

# 读 书 报 告

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时间：2019.12.1



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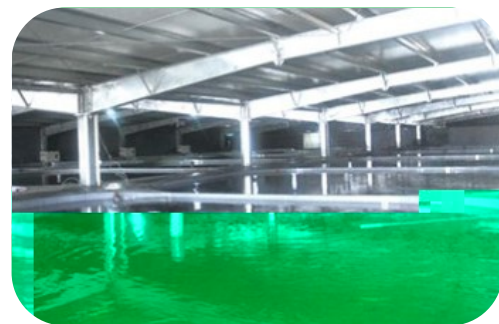
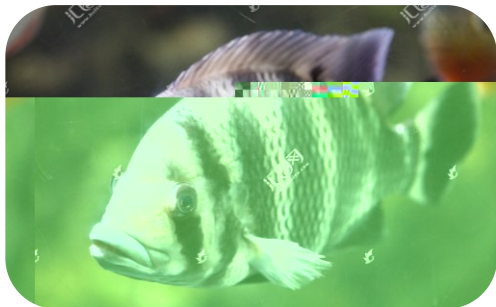
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# 研究背景

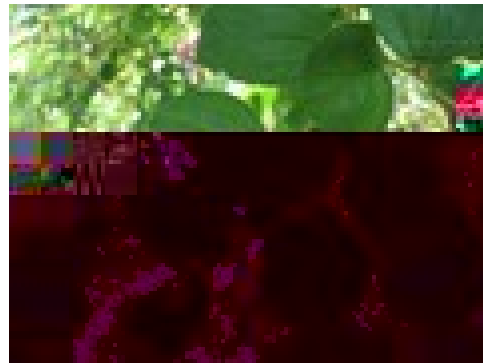






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# 提出问题

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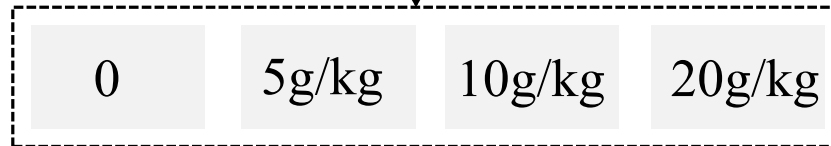
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(9.63 0.05g)



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# 生长性能和饲料利用指标

**Table 3**  
Growth performances and feed utilization of Nile tilapia fingerlings fed different *Z. mauritiana* (ZLP) levels for 12 weeks.

Items	ZLP (g/kg diets)			
	0	5	10	20
Initial weight (g)	9.63 ± 0.04	9.67 ± 0.01	9.68 ± 0.04	9.64 ± 0.02
Final weight (g)	26.55 ± 0.26 <sup>b</sup>	26.50 ± 0.26 <sup>d</sup>	26.20 ± 0.20 <sup>c</sup>	26.10 ± 0.20 <sup>b</sup>
Weight gain (g)	16.92 ± 0.22 <sup>b</sup>	16.83 ± 0.25 <sup>d</sup>	16.52 ± 0.20 <sup>c</sup>	16.46 ± 0.18 <sup>a</sup>
SGR (% g/day) <sup>1</sup>	1.57 ± 0.01 <sup>b</sup>	1.30 ± 0.01 <sup>d</sup>	1.49 ± 0.01 <sup>c</sup>	1.63 ± 0.01 <sup>a</sup>
Feed intake (g feed /fish)	40.87 ± 0.26 <sup>b</sup>	34.85 ± 0.07 <sup>d</sup>	39.85 ± 0.16 <sup>c</sup>	42.42 ± 0.31 <sup>a</sup>
FER <sup>2</sup>	64.97 ± 1.04 <sup>b</sup>	54.97 ± 0.65 <sup>d</sup>	60.77 ± 0.63 <sup>c</sup>	67.45 ± 0.75 <sup>a</sup>
PER <sup>3</sup>	2.34 ± 0.05 <sup>a</sup>	2.00 ± 0.02 <sup>c</sup>	2.20 ± 0.04 <sup>b</sup>	2.42 ± 0.02 <sup>a</sup>
APU (%) <sup>4</sup>	11.71 ± 1.88 <sup>ab</sup>	9.10 ± 0.50 <sup>c</sup>	10.82 ± 0.58 <sup>b</sup>	12.28 ± 0.25 <sup>a</sup>
EU (%) <sup>5</sup>	6.25 ± 1.19 <sup>a</sup>	5.59 ± 0.44 <sup>b</sup>	6.29 ± 0.45 <sup>a</sup>	6.09 ± 0.86 <sup>a</sup>

