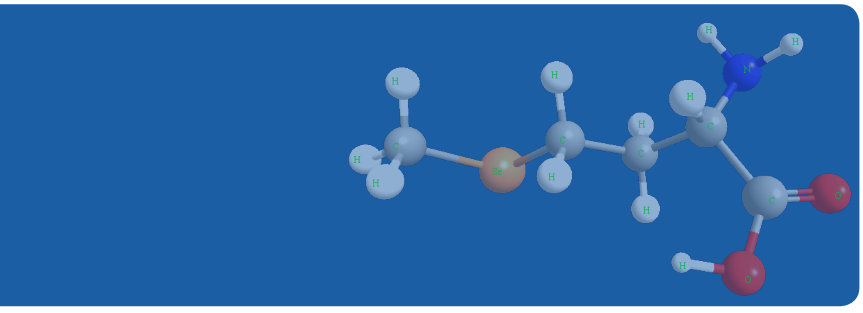
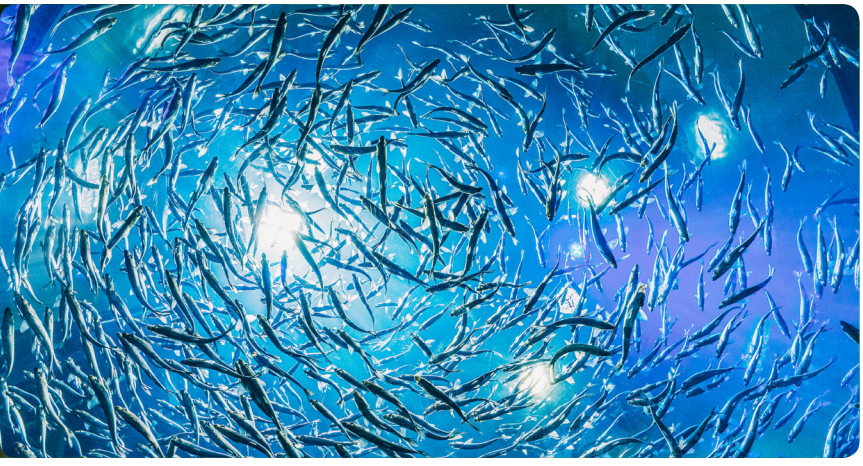
Sinyiml新一美

SePower

Selenomethionine+VE







四川新一美生物科技有限公司

Sichuan Sinyiml Biotechnology Co.,Ltd.

Unidentified growth factors (UGF) and the secret of fishmeal

Many studies have confirmed that UGF in fish meal and alfafa play an important role in the growth and health of fish and shrimp,even on small dosage.

Most of nutritionist's love and awe for fishmeal in the formula come from the recognition of UGF in fishmeal. In the long process of research, scientists found that UGF in fish meal was a kind of mixture. With the progress of science, more and more results point to "selenium, vitamin B12, methionine, Omega-3 fatty acids in fish meal as UGF of fish meal, which are beneficial to the growth and health of aqua animals. It is known that selenium is an essential nutrient for fish and shrimp. It is mainly involves in the antioxidant function in the body and plays an important role in the growth and disease resistance of animals. Selenium deficiency will cause fish and shrimp to suffer from growth retard, loss of appetite, muscle atrophy, liver necrosis, disease resistance decline and other symptoms.

Fish is rich in selenium, and fish meal is a high selenium ingredient

Compared with terrestrial animals and plants, both freshwater fish and marine fish are rich in selenium (Table 1). Of course, fish meal is also the ingredient with the richest selenium content (Table 2). The average content of selenium in marine fish meal is about 2mg/kg, while that in tuna meal can be as high as 4-6 mg/kg. However, the selenium content in other feed materials is relatively low.

