

RESEARCH NOTE: 2

THE EFFECTS OF APPLICATION OF FERTILIZER ON THE GROWTH, NODULATION AND NUTRIENT UPTAKE OF ALBIZIA LEBBECK (LINN) BENTH - A SHORT NOTE

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ABSTRACT

A four month experiment was conducted in the greenhouse to assess the effects of 0, 50, 100kg/ha of 15:15:15 NPK fertilizer application to the soil on early growth, dry matter yield, nodulation and nutrient uptake of *Albizia lebeck*. The results indicated that this legume grows well on the soil used for the study without fertilizer supplementation. Plant height, dry matter yield, nutrient uptake and nodulation were decreased by the application of fertilizer to the soil. This legume nodulated profusely.

INTRODUCTION

*Albizia lebeck* is a tropical legume whose potentials have not been fully investigated. It is a valued tree in several parts of the dry tropics (NFTA, 1988) and has a high surviving rate in semiarid regions (Bangarwa, 1991). Its ability to nodulate profusely has been reported (NFTA, 1988). It is also a common shade tree in Australia though it has never been grown for feed (Prinsen, 1986). However, in extensive pastoral systems it

may have unique value because of the dry season fall of its leaf, flower and pod (Lowry, 1989). In some parts of the world, it is grown as source of pulp for paper making.

Despite its varied usefulness and its potential in improving the fertility of the site on which it is grown, there has been little or no attention paid to this tree in legume research. The literature is scanty on the factors that may influence the cultivation of this legume. With the current emphasis on Agroforestry/Reforestation programmes in the tropics, there is need for urgent research into those legumes that may be

potentially useful in such agricultural systems. This study was therefore conducted to determine to what extent 15:15:15 NPK fertilizer would affect growth, nodulation, dry matter yield and nutrient uptake in Albizia lebeck.

## **MATERIALS AND METHODS**

The soil used for the study was collected from one of the

farm sites at the University of Ibadan, Ibadan (Lat 7.23<sup>o</sup>N and 3.56<sup>o</sup>E). This site had been cultivated for about five years without nutrient supplementation. 10kg of soil was weighed into each of the pots used for the experiment. Three levels 0, 50 and 100kg/ha of 15:15:15 NPK fertilizer were separately mixed with soil from the farm site. The properties of the soil used are shown in Table 1.

**Table 1: Properties of soils used for experiments**

Soil Property	
pH	5.50
Na (cmol kg <sup>-1</sup> )	0.25
K (cmol kg <sup>-1</sup> )	0.51
Ca (cmol kg <sup>-1</sup> )	1.60
Mg (cmol kg <sup>-1</sup> )	0.12
EA (cmol kg <sup>-1</sup> )	0.20
ECEC (cmol kg <sup>-1</sup> )	2.68
P (mg kg <sup>-1</sup> )	8.82
N (g kg <sup>-1</sup> )	0.7
C (g kg <sup>-1</sup> )	7.4

\*Available forms of nutrient elements were measured.

The seeds of Albizia lebeck were obtained from the Forestry Research Institute of Nigeira (FRIN), Ibadan. Seeds were sown directly into the pots without any form of pre-sowing treatment.

This study carried out in the greenhouse for a period of four months was laid out in a Completely Randomized Design (CRD). Watering of the soil to field capacity was done daily through the period of growth.

Statistical analysis was done using the Stat-View Software on the Apple Mac Computer.

## **RESULTS**

Table 2 shows the mean nutrient uptake (N, P, K, Ca, Mg and Na). Generally the application of fertilizer did not increase nutrient uptake.

**Table 2: Effect of fertilizer application on mean nutrient uptake**

Treatment (kg/ha NPK)	N	P	K	Ca	Mg	Na
0	0.56	0.05	0.05	0.31	0.04	0.04
50	0.57	0.04	0.05	0.26	0.02	0.04
100	0.05	0.003	0.003	0.02	0.002	0.003
LSD	0.16	0.01	0.02	0.05	0.02	0.03

Table 3 shows the height data for the four -month growth period. Fertilizer application did not increase height over the four month growth period (Table 3). Rather there was a decrease as the level of fertilizer applied increased. This reflected the pattern of nutrient uptake. The control treatment where no fertilizer

application occurred had the greatest plant height throughout. Fertilizer application decreased plant height by as much as 33% at the 50kg/ha rate of application and by 74% at the 100kg/ha rate of application compared to the control treatment.

**Table 3: Effect of fertilizer application on mean monthly plant height (cm)**

Treatment (kg/ha NPK)	1	2	3	4
0	6.20	18.30	49.50	114.00
50	2.90	14.70	38.40	76.80
100	6.00	11.00	12.20	29.40
LSD	2.28	8.14	13.53	18.91

**Table 4: Effect of fertilizer application on mean dry weight of tops, nodule No. and nodule dry weight**

Treatment (kg/ha NPK)	Mean dry wt(g)	Nodule No.	Nodule dry wt (g)
0	29.00	582.50	5.10
50	23.00	346.50	1.20
100	1.80	40.50	0.10
LSD	5.38	36.90	0.39

Fertilizer application decreased dry matter yield (Table 4). As level of fertilizer applied increased, the dry matter yield of plant tops decreased significantly ( $P = 0.05$ ) becoming as low as 1.80g at the 100kg/ha rate.

There was a significant reduction ( $P=0.05$ ) in the number of nodules produced as the level of fertilizer applied increased (Table 4). Nodulation decreased by 40% and 93% at the 50kg/ha

and 100kg/ha rates of fertilizer application compared to control.

## DISCUSSION

Albizia lebbeck appears to grow well without fertilizer application in a soil such as the one used for this study. The application of 15:15:15 NPK fertilizer decreased plant height as the level of fertilizer applied increased. Hussein *et al* (1989) also observed a proportionate decrease in height as the concentration of L-methionine increased. Generally the zero level of fertilizer application showed a higher uptake of nutrient by Albizia lebbeck. This higher uptake of nutrients may be responsible for the greater height, drymatter accumulation and nodulation at the zero level than at the other levels of NPK 15:15:15 application. Albizia lebbeck has a tendency to nodulate profusely

and it is generally nodulated by the native rhizobium in most soils. Albizia lebbeck may therefore be describe as being symbiotically promiscuous as far as the rhizobium genus is concerned. In a study, Siddiqui (1989) observed that Albizia lebbeck nodulated more than the other legumes studied.

In view of the low nitrogen status of the soil used in this study, it is most probable that Albizia lebbeck is able to fix enough nitrogen which it requires for its growth. Because of this combined ability of a probable high degree of nitrogen fixation (Ogbogodo, 1994) and biomass production, Albizia lebbeck may be a very good legume to incorporate in an agroforestry system such as alley cropping.

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