MANIPULATION OF CULTURAL PRACTICES FOR IPIL-IPIL AND ITS EFFECT ON THE INTERCROPPED CASSAVA

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ABSTRACT

Pruning and intercropping affected plant height and fresh herbage yield of ipil-ipil. Both parameters declined as the crop was cut back periodically. Plant population also compounded the effect. At high plant population, the pruned plants developed thin and elongated stems which reduced herbage yield per plant per unit area. However, the higher number of plants per unit area compensated for the reduced vegetative growth. High herbage yields were obtained at close planting distance. The cassava plants competed intensely with ipil-ipil for light and space. Due to rapid growth and development of the pruned ipil-ipil, growth and development of plant parts and formation of cassava tubers were greatly affected as manifested by the higher yield of the monoculture crop. A planting distance of 3 m x 15 cm for ipil-ipil resulted in the production of reasonable tuber yields per hectare of cassava.

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KEY WORDS: Pruning. Intercropping. Ipil-ipil. Cassava. Herbage yield. Tuber yield.

INTRODUCTION

Ipil-ipil has varied uses, such as for food, feed, fertilizer, and as material for industrial purposes. Due to its great potential, its importance is gaining wide interest among crop and animal scientists.

High yield of ipil-ipil herbage is aimed for forage production. *Leucaena* pruned at 1-m high at 3-month intervals can yield 500-600 kg N/ha per year. Research in Hawaii (Brewbaker, 1975a) has

shown that 64-95 metric tons of fresh herbage had been harvested per ha per year, while Alferez (1976) reported that ipil-ipil can produce a herbage yield of 10-24 t/ha of dry matter per year. It was further claimed that ipil-ipil contains 20-36 kg of N/ton, 1.5-5.0 kg P/ton and about 13-24 kg K/ton of dry matter. Brewbaker (1975b) observed that the fertilizer equivalent of a year's harvest per hectare of "Hawaiian Giant" is estimated to be more than 550 kg N, 225 kg P_2O5 and 550 kg K_2O. These plant nutrient values are equivalent to 52 bags of ammonium sulfate, 20 bags of superphosphate, and 18 bags of muriate of potash. Studies showed that cereals such as corn, when intercropped with ipil-ipil, yielded 23% more than the control. Farmers who cannot afford to buy inorganic fertilizer or who are far from the source can use ipil-ipil as organic fertilizer.

The use of ipil-ipil on corn as green manure applied on the soil surface had been tried. Plots applied with ipil-ipil leaves yielded 4.2 t/ha compared to check plots which yielded 1.8 t/ha. The former even yielded more than those plants treated with inorganic fertilizer at the rate of 75 kg/ha (Guevarra, 1976).

To obtain higher herbage production of ipil-ipil, the different cultural practices need to be investigated. One aspect that should be looked into is the effect of planting distance and pruning on organic matter production for utilization as animal feeds or as fertilizer on crops such as cassava planted between ipil-ipil rows to take advantage of the latter as nitrogen source.

MATERIALS AND METHODS

Soil samples were collected and analyzed before the application of the treatments (50 kg each of P and K fertilizers). No nitrogen was applied throughout the experiment.

The experimental area was laid out in a randomized complete block design with three replications. Giant ipil-ipil seeds (Peruvian var.) were sown at the rate of 10-20 kg/ha in the rows (10 m long) at the following distances:

A = 1 m x 15 cm (5 rows) — for intercropping or intensive grazing system
B = 3 m x 15 cm (4 rows) — for grazing or when intercropped with food crops or short term crops
C = control (no ipil-ipil)
D = 30 cm x 15 cm (10 rows) — for facilitating mechanized forage harvesting
E = 3 m x drill (4 rows) — same use as in B with seeding having facilitated
F = 1 m x drill (5 rows) — same use as in A with seeding having facilitated

The ipil-ipil crop was allowed to grow for one year and then pruned every 3 months (90 days) thereafter at a height of 30 cm from the ground. After taking the herbage yield during each pruning, the

pruned plant parts were spread in the plots where they were cut. This procedure was done every time the ipil-ipil plants were cut back.

After the first pruning of ipil-ipil, cassava cuttings were planted vertically on ridges in-between the ipil-ipil rows. A control plot (cassava alone) without N but with P and K was also established for comparison. Weed control was maintained in all plots using both manual and chemical methods (gramoxone), whenever necessary.

