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Biochemical Studies on the Influence of Different Organic Manures on the Growth of Mulberry in Anantapuramu Dist. of Andhra Pradesh, India

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Abstract: ***Mulberry silkworm i.e. Bombyx mori Linn. nourishes its nutrition from its sole food plant i.e. Mulberry (Mours spp.) Bombyx mori Linn. is an insect of immense economic importance for sericulture industry, feeds on mulberry leaves during its larval period and spins silk cocoons. Keeping in view of the importance of silkworm, B. mori and its host plant mulberry the present study was carried out. The V1 mulberry plant was grown in four different organic manures viz., Poultry manure, Vermi-compost, Compost and Cow dung to assess the leaf biochemical evaluation. Leaf biochemical analysis was carried out for leaf Moisture content, Carbohydrates and Proteins. The present study reveals that the poultry manure applied mulberry plants exhibited significant difference for all the parameters studied. The nutritive qualities of the leaves of poultry manure applied V1 plant were found superior than that of other organic manure.***

Keywords: Morus, V1, Manure, Vermi-compost, Nutritive parameters

1. Introduction

Mulberry (Morus spp.) is a perennial, deep rooted, fast growing and high biomass producing foliage plant. It forms the basic food material for the silkworm, Bombyx mori L. Increased production of raw silk, to large extent, depends on timely supply of quality mulberry leaves to silkworms. It is therefore clear that mulberry leaf plays a dominant role in cocoon production as a source of nutrition to the silkworm. The quality of mulberry leaf is influenced by several factors such as variety, agronomic practices, biotic and abiotic components (Krishnaswami et al. 1970). In mulberry cultivation, chemical fertilizers are usually used to maintain and enhance the growth and leaf quality. However, frequent use of chemical fertilizers for a prolonged period deteriorates the surface soil characteristics and affects the availability and uptake of nutrients to plants (Subbaswamy et al., 1994). Espiritu et al. (1995) had shown that the addition of nitrogen fixers can enrich and enhance the nutrient value of any compost and thus facilitate supplementation or replacement of chemical fertilizers. The maximization of quality of leaf yield is one of the most important factors for successful and good quality cocoon production. The concentrated organic manures being rich in plant nutrient could replace the inorganic fertilizers on equivalent nutrient basis. Application of organic manure improves the soil physical, chemical and biological properties with direct impact on moisture retention, root growth and nutrient conservation etc. Organic matter neutralizes the rapid fall in yield due to continuous use of inorganic fertilizers. Heavy metals react with organic matter, clay exchange site, carbonates and oxide surfaces and precipitate as hydroxides, carbonates, sulphides and phosphate in the soil. Hence, organic farm agricultural products are residue free and fetch a higher price in the market than any other chemical farm produces. Smith (1950) observed that in poultry manure, two percent of nitrogen in the form of uric acid, which changes rapidly to ammonia form for easy utilization by the plants. India has abundant organic manures as nitrogen sources viz., Poultry manure, fish meal, pig manure, farmyard manure and press mud produced by 150 million poultry, 8.6 million pigs, 182 million and 700 sugar mills which are doubled by 2000 A.D. Poultry manure is a rich source of nutrient, besides serving as a soil conserving material as stated by Eno (1966). Application of poultry manure at higher rates increased the soluble phosphorus concentration in the soil (Warneke and Siregar, 1994). Poultry manure is a rich source of nutrient, since liquid and solid excreted together without loss of urine and it ferments quickly. An attempt was made to know the influence of manures on the biochemical components of Mulberry.

2. Material and Methods

Mulberry belongs to the genus Morus of the family Moraceae, the biggest family in the order Urticales. The V1 mulberry plant raised in bush form was used for the study. The experiment was conducted in a randomized block design with 3 replications and was raised at a plant spacing of 60cm x 60cm. The experimental plot consisted of four blocks and each block had six rows. The fertilizers were applied in the form of poultry manure, goat waste, piggery waste, and cow dung in equal split doses. The control without applying fertilizers was also maintained separately. The leaf samples of mulberry were subjected to biochemical studies. Total protein (Lowry et al., 1951), total carbohydrates (Dubious et al., 1956), and moisture percentage were estimated. The moisture percentage was estimated according to gravimetric method.