<sup>1</sup> Specific growth rate (SGR) = 100 (ln W2 - ln W1) / T

<sup>2</sup> feed efficiency ratio (FER) = 100 (weight gain / feed intake).

<sup>3</sup> protein efficiency ratio (PER) = weight gain / protein intake.

<sup>4</sup> apparent protein utilization (APU) = 100 [protein gain in fish(g) / protein intake in diet (g)].

<sup>5</sup> energy utilization (EU) = 100 [Energy gain in fish (g) / energy intake in diet (g)]. Where W1 and W2 are the initial and final weights, respectively, and T is the experimental period (days). Data are presented as mean ± SEM. Means with the same letters in the same row are not significantly different at P < .05, using Tukey post hoc test.

and final weights, respectively, and T is the experimental period (days). Data are presented as mean ± SEM. Means with the same letters in the same row are not significantly different at P < .05, using Tukey post hoc test.



# 体成分分析

**Table 4**  
Whole body composition (g/kg, on fresh weight basis) of Nile tilapia fingerlings fed different *Z. mauritiana* (ZLP) levels for 12 weeks.

Items	ZLP (g/kg diets)			
	0	5	10	20
Moisture	741.0 ± 0.31 <sup>a</sup>	733.8 ± 0.22 <sup>ab</sup>	738.0 ± 0.18 <sup>ab</sup>	731.9 ± 0.21 <sup>c</sup>
Crude protein	160.5 ± 0.21 <sup>b</sup>	167.6 ± 0.28 <sup>ab</sup>	167.3 ± 0.56 <sup>ab</sup>	171.0 ± 0.63 <sup>a</sup>
Total lipids	52.4 ± 0.26 <sup>a</sup>	49.8 ± 0.64 <sup>ab</sup>	48.9 ± 0.32 <sup>ab</sup>	48.2 ± 0.71 <sup>b</sup>
Total ash	46.1 ± 0.05 <sup>a</sup>	45.0 ± 0.62 <sup>ab</sup>	43.3 ± 0.06 <sup>b</sup>	44.9 ± 0.13 <sup>ab</sup>

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# 血液离子指标

Table 5

Serum ion concentrations ( $mEq/l$ ) of Nile tilapia fingerlings fed different *Z. mauritiana* (ZLP) levels for 12 weeks.

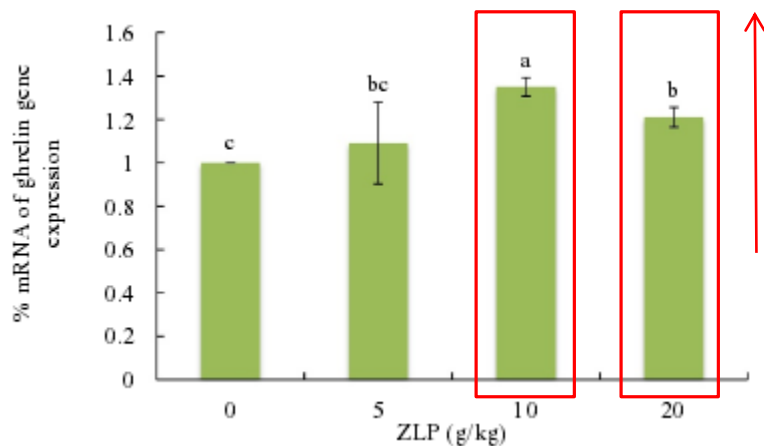
Item	ZLP (g/kg diets)			
	0	5	10	20
Na <sup>+</sup>	160.28 ± 0.48 <sup>b</sup>	164.00 ± 1.02 <sup>a</sup>	164.76 ± 0.68 <sup>a</sup>	164.86 ± 1.20 <sup>a</sup>
K <sup>+</sup>	03.23 ± 0.14 <sup>b</sup>	04.27 ± 0.18 <sup>a</sup>	04.13 ± 0.09 <sup>a</sup>	03.30 ± 0.20 <sup>b</sup>
Ca <sup>++</sup>	140.52 ± 1.64 <sup>b</sup>	146.09 ± 0.63 <sup>a</sup>	146.67 ± 0.60 <sup>a</sup>	149.86 ± 1.81 <sup>a</sup>

