EFFECT OF METHOD OF PLACEMENT AND RATE OF LEUCAENA LEAVES APPLICATION ON TARO

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ABSTRACT

Depth of placement of ipil-ipil herbage failed to give significant effect on all agronomic and yield characters of upland taro. However, rates of fertilizer application significantly influenced the parameters tested. In general, the agronomic and yield parameters increased with an increase in ipil-ipil herbage application except for non-marketable corms. Notable differences were observed between the unfertilized and ipil-ipil treated plants.

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KEY WORDS: *Leucaena leucocephala.* Fertilizer source. Method of placement. Taro. Agronomic characters. Yield and yield components.

INTRODUCTION

Among root crops, taro *Colocasia esculenta* (L.) Schott, locally known as gabi, still lags behind in terms of research and development emphasis (Villanueva, 1979). It is considered a minor crop and little research has been done on its production including fertilizer application. In addition, the high cost of fertilizers discourages most farmers to fertilize gabi due to uncertainty of obtaining higher yields or profit. Hence, studies must be undertaken to establish critical fertilizer levels in taro to get its maximum corm yield.

With the high price of commercial fertilizers, farmers may tap other sources which could replace much of the required amount for crop production. Organic fertilizers like ipil-ipil is one of them. Curran (1976) reported that 120 t of ipil-ipil leaves may contain up to 1,000 kg N, 200 kg of phosphoric acid and 800 kg of muriate of potash. Sidedressing ipil-ipil leaves provides organic matter that serves to improve the

physical and chemical conditions of the soil by increasing water retention, fertility level, and general tilth (Serrano, 1979). The utilization of ipil-ipil leaves as fertilizer is a bright prospect for small farmers since ipil-ipil leaves are cheap and locally available.

This study was conducted to determine the effect of depth and rates of ipil-ipil herbage application on yield and other agronomic characters of taro.

MATERIALS AND METHODS

Preparation of Materials. — Setts of taro (Kalpao variety) which consist of the upper 1-2 cm tip section of corms and 20-25 cm of petiole were prepared as planting materials. Giant ipil-ipil (variety K2) was prepared by removing the compound leaves from its branches and drying them for 4 to 6 days and then used as fertilizer source.

Experimental Design and Field Layout. — A split-plot arranged in randomized compiete block design replicated 3 times was used with depth of ipil-ipil leaves placement as main plot and rates of application based on analysis of Curran (1976) as subplots. Each subplot with 5 rows was separated by 1 m alleyway and measured 5.0 m x 3.75 m. The treatments used were as follows: —

Main plot:

P_1 - broadcast on the soil surface
P_2 - buried 5 cm deep in band
P_3 - buried 10 cm deep in band

Subplots:

F_0 - control (no ipil-ipil leaves applied)
F_1 - 5 t dried ipil-ipil leaves/ha (equivalent to 41.67 kg N, 8.33 kg P_2O_5 and 33.33 kg K_2O)
F_2 - 10 t dried ipil-ipil leaves/ha (equivalent to 83.33 kg N, 16.67 kg P_2O_5 and 66.67 kg K_2O)
F_3 - 20 t dried ipil-ipil leaves/ha (equivalent to 166.67 kg N, 33.33 kg P_2O_5, and 133.33 kg K_2O)

Setts were planted 75 cm x 50 cm apart at the rate of one plant per hill with the basal portion buried about 11 cm deep into the soil. Ipil-ipil herbage was applied once at 2 weeks before planting. Weeding and insect control (using Azodrin and Furadan) were done in all treatment plots. Benlate was used to control leaf blight disease. Drainage canals were constructed to prevent waterlogging.

Data Gathered. — From the 5th month after planting until maturity, measurements were taken at monthly intervals based on 10 plant samples per treatment. Plant height was measured from the ground level up to the tip of the second opened leaf while the total number of fully expanded leaves per plant was counted. To obtain the leaf area, the length of one fully expanded leaf at its longest point and the width at its

widest part were measured.

At harvest, 24 sample plants from the 3 inner rows per treatment were used to determine the herbage weight and the number of runners per plant. The length and girth of the main corms were taken with the use of a foot rule and vernier caliper, respectively. Marketable (those approximately 100 g and disease-free) and non-marketable corms were counted separately and weighed thereafter.

RESULTS AND DISCUSSION

Soil Analysis.

An initial 2.5% organic matter (OM) content which included nitrogen was indicated by soil analysis before planting (Table 1). After harvest, OM content increased to 4.5% and pH from 5.0 to 5.3. The increase in OM content was attributed to the addition of decomposed ipil-ipil whereas the increase in pH value was probably due to waterlogged conditions brought about by heavy rainfall. On the other hand, the amounts of phosphorus and potassium decreased after harvest. The reduction of these elements due to crop removal indicates that taro needs sufficient amounts of phosphorus and potassium aside from nitrogen.

