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A preliminary study on the use of the local variety of ipil-ipil *Leucaena leucocephala* as a protein source for prawn feed

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Leucaena leucocephala, more commonly known in the Philippines as ipil-ipil, is a leguminous plant whose pod and leaves are used as diet components in animal feeds. It has been incorporated in experimental fish pellets and shellfish feeds in Hawaii where it is commonly known as *koahaole* (Glude, 1975). Protein content of the leaves and seeds are relatively high (34 to 41% and 26 to 48%, respectively) depending on the variety. Besides the protein content, the leaves contain beta-carotene, which imparts a yellow color to egg yolks.

In search for an economical and biologically viable diet for *P. monodon,* ipil-ipil as a protein source was used because of its local availability. In previous unpublished experiments at the Feed Laboratory leaves or seeds in an amount of 30% of the diet did not produce adverse effects on the survival rate when the "Hawaiian Giant" Peruvian variety (*L. leucocephala*) was used. When the same amount of the local variety was included in the diet, very low survival rate and poor growth were obtained. This study was carried out to determine the effect of 10 or 20% leaves or seeds in the diet and the extent to which local ipil-ipil could replace head shrimp meal.

P. monodon postlarvae weighing from 0.3 to 1.2 g and from 45 to 53 mm in length, obtained from the Leganes ponds, were reared for 28 days, from Nov. 17 to Dec. 15, 1977. Six diets with the same basic ingredients (Table 1) were prepared in essentially the same manner. Protein content was calculated to be 30%. Standard methods were used for promixate analysis and digestible energy in kcal/g as computed for D. E. values for channel catfish are shown in Table 2. Seeds and leaves were dried in a draft oven until they were brittle and ground in a Wiley mill. They were sieved through a No. 60 mesh sieve and mixed with other ingredients in a Hobart mixer. Oil was gradually added to the dry mass. Corn starch was first gelatinized (40mL water/5 g) and added to the mixture. The pellets were steamed for five minutes and dried in a draft oven at about 60°C for about 8 hours until moisture content was not more than 10%. The diets were supplemented with a poultry vitamin-mineral mix, V-22 (Table 1).

Table 1. Composition of the diet in percent.

Ingredients	DIETS (%)					
	I	II	III	IV	V	VI
Shrimp head meal	50	40	50	40	50	40
Ipil-ipil leaves	10	20	—	—	5	10
Ipil-ipil seeds	—	—	10	20	5	10
Wheat flour	20	20	20	20	20	20
Corn starch	10	10	10	10	10	10
Fish oil	3	3	3	3	3	3
Corn oil	3	3	3	3	3	3
Vitamin-mineral mix	4	4	4	4	4	4
Total	100	100	100	100	100	100
Water	40	40	40	40	40	40

Each 4 g of vitamin-mineral mix contains:

Vitamin A — 6688 USP units, Vit. D — 2508 USP units, Vit. E — 2.92 I. U., Vit. K — 0.46 mg, Vit. C — 200 mg, Vit. B_1 — 1.67 mg, Vit. B — 3.34 mg, Vit. B_6 — 0.42 mg, Vit. B_{12} — 16.72 mg, CaPanthothenate — 4.56 mg, Choline chloride — 167.7 mg, Folic acid — 0.84 mg, Iron (ferrous sulfate) — 33.44 mg, Iodine (potassium iodide) — 1.672 mg, Calcium (carbonate, phosphate, sulfate) 456 mg, Cobalt sulfate — 0.167 mg, Copper sulfate — 1.672 mg, Magnesium sulfate — 25.08 mg, Potassium sulfate — 0.250 mg, Zinc sulfate — 66.88 mg, Manganese sulfate — 45.6 mg, L-lysine hydrochloride — 25.08 mg, Methionine — 33.44 mg.

Table 2. Proximate chemical composition of the diets in percent [a]

	I	II	III	IV	V	VI	Ipil-ipil Leaves	Ipil-ipil Seeds
Crude protein	29.44	27.50	28.71	28.52	21.3[b]	26.9	41.13	48.66
Ether extract	8.78	10.10	9.36	9.62	7.27	13.09	9.14	10.88
Crude fiber	10.19	8.10	8.38	9.38	9.11	8.05	9.50	7.81
Nitrogen fuel extract	29.49	31.80	28.79	26.77	37.04	29.00	21.68	18.88
Ash	17.10	16.50	18.76	19.26	19.27	16.96	7.21	7.79
Dry matter	95.00	94.00	94.00	94.00	94.00	94.00	88.66	94.02
D. E. in kcal/g[c]	2.5	2.6	2.5	2.4	2.4	2.7	2.9	3.2

[a] Analyzed by the chemistry section, SEAFDEC, Tigbauan, Iloilo

[b] Reanalyzed value for protein was 25.9

[c] Calculations were based on the D. E. for channel catfish

Protein = 3.5, Carbohydrate, 2.5 and Fat, 8.1 kcal/g

Recompute kcal to include fiber.

Table 3. Mean weight gain and survival rate of *P. monodon* larvae fed shrimp head meal and ipil-ipil as protein sources[a].