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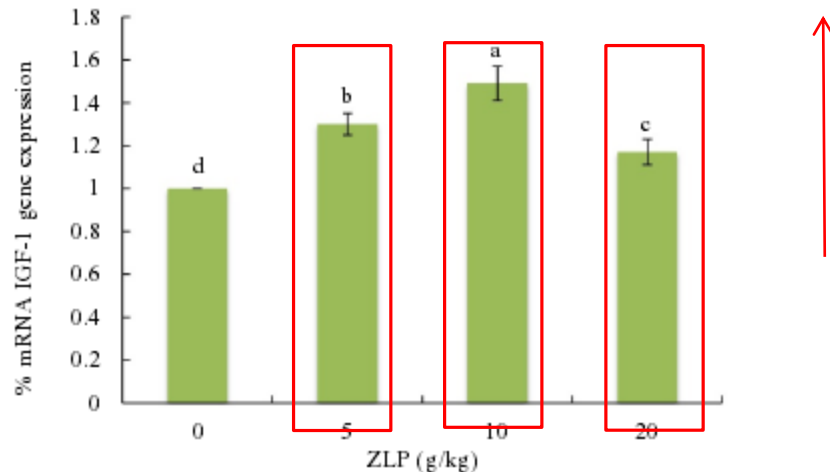


# 摄食和生长相关基因表达

A



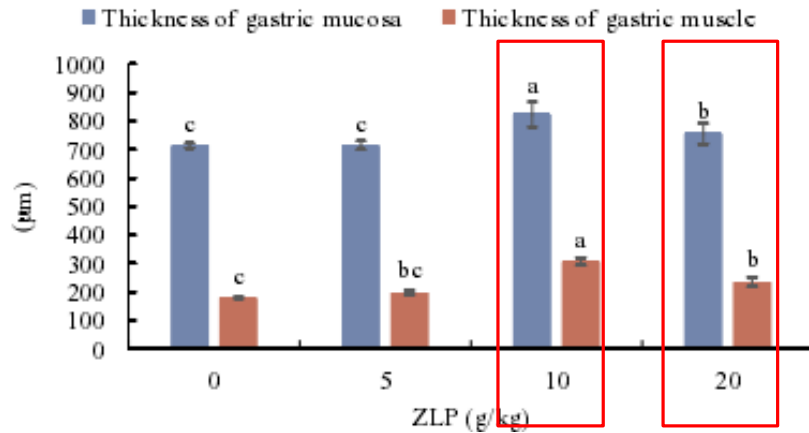
B



**Fig. 1.** The relative mRNA expression of (A) ghrelin gene in the stomach (B) insulin like growth factor (IGF-1) gene in the liver of Nile tilapia fed different concentrations of *Z. mauritiana* (ZLP) for 12 weeks. Data are presented as mean  $\pm$  SEM ( $n = 4$ ). Means with different letters are significantly different at  $P < .05$ , using Tukey post hoc test.



