

Potential Use of Ipil-Ipil (*Leucaena leucocephala* Lam.) As Fish Feed Ingredient: A Minireview

ABSTRACT

Nnnnbb

Keywords: Clarias gariepinus; Tilapia zilli; Leucaena leucocephala, growth; fish feed ingridient.

1. INTRODUCTION

The genus of *Leucaena* is a fast growing tropical legume and a member of the family *Leguminose*(1,2). *Leucaena leucocephala* (Lam), commonly is commonly used and is named for short "Leucaena" or white leadtree, in the Philippines it is called "Ipil-Ipil", in Indonesia "Lamtoro" (1). *Leucaena* is native to Central America, Spaniards took them from Mexico to the Philippines (3,4). *Leucaena* is one of the suitable plant protein alternatives to fishmeal for fish feed due to its medium-high protein content, suitable levels of amino acids and most importantly, very affordable market price tag(3). However, in compiling fish feed ingredients attention must be emphasized at the optimal level in feed and appropriate processing related to the presence of several limiting factors such as high crude fiber and antinutrient factors(5).

One of the efforts that can overcome dependence on imported feed raw materials is the use of local raw materials for the manufacture of fish feed. One of the local raw materials that has the potential to be used as raw material for fish feed is Ipil-Ipil leaves

(*Leucaena*). *Leucaena* plant is a local biological resource that has the potential to be used as a source of vegetable protein. The use of *Leucaena leucocephala* leaves has been widely applied as feed raw materials in aquaculture activities, such as tilapia, rohu fish, and Indian snakeheadfish, *Channa punctate*(6)

Leucaena leucocephala is one of the potential sources of vegetable protein for fish and livestock feed (7). *Leucaena leucocephala* leaf flour and the seeds have a fairly high protein content of around 25%. However, it is also known that *Leucaena* contains mycotoxin which is able to inhibit protein biosynthesis in animals so that it has an impact on decreasing the growth rate. Using leaf meal as a supplement for broilers, a daily growth of 100-110 g per week can be determined; in addition, in quantities not exceeding 5% of the diet, leaf meal could be used with other xanthophyll sources to give a satisfactory color to the carcass. Adult chickens fed with *Leucaena* leaf meal up to 7% of the diet showed an increase in these of crude protein and metabolizable

75 energy. Feeding broiler chicken with boiled *L.*
 76 *leucocephala* meal (10% of the diet)
 77 was recommended since it furnished high
 78 carcass and meat attributes of broiler
 79 chicken(3)

80 The taxonomy of *Leucaena leucocephala*
 81 is as follows (8).

Kingdom	Plantae
Subkingdom	Tracheobionta
Superdivision	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Rosidae
Order	Fabales
Family	Fabaceae-Pea family

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 83 Limited supply of quality feed raw
 84 materials is the main obstacle to the creation
 85 of sustainable aquaculture business activities
 86 during competition with other food production
 87 business activities(9). High-quality sources of
 88 feed protein such as fish meal and soybean
 89 meal are increasingly limited, because the
 90 stock of trash fish in the sea as raw materials
 91 for fishmeal production is running low, so the
 92 price is increasing, and the price of soybeans
 93 is increasingly unaffordable. Consequently,
 94 efforts to find alternative sources of raw
 95 materials that have high nutritional value and
 96 abundant availability are the main focus of
 97 attention for fish nutrition farmers and
 98 researchers today. The high price of feed is
 99 due to the increase in the price of feed raw
 100 materials. Fish feed raw materials such as fish
 101 meal, soybean meal, cornmeal and Meet Born

102 Meal flour are still dependent on imports(10).
 103 As a result, the selling price of feed at the level
 104 of fish farmers is quite expensive.

