



# Comparison Traditional and New Technology on Shrimp Farming Nutritional Components of Shrimp

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## Abstract

One of the major global sectors is aquaculture, which includes shrimp farming. In order to determine the differences in shrimp development, muscle, and nutritional components, this study examines the use of new and traditional technology. The results of the various experimental groups' *Penaeus vannamei* weight gain rate, specific growth rate, survival rate, and feed coefficient showed that the eco-based materials may encourage shrimp growth. Each group's shrimp muscle had an essential amino acid score (AAS) of greater than 0.80 and a chemical score (CS) of greater than 0.60. In the muscle of each treatment group, the proportion of saturated fatty acid (SFA), monounsaturated fatty acid (MUFA), and polyunsaturated fatty acid (PUFA) was 1:0.4:1.4. It revealed a deficiency of MUFA in comparison to the optimal ratio of 1:1:1. It has also been demonstrated that dietary lipids influence the composition of fatty acids. The ecological base can raise the amount of elements in prawn muscles, support shrimp growth and development, and maintain metabolic balance, all of which will boost prawn production. Compared to other treatment groups, the ecological basis group has higher levels of hardness, flexibility, and chewiness in the shrimp muscle.

## Subject Areas

Aquaculture, Fisheries & Fish Science

## Keywords

*Penaeus vannamei*, Amino Acids, Shrimp Texture, Shrimp Muscle

## 1. Introduction

Within the aquaculture sector, shrimp farming is a key pillar industry. The

*Penaeus vannamei*, or whiteleg shrimp, is found in the East Pacific Ocean. Its cultivation is expanding quickly due to strong demand; it is also economically significant. The quick rise of the shrimp farming sector in recent years has benefited society economically. Due to their high nutritious content, shrimp products are widely consumed [1]. Shrimp production reached 5.03 million tons in 2020, and 6.1% more is predicted to grow in the upcoming years [2]. 55% of the world's shrimp are produced by aquaculture; Asia produces the majority of the world's shrimp, with China being the largest producer. The management of shrimp culture has consistently been a primary priority within the *Penaeus vannamei* agricultural sector. The quality and health aspects of aquatic products, such as muscle, are influenced by the fatty acid content fed to the animals, as noted by [3] [4]. It was discovered that the number of gut microbiota and the nature of the diet affect the gut microbiota and how energy is absorbed and stored [5]-[7].

*Pseudomonas*, a possible source of probiotics in shrimp production, can be inhibited by pathogenic bacteria [8]. According to earlier research, eating shrimp meat and different diets can change the texture qualities [9] [10]. Higher fat and water content lower the structural components of muscle tissue, which in turn reduces shrimp hardness [11]. The freshness of the meat also affects the amount of flavor-enhancing amino acids present [12] [13]. The growth of species is improved by defatted insects of the meal that have the right amounts of replacement [14]. Mealworm considerably increases *P. vannamei* shrimp growth [15] [16] verified that, stating that substituting defatted black soldier fly meal for fish meal in diets, did not impact *P. vannamei* shrimp growth performance, nor did pupae meal replacement [17]. Therefore, for adequate replacement levels, different insect species, processing technologies, feed formulation, feeding period, and appealing settings may differ [18] [19]. Potential impacts are reflected in the digestive enzyme activity on feed utilization and growth performance [20] [21].

*P. vannamei* microbiota knowledge is still lacking [22]-[27]. On the other hand, next generation sequencing (NGS) research on crustacean microbiota is progressing [9] [10] [12] [23]-[27]. Antibiotics are no longer effective in treating luminescent vibriosis [28]. Probiotics, on the other hand, help the host by changing its immediate environment or providing nutrition [29]. Aquaculture can benefit greatly from broad spectrum and better generic disease protection that effective probiotic therapies may offer [30] [31].