# 胃形态学分析



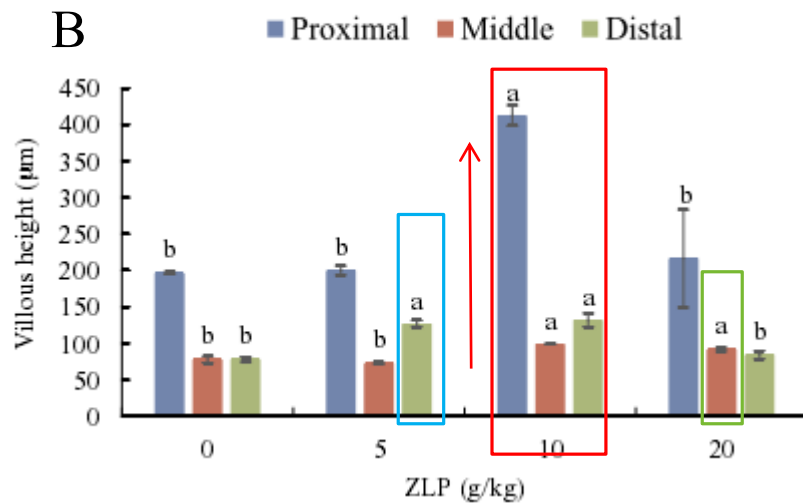
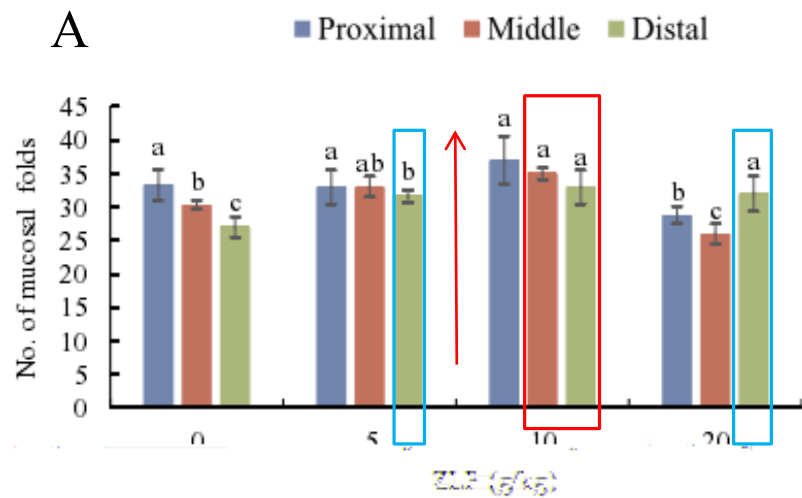
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Fig. 2. Effect of different concentrations of *Z.mauritiana* (ZLP) on Nile tilapia gastric morphometric measurements; thickness of the gastric mucosa and thickness of the gastric muscle layer. Data are presented as mean  $\pm$  SEM (n=3). Bars with the same colour, with different letters, are significantly different (P < 0.05) according to the Tukey's test.



