



Transition paths to sustainable legume-based systems in Europe

Novel feed formulation for Aquaculture

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Blue Lupin for White Shrimp? A step towards sustainable aquafeed

Most of the world's rising demand for fish and shellfish is met by aquaculture. High protein fish feeds are generally produced with substantial amounts of fish meal – which is expensive and unsustainable. Legumes are being tested as sustainable, local replacements for fishmeal in feeds for important European aquaculture species like White Leg Shrimp, Atlantic Salmon and European Sea Bass. In the present study we formulate aquafeeds with lupin kernel meal (*L. angustifolius*) for the White Leg Shrimp *Litopenaeus vannamei*, one of the world's most important aquaculture species.



Ingredient g/kg	Basis	L10	L20	L30
Fishmeal	250	150	50	0
Shrimpmeal	90	90	90	0
Lupine		100	200	300
Corn gluten		75	130	220
Wheat	398	322	260	193
Sum	738	737	730	713
Calculated composition				
DM%	90	90	89	87
Ash%	10	8	6	3
GE MJ/kg	18	18	18	18
DE MJ/kg	14	13	12	11
CP%	37	37	36	36
Lipid%	8	8	8	8
Fibre%	2	2	2	1

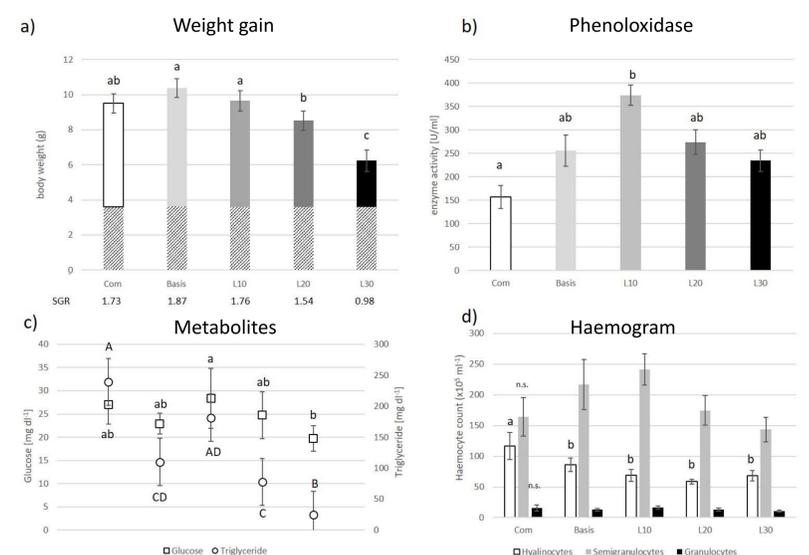


Material and Methods

Experimental diets were formulated including 10, 20 and 30 % *Lupinus angustifolius* kernel meal, incrementally replacing fishmeal. All diets were balanced to meet the requirements of *L. vannamei* at grow out, and were iso-energetic and iso-nitrogenous. A commercial control was also maintained. Feeding experiments were conducted over 8 weeks in a RAS device, with 18 separate 50 l tanks each stocked with 25 shrimp. Experimental diets were fed in 4 replicates, the commercial diet in duplicate. In the end of the experiment weight gain and various haemolymph parameters were determined to assess dietary impacts on metabolism and immune response.

Results and Discussion

- Survival rate 65%, no significant differences
 - Growth of animals fed L30 significantly lower
 - Metabolic analyses (glucose and triglycerides) show malnutrition of animals fed L30 diet
 - Haemogram: Hyalinocytes lower with test diet, Semigranulocytes highest with L10 diet
 - Phenoloxidase: Immune system stronger when shrimps were fed with low levels of lupine (L10)
- With an inclusion rate of 10% Lupine Haemogram and PO values indicate immunostimulating effect .
- Untreated lupine meal can be used as an alternative protein source up to 10% (-20%) of the feed.



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