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EFFECT OF FERTILIZER APPLICATION ON THE GROWTH AND NUTRITIONAL COMPOSITION OF MULBERRY LEAF

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ABSTRACT
The influence of *Leucaena leucocephala*, pig dung and NPK fertilizer application on the growth (girth and height), total yield, coppice potential as well as nutritional composition of mulberry leaf was examined. The treatment were replicated four times in completely randomized design. There were significant (p0.05) differences on the height, girth, yield potential and fat content of mulberry plant while there were no significant (p0.05) differences in girth, moisture content, Nitrogen, potassium, phosphorus, crude protein and dry matter of mulberry leaves

KEY WORDS: *Leucaena leucocephala*, pig dung, mulberry, and silkworm.

INTRODUCTION

In ancient time Mulberry (Morus sp) tree grew individually in the wilderness, besides houses or along roads and wild mulberry silkworm were domesticated and reared by man. The wild mulberry, through ages of cutting and by natural or artificial selection, were transformed from the wild into numerous cultivated varieties and kinds. (Kasiviswanathan *et al*; 1988).

Mulberry is basically recognized as food plant of the silkworm (*Bombyx mori L).* The silkworm feeds only on a fresh mulberry leaf of specific quality depending upon its age. In addition to the nature of the silkworm, specific quality requirement of the insect during different phases of growth reflect the importance of mulberry cultivation practices (Kasiviswanathan *et al;* 1988). Recycling of the mulberry biomass is practiced by individual farmers. Silkworm litter is used as manure in mulberry plantation while the protein rich of mulberry leaves are used in cattle feed for milk production as reported by Kasiviswanathan *et al*; (1988). The timber of mulberry is used for furniture, tools making and sport, the fruits of mulberry tree is used for making wine and the seed for making jam (Datta and Raviskuman, 1988). The mulberry leaves serves as a source of delicious vegetable, which is very high in protein (Datta, 1992).

Another interesting feature is the "mulberry bed fish pond ecosystem" developed efficiently for recycling of the waste biomass. Silkworm litter is fed to fish while fish pond silt is used as manure for mulberry (Kasiviswanathan *et al*; 1988). The mulberry can be grown as low bush or high trunk or deep-rooted forest tree and as such be utilized in afforestation of land and ant-erosion programmes (Datta and Raviskuman 1988). Powder of *Morus alba* leaves has been drunk by some people as a healthy diet in Japan but its chemical composition is not completely understood clear (Shimiza *et al*; 1992).

Mulberry (*Morus spp*) has spread over forty two countries while the bulk (166 tonnes, 95%) of its total world production comes from China, India, Japan, South Korea and U.S.S.R. Production from tropical countries accounts for 19% with India as the largest contributor (Kasiviswanathan *et al*; 1988).

India and China are about the largest producer of raw silk from sericulture in the world with a total areas of cultivated land of about 700,000ha producing about 50,000 millions tonnes of raw silk every year (Sengupta *et al*; 1991). Fertilizers and mode of their application play a key role in the improvement of quality and yield of mulberry leaf. (Zhang *et al*; 1988). The limitation of leaf yield in conventional system of mulberry plantation is due to lack of fertilizer application, poor initial establishment, inadequate cultural operation to preserve soil moisture and low yielding mulberry variety (Manjeets, 1986).

Maximization of yield in mulberry could be achieved mainly through agronomic inputs like water and fertilizer. Mulberry cultivation in some regions were practiced in the traditional way, without fertilizer application. Recommendation for use of fertilizer for rain fed mulberry was first given during 1970 - 1971 period. This resulted in an increase of production from 5,000 to 8000 kg/ha/year (Manjeets, 1986).

Krishnaswami (1988) recorded that there were varietal differences in nutritive value with special emphasis on nitrogen and amino acid contents.

