mg/g)
T_1 : Without chemical fertilizer application	66.61	1.53	0.54
T_2 : 50 % nutrients through customized fertilizers	70.57	1.58	0.58
T_3 : 75 % nutrients through customized fertilizers	74.67	1.66	0.64
T_4 : 100 % nutrients through customized fertilizers	77.60	1.72	0.70
T_5 : 125 % nutrients through customized fertilizers	78.26	1.75	0.76
T_6 : 150 % nutrients through customized fertilizers	81.75	1.78	0.81
T_7 : Recommended dose of fertilizers (RDF as per UAS package)	73.19	1.59	0.64
F – Test	*	*	*
S. Em ±	1.63	0.02	0.01
C.D @ 5%	5.04	0.09	0.04

*Significant at 5 %.

Table 2: Carbohydrates, soluble protein and soluble and reducing sugars content of V_1 mulberry leaf as influenced by customized fertilizers on 75th day after pruning

Treatments	Carbohydrates (%)	Reducing sugar (%)	Soluble Sugar (%)	Soluble Protein (%)
T_1 : Without chemical fertilizer application	20.33	1.75	11.36	8.28
T_2 : 50 % nutrients through customized fertilizers	21.50	1.84	11.93	8.45
T_3 : 75 % nutrients through customized fertilizers	22.68	1.87	12.44	8.57
T_4 : 100 % nutrients through customized fertilizers	23.38	1.88	12.58	9.00
T_5 : 125 % nutrients through customized fertilizers	24.43	1.93	12.65	9.69
T_6 : 150 % nutrients through customized fertilizers	25.26	2.02	12.97	10.04
T_7 : Recommended dose of fertilizers (RDF as per UAS package)	22.20	1.84	12.28	8.50
F – Test	*	*	*	*
S. Em ±	0.24	0.02	0.08	0.16
C.D @ 5%	0.76	1.08	0.27	0.50

*Significant at 5 %.

Table 3: Micro nutrient content of V_1 mulberry leaf as influenced by customized fertilizers on 75th day after pruning

Treatment	Urea kg/plot	DAP Kg/plot	MOP Kg/plot	Zinc sulphate g/plot	Ferrous sulphate g/plot	Borax g /plot	Copper Sulphate g/plot	Manganese g/plot	Sodium Molybdate g/plot
T1-Control	-	-	-	-	-	-	-	-	-
T2-50%	1.370	1.571	0.660	5.875	11.750	2.938	2.938	2.938	0.118
T3-75%	2.054	2.358	0.991	8.813	17.625	4.407	4.407	4.407	0.176
T4-100%	2.739	3.142	1.322	11.750	23.500	5.875	5.875	5.875	0.235
T5-125%	3.422	3.929	1.653	14.688	29.376	7.344	7.344	7.344	0.294
T6-150%	4.109	4.713	1.982	17.625	35.250	8.813	8.813	8.813	0.353
T7-university recommendation	-	-	-	-	-	-	-	-	-
Total required	13.694*3 =42 kg	15.713*3 =48 kg	6.608*3 =20kg	58.751*3 =177g	117.501*3 =353g	29.377*3 =89 g	29.377*3 =89 g	29.377*3 =89 g	1.17*3 =4 g

(T_1-without fertilizer application; T_2-T_6 customized fertilizer application; T_7-direct fertilizer application)

Plot size and plant spacing: Gross plot size: 4.5 m × 4.5 m (20.25 m^2); Net plot size: 2.7 m × 2.7 m (7.29 m^2); Plant spacing; 90 cm × 90 cm (between rows and plants)

According to Rashmi *et al*. (2006) reported that combination of organic manures with bio-inoculants and inorganic fertilizers recorded significantly higher total soluble sugars in S_{36} and M_5 mulberry leaves. Similarly, plots which received bio-inoculants at 20 kg/ha of *Azotobacter* + 25 kg/ha of *A. awamori* + 20 kg/ha of *T. harzianum* + 75 per cent recommended N and P each through chemical fertilizer with full recommended dose of FYM and K has recorded similar total soluble protein, total soluble sugar with that of the standard check in M_5 mulberry (Sori *et al*, 2008).

The present results are in close conformity with the findings of Rajanna *et al.* (2000) reported the mulberry raised with recommended NPK with FYM had significantly higher total soluble carbohydrates (17.61 %) and crude protein (17.89 %) followed by sheep manure with recommended NPK and swine waste with recommended NPK. Application of 20 MT of vermicompost along with full dose of NPK produced significantly highest quantity of mulberry leaf with more total soluble proteins and soluble sugar contents (Setua and Ghosh, 2005).

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