105 2. NUTRIENT CONTENT OF IPIL-IPIL 106 (*Leucaena leucocephala*)

107 *Leucaena leucocephala* is a multipurpose
 108 tree and provides fuel wood, green manure,
 109 improves degraded lands and can be used as
 110 a cover crop. *Leucaena* leaf is known to
 111 contain about 22.7% crude protein (11)(and
 112 survives well on degraded soils which are low
 113 in nutrients. It has bipinnate leaves, lanceolate
 114 leaflets and has flat pods containing small
 115 seeds. The leaves and seeds contain the
 116 antinutritional factor mimosine(12) . Mimosine
 117 is known to inhibit the growth of animals,
 118 especially nonruminants. *Leucaena* is
 119 available in almost every geographical location
 120 in Ghana and grows fast. Its leaves are a good
 121 source of protein and needs to be examined in
 122 greater detail on its suitability for the African
 123 catfish, *Clarias gariepinus*. *Leucaena* seed
 124 protein isolates with relatively low mimosine
 125 levels have been prepared successfully by
 126 isoelectric precipitation of seed kernel proteins.
 127 Protein isolate preparation could itself be
 128 considered as a means of using *Leucaena*
 129 proteins for food purposes, with minimal
 130 mimosine toxicity(13). All parts of *L.*
 131 *leucocephala* such as leaves, young stems,
 132 flowers, pods, including grain, can be
 133 consumed by livestock(10). *L. leucocephala* is
 134 an important source of animal feed because it
 135 is rich in protein, essential amino acids,
 136 minerals, carotenoids, and vitamins (8).

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138 **Table 1. Proximate analysis of *Leucaena leucocephala* on various plant parts meal**

Chemical compounds	Parts of plant	
	Leaf*	Seed**
Crude Protein (%)	24.2	31.1 ± 0.4
Crude Fat (%)	6.5	5.6 ± 0.4
Crude Fiber (%)	21.5	13.2 ± 0.2
Crude Ash (%)	7.5	4.5 ± 0.5
Dry Matter (%)	88.2	94.8 ± 0.1
Energy (kcal/kg)	2450	2573.3 ± 4.2

References : *(3)**(16)

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140 *L. leucocephala* leaves contain crude fiber
 141 by 6.15%, cellulose by 12.56%, hemicellulose
 142 by 8.34%, tannins by 4.5% and mimosine by
 143 2.2%. Tannins and mimosine are anti-
 144 nutritional substances that can interfere with
 145 the absorption of nutrients in the digestive tract
 146 and affect fish growth Tannins are protease
 147 enzyme inhibitors so that they inhibit protein

148 digestibility in the fish digestive tract, lowering
 149 the value of feed palatability so that the
 150 amount of feed consumption and fish growth
 151 decreases. Therefore, efforts are needed to
 152 reduce the high value of crude fiber and the
 153 content of anti-nutritional substances in *L.*
 154 *leucocephala* leaves, one of which is by
 155 carrying out the fermentation process(6,14,15).

Table 2. Minerals of *Leucaena leucocephala* on seed and leaf meal

Minerals	Leaves*	Seeds**
Sodium	1.0 g/kg	61917 ± 2751 mg/g
Potassium	5.5g/kg	29272 ± 3893 mg/g
Calcium	6.2 g/kg	261742 ± 17284 mg/g
Iron	12.7 mg/kg	2602 ± 225 mg/g
Magnesium	1.9 g/kg	39979 ± 3423 mg/g
Copper	7.2 mg/kg	-
Zinc	58.0 mg/kg	2200 ± 109 mg/g
Manganese	44.0 mg/kg	-
References *(2)**(17)		

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159 3. EFFECT OF IPIL-IPIL (*Leucaena* 161 160 *leucocephala*) AS FISH FEED