Mulberry of high yielding, good quality resistance varieties, adaptable to mechanized farming are urgently needed today. In order to increase the output of silk cocoons, international research and exchange of technical information on production, utilization and preservation of mulberry resources is needed for these reasons. This is important to understand the distribution, classification, yield and the nutritional composition of mulberry throughout the world (Zhang *et al*; 1988).

The objective of this study is therefore, to examine the effect of fertilizer(L. leucocephala, pig dung, and NPK) application on the growth(girth and height) yield potential as well as the nutritional quality of mulberry plant.

MATERIALS AND METHODS

Inorganic fertilizer and organic fertilizer were tried on the growth performance of mulberry plant at Akure Ondo State, Nigerian. The organic fertilizer treatment were those of pig dung, *L. leucocephala* and inorganic fertilizer (NPK 20:10:10) and the control. The whole treatment were replicated four time in complete Randomize Design.

Land was manually cleared using a cutlass and hoe. Cuttings of mulberry varieties of S_{36} were obtained from Ondo State sericulture demonstration centre, Akure. Each plot was 2 x 3 m with plants spaced at 1 x 1 m and 6 plants were grown per plot. The laboratory analysis has shown that fresh leaves

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of *L leucocephala* contains 6.12 % of Nitrogen while piggery dung contain 1.43% Nitrogen. Thus the above result was used to calculate the quantity of fertilizer that was applied to each mulberry plant per treatment (30 g of NPK, 163 g of *L leucocephala* and 730g of Piggery dung were applied) Pig dung, chopped *L. leucocephala* were applied on soil below each plant using ring method 30 days after planting. Manual weeding was done with hoe four weeks interval.

Soil Analysis

Before the mulberry planting on the site, surface soil samples (0-15cm) were collected from the site and bulked for analysis. The soil samples were air-dried and sieved (2mm). Mechanical analysis was carried out using the Bouyoucas hydrometer method. Soil organic matter was determined by the wet digestion method, total Nitrogen(N) was determined by the micro kjeldhal method, available phosphorus (P) was examined with Bray- 1 solution and determined by Molybdenum Chlorine try, exchangeable K, Ca, Mg and Na were extracted with ammonium acetate and determined using flame photometer (Ass).

Leaf Analysis

Mulberry leaf samples were collected randomly from each sample plot 14 weeks after planting. The samples were air-dried and ground. The grounded samples were digested using $HClO_3$ | HNO_3 | H_2SO_4 mixture, Nitrogen in the digest was evaluated using aceto-analyzer whereas K was determined using flame photometer. Lipid fat was determined through extraction with 40/60°C petroleum ether in an extractor.

Stem girth and shoot length : The stem girth and shoot length were taking with the aid of venier caliper and measuring tape at fourteen weeks after planting. The data obtained were average per treatment to find the mean girth and mean height. The final mean girth and lengths were further analyzed using analysis of variance to deduce the treatment that gave the best growth (girth and height).

RESULT AND DISCUSSION

The result of the mechanical analysis shows that the soil at the site of the experiments was sandy with high organic matter (79%, sand, 7%, silts, 14%, clay, 11.48%, organic matter, 0.42%, N, 0.25ppm available P and exchangeable K, Na, Ca and Mg values of 0.25, 1.45, 0.028 and 0.09 mol/kg soil, respectively). The result revealed that application of fertilizers increases nutritive value of leaves though there were no significant (P<0.05). differences in crude protein, dry matter and moisture content at (Table 1) Appreciable higher nutritive value of mulberry leaves treated with piggery dung was however obtained. Mulberry plants grown on piggery dung had significantly (P0.05) higher leaf fat content than those of other treatments and control (Table 1)

Mulberry yield components such as girth growth, and copice potential increased with fertilizer application (Table 2). The effect on mulberry height and fresh yield were statistically significant (P 0.05). The result showed that NPK fertilizer gave the highest yield followed by piggery dung and the control gave the lowest yield value (Table 2). The results of this study agree with the finding of Manjeets (1986) who recommended the use of fertilizer for rain fed cultivation of mulberry. He recorded an increase in production from 4,000 to 8,000 kg/ha/year while in this study 7,724.56kg/ha/year, 4960.30kg/ha/year and 4121.74kg/ha/yer and 3042.52kg/ha/year were obtained from NPK, piggery dung, *L.. leacocephala* and control respectively.