Selenium content in fish, livestock and poultry meat (Table 1)

Ranking	Species	Weight (g)	Selenium content(μg)
Fish containing selenium No.1	Tuna	100	78.00
Fish containing Selenium No.2	Smallyellow croaker	100	55.20
Fish containing selenium No.3	Yellow croaker	100	42.57
Fish containing selenium No.4	Octopus	100	41.68
Fish containing selenium No.5	Black carp	100	37.69
Fish containing selenium No.6	Hairtail	100	36.57
Fish containing selenium No.7	Codfish	100	24.48
Fish containing selenium No.8	Salmon	100	17.20
Fish containing selenium No.9	Silver carp	100	15.68
Fish containing selenium No.10	Common Carp	100	15.38
Fish containing selenium No.11	Crucian carp	100	14.31
Fish containing selenium No.12	Squid	100	13.65
Pork Selenium content		100	10.60
Beef Selenium content		100	10.55
Chicken Selenium content		100	5.40

Selenium content in ingredients (Table 2)

Ingredient	Average ± SE (mg/kg)	Ingredient	Average ± SE (mg/kg)
Soybean meal (32)	0.12±0.006	Cheese (2)	0.17
Flax meal (10)	1.05±0.070	Whey (11)	0.06±0.006
Corn gluten meal (11)	0.31±0.030	Meat meal (34)	0.40±0.020
Corn protein feed (12)	0.17±0.010	Herring Meal (10)	2.84±0.140
DDGS(3)	0.38±0.040	White Fish Meal (6)	1.83±0.080
Distiller's dried grains (12)	0.35±0.060	Fish Meal (8)	1.96±0.110
Distiller's dried grains soluble (8)	0.33±0.060	Feather powder (8)	0.72±0.030
Brewers' grains (4)	0.94±0.060	Blood powder (14)	0.69±0.060
Malt root (6)	0.60±0.100	Calcium carbonate (3)	0.04±0.003
Alfalfa powder (16)	0.06±0.007	Limestone (11)	0.04±0.003
Skimmed milk powder (4)	0.12±0.020	Calcium phosphate (11)	0.07±0.020
Buttermilk powder (3)	0.12±0.006	Phosphate rock (1)	0.64

Super high selenium requirements of fish

Under natural conditions, fish can obtain a large amount of selenium through food chain enrichment, of which more than 90% exists in the form of selenomethionine. The selenium requirement of livestock and poultry is about 0.3mg/kg. A large number of studies have shown that most of the selenium requirements of fish and shrimp exceed 1mg/kg. High selenium requirements are an important nutritional feature of aqua animals which is different from homothermalanimals. High selenium requirement is directly related to the fact that fish and shrimp are rich in polyunsaturated fatty acids and need a large amount of selenium for antioxidant purposes. A large number of studies have confirmed that the demand for selenium of most aquatic animals is far more than that of terrestrial animals, and even far more than our cognition (Table 3 and Table 4). The upper limit of fish selenium requirements set by the United States Environment Agency has even reached 7.9mg/Kg.

Selenium requirements of carnivorous aqua animals (Table 3)