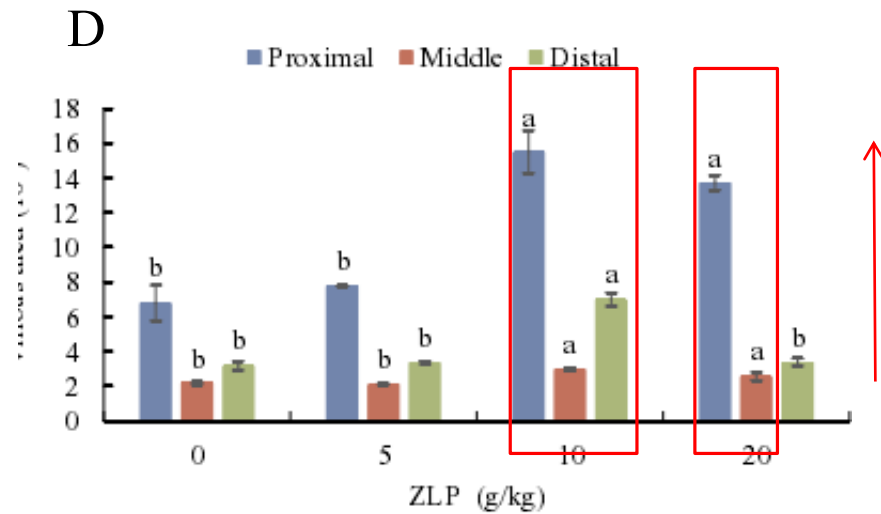
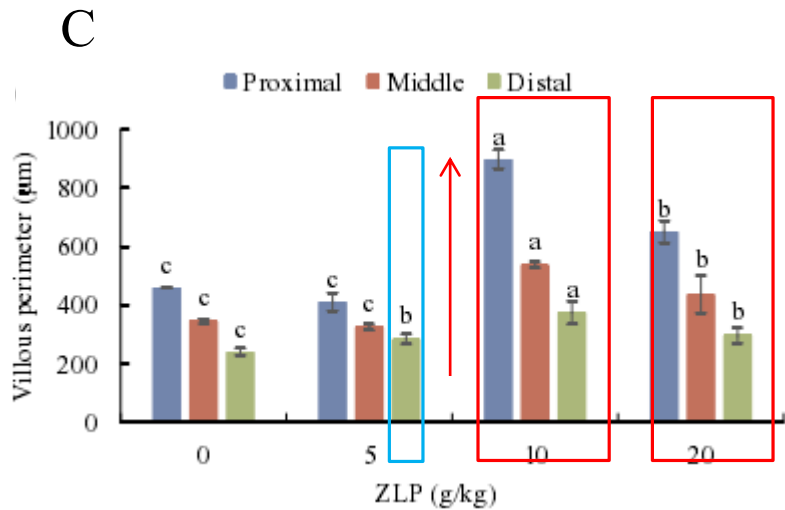


# 肠道形态学分析



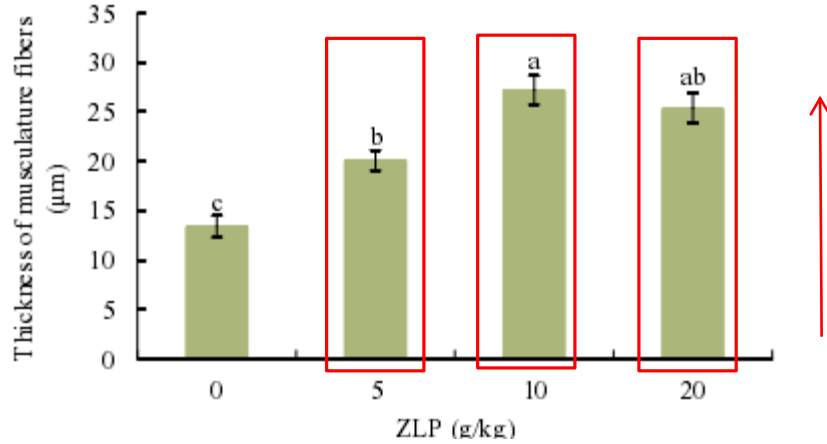


# 肠道形态学分析





# 肌肉形态学分析



**Fig. 4.** Effect of different concentrations of *Z. mauritiana* (ZLP) on Nile tilapia musculature fiber thickness. Data are presented as mean  $\pm$  SEM ( $n = 3$ ). Means with different letters are significantly different at  $P < .05$ , using Tukey post hoc test.



