

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

ABSTRACT

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

1. INTRODUCTION

26 "The genus of *Leucaena* is a fast growing
27 tropical legume and a member of the family
28 *Leguminose*"(1,2). "*Leucaena leucocephala*
29 (Lam), commonly is commonly used and is
30 named for short *Leucaena* or white leadtree, in
31 the Philippines it is called *Ipil-Ipil*, in Indonesia
32 *Lamtoro*"(1). "*Leucaena* is native ti Central
33 America, Spaniards took them from Mexico to
34 the Philipphines"(3,4). "*Leucaena* is one of the
35 suitable plant protein alternatives to fishmeal
36 for fish feed due to its medium-high protein
37 content, suitable levels of amino acids and
38 most importantly, very affordable market price
39 tag"(3). "However, in compiling fish feed
40 ingredients attention must be emphasized at
41 the optimal level in feed and appropriate
42 processing related to the presence of several
43 limiting factors such as high crude fiber and
44 antinutrient factors"(5).
45 "One of the efforts that can overcome
46 dependence on imported feed raw materials is
47 the use of local raw materials for the
48 manufacture of fish feed. One of the local raw
49 materials that has the potential to be used as

50 raw material for fish feed is *Ipil-Ipil* leaves
51 (*Leucaena*). *Leucaena* plant is a local biological
52 resource that has the potential to be used as a
53 source of vegetable protein. The use of
54 *Leucaena leucocephala* leaves has been
55 widely applied as feed raw materials in
56 aquaculture activities, such as tilapia, rohu
57 fish, and *Indian snakeheadfish*, *Channa*
58 *punctate*"(6)
59 "*Leucaena leucocephala* is one of the
60 potential sources of vegetable protein for fish
61 and livestock feed"(7). "*Leucaena leucocephala*
62 leaf flour and the seeds have a fairly high
63 protein content of around 25%. However, it is
64 also known that *Leucaena* contains mycotoxin
65 which is able to inhibit protein biosynthesis in
66 animals so that it has an impact on decreasing
67 the growth rate. Using leaf meal as a
68 supplement for broilers, a daily growth of 100-
69 110 g per week can be determined; in addition,
70 in quantities not exceeding 5% of the diet, leaf
71 meal could be used with other xanthophyll
72 sources to give a satisfactory color to the
73 carcass. Adult chickens fed with *Leucaena* leaf

74 meal up to 7% of the diet showed an increase
 75 in these of crude protein and metabolizable
 76 energy. Feeding broiler chicken with boiled *L.*
 77 *leucocephala* meal (10% of the diet)
 78 was recommended since it furnished high
 79 carcass and meat attributes of broiler
 80 chicken”(3)

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

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

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

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

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

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

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

149 protease enzyme inhibitors so that they inhibit
 150 protein digestibility in the fish digestive tract,
 151 lowering the value of feed palatability so that
 152 the amount of feed consumption and fish
 153 growth decreases. Therefore, efforts are
 154 needed to reduce the high value of crude fiber
 155 and the content of anti-nutritional substances

156 in *L. leucocephala* leaves, one of which is by 158 process" (6,14,15).
 157 carrying out the fermentation

159 **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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162 **3. EFFECT OF IPIL-IPIL (*Leucaena* 164
 163 *leucocephala*) AS FISH FEED**

165 Several researchers have tested the effect 199
 166 of giving *Leucaena leucocephala* plants to 200
 167 several types of fish. Therefore, dependable 201
 168 indices are necessary to determine the growth 202
 169 performance of the fish fed with formulated 203
 170 feed. The parameter such as feed conversion 204
 171 ratio, weight gain, feed consumed and protein 205
 172 efficiency ratio are relevant examples of such 206
 173 indicators that reflects how effective a feed fed 207
 174 to the fish can be in order to evaluate the 208
 175 profitability of a fish farm. Based on the 209
 176 researches, the experimental diets indicating 210
 177 that the levels of incorporation of *Leucaena* 211
 178 leaf meal did not affect the palatability of the 212
 179 diets, instead there was observed significant 213
 180 increase in growth as the inclusions levels 214
 181 increases (18). This could be due to the 215
 182 processing technique applied which involved 216
 183 soaking and drying the leave hence reducing 217
 184 the antinutrient in *Leucaena* leaf meal which is 218
 185 mainly mimosine. The survival rate recorded in 219
 186 the experiment could be credited to good 220
 187 management practices in the feeding and 221
 188 water quality management by monitoring the 222
 189 water quality characteristics during the 223
 190 experimental periods. 224

191 The addition of *Leucaena* 225
 192 *leucocephala* leaf meal showed positive 226
 193 results on the growth performance of *Tilapia* 227
 194 *zilli* fingerlings showed an improved 228
 195 performance from the view point of specific 229
 196 growth rate, weight gain and feed conversion 230
 197 ratio, this is an indication that all the fishes in 231
 198 the experiment accept the various gradient 232
 233

199 levels in their feed. The effect of using
 200 *Leucaena* leaf meal in this study established
 201 that it could be used at recommended level of
 202 inclusion in the fish diet. the use of plant
 203 protein, But the used of *Leucaena* leaf meal to
 204 replace animal protein in the diet of *Tilapia zilli*
 205 fingerlings in order to reduce competition
 206 between man and animal which often times
 207 precede the scarcity and over prizing of it as
 208 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	Weight Gain and	Reference
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		Addition (%)	Growth Rate (g)	
Tilapia zilli	Leaf	0	3.30	(19)
		2.5	3.50	
		5	2.81	
		7.5	3.56	
		10	3.29	
Clarias Gariepinus	leaf	0	4.29±0.72	(20)
		10	3.81±0.11	
		20	4.3±1.13	
		30	3.23±0.59	
Clarias Gariepinus	seeds	0	3.49	(21)
		25	2.75	
		50	2.40	
		75	1.51	
		100	1.27	
Clarias Gariepinus	Leaf	0	0.081	(22)
		5	0.088	
		10	0.087	
		15	0.090	
		20	0.090	

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236 4. CONCLUSION

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

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

255 COMPETING INTERESTS

256 Author has declared that no competing
257 interests exist.

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