



Effect of Dietary Replacement of Fishmeal by Insect Meal on Growth Performance and Non-specific Immunity of Growing Pigs

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Introduction

In addition to well-studied insect species, including the recently widely used *Hermetia illucens* species, it is interesting to study the nutritional properties and the possibility of effective use for feeding farm animals, other insect species, including domestic crickets (*Acheta domestica*), mealworms (*Tenebrio molitor*), superworms (*Zophobas morio*), waxworms (*Galleria mellonella*), which is important in the development of feed industries in various countries of the world. Recent data show that dried larvae of darkling beetles (*Zophobas morio* L., DZML) and dried larvae of wax moths (*Galleria mellonella* L., DGML) contains a significant amount of protein, fat, chitin, melanin, antimicrobial peptides, trace elements etc. Larva's fat is rich in lauric and other medium-chain fatty acids.

The aim of our research - to study the influence of dietary replacement of fishmeal (FM) by insect meal on growth performance and nonspecific immunity of growing pigs.

Zophobas morio *Galleria mellonella*



Material & Methods

Experiments were performed using crossbred ((BWxL)xD) pigs (BW1=14.39±0.19 kg, N=27, n=9) during the growing period. Animals were allocated to 3 groups: 1 – control (standard feed (SF), including FM), 2 – experimental (SF+2.5%DZML), 3 – experimental (SF+3.0%DGML). Experiments on animals were carried out within the scientific-economic research, which included balance (metabolic) tests, in the physiological yard and laboratories of the L.K. Ernst Federal Science Center for Animal Husbandry. The materials obtained in the experiment was biometrically processed using the ANOVA method (at p>0.05 or p<0.05).

Results

The use of DZML&DGML in feed didn't reduce ADG of experimental animals during the growing period (413.23&413.76 vs. 413.76 g) compared to the control group.

Dried larvae supplementation didn't reduce feed intake and nutrient digestibility. The fat digestibility increased in the 2&3-experimental group (45.0&44.36 vs 29.75%, p<0.05), due to the high level of lipids and the profile of fatty acids in the larvae.

In nitrogen retention, pigs that received insect larvae instead of fish meal had no significant changes in the reduction of nitrogen excretion through feces and urine, which did not lead to significant changes in nitrogen retention.

Biochemical blood test showed a higher ALB/GLB ratio (0.85&1.43 vs 0.59, p=0.05), higher number of WBC (12.36&12.89 vs. 10.44, p=0.19) in the blood of the experimental animals compared to the control group.

Growing pigs of the experimental groups had a higher level of nonspecific immunity, which is expressed in an increase in lysozyme activity (LA) of blood serum and phagocytic activity of neutrophils (PA, PI, PAM).

Items	Group			SEM	p-value
	1-control	2-exp (2.5%DZML)	3-exp (3.0%DGML)		
Body weight (kg)					
Initial	14.24	14.37	14.54	0.21	0.82
42 days	31.54	31.72	31.92	0.32	0.97
Average daily gain (g)	411.90	413.23	413.76	8.19	0.99
Average daily feed intake (g)	1,200	1,200	1,200	-	-
Feed:gain ratio	3.02	2.97	3.02	0.01	0.98
Nutrient digestibility (%)					
Dry matter	74.34	74.88	75.04	0.41	0.92
Crude protein	75.49	74.02	77.29	8.05	0.65
Crude fiber	37.96	40.30	40.90	7.20	0.80
Crude fat	29.75	45.00	44.36	223.4	<0.05
N-retention (g/d)					
N-intake	4.88	4.86	4.90	-	-
N-feces	1.09	1.10	0.97	0.02	0.57
N-urine	1.69	1.70	1.90	0.04	0.36
N-retention	2.10	2.06	2.04	0.003	0.95
Parameters of non-specific resistance of experimental animals					
LA, %	15.24	20.47	16.19	23.35	0.20
Lysozyme, mkg/mL	0.31	0.39	0.33	0.01	0.21
AU/TP	2.56	3.12	2.66	0.27	0.64
BA, %	65.83	60.00	60.83	29.86	0.23
PA, %	35.09	37.33	39.10	12.08	0.34
PI	2.06	2.30	2.22	0.05	0.21
PAM	0.72	0.86	0.87	0.02	0.11

Conclusion

Inclusion of dried larvae (*Zophobas morio* and *Galleria mellonella*) instead of 2% fish meal in growing pig's diet is beneficial for growing pigs by improvement of growth performance. Dried larvae supplementation don't reduce feed intake and nutrient digestibility without any detrimental effect on immune response. Dried larvae powder is available as protein source for weaning pigs' diet. Consequently, it is possible to consider the prospects of using DGML&DGML as dietary supplements to diets of growing pigs.

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