Agronomic Characters

Depth of ipil-ipil leaves placement showed no significant effects on plant height, leaf area index, leaf count and herbage yield of taro at maturity (Table 2). Similarly, no significant interaction effect was noted on the same growth parameters as influenced by depth of placement and the rates of fertilizer application.

Plant Height (cm).

Table 2 indicates that plants treated with 10 and 20 t/ha except those applied with 5 t/ha of ipil-ipil herbage, were significantly taller than those that did not receive fertilizer. Soil analyses indicated that inspite of the addition of fertilizer, soil nutrients especially

Table 1. Analyses of soil samples taken from the experimental area before application of ipil-ipil leaves and planting taro, and after harvesting the crop.

Samples taken	pH	O.M. (%)	Available P (ppm)	Extractable K (ppm)
Before application of ipil-ipil leaves and planting taro	5.0	2.5	85	268
After harvest of crop	5.3	4.5	31	8

Table 2. The agronomic character of taro as influenced by method of placement and rate of fertilizer (ipil-ipil) application.

Treatment	Agronomic Characters									Herbage yield at harvest (kg/plot)
	Plant Height (cm)			Leaf Area Index			No. of Leaves/Plant			
Depth of ipil-ipil leaves placement[ns]	5th mo.	6th mo.	7th mo.	5th mo.	6th mo.	7th mo.	5th mo.	6th mo.	7th mo.	
P_1 (surface)	85.6	76.7	72.1	1.8	1.6	1.4	3.6	3.1	2.7	15.8
P_2 (5 cm)	81.5	74.7	69.2	1.6	1.5	1.3	3.6	3.2	2.9	16.7
P_3 (10 cm)	90.8	82.6	76.8	2.0	1.6	1.4	3.6	3.2	2.8	16.6
Rate of ipil-ipil leaves application*										
F_0 (control)	71.6c	65.6c	60.4c	0.9c	0.8c	0.5c	3.5	3.0	2.6	12.6c
F_1 (5 t/ha)	81.5bc	74.8bc	69.5bc	1.7b	1.4b	1.2b	3.6	3.2	2.8	15.4bc
F_2 (10 t/ha)	91.3ab	81.9ab	76.8ab	2.0ab	1.7b	1.6b	3.7	3.2	2.8	17.1ab
F_3 (20 t/ha)	99.7a	89.8a	84.1a	2.5a	2.3a	2.1a	3.7	3.3	2.9	20.3a
Mean	86.0	78.0	72.7	1.8	1.6	1.3	3.6	3.2	2.8	16.3
C.V. (a)%	15.9	13.6	14.8	24.2	16.5	19.6	6.4	5.4	10.6	8.6
C.V. (b) %	6.4	6.2	7.0	11.2	13.0	15.8	5.3	8.3	8.0	9.12

ns = not significant

* In a column, treatment means followed by a common letter are not significantly different at 1% level based on Scheffe's test.

phosphorus and potassium decreased which indicates that the inherent supply of these nutrients in the soil were insufficient for the plant requirements. When the rate of fertilizer was increased, it resulted in a corresponding increase in plant height over unfertilized ones.

Leaf Area Index (LAI).

Statistical analyses revealed that ipil-ipil herbage application did not significantly affect leaf production of taro. However, leaf area index values were markedly affected by rates of ipil-ipil leaves applied (Table 2). As in plant height, LAI increased with the increasing rates of ipil-ipil leaves applied. Relatively lower LAI values among unfertilized plants were noted. The result suggests that ipil-ipil herbage enhanced crop growth, hence increased the LAI of taro.

Herbage Yield (kg/plot).

Ipil-ipil leaves application at the rates of 10 to 20 t/ha produced significantly heavier herbage over the control (Table 2). The vigorous growth of taro due to fertilizer application as exhibited by taller plants and greater LAI values contributed largely to the increase in weight of leaves and petioles at harvest.

Yield and Yield Components

As in the agronomic characters, the depth of placement did not significantly influence yield and yield parameters tested (Table 3).

Number of Runners Per Plant.

Regardless of depth of placement, plants applied with ipil-ipil herbage at different rates resulted in increased production of runners per plant (Table 3). Plants that received 5 to 10 t/ha of ipil-ipil herbage produced significantly more runners per plant than the untreated ones. Still more runners were produced in plants applied with 20 t/ha of ipil-ipil herbage. This indicates that ipil-ipil leaves enhanced the production of runners.