Varieties	Form of selenium	Index	Selenium requirement mg Se/kg	Origin
Salmo salar	Sodium selenite	Healthy	1-3	Berntssen et al., 2018
Salmo salar	Sodium selenite,selenomethionine	Balance of selenium in the body	0.14-0.65	Prabhu et al., 2020
Salmo salar	Selenomethionine	Selenium balance in the body and health promotion	0.65	Prabhu et al., 2020
Huso dauricus	Selenomethionine	Weight gain and leukocyte selenium	11.56-20.26(Max)	Arshad et al., 2011
Black sea bream	Selenium polysaccharide	Weight gain	0.87	Wang et al., 2019
Cobia	Selenomethionine	Specific growth rate, leukocyte selenium	0.788-0.811	Kang et al., 2010
Cobia	Selenomethionine	Final weight, SGR	2.2-2.4	Pam et al., 2019
Silver salmon	Sodium selenite	Weight gain and leukocyte selenium	8.6	Felton et al., 1996
Silver salmon	Sodium selenite	Specific growth rate and leukocyte selenium	0.39-0.43	Du et al., 2021
Clark Croaker Trout	Selenomethionine	Weight gain and leukocyte selenium	7.2-9.2	Hardy et al., 2010
Gold headed sea bream	Selenomethionine (Yeast)	Weight gain and immune index	0.546-0.604	Zheng et al., 2018
Grouper	Selenomethionine	Weight gain and leukocyte selenium	0.7	Lin and Shiau., 2005
Grouper	Sodium selenite	Weight gain	0.9	Lin., 2014
Grouper	Selenomethionine	Weight gain	0.98	Lin., 2014
Hybrid striped bass	Sodium selenite	Weight gain	1.19	FJaramillo et al., 2019
Hybrid striped bass	Selenomethionine	Weight gain	0.9	FJaramillo et al., 2019
Large-mouthed bass	Sodium selenite	Weight gain and enzyme activity	1.60-1.85	Zhu et al., 2012
White Chinese croaker	Selenomethionine (Yeast)	Weight gain, antioxidant and immune indexes	3.98	Mansour et al., 2017
White Chinese croaker	Selenomethionine (Yeast)	Weight gain and specific growth rate	3.62-4.15	Khalil et al., 2019
Rainbow trout	Sodium selenite	Enzyme activity	0.15-0.28	Hilton et al., 1980
Eel catfish	Nano selenium	Specific growth rate and feed coefficient	1.02-1.11	El-Sharawy et al., 2021
Yellowtail Kingfish	Selenomethionine (Yeast)	Weight gain	5.56	Le and Foteday., 2013
Black sea bass	Selenomethionine	Growth performance and disease resistance	0.62-0.92	Zhang Qingwen et al., 2018
Japanese sea bass	Sodium selenite	Growth performance	0.63-0.75	Tan Feng et al., 2015

Selenium requirement of herbivorous &ominivorous aqua animals (Table 4)

Varieties	Form of selenium	Index	Selenium requirement mg Se/kg	Origin
Blunt-snout bream	Sodium selenite	Weight gain and specific growth rate	0.96	Hao et al., 2020
Channel catfish	Sodium selenite	Growth performance, glutathione activity	0.25	Gatlin and Wilson(1984)
Channel catfish	Sodium selenite;selenomethionine	Weight gain, glutathione activity	0.17-0.28	Wang and Lovell(1997)
Channel catfish	Selenomethionine	Weight gain, glutathione activity	0.09-0.12	Wang and Lovell (1997)
Common carp	Sodium selenite	Weight gain and survival rate	0.12-0.15	Gaber,2009
Common carp	Nano selenium	Weight gain and enzyme activity	1	Ashouri et al., 2015
Common carp	Sodium selenite	Weight gain	1	Li Shaojin, 2019
Common carp	Sodium selenite	Weight gain	0.434-0.517	Jin Mingchang, 2003
Nile tilapia	Selenomethionine	Weight gain	1.06-2.06	Lee et al., 2016
Nile tilapia	Selenomethionine	Weight gain and enzyme activity	0.57	Ning et al., 2020
Nile tilapia	Nano selenium	Weight gain	1.23	Rathore et al., 2021
Crucian carp	Selenomethionine	Weight gain, glutathione activity	1.18	Han et al., 2011
Crucian carp, Zhongke No.3	Selenomethionine	L-Se and enzyme activity	0.73-1.19	Zhu et al., 2017
Loach	Sodium hydrogen selenite	L-Se and blood indexes	0.48-0.50	Hao et al., 2014
Loach	Selenomethionine	Growth performance	1.00	Dandan Ju et al., 2023
Grass carp	Sodium selenite	Enzyme activity	0.83	Liu et al., 2018
Grass carp	Selenomethionine (Yeast)		0.546-0.604	Zheng et al., 2018
Fine-scale fat carp	Selenomethionine (Yeast)	Enzyme activity, immunity	1.56	Takahashi et al., 2017
Macrobrachium nipponense	Selenomethionine (Yeast)		0.68	Kong et al., 2017
Penaeus vannamei	Nano selenium	Growth performance	0.2-0.4	Aliakba et al., 2022
Penaeus vannamei	Selenomethionine	Weight gain, survival rate	0.84	Qiuran Yu et al., 2022
Abalone	Sodium selenate		1.408	Wang et al., 2012

