Universitat Autònoma de Barcelona

ALTERNATIVE PROTEIN SOURCES FOR LAYING HENS

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Objectives

1. Define alternatives protein sources that could replace the ones currently in use for aviculture
2. Compare this sources with the ones being used (soybean meal and fish meal mainly) and see if they could fulfill the amino acid and proteic requirements of the birds.

Traditional protein sources			
Feed	PB %	Methionine %	Lysine %
Soybean meal	44-48	0,644	2,8
Fish meal	62	1,62	4,5

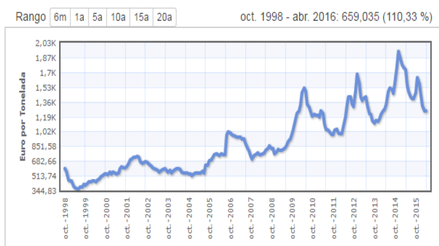
Protein and amino acid requirement for laying hens (cages – ground)			
Age	PB %	Methionine %	Lysine %
Prelaying (17 weeks – laying start)	16,4-16.2	0,38	0,78-0,71
Laying start (<45 weeks)	16,5-16	0,4	0,80-0,74
Laying end (>45 weeks)	15,8-15,5	0,35	0,71-0,68

Protein and amino acid content of some feedstuffs (as dry matter)			
Feedstuff	PB %	Methionine %	Lysine %
Duckweed	24-45 (average 35)	0,525	2,24
Algae(*Spirullina*)	60-70	1,02	1,68
Algae (*Chlorella*)	60	1,08	3,33
Yeasts (*Sacharomyces*)	20-24	0,9	2,3
Forest trees and shrubs	17-35	0,31	1,285 (Leucaena)
Grain legumes	20-27	0,15-0,35	1,33-1,88
Copra meal	20	0,36-0,48	0,47-0,54 (fermented)
Kernel meal	20	0,33-0,45	0,60-0,81 (fermented)
Sesame meal	41-58	1,25	1
Linseed meal	35	0,7	1,4
Safflower meal	40	0.67	1,29
Snail meal	53	1,12	2,14
Maggot meal	42-62	1,1	3,05
Earthworm meal	63	1,72	1,43
Silkworm pupae meal	60	0,608	1,12
Worm meal	50	0,78	2,8
Black soldier fly larvae	40	0,88	2,7
Acridid	63	1,38	2,82

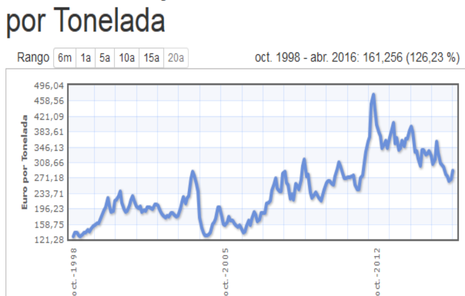
below requirements | below soy meal, over requirements | over soy meal

In these graphics we see the steady increase in prize of soy and fish meal witch are the 2 most common protein sources in aviculture.

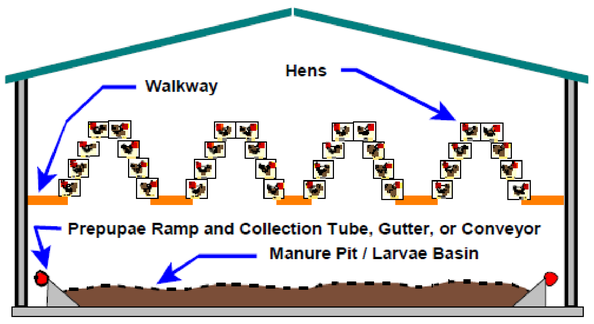
Harina de pescado Precio Mensual - Euro por Tonelada



Harina de soja Precio Mensual - Euro por Tonelada



Inclusion limits of some protein sources	
Duckweed	15-20% of diet
Copra meal	Can substitute soy up to 50%
Palm kernel meal	Can substitute soy up to 50%
Sesame meal	Can substitute soy up to 30%
Safflower meal	10% of diet
Snail meal	10% of diet fresh
Housefly maggot meal	Can substitute fishmeal up to 100%
Earthworm meal	14% of diet (broilers)
Silkworm pupae meal	8% of diet



Figrue 3. Hen house with Hermetia manure processing.

Conclusions

1. There exist multiple protein sources with potential to substitute or complement soy bean or fish meal.
2. We need more studies to determine nutrient characteristics, inclusion limits for laying hens that do not impair performance, and better methods to obtain and process them.
3. The best sources of protein studied are those coming from insects, larvae and worms which have higher PB than plants and a better amino acid profile which sometimes compares or overtakes even fishmeal.
4. Insects have much better conversion rates than domestic animals, which gives them a lot of potential as protein sources for compared to traditional animal protein sources which are more expensive and more contaminant.
5. Some plant sources like duckweed seem to have a bright future as protein sources, because they seem to be able to give more protein /ha at a faster growth rate and also come with added benefits like the purification of water and the availability of protein at a similar price all year around due to clonal growth which enables farmers to recollect it continuously.

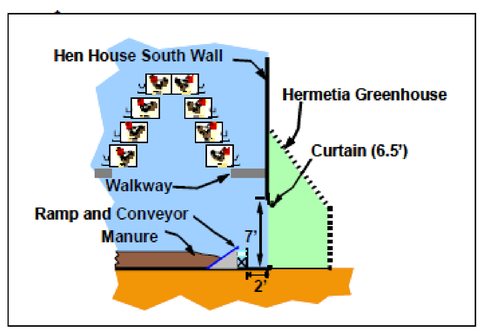


Figure 4. Hen house with integrated Hermetia reproduction and automated prepupae collection.