Plants applied with different rates of ipil-ipil herbage produced significantly longer corms than the untreated ones. Corm length increased with the increasing rates of fertilizer applied (Table 3). These findings corroborate with those obtained by Abit (1978) with the use of inorganic fertilizer, i.e., the increment in corm length is proportional to the amount of fertilizer applied.

The same is true with corm diameter. This suggests that application of ipil-ipil leaves as fertilizer also positively influenced corm enlargement resulting in differences in corm diameter. Ipil-ipil — fertilized plants had significantly longer corm girth than the unfertilized ones.

Number of Corms Per Plot.

Plants applied with 20 t/ha of ipil-ipil herbage developed the most number of marketable corms. However, all rates used produced statistically similar number of marketable

Table 3. Mean yield and yield components of taro as influenced by methods of placement and rates of ipil-ipil application.

Treatment	Yield and Yield Components							
	No. of	Corm Size		Marketable Corms		Non-marketable Corms		Total
Depth of ipil-ipil leaves placement[ns]	runners per plant	Length (cm)	Girth (cm)	No. per plot	Weight (kg/plot)	No. per plot	Weight (kg/plot)	yield (t/ha)
P_1 (surface)	5.5	10.3	8.2	18.2	8.6	5.7	0.4	10.0
P_2 (5 cm deep)	5.2	10.2	8.0	18.2	7.8	5.6	0.4	9.2
P_3 (10 cm deep)	5.6	11.1	7.9	17.9	8.6	6.0	0.4	10.0
Rate of ipil-ipil leaves application*								
F_0 (control)	3.3c	9.1c	6.5c	16.3bc	6.6c	7.3a	0.6a	8.0bc
F_1 (5 tons/ha)	5.0b	10.4b	7.7b	17.9 abc	7.9bc	6.0ab	0.4ab	9.2bc
F_2 (10 tons/ha)	6.0ab	10.9ab	8.5ab	18.8ab	8.7ab	5.1abc	0.4abc	10.1ab
F_3 (20 tons/ha)	7.0a	11.7a	9.4a	19.4a	10.2a	4.5bc	0.3c	11.7a
Mean	5.3	10.5	8.0	18.1	8.4	5.7	0.4	9.8
C.V. (a) %	14.0	10.2	9.9	5.6	15.4	19.8	12.7	14.5
C.V. (b) %	12.2	5.0	5.7	6.4	10.6	20.6	20.8	10.4

ns = not significant

* In a column, treatment means followed by a common letter are not significantly different at 1% level based on Scheffe's test.

corms. There was a considerable reduction in the number of corms when no ipil-ipil herbage was applied. This indicates that application of ipil-ipil as fertilizer can enhance development of corms.

This result agrees with the findings of Acedo and Javier (1980) that fertilizer application increased the production of marketable tubers in sweet potato plants.

It was also noted that more runners were produced in fertilized plants and these probably competed with the corms for nutrients necessary for its development. Inspite of this, more marketable corms were still produced. This suggests that ipil-ipil leaves enhanced the production of both runners and marketable corms.

The number of non-marketable corms was significantly affected by ipil-ipil herbage application. Plants applied with any rate of ipil-ipil leaves (5-20 t/ha) developed fewer non-marketable corms than the unfertilized ones. This resulted in the production of more and bigger marketable corms in the fertilized plots.

Weight of Marketable and Non-Marketable Corms (kg/plot).

Plants that received 10 and 20 t/ha of ipil-ipil herbage produced significantly heavier marketable corms than the unfertilized plants (Table 3). This indicates that ipil-ipil enhanced corm growth which consequently resulted in higher corm weights.

The weight of non-marketable corms was significantly greater in unfertilized plants than those applied with 20 t/ha but not in plants applied with 5 and 10 t/ha of ipil-ipil leaves. This suggests that high N level in the soil considerably reduced the production of non-marketable corms (Table 1). This result confirms the findings of Urdaneta (1980) that a marked increase (32%) in the number of marketable tubers of sweet potato occurred when applied with 5.97 t of N/ha (60 kg of N/ha) of ipil-ipil leaves compared with the control.

Total Corm Yield (t/ha).

A slight increase in corm yield was noted with increasing rates of fertilizer applied. Similar result was obtained by Robin (1978) who observed increased corm yield of taro with the increasing rates of organic fertilizer (Sagana 100) applied up to 200 kg/ha. Application of 20 t/ha of ipil-ipil leaves produced the highest corm yield which was significantly higher than that of the control plants. The slightly higher yield obtained using 20 t/ha of ipil-ipil leaves was not significantly different from that of taro applied with 10 t/ha. Hence for economic considerations, the latter is highly recommended.

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