This selenium is not that selenium: selenium-chemical form determines efficacy and function

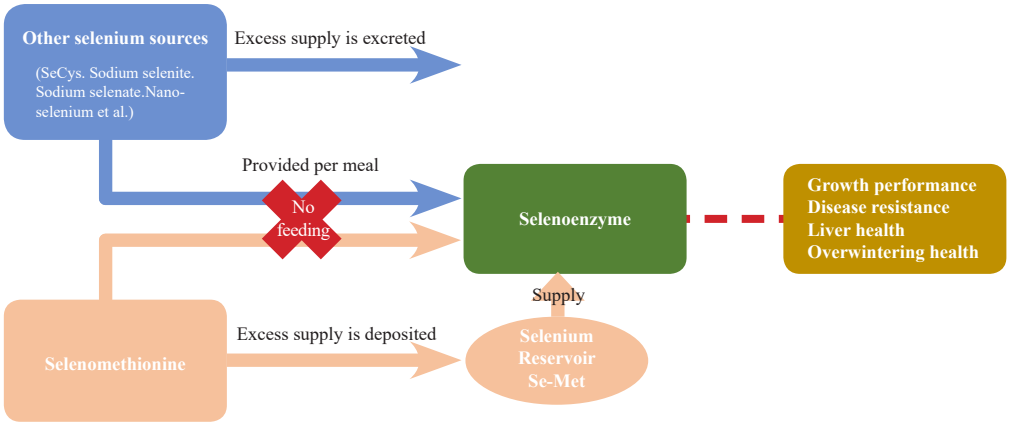
Selenium in fish meal mainly exists in the form of selenomethionine, which is an organic form. Sodium selenite is the main additive form of selenium in feed at present, and it is an inorganic selenium, and its selenium exists in the form of +4 valence. Different selenium sources have different metabolic pathways and different physiological activities in animals (Table 5). The toxicity of sodium selenite lies in the consumption of reduced glutathione in the process of its transformation into organic selenium, which is an important antioxidant substance in the body, so high dose of inorganic selenium will show very strong oxidative toxicity, and selenomethionine is the safest selenium source because it does not need the metabolism of reduced glutathione .

Sodium selenite and selenomethionine (Table 5)

Selenium source	Main sourc	Chemical valence	Toxicity	Can it be stored in the body	Bio-efficiency
Sodium selenite	mineral	+4	High	No	Low
Selenomethionine	Living matter	-2	Low	Yes	High

A large number of studies have showed that selenomethionine is the selenium source with the highest biological potency, and its biological potency is 2-9 times that of inorganic selenium. In addition to the biological potency, the more essential difference between different selenium sources is whether it can be stored in the body. Studies have confirmed that selenomethionine is the only selenium source that can be stored efficiently in the body (Figure 1), while the other selenium sources are not only extremely inefficient, but also toxic when added in high doses. Selenium that cannot be stored in fish and shrimp will easily lead to selenium deficiency especially in the no-feeding situation such as raining and winter season. This is the secret of the unidentified growth factor of fish meal: a specific form of selenium with unique storage characteristic.