3. Results

Nutritional level assessed through chemical analysis

The results revealed that V1 variety of mulberry grown in different organic manures under study vary in their nutritional constitutions. Among the manures, poultry manure applied V1 mulberry plants (76.76%) exhibited higher leaf moisture content, followed by (75.46%), (73.80%) and (73.48%). Organic manures (poultry manure, Vermi-compost, Compost and Cow dung) applied V1 plants showed very high protein, carbohydrate and lipid content when compared to the total protein, carbohydrate and lipid content in control V1 plants. The amounts of protein, carbohydrate were 201.5 mg/g, 36.592 mg/g, respectively. Different manures applied V1 plants showed high total hexose, reducing sugar and polysaccharide values when compared to the control V1 plants.

Biochemical parameter	Poultry manure	Vermi-compost	Compost	Cow dung
MOISTURE %	75.89	74.68	73.88	73.66
CARBOHYDRATES (mg/g of fresh leaf)	37.82	36.66	35.81	35.12
PROTEINS (mg/g of fresh leaf)	223.23	219.74	209.22	208.30

4. Discussion

Nutritional studies with varying levels of leaf quality produced under different organic manures treatment of V1 mulberry variety. The application of the poultry manure might have increased the release of macro as well as micro nutrients, which intern increased dry matter production, plant height, and nutrient uptake leading to higher mulberry leaf yield. In the present study, the results ensure that the application of poultry manure has increased the uptake of nutrients in mulberry leaf. Increased uptake might have been due to the increased total and available nitrogen of poultry manure. Increased dry matter production and nitrogen content contributed higher nitrogen uptake. Nainar and Pappiah (1999) recorded similar observation. Simth (1950) observed that 60% of nitrogen in poultry manure was in the form of uric acid, which changes rapidly to ammonical form for easy utilization by the plants. Improvement in soil physico-chemical properties, steady and adequate supply of nitrogen might have increased the nutrient uptake by poultry manure. Similar observation was recorded by Hsieh and Hsu (1993) in different crops. Brown (1958) stated that the poultry manure increased the growth promoting substances, which might have induced the plant for better growth and higher uptake of nutrients. An important factor, which contributed or influenced the crop to produce better growth and yield component was the high amount of phosphorus availability in the poultry manure (Ramesh, 1997).From the above findings, it is evident that the poultry manure contains the entire essential plant nutrient such as nitrogen, phosphorus, potassium, calcium, magnesium, sulphur, boron, zinc, copper, manganese iron etc, which are necessary for increasing the leaf yield and quality (Dosani et al., 1999). Since solid and liquid portions of the poultry are excreted together, poultry manure is a concentrated source of nitrogen and phosphorus. It is well documented to be an excellent source of fertilizer by Simpson (1990), and Edward and Daniel (1992). The moisture content of the mulberry leaves is a genetic character and is related to the available soil moisture content and root proliferation. The moisture content of the leaf determines the digestibility of silkworm (Kasiviswanathan et al., 1973). Usually moisture content varies from 64-83% in mulberry leaves (Yokoyama, 1975) and moisture of 70% above is considered as optimum (Singh and Singh, 1976). Silkworm fed on leaf with higher moisture content (75%) produced heaviest cocoon (Kataoka and Imai, 1986). In the present study, the moisture content varies from 71.25% to 76.76% in the control as well as organic manure applied plant leaves. Mulberry leaf with more moisture, protein, sugar and carbohydrates and less minerals and crude fiber content is the best from the silkworm nutrition point of view (Krishnaswami, 1978).

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