For many years, Zhejiang Zhoushan Fisheries Research Institute conducted pertinent research in the areas of aquatic animal illnesses, fisheries water environment monitoring, and the development and implementation of aquatic technology models. The goal of the current project is to conduct demonstration research on *Penaeus vannamei* high-level pond farms in Zhoushan City. Three elite pond culture operations of *Penaeus vannamei* breeding variations in various island locales were chosen for this study. Daju Island, Panzhi Island, and Cezi Island are all surrounded by a variety of farms. The application demonstration of new technologies is carried out by the three farms: Yingbo Aquaculture Farm, Daju

Aquaculture Farm, and Dinghai Panzhi Aquaculture Farm. Yingbo Aquaculture Farm is a newly established *Penaeus vannamei* farming operation that boasts sophisticated and comprehensive facilities and equipment. It also features a national monitoring station for aquatic animal illness monitoring and a specific monitoring point for epidemic diseases. This study compares the nutritional value of old and innovative technologies to reveal the amino acid and fatty acid compositions, inorganic elements, and texture properties of shrimp muscle.

## 2. Methodology

In order to conduct a more thorough investigation of the new ecological breeding method of the farmed species *Penaeus vannamei*, the farm conducted research on shrimp growth, muscle composition, and intestine microbial structure analysis. The demonstration pond for new technology promotion is rectangular, measuring 3 × 3 meters with a single pond area and 0.9 meters of water depth. The method used to fill and empty the breeding pond is the same as it is for the other breeding ponds on the property. The demonstration pool's basic water environment parameters are as follows: the initial biological body length (2.92 - 3.1 cm ± 0.04), initial wet weight (0.23 - 0.04 g), and stocking density (667 fish/m<sup>2</sup>) of the prawns. The water temperature is between 25°C and 31°C, and the pH ranges between 7.6 and 8.6.

The same breeding ponds were employed for the breeding period, which ran from July 30, 2021, to October 30, 2021, a length of ninety days. The water is changed every morning at five o'clock, and the bait feeding is done daily at six, ten, fourteen, and eighteen. When comparing the experimental pond to the conventional breeding pond, the daily water change is cut in half. Conditions related to water quality, including feed volume, water displacement, temperature, pH, salinity, and DO, were promptly recorded each day.

Implementation Plan: Throughout the demonstration procedure, a total of 6 experimental ponds and 1 control pond were built up in order to examine the application effects of new and old breeding technologies. Among these, the experimental ponds A, B, and C are arranged in two parallels, respectively. The probiotic "Geyijing" and the Akeman ecological base were "hung" simultaneously in experimental pond A; the probiotic "Geyijing" was the only thing added to experimental pond B; the ecological base was the only thing added to experimental pond C; and the traditional breeding methods were used in control pond D. In the control pond, 3 ppm of bacteria and algae agents were added every 5 days in the early stages of culture, and every 3 days in the middle and later stages of culture. The A and C experimental ponds "hung" the ecological base evenly in the breeding pond by attaching falling stones, and the placement density is 0.12 m<sup>2</sup>/m<sup>3</sup>. The bacterial algae agent in the C experimental group is half as much (1.5 ppm/3d) as it is in the control group. "Geyijing" was added to experimental ponds A and B once every five days at a rate of 0.2 grams per cubic meter in the middle and later stages of cultivation, and once every fifteen days at a rate of 0.1 grams

per cubic meter in the early stages.

## 2.1. Collection and Preservation of Cultured Prawn Samples

Every ten days, 50 randomly selected samples of *Penaeus vannamei* were taken from the test and control ponds using the on-site fishing method. The samples were then put in sterile sampling bags, labeled, refrigerated, and brought to the laboratory to measure muscle index.

Monitoring the muscle composition of shrimp

The muscles of *Penaeus vannamei* in the test group and the control group were mashed, beaten, and mixed before being sent in sample bags to the company. The final collected shrimp sample was used as the analysis object. To assess the nutritional value of the muscles, consider their basic nutritional components (moisture, coarse ash, crude protein, crude fat, total sugar), as well as their fatty acid and amino acid compositions, inorganic elements, etc.