# 胃上皮细胞电镜图

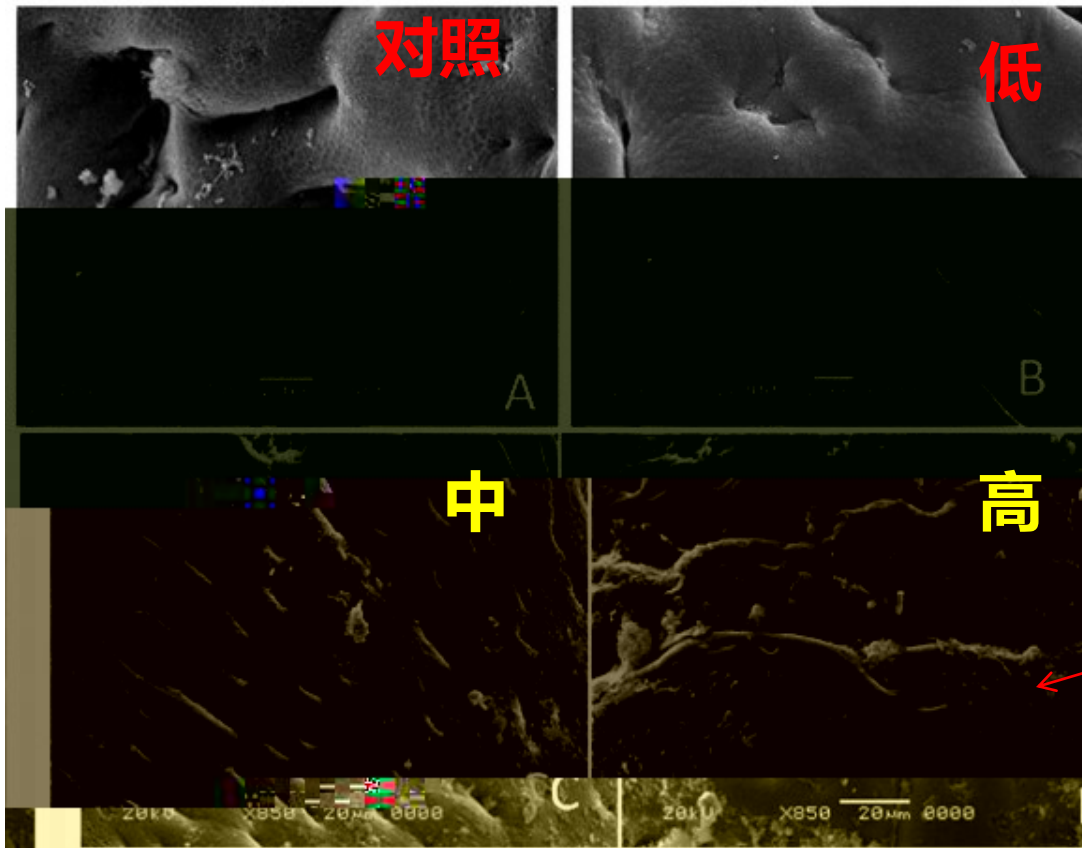


Fig. 5. Micrograph of the stomach of Nile tilapia at the control group (A), (B-D) obtained from fish received different concentrations of *Z. mauritiana* (ZLP) fed groups. (A), showing normal and regular oval or rounded columnar epithelial cells (CEC) lining mucosal folds and gastric pits ( $\times 650$ ); (B) stomach of fish received *Z. mauritiana* at 5 g/kg diet showing normal and regular CEC with partially opened pits ( $\times 1000$ ); (C) stomach of fish received *Z. mauritiana* at 10 g/kg diet showing normal and regular CEC with partially opened pits with accumulation of mucous ( $\times 850$ ); (D) stomach of fish received *Z. mauritiana* at 20 g/kg diet showing normal and regular CEC with partially opened pits and severe mucus secretion ( $\times 850$ ).

粘液



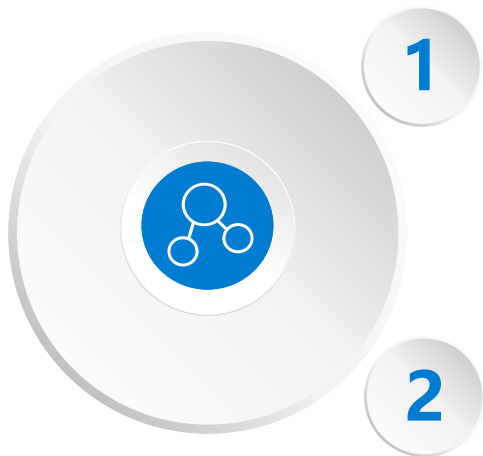
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