Diets	Mean wt gain (g)	Survival rate *(%)*
I 10% ipil-ipil leaves	0.27[a]	55.5[a]
II 20% ipil-ipil leaves	0.60[a]	24.4[b]
III 10% ipil-ipil seeds	0.23[a]	62.2[c]
IV 20% ipil-ipil seeds	0.39[a]	46.7[d]
V 5% leaves, 5% seeds	0.51[a]	55.5[a]
VI 10% leaves, 10% seeds	0.46[a]	15.5[e]

[a] Figures with the same superscripts are not significantly different from each other at the $P < 0.05$ level.

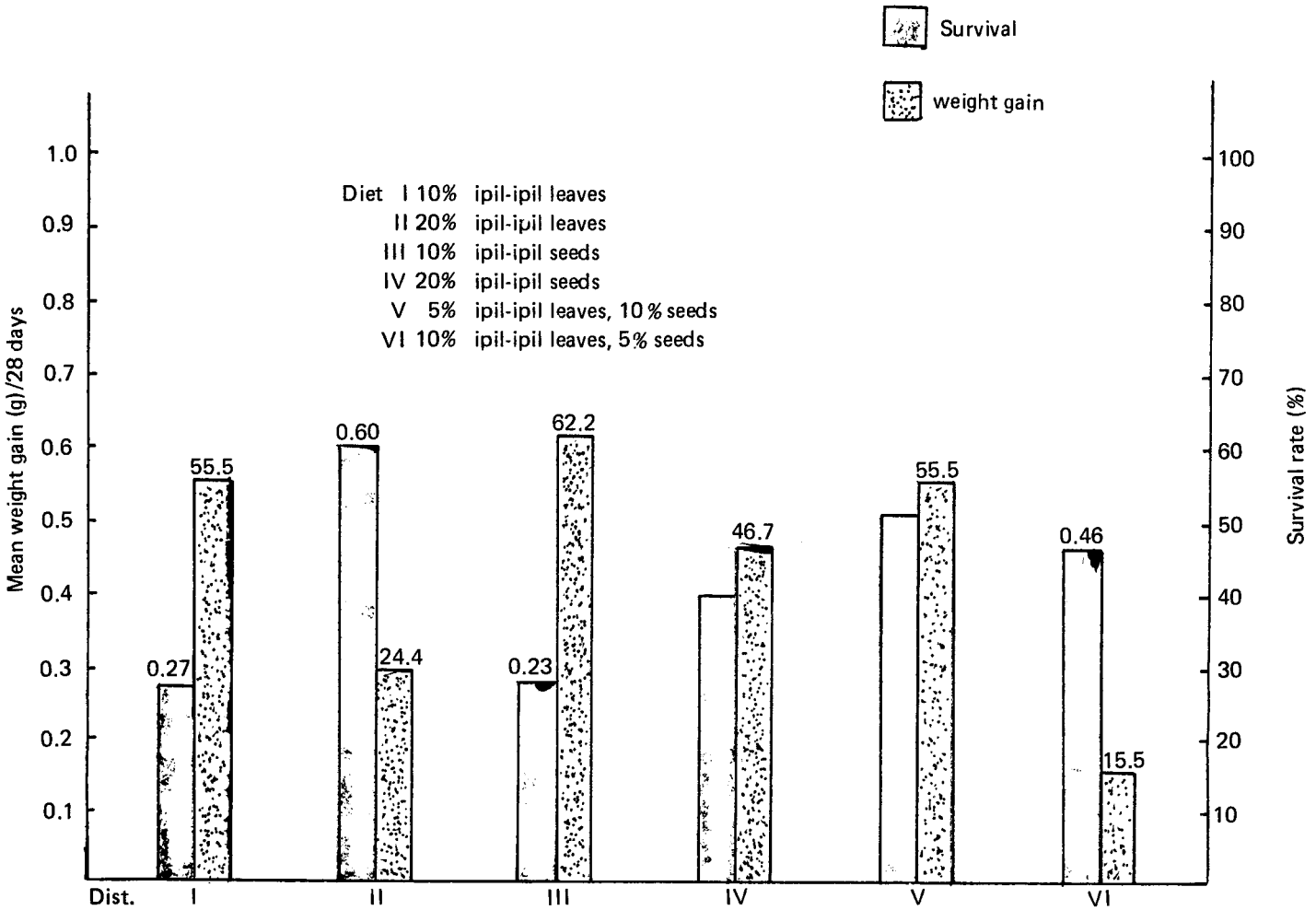

Fig. 1. Mean weight gain and survival rate of *P. monodon* postlarvae fed with diets containing various amounts of Ipil-ipil leaves and seeds.

There were six treatments arranged in a randomized complete block design with three blocks. Thus, there were a total of three aquaria receiving the same diet for each of the six treatments. Analysis of covariance and the Duncan's multiple range test were used ($P < 0.05$) to evaluate the differences among treatment means.

Mean weight gains for all 6 groups were poor and not statistically significant. Lowest average weight gain (0.23 g) was obtained from those fed 10% ipil-ipil seeds, while highest gain (0.6 g) was observed in the group given 20% ipil-ipil leaves. Carotene in the leaves may account for better weight gains among those fed leaves than those fed seeds. Survival rates for those fed 10% ipil-ipil were significantly higher than those fed the 20% ipil-ipil diets ($P < 0.05$). Whenever the survival rate was high, mean weight gain was low and vice-versa. The presence of the toxic alkaloid mimosine in ipil-ipil could have caused the low survival rate among those fed 20% compared to those fed 10% ipil-ipil. Further chemical and biological studies to determine the effect of mimosine will be conducted to verify these preliminary reports.

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