Moisture content is determined by the direct drying method (GB 5009.3-2016);

The crude ash content is determined by the total ash method in food (GB 5009.4-2016);

The crude protein content is determined by the Kjeldahl method (GB 5009.5-2016);

Crude fat content is determined by the Soxhlet extraction method (GB 5009.6-2006);

The texture properties of prawns were determined by texture analyzer (TA.XT-plus) and texture profile analysis (TPA);

Amino acid composition and content are determined by an automatic amino acid analyzer (GB 5009.124-2016).

The calculation formulas of amino acid score (AAS), chemical score (CS) and essential amino acid index (EAAI) in the muscle of *Penaeus vannamei* are as follows:

$$\text{AAS} = \frac{\text{Essential Amino acid content in the sample}}{\text{The essential Amino acid content corresponding}}$$

$$\text{CS} = \frac{\text{Essential Amino acid content in the sample}}{\text{corresponding essential Amino acid content in egg protein}}$$

$$\text{EAAI} = \sqrt[n]{100\text{CS}_1 \times 100\text{CS}_2 \times \dots \times 100\text{CS}_n}$$

Note: mg/g N in the formula represents the milligram amount of amino acid per gram of nitrogen (muscle amino acid content  $\times$  62.5/percentage of muscle protein), and n is the number of essential amino acids to be compared.

## 2.2. Data Analysis Method

Data on shrimp growth performance and muscle composition content were subjected to one-way ANOVA (Analysis of Variance) and LSD (least significant difference) multiple comparisons, provided that the homogeneity of variance was satisfied. The data were compared for multiple differences using the Dunnett T3

test if the homogeneity of variance was not satisfied. A significant difference was denoted by  $P < 0.05$ , and an extremely significant difference was indicated by  $P < 0.01$ .

### 3. Results and Discussion

**Table 1** lists the *Penaeus vannamei* weight increase rate, specific growth rate, survival rate, yield, and feed coefficient for each experimental group. The weight gain rate of the prawns in the experimental group was found to be higher than that of the control group, but it was highest in the ecological base group once the new technology was popularized and shown. The ecological basic group had the lowest feed coefficient, whereas the common group and the basic group had lower feed coefficients than the control group. The basic group had the highest yield. The experimental group's prawn survival rate was lower than the control group's. The reason could be because the prawns' overcrowding caused the breeding density to rise, which in turn caused the prawns' mortality and reduced survival rate. The outcomes showed that prawn growth can be encouraged by the eco-based materials.

**Table 1.** Growth of *Penaeus vannamei* in aquaculture farm during breeding period.

group	weight gain WGR%	specific growth rate SGR%	survival rate S%	Yield catty	Feed coefficient FCR %
D.	4829.78	4.33	97.61	121.52	227.07
A	4831.11	4.33	94.345	122.66	221.35
B	4864.89	4.34	88.71	120.4	227.46
C	5260.905	4.43	89.21	123.98	220.71

#### 3.1. Evaluation of Nutritional Components of Shrimp Muscle

A statistical analysis was conducted on the general nutritional index, amino acid, fatty acid, inorganic element, and textural features of the cultured *Penaeus vannamei* shrimp muscle in each of the experimental groups. The control group, the ecological basis plus the Geyijing experimental group, the Geyijing addition group, and the ecological base group are represented by D, A, B, and C among them, in that order. There are two parallel experimental pools for every experimental group.

#### 3.2. Conventional Nutritional Composition

Shrimp's protein and fat composition are crucial markers for assessing its nutritional worth. The general nutritional contents of *Penaeus vannamei* muscle in each of the experimental groups are shown in **Table 2**. The comparison shows that the prawn muscles in the control group had lower levels of water, ash, crude protein, and crude fat than those in the experimental group. Additionally, there was no discernible difference between the prawn muscles in each treatment

group's general nutritional composition ( $P > 0.05$ ).