Different selenium sources, different Metabolic pathways and different results (Figure 1)



Fish meal reduction and selenium deficiency

One of the unidentified growth factors in fish meal is selenium in the form of selenomethionine, which has high biological potency and low toxicity, and the most important thing is that it can be stored in the body. When the formula reduces the addition of fish meal, the supply of selenomethionine also decreases linearly and rapidly (Figure 2), which means the lack of selenium. However, the traditional biological efficiency of inorganic selenium is low, which can't meet the high demand of selenium for fish and shrimp. The lack of selenium will become more and more serious with the decrease of fish meal.

In addition, what is more serious is that the decrease of fish meal leads to the transformation of dietary selenium forms. It is known that the selenium source provided by non-selenomethionine must be supplied through diet every meal, otherwise there will be selenium deficiency in the body. This is a severe challenge for fish and shrimp that are fed less or no feeding due to weather or disease, especially during the winter season, because the decline of disease

resistance caused by selenium deficiency will be fatal. Therefore, based on the research of unidentified growth factors and the characteristics of selenium nutrition in fish and shrimp, fish and shrimp need selenomethionine, a high biological potency and storable selenium source, rather than selenium in the general sense, which is also the mystery of unidentified growth factors.

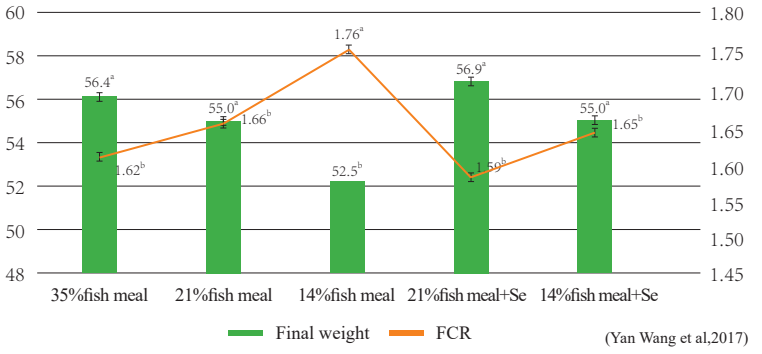
Relationship between fish meal reduction and selenium (selenomethionine) supply (Figure 2)



Selenomethionine and scientific reduction of fish meal

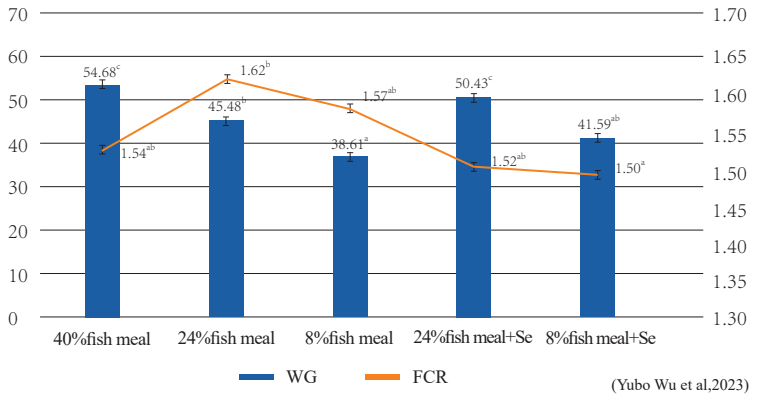
Scientific reduction of fish meal is a permanent topic in the field of aquatic feed. Scientifically recognize the beneficial components in fish meal and add them scientifically; Meanwhile, recognize the harmful components in substitute raw materials and try to eliminate them. Combine the two sides are the main holistic solution for scientific fish meal replacement. Selenomethionine, which has high biological potency and can be stored, is a specific component of the unidentified growth factor of fish meal, rather than selenium in the ordinary sense. This substance is particularly important for the production performance and disease resistance of fish and shrimp. Supplementing selenomethionine has been fully proved that the production performance of low fish meal diet and the health of fish and shrimp can be effectively improved (Figure 3 and Figure 4).