RESULTS AND DISCUSSION

One year after planting, the ipil-ipil crop was harvested. Table 1 reveals no significant differences on plant height among treatments. Generally, the plants grew from 4.06 m to 5.58 m. This difference in height was due to the very close planting distance of the latter (30 cm x 15 cm) compared to the former (3 m x 15 cm). Intense competition took place among plants which were closely planted while those with wide distances grew normally. The highest herbage yield of 74 t/ha was obtained when the plants were grown at a distance of 1 m between rows and drilled within the area. Low herbage yields were noted in wider rows under treatments B (3 m x 15 cm and E (3m x drill) at 29.5 t/ha and 18.6 t/ha, respectively.

During the second pruning, ipil-ipil plant height decreased compared with that of the first pruning. This was attributed to the effect of cassava planted in-between the rows of ipil-ipil shortly after the first pruning of the former. Cassava competed for light, space, moisture, and nutrients, thus suppressing the growth of ipil-ipil. Under treatments B and E, the root crop grew more than 2 m high (Table 2). However, the reverse occurred in treatments D and F (very close planting of ipil-ipil) where cassava had high mortality. Despite the intense competition between ipil-ipil and cassava, the former grew fast and crowded and shaded the latter (Figs. 1-4).

In all the prunings made, ipil-ipil was able to recover rapidly. However, there was a decrease in plant height from the first to the fourth prunings in all the treatments. Development of branches was enhanced at the expense of vertical growth of the plants. According to Mitchell (1970), the carbohydrate reserves are translocated to the aerial parts and used in the production of photosynthetic area. When enough foliage is formed, the carbohydrate is replenished in the reserve organs (roots, stubble). After the plant has been partially or completely pruned, the carbohydrate reserve materials are used in the following order: new leaf growth, restoration of carbohydrate reserves, and root growth. Furthermore, since cassava had already a headstart after the first ratoon, shading affected the early growth of the ratoon crop of ipil-ipil.

Cutting back and intercropping affected plant height of ipil-ipil as well as its fresh herbage yield as manifested by a corresponding decrease in all the treated plants. The same trend was observed in the

Table 1. Plant height, fresh herbage yield, and number of plants/ha of ipil-ipil at each harvest as affected by planting distance.[1]

TREATMENT (Planting distance of ipil-ipil)	Plant height (m) Harvest no. of ipil-ipil				Weight of fresh herbage (t/ha) Harvest no. of ipil-ipil				Total herbage yield (t/ha)	No. of pits per hectare at final harvest
	1st	2nd	3rd	4th	1st	2nd	3rd	4th		
A (1 m x 15 cm)	5.37 a	3.70 b	3.33 a	2.11 a	70.3 a	58.65 b	43.20 b	8.00 b	180.2	69,222.20
B (3 m x 15 cm)	5.58 a	4.03 a	3.37 a	2.51 a	29.5 b	31.62 c	23.22 c	2.82 b	87.2	22,814.80
C (control - no ipil-ipil, cassava alone)	—	—	—	—	—	—	—	—	—	—
D (30 cm x 15 cm)	4.06 b	3.73 b	3.23 a	2.36 a	72.6 a	93.33 a	62.78 a	15.56 a	244.3	201,111.13
E (3 m drill)	5.24 a	3.95 a	3.33 a	2.40 a	18.6 b	29.33 c	20.00 c	3.89 b	71.8	23,555.53
F (1 m x drill)	5.39 a	3.75 ab	3.41 a	2.30 a	74.0 a	69.15 b	52.00 ab	16.50 a	211.6	65,111.10
Total	25.64	19.16	16.67	11.68	265.0	282.10	201.20	46.77	795.16	358,259.00
Mean	5.13	3.83	3.33	2.34	53.0	56.42	40.24	9.35	198.76	71,652.00
C.V. (%)	8.19	3.64	3.17	10.3	35.53	20.1	15.7	30.65		

[1] Means having the same letters are not significantly different at 5% level using DMRT.

Table 2. Plant height, population per hectare, weight of aboveground parts, weight of marketable and non-marketable tuber and total tuber yield of cassava at harvest.[1]