**Table 2.** General nutrient content in the muscle of *Penaeus vannamei* in different experimental groups.

Nutritional indicators	D.	A	B	C
Moisture%	76.3	76.7	76	76.3
Ash%	1.62	1.53	1.65	1.63
Crude protein (g/100 g)	21.1	21.2	20.4	21.3
Crude fat%	0.58	0.66	0.55	0.62

### 3.3. Amino Acid Composition

According to Li [32] and Chen [33], each amino acid has a distinct flavor, and each one's flavor contribution is based on its taste activity value—the ratio of the taste substance in the sample to its threshold value. Important meat ingredients called free amino acids have an impact on how aquatic animals taste [32]. **Table 3** lists the amino acid composition of the muscle of *Penaeus vannamei* across the various experimental groups. Each experimental group's shrimp muscle had the same overall amino acid makeup, but a varied content. Each group contains the highest concentration of glutamic acid (13.31 - 14.82), aspartic acid (8.26 - 9.1), arginine (7.99 - 84.1), and the lowest content of histidine (1.67 - 1.88). Comparison (**Table 3**) shows that total amino acid content, essential amino acid content, semi-essential amino acid content, non-essential amino acid content, and umami amino acid content in the shrimp muscle of each group did not significantly differ ( $P > 0.05$ ). TAA and EAA are significant indices of the nutritional content of aquatic goods [34]. The ecological basis group's shrimp muscle had higher overall total amino acid content (TAA/%), essential amino acid content (EAA/%), non-essential amino acid content (NEAA/%), and umami amino acid content (DAA/%) than the other groups. The treatment group provides evidence that the ecological base can raise the amount of amino acids in prawn muscle, encourage prawn growth that is healthy, and enhance prawn flavor. Shrimp flavor is significantly influenced by amino acids, particularly aspartic acid, glutamic acid, glycine, and alanine [35].

**Table 3** shows that, with contents of 33.03%, 60.17%, and 43.75%, respectively, the control group, Geyijing group, and ecological base group had the greatest values of EAA/TAA, EAA/NEAA, and DAA/TAA. The aforementioned values are a high-quality source of protein and meet the ideal model requirements of the FAO/WHO. They also have a beneficial effect on amino acid balance.

**Table 4** displays the chemical score (CS) and amino acid score (AAS) for the muscle of *Penaeus vannamei* across the various experimental groups. Every treatment group's AAS and CS of essential amino acids in shrimp muscle were larger than 0.80 and 0.60, respectively, with the exception of methionine and valine acid. With an essential amino acid index (EAAI) of 66.62 - 72.67 ( $<80$ ), the AAS and

**Table 3.** Amino acid content in the muscle of *Penaeus vannamei* in different experimental groups.

Amino acid type	Amino acid content (g/100 g)			
	D.	A	B	C
Aspartic acid	8.78	8.66	8.26	9.1
Threonine	3.29	3.24	3.08	3.39
Serine	3.51	3.47	3.31	3.65
Glutamic acid	14.14	14.07	13.31	14.82
Glycine	7.8	8.13	7.02	9.01
Alanine	5.29	5.08	4.93	5.35
Valine	3.16	3.11	2.93	3.24
Methionine	2.42	2.12	2.24	2.22
Isoleucine	2.98	2.92	2.74	2.94
Leucine	6.61	6.43	6.1	6.54
Tyrosine	3	2.84	2.76	2.69
Phenylalanine	3.6	3.54	3.38	3.62
Lysine	6.31	6.21	5.88	6.44
Histidine	1.8	1.79	1.67	1.78
Arginine	8.39	8.29	7.99	8.41
Proline	4.78	4.08	4.21	4.29
Total amino acid content TAA/%	85.86	83.98	79.81	87.48
Essential amino acid content EAA/%	28.36	27.57	26.35	28.39
Semi-essential amino acid content SEAA/%	10.2	10.08	9.67	10.18
Non-essential amino acid content NEAA/%	47.31	46.33	43.79	48.91
Umami amino acid content DAA/%	36.01	35.94	33.51	38.27
EAA/TAA%	33.03	32.83	33.02	32.45
EAA/NEAA%	59.95	59.51	60.17	58.04
DAA/TAA%	41.94	42.8	41.99	43.75