The effect of organic selenium supplemented by soybean meal instead of fish meal on the growth performance of Pompano (Figure 3)



(Yan Wang et al,2017)

The effect of organic selenium supplemented by soybean protein concentrate instead of fish meal on the growth performance of Pompano(Figure 4)

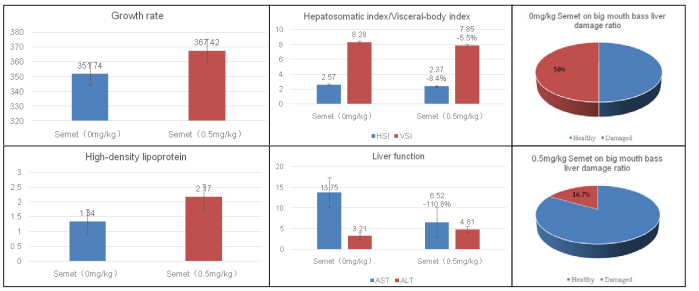


(Yubo Wu et al,2023)

Selenomethionine and liver health

In 1950s, American scholar Schwarz first discovered that selenium had a preventive effect on animal liver necrosis, and selenium was also called "anti-liver necrosis factor" from then on. The liver is one of the selenium abundant organ, and most cases of liver diseases have selenium deficiency, and the more serious selenium deficiency, the more serious the condition. This is closely related to the function of selenium in anti-oxidation and maintaining cell health. Adding organic selenium with selenomethionine as the main form in fish and shrimp diets can effectively reduce the necrosis of liver cells and the incidence of liver diseases (Figure 5). There is a strong correlation between the decline of fish meal in commercial formula and the lack of targeted supplementation of selenomethionine and the prevalence of hepatobiliary diseases in fish and shrimp.

Protective effect of high dose organic selenium on health on big mouth bass (high-energy and high protein diet)(Figure 5)

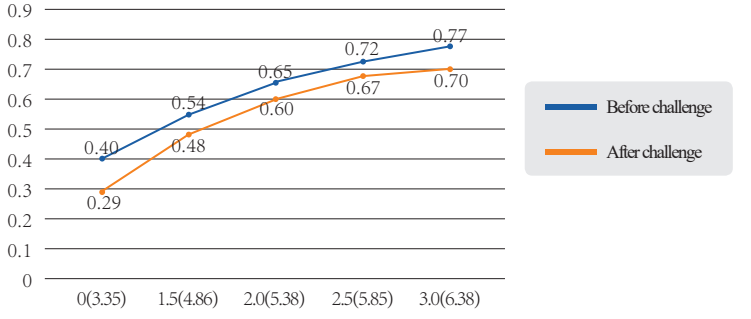


(Li Ling et al., 2017)

Selenomethionine and disease resistance

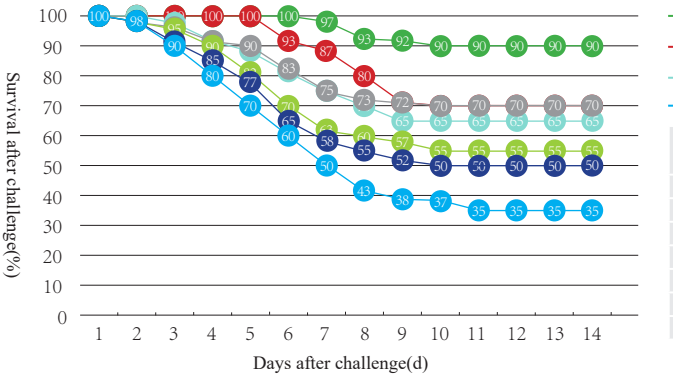
Selenium can improve the nonspecific immunity and specific immunity of fish and shrimp. When the disease challenges, the body will increase the expend for selenium, and at the same time the selenium storage level in the body will drop significantly (Figure 6). Therefore, when selenium is deficient, the anti-stress ability and disease resistance ability of fish and shrimp will decrease significantly. Selenomethionine is a selenium source with higher biological potency and can be stored, so it has stronger immune enhancement effect than inorganic selenium (Figure 7).