Treatment (Planting distance)	Plant height (m) Harvest no. of ipil-ipil 2nd	3rd	4th	Plant population per hectare	Wt. of above-ground parts (t/ha)	Wt. of marketable tubers (t/ha)	Wt. of non-marketable tubers (t/ha)	Total tuber yield (t/ha)
A (1 m x 15 cm)	1.61 b	2.25 a	2.29 ab	13,452.4 b	10.83 b	0 c	4.03 b	4.0 bc
B (3 m x 15 cm)	2.16 b	2.21 a	2.99 a	13,068.8 b	23.85 a	10.58 b	8.69 b	19.3 b
C (control - no ipil-ipil, cassava alone)	1.54 b	2.23 a	2.98 a	26,666.7 a	27.218 a	23.54 a	17.06 a	40.6 a
D (30 cm x 15 cm)	1.62 b	2.17 a	1.76 bc	7,301.6 c	3.15 b	0.62 c	1.47 b	2.1 c
E (3 m x drill)	2.33 a	2.48 a	2.73 a	12,962.9 b	23.03 a	7.95 bc	5.53 b	13.5 bc
F (1 m x drill)	1.52 b	2.20 a	1.80 c	11,785.7 b	7.91 b	2.53 bc	2.51 b	5.0 bc
Total	10.76	13.54	14.55	58,716.92	95.98	45.20	39.3	84.5
Mean	1.80	2.26	2.42	9,786.15	16.00	7.5	6.6	14.1
C.V. (%)	7.84	25.24	17.94	17.3	35.53	65.18	59.98	58.5

[1] Means having the same letters are not significantly different at 5% level using DMRT.

previous crops with treatment D having the highest total yield of 244.3 t/ha followed consecutively by treatments F, A, B, and E (Table 1).

The results show that herbage yield was greatly influenced by plant population and plant height, and was affected greatly by the former. Generally, as plant population increased, plant height decreased and vice-versa. The low yield of shorter and thinner plants was compensated by their greater number per unit area.

As for cassava, plant growth varied from treatment to treatment. The plants grew taller under treatments B and E during the second harvest of ipil-ipil. At the third harvest of ipil-ipil, there were no significant differences among the different treatments. At this stage, cassava plants competed with ipil-ipil plants. Under the control plot, cassava grew shorter compared to

Fig. 1. Two cassava rows planted in-between ipil-ipil rows spaced at 3 m apart. This ipil-ipil crop was pruned 2 months earlier.