CS scores were not statistically significant. Differences ( $P > 0.05$ ) between treatment groups reveal low protein quality, suggesting that neither the ecological background nor the probiotics “Geyijing” have a discernible impact on raising the amount of amino acids in shrimp muscle. In order to increase their nutritional worth, the first and second limiting amino acids are advantageous.

Food’s nutritional value is determined by the type and quantity of amino acids it contains. Foods richer in amino acids can offer greater nutritional benefit to humans [36]. Important markers of the nutritional content of aquatic goods are TAA and EAA as well [34].

**Table 4.** Amino acid score (AAS) and chemical score (CS) in the muscle of *Penaeus vannamei* in different experimental groups.

Essential amino acid	AAS				CS			
	D.	A	B	C	D.	A	B	C
Threonine	0.93	0.89	0.90	0.92	0.79	0.77	0.77	0.79
Valine	0.72	0.69	0.70	0.71	0.54	0.52	0.53	0.54
Methionine	0.77	0.67	0.75	0.68	0.44	0.38	0.43	0.39
Isoleucine	0.84	0.81	0.81	0.80	0.63	0.61	0.61	0.60
Leucine	1.06	1.01	1.02	1.01	0.87	0.83	0.84	0.83
Phenylalanine + Tyrosine	1.22	1.16	1.19	1.25	0.82	0.78	0.80	0.84
Lysine	1.31	1.26	1.27	1.29	1.01	0.97	0.98	0.99
Essential Amino Acid Index EAAI	/	/	/	/	70.55	66.62	68.35	72.67

### 3.4. Fatty Acid Composition

In addition to being necessary for the growth and reproduction of organisms, polyunsaturated fatty acids (PUFAs) can improve human immunity, lower blood viscosity, and enhance food flavor when heated [37]. Pacific white shrimp, particularly the Syaqua strain, have higher PUFA concentrations than pomfret [38]. Furthermore, compared to Chinese white shrimp *Fenneropenaeus chinensis*, all four strains exhibited greater amounts of monounsaturated fatty acids (MUFA) [39]. **Table 5** displays the fatty acid composition of *Penaeus vannamei* muscle across various experimental groups.

According to **Table 5**, the concentration of palmitic acid (C16:0), linoleic acid (C18:2n-6), and linolenic acid (C18:3n-3) in muscle is the greatest, second-highest, and lowest, respectively. The levels of EPA + DHA, MUFA, PUFA, and saturated fatty acid (SFA) in shrimp muscle did not significantly change between treatment groups ( $P > 0.05$ ). Therefore, the probiotics “Geyijing” and the ecological base can increase the fatty acid content in prawn muscle and promote nutrient metabolism in prawns. Overall, the fatty acid content of the experimental group was higher than that of the control group, and the fatty acid content of the Geyijing group was generally higher than that of the other groups. When compared to the optimal ratio of 1:1:1, the ratio of SFA, MUFA, and PUFA in the muscle of *Litopenaeus vannamei* in each treatment group was 1:0.4:1.4, indicating a deficiency in MUFA. Thus, in order to improve its nutritional value during the breeding process, unsaturated fatty acids should be appropriately provided.