Effects of different doses of organic selenium on the content of selenium in muscle before and after Vibrio *anguillarum* challenge (mg/Kg)(Figure 6)



(Ky Trung Le et al., 2013)

After adding different selenium sources to Nile tilapia diet for 8 weeks,Survival rate and Relative percentage survival (RPS) after streptococcus *agalactiae* challenge (1×10^8 CFU/fish)(Figure 7)



Se source	Se levels (mg/kg diet)	Survival rate (%)	RPS(%)
Control	0	35.0±4.3^{d}	
SeMet	1	90.0±2.0^{a}	84.62
SeMet	3	70.0±3.0^{b}	53.85
SeMet	5	65.0±2.3^{b}	46.15
Na_2SeO_3	1	55.0±3.0^{c}	30.77
Na_2SeO_3	3	70.0±2.0^{b}	53.85
Na_2SeO_3	5	50.0±3.3^{c}	23.08

(Wangkahart et al., 2021)

Unidentified growth factor and selenium secret

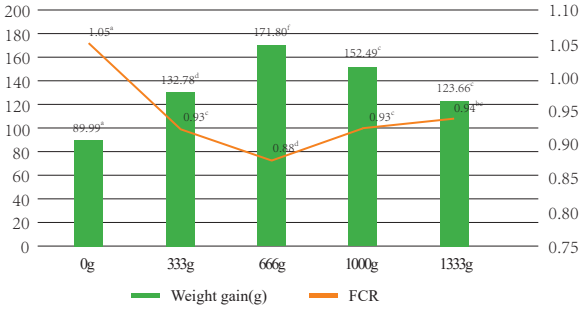
With the progress of science, the secrets of unidentified growth factors are being solved one by one. Combined with the cutting-edge knowledge of fish and shrimp nutrition, Sinyiml Company pioneered the development of "SePower", a concentrated product of unidentified growth factors. The product is rich in fish meal and alfalfa's unidentified growth factors which proves that it can effectively improve the growth performance and health of fish and shrimp (Figure 8 and Figure 9), so as to help realize the scientific reduction of fish meal and the healthy maintenance of fish and shrimp.

"SePower", the secret in unidentified growth factors!

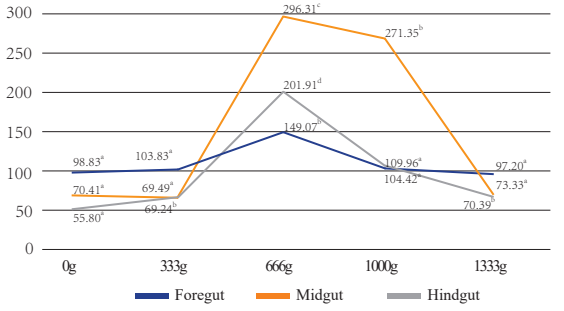
"SePower", the formulation secret of fishmeal scientific reduction!

"SePower", the secret of fish and shrimp health!

Effect of SePower on Grass carp growth performance (Figure 8)



Effect of SePower on IgM content of Grass carp gut(Figure 9)



Product function

1.Provide Se,VE requirement of aqua animals with high efficiency and safety

2.Improve immunity and health of aqua animals

3.Decrease free radical damage to cell

4.Improve liver health

5.Reduce all kinds of stress

Product composition

Ingredient	Content
Vitamin E	≥2000IU/kg
L-Selenomethionine	≥0.25%
Se	≥0.10%
Carrier	Zeolite Power, Silicon dioxide

Recommended dosage

300-500g/ton of complete feed.

Package: 25Kg/bag

Storage condition: Cool and dry

Expiration date: 24 months

SePower

Power of Selenium

Sinyiml新一美

High-quality Trace Minerals Manufacturer

新一美微信公众号

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