Application of organic & inorganic fertilizer did not show any significant effect on the mineral content of the treated mulberry plants, but there were appreciable increment in N and P when *L. leucocephala*, piggery dung and N.P.K were applied. (Table 3). FAO(1988) reported that mulberry leaves contains 0.8 - 1.2 percent Nitrogen, which is very essential for protein, and chlorophyll synthesis and for other components of cell nucleus, while 1.35 - 1.79 percent Nitrogen were obtained in this study.

The findings of this study are also similar to those of FAO (1988), who reported 0.19 - 0.24 percent phosphorus in mulberry leaves. While Potassium which exists in the mulberry in free state is in the range of 0.51 - 0.56percent.

Piggery manure would be an effective source of nutrients for the cultivation of mulberry plant in south western Nigeria. Its application during mulberry cultivation gave the highest yield and weight. However piggery manure was less effective in improving mulberry yield compared to 7,724.56kg/ha N.P.K fertilizer.

Table 1: Effect of fertilizer application on proximate composition in percentage

	Crude Protein %	Dry Matter %	Moisture content %	Con-Fat Content %
NPK	9.63 ± 3.78a	11.36 ± 0.49a	78.64 ±0.49a	25.97 ±1.06b
Piggery dung	14.66 ± 3078a	19.87 ± 1.35a	80.14 ± 1.35a	32.37 ± 1.99a
L. leuco-cephala	1.16 ± 4.37a	17.98 ± 3.00a	82.23 ± 3.00a	25.53 ± 2.13b
Control	14.00 ± 7.92a	20.97 ± 1.62a	79.03 ±1.61a	24.57 ± 0.51b
LSD (0.05)	ns	ns	Ns	2.98

Means in the same column that follow with different alphabet are significantly different. (P 0.05).

Table 2: Effect of fertilizer application on mulberry yield components

	Height (cm)	Girth (cm)	Coppice Potential (cm)	Fresh yield/plant (g)	Fresh yield/ plant/ha/Yr Kg
NPK	84.01 ± 55.53a	1.568 ± 0.20a	32.38 ± 12.23a	386.23 ± 149.94a	7724.56
Piggery dung	78.06±45.74a	1.35±0.31a	28.13±9.14a	248.02±39.39b	4960.30
L. leuco-cephale	72.6±48.31b	1.36±0.14a	33.39±5.41a	206.09±75.00b	4121.74
Control	56.67±38.01c	1.78±0.23a	19.25±7.90a	159.63±42.65b	3042.52
LSD (0.05)	9.62	ns	ns	137.14	

Means in the same column that follow with different alphabet are significantly different. (P 0.05).

Table 3: Effect of fertilizer application on mineral composition of mulberry leaves

	N. Content %	K%	P%
NPK	1.35 ± 1.03a	0.08 ± 0.1a	0.25 ± 0.03a
Piggery dung	1.54 ± 0.61a	0.7 ± 0.01a	0.25 ± 0.04a
L. leucocephala	1.79 ± 0.70a	0.7 ± 0.01a	0.24 ± 0.02a
Control	0.24 ± 0.26a	0.5 ± 0.01a	0.19 ± 0.02a
LSD (0.05)	ns	Ns	ns

Means in the same column that follow with different alphabet are significantly different. (P 0.05).

CONCLUSION

The result of this study revealed that fertilizer application increased growth yield and fat content of mulberry plant . Fertilizer application however had no influence on the mineral composition crude protein, moisture content and dry matter content of mulberry leaves.

NPK at 300 kg/ha or pig dung at 7,300kg/ha is thus suggested for use in mulberry cultivation.

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