With the exception of common shrimp, all strains’ profiles were dominated by PUFA, which was followed by SFA and MUFA. The predominant SFA was palmitic acid (C16:0), whereas stearic acids (C18:0) were also widely distributed. Oleic acid was the most prevalent MUFA (C18:1). Since LA is a lipid acid that is

**Table 5.** Fatty acid content in the muscle of *Penaeus vannamei* in different experimental groups.

Types of fatty acids	Fatty acid content%			
	D.	A	B	C
Palmitic Acid (C16:0)	22.49	21.5	20.12	21.05
Stearic acid (C18:0)	10.29	12.94	12.85	13.1
Oleic acid (C18:1n-9)	14.4	12.94	14.15	13.32
Linoleic acid (C18:2n-6)	21.6	21.94	22.33	21.48
Linolenic acid (C18:3n-3)	2	1.18	1.56	1.12
Arachidic acid (C21:0)	2.41	2.19	3.12	2.36
Glyceric acid (C20:3n-3)	1.18	0.97	1.69	0.95
Arachidonic acid (C20:4n-6)	2.41	2.19	2.51	2.36
EPA (C20:5n-3)	9.99	12.29	12.59	12.67
C2DHA (2:6n-3)	13.23	11.85	9.09	11.6
Saturated fatty acids ( $\Sigma$ SFA)	35.19	36.64	36.09	36.51
Monounsaturated fatty acids ( $\Sigma$ MUFA)	14.4	12.94	14.15	13.32
Polyunsaturated fatty acids ( $\Sigma$ PUFA)	50.41	50.42	49.76	50.17
EPA + DHA	23.22	24.13	21.68	24.27
<i>n</i> – 3 polyunsaturated fatty acids $\Sigma$ n-3PUFA	24.4	25.1	23.37	25.21
<i>n</i> – 6 polyunsaturated fatty acids $\Sigma$ n-6PUFA	24.02	24.13	24.83	23.84
$\Sigma$ n-6PUFA/ $\Sigma$ n-3PUFA	0.98	0.96	1.06	0.95

normally found in plants, shrimp's high LA level may be explained by their omnivorous diets. Actually, an earlier work [40] found that the muscle of *L. vannamei* fed diets supplemented with two kinds of marine algae had a greater level of LA. The fatty acid composition of *L. vannamei* has also been demonstrated to be influenced by dietary lipids; whole body shrimps fed diets high in unsaturated fatty acids displayed increases in MUFA and PUFA. Due to their ability to decrease serum triglycerides, two of the most beneficial FAs, EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid), are crucial in the prevention of cardiovascular and inflammatory illnesses [41].

### 3.5. Composition of Inorganic Elements

Ammonium and other inorganic nitrogenous species are intrinsically linked to aquaculture systems, and this relationship becomes stronger as the water is enriched [42]. Concerns regarding the origins have been raised by the detection of trace elements in biota and concentrations in commonly consumed foods in environmental sample data [43]-[48]. Table 6 displays the inorganic element composition of the muscle of *Penaeus vannamei* across the various experimental

groups. Overall, the experimental group's shrimp muscles had higher levels of the macroelements Ca, K, and trace elements than the control group's, and the element contents of the Geyijing plus ecological base group and the ecological base group were generally higher than those of the control group and the Geyijing group. This suggests that the ecological base can raise the element content in prawn muscles, support prawn growth and development, and maintain metabolic balance, all of which will increase prawn production.

**Table 6.** Contents of other trace elements in the muscle of *Penaeus vannamei* in different experimental groups (mg/kg).