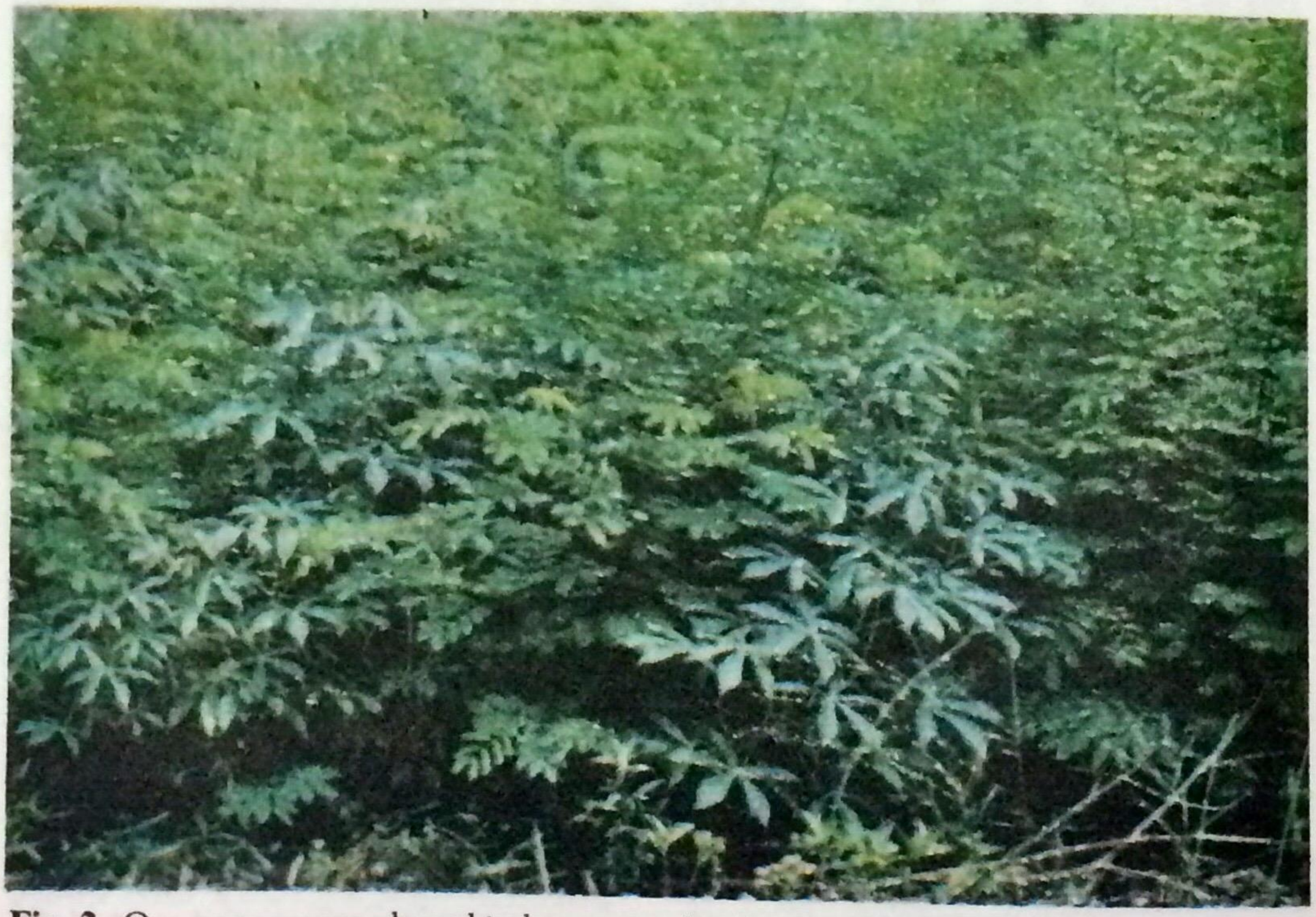

Fig. 2. One cassava row planted in-between ipil-ipil rows spaced at 1 m apart. The ipil-ipil crop was pruned 2 months earlier. Note the faster growth of ipil-ipil and the inability of the cassava plants inside the rows to compete with ipil-ipil.

Fig. 3. Cassava was planted between 2 rows of ipil-ipil planted at 30 cm apart. The ipil-ipil crop was pruned 2 months earlier. Note the fast growth of ipil-ipil and the inability of cassava to survive. High mortality of cassava was noted under this treatment.

other treated plants. No ipil-ipil leaves were used as fertilizer in this treatment.

Table 2 shows that at wider spacings of ipil-ipil (Treatments B and F), cassava grew taller than in other treatments. However, they almost had the same height shortly before the fourth harvest of ipil-ipil except for treatments D (30 cm x 15 cm) and F (1 m x drill). Plants under these treatments did not even reach 2 m because of closer planting distance of ipil-ipil. Competition for light, space, moisture, and nutrients was intense between ipil-ipil and cassava.

Prior to harvesting the cassava, plant population was determined. Most plants survived in the control plots. This was attributed to lack of competition with other plants. Those that were intercropped at wider spacing of ipil-ipil (Treatments A, B, E, and F) had more or less the same plant population. Cassava plants had high mortality in the closest spacing (30 cm x 15 cm) due to intense competition for space, moisture, and nutrients, aside from too much shading provided by ipil-ipil to cassava.

The weight of the above-ground parts of cassava showed that the wider the distance of planting of ipil-ipil, the higher the values of this parameter. Treatments B, C, and E produced heavier herbage yield compared to other treatments (A, D, and F). At wider planting

distance of ipil-ipil, the intercropped cassava grew and developed more or less normally. Closer planting of the main crop resulted in the development of thin and elongated stems of cassava with lighter weight.

For marketable tuber yield, the monoculture cassava plot (control) gave the highest yield (23.54 t/ha), followed by treatment B at 10.58 t/ha. The lowest tuber yields of 0.62 and 2.53 t/ha were obtained in the closest planting distance of ipil-ipil (30 cm x 15 cm and 1 m x drill). Surprisingly, no marketable tubers were harvested under Treatment A. The same trend was noted in yields of non-marketable tubers under different treatments. Most of the non-marketable tubers in this case were usually underdeveloped due to overcrowding between ipil-ipil and cassava plants resulting in intense intra- and interplant competition.

Monoculture cassava gave the highest total tuber yield of 40 t/ha, followed by treatments B (3 m x 15 cm and E (3 m x drill) with 19.3 and 13.5 t/ha, respectively. The reduced tuber yield was attributed to mutual shading and competition for moisture, space, and nutrients. Even without ipil-ipil to provide nutrient and organic matter, cassava yielded high in the control plot. This root crop was apparently affected more by shading and competition for space rather than competition for or lack of nutrients.

The results of this experiment

Fig. 4. Control plot of monoculture 6-month-old cassava planted at 1 m x 50 cm. Note its vigorous growth and height compared with ipil-ipil pruned 6 months earlier.

show that if cassava had to be intercropped with ipil-ipil, it is advisable to plant the latter at a distance of at least 3 m x 15 cm to have a reasonable tuber yield of cassava. Furthermore, to obtain high amount of ipil-ipil herbage, the crop should be planted closer to have more plants per unit area and pruned every 2 months to have more leaves and succulent stems.

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