162 Several researchers have tested the effect 196
163 of giving *Leucaena leucocephala* plants to 197
164 several types of fish. Therefore, dependable 198
165 indices are necessary to determine the growth 199
166 performance of the fish fed with formulated 200
167 feed. The parameter such as feed conversion 201
168 ratio, weight gain, feed consumed and protein 202
169 efficiency ratio are relevant examples of such 203
170 indicators that reflects how effective a feed fed 204
171 to the fish can be in order to evaluate the 205
172 profitability of a fish farm. Based on the 206
173 researches, the experimental diets indicating 207
174 that the levels of incorporation of *Leucaena* 208
175 leaf meal did not affect the palatability of the 209
176 diets, instead there was observed significant 210
177 increase in growth as the inclusions levels 211
178 increases(18). This could be due to the 212
179 processing technique applied which involved 213
180 soaking and drying the leave hence reducing 214
181 the antinutrient in *Leucaena* leaf meal which is 215
182 mainly mimosine. The survival rate recorded in 216
183 the experiment could be credited to good 217
184 management practices in the feeding and 218
185 water quality management by monitoring the 219
186 water quality characteristics during the 220
187 experimental periods. 221

188 The addition of *Leucaena* 222
189 *leucocephala* leaf meal showed positive 223
190 results on the growth performance of *Tilapia* 224
191 *zilli* fingerlings showed an improved 225
192 performance from the view point of specific 226
193 growth rate, weight gain and feed conversion 227
194 ratio, this is an indication that all the fishes in 228
195 the experiment accept the various gradient 229
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levels in their feed. The effect of using
Leucaena leaf meal in this study established
that it could be used at recommended level of
inclusion in the fish diet. the use of plant
protein, But the used of *Leucaena* leaf meal to
replace animal protein in the diet of *Tilapia zilli*
fingerlings in order to reduce competition
between man and animal which often times
precede the scarcity and over prizing of it as
emphasized by(19).

The addition of *Leucaena* leaf meal
could be included up to 30% level in *Clarias*
gariepinus diets without any negative effects
on the growth. However, study the best
inclusion level was found in the diet containing
the 20% *Leucaena* leaf (18). Otherwise, the
relative weight gain value reduced with
increase in leucena seed meal inclusion level.
The highest value connoting poor FCR(feed
conversion ratio) was recorded in treatment
(100%). Reduced weight gain, SGR (specific
growth rate), PER (protein efficiency ratio)
values at higher seedmeal proportions (> 50%)
in fishmeal diet indicated poor utilization of
LSM by fish (20). It is well known that the
efficiency of feed utilization and consequent
growth performance is affected by the quality
of dietary protein. The poor nutrient utilization
may not totally be hinged on the fibre content
of the test diets as this was generally less than
10%(21). A summary of the effects of the
addition of seeds and leaves of *Leucaena*
leucocephala on various fish can be seen in
Table 3

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Table 3. The effects of the addition of seeds and leaves of *Leucaena leucocephala* on fish

Fish	Parts of Ipil-Ipil	Concentration of Addition (%)	Weight Gain and Growth Rate (g)	Reference
<i>Tilapia zilli</i>	Leaf	0	3.30	(19)

		2.5	3.50	
		5	2.81	
		7.5	3.56	
		10	3.29	
Clarias	leaf	0	4.29±0.72	(20)
Gariiepinus		10	3.81±0.11	
		20	4.3±1.13	
		30	3.23±0.59	
Clarias	seeds	0	3.49	(21).
Gariiepinus		25	2.75	
		50	2.40	
		75	1.51	
		100	1.27	
Clarias	Leaf	0	0.081	(22)
Gariiepinus		5	0.088	
		10	0.087	
		15	0.090	
		20	0.090	

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233 4. CONCLUSION

234 Leaf meal and seed meal contain
235 proteins, fibre, energy, and dry matter. The
236 highest protein content is found in seed meal.
237 Leaf meal showed positive results on the
238 growth performance is highly nutritious, can be
239 incorporated in animal diets, including fish as a
240 feed ingredient and it's suitability at 20% level
241 of inclusion without any negative effects on the
242 growth.

243 . Leucaena seeds meal can replace a
244 feed ingredient on a fish diet. However, for
245 optimum production of the fish feed, higher
246 seeds meal proportions (>50%) in fishmeal
247 diet indicated poor utilization of seeds meal by
248 fish. The proportions was recommend at 10%
249 inclusion level of seeds meal for replacer
250 fishmeal in the diets.

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252 COMPETING INTERESTS

253 Author has declared that no competing
254 interests exist.

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