Types of Inorganic Elements		Element content			
		D.	A	B	C
Constant element	Ca	223	232	246	265
	K	3714	3743	3611	3681
	Mg	412	386	390	380
	Na	1609	1527	1555	1439
Trace elements	Zn	11.8	12.2	11.3	12.2
	Cu	5.95	6.04	5.91	5.96
	Mo	0.0124	/	0.0125	/
	Fe	2.55	7.92	2.63	2.36
	Mn	0.168	0.179	0.161	0.162
	Se	0.198	0.253	0.184	0.258
	Ni	/	/	/	/
	Al	5.15	6.73	7.77	10.9
	Sr	2.75	2.75	3.06	3.12
Harmful elements	Pb	0.033	/	0.0279	0.039
	As	0.338	0.367	0.34	0.36
	Cd	0.0049	0.00814	0.006	0.00795
	Hg	0.0088	0.0081	0.00755	0.008
	Cr	0.103	/	0.0945	0.1

### 3.6. Characteristics of Texture

The water-holding capacity (WHC), which is a significant factor in determining the physical characteristics of shrimp, including texture, can influence both color and texture to some extent [49]. Past research has shown the importance of physical characteristics like texture and color during the preparation of shrimp [50] [51].

It is evident that prawns treated with environmentally friendly technologies have a greater flavor. Variations in food structure and chemical composition are

reflected in visual and textural attributes [52]. The characteristics related to texture that are utilized to forecast moisture content, as well as hardness and elasticity. Shrimp's color and texture variations while drying can be explained by combining their internal and external characteristics [53]. Ineffective drying can have a negative influence on the dried shrimp product's color, texture, and nutritional qualities [54]. As a result, the hardness, elasticity, and chewiness are causing moisture changes that will impact the contraction of muscle fibers and change the texture of shrimp meat [55]. The textural characteristics of *Penaeus vannamei* muscle in the various experimental groups are shown in Table 7. The results show that the cohesion, elasticity, hardness, and chewiness of the shrimp are not substantially different ( $P > 0.05$ ), and that the ecological basis group has higher levels of chewiness, elasticity, and hardness of the shrimp muscle than the other treatment groups.

**Table 7.** Texture properties in the muscle of *Penaeus vannamei* in different experimental groups.

Textural properties/groups	D	A	B	C
Hardness/g	130	125	120	130
Elasticity	0.699	0.685	0.727	0.73
Cohesion	0.604	0.6	0.628	0.609
Chewiness/g	52.17	58.49	56.09	60.97

#### 4. Conclusions

The experimental group's shrimp cultivation water had lower quantities of ammonia nitrogen, nitrite nitrogen, active phosphate, and total phosphorus than the control group's. AAS and CS scores were not statistically significant. Differences ( $P > 0.05$ ) between treatment groups reveal low protein quality, suggesting that neither the ecological background nor the probiotics "Geyijing" have a discernible impact on raising the amount of amino acids in shrimp muscle.

In the shrimp muscle of the ecological basis group, the values of total amino acid content (TAA/%), essential amino acid content (EAA/%), non-essential amino acid content (NEAA/%), and umami amino acid content (DAA/%) were all greater than those of the other groups. The study found that the Panzhi farm experimental group's prawns had a greater amino acid content and better texture than the control group. This indicates that the prawns in the experimental pond had better nutritional value and flavor when compared to the control group. The production of prawns in the experimental groups of Daju farms and Yingbo farms increased by 1.24% and 7.88%, respectively, compared with the control group, and the cost input of prawns in the experimental ponds of the farms of each demonstration point was somewhat reduced.

The fatty acid composition of *L. vannamei* has also been demonstrated to be influenced by dietary lipids; whole body shrimps fed diets high in unsaturated

fatty acids displayed increases in MUFA and PUFA. Thus, in order to improve its nutritional value during the breeding process, unsaturated fatty acids should be appropriately provided. The Geyijing plus ecological base group and the ecological base group had element contents that were generally higher than those of the control group and the Geyijing group, and the macroelements Ca, K, and trace elements were higher in the experimental group's shrimp muscles than in the control group's.

The cohesion, elasticity, hardness, and chewiness of the shrimp do not differ substantially ( $P > 0.05$ ). The ecological basis group exhibits higher levels of hardness, elasticity, and chewiness in the shrimp muscle compared to the other treatment groups.

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### Conflicts of Interest

The authors declare no conflicts of interest.

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