

## Fisugarpeptide Biology Engineering Co., LTD

### Usage method of Five Sugar Acid

WLT people believe that: Feed Acidifier must be “Tastable Acid, Effective Acid”, and will become a small proportion of feed ingredients, which is the trend of The Times and history. "Five Sugar Acid" adopts corn, broken rice, soybean meal, vegetable oil and corn protein powder (Peru steam dried fishmeal/alfalfa meal) five feedstuffs asynchronous enzymatic hydrolysis, vegetable oil & sugar-based homogeneous emulsion and synchronous fermentation acidification of mixed bacteria and high sugar medium, original taste and flavor, sour and sweet, has good smell and fragrance, good anti-stress effect and excellent attractants, is a kind of feed acidifier that truly realizes the "Tastable Acid, Effective Acid". Eight functions: liking drinking, anti-diarrhea, heavy-milking, growing fast, treating enterovirus syndrome, producing more eggs, resisting stress and purify intestines and water. FSA (short for "Five Sugar Acid") is rich in Citric Acid, Lactic Acid, Acetic Acid, Propanoic Acid, Butyric Acid, Emulsified Fat, active small peptide (including antibacterial peptide), Probiotics, high sweet Oligose, Yeast Protein, Biological Enzyme, Vitamin, Organic Acid Calcium Leaven fragrant & sweet element and the unnamed growth factor, can substitute antibiotics, emulsified fat powder, whey powder, plasma protein, glucose and fermented soybean meal and other biological ingredients. In a sense, it is a kind of etching-coated type compound organic acid acidifier combined acidifier with enzymatic hydrolysis fermented feed and emulsified fat, the later two of which are as carrier, perfectly realize the mutual improvement among them. See table 1, 2 and 3 for the basic nutrition of FSA in detail.

There are great differences between FSA and some "mixed feed acidifier" in effective components, cost performance and actual feeding effect. In short, it is "One same Three differences".

"One same": FSA and part of "mixed feed acidifier" on the market is same in total acid, meaning both in stimulating animal feed intake, promoting the growth of livestock, poultry and fish & shrimp, promoting the sow's lactation, acidified animal intestines, restraining and sterilizing bacteria, preventing and treating diarrhea of piglets, preventing and treating enterovirus syndrome of poultry, preventing and treating the serious illness of "belly" of fish and shrimp, curing intestinal and purifying water and other aspects of ability and effect is the same. In some cases, that of FSA is even better than some "mixed feed acidifier".

"First difference": FSA contains five kinds of organic acids, and part of "mixed acidifier" on the market contains mostly phosphoric acid, organic acid as a supplement, the determination of ash and total phosphorus tells whether it is true or not.

"Second difference": FSA's carrier is enzymatic hydrolysis fermented feed and emulsified fat, while all "mixed feed acidifier"'s carrier is Silicon Dioxide, the

determination of protein and fat tells whether it is true or not.

"Third difference": FSA's coating type is natural etching coated, while the "mixed feed acidifier" on the market most of them are uncoated or coating agent coated, the determination of the reaction speed of stone powder tells whether it is true or not.



Therefore, FSA contains five acids, protein, high energy, viable bacteria, good palatability, large intake, can not only "go through the stomach into the intestinal" to acidify the intestines of livestock and poultry, but also can supplement protein, energy, vitamins, probiotics and other nutrients, it can be said to "kill many birds with one stone". The "mixed feed acidifier" on the market does not contain protein, does not contain viable bacteria, low energy, poor palatability and small intake.

FSA's nutritional composition can be simply concluded as "Five kinds of acid, Two kinds of bacteria, 12% protein and 6% fat". In terms of energy and protein nutrition, adding 10kg of FSA is equivalent to adding 1kg of vegetable oil, 1kg of fermented soybean meal and 8kg of fermented corn.

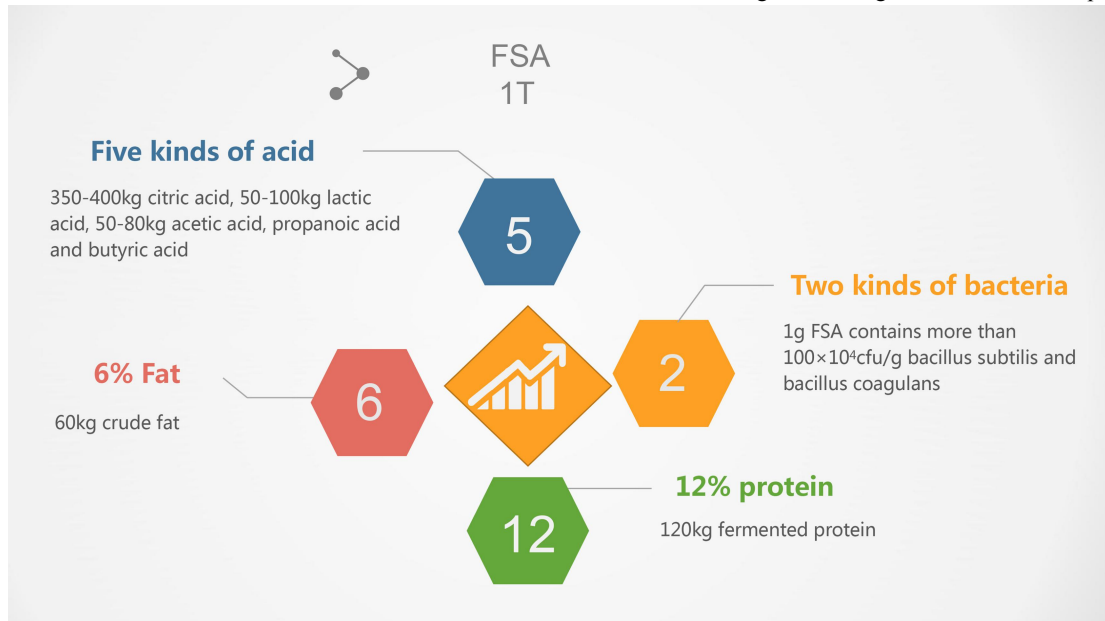
Among them, the detailed explanation and brief diagram are as follows:

"Five kinds of acid": one ton of FSA rich in 350-400kg citric acid, 50-100kg lactic acid, 50-80kg acetic acid, propanoic acid and butyric acid five kinds of organic acids.

"Two kinds of bacteria": 1 gram of FSA is rich in more than  $100 \times 10^4$ cfu/g of bacillus subtilis and bacillus coagulatorius two kinds of viable bacteria.

"12% protein": one ton of FSA contains more than 12% fermented protein, that is to say, one ton of FSA contains 120kg fermented protein.

"6% fat": one ton of FSA contains more than 6% crude fat, that is to say, one ton of FSA contains 60kg crude fat.



Among them, the specific explanation of "determination of ash and total phosphorus" : the ash content and total phosphorus content of phosphoric acid acidifier on the market are up to more than 50% and 3.5% respectively. The ash content of FSA is only 8-10%, and the total phosphorus content was only 0.8-1.0%. That is to say, when acidifier takes phosphoric acid as raw material, the content of ash and total phosphorus will be high; When fermented feed and emulsified fat are used as raw material, the content of ash and total phosphorus will be low.

Among them, the specific explanation of "determination of protein and fat": all acidifiers on the market do not contain protein and crude fat. While FSA contains more than 12% fermented protein and more than 6% crude fat. That is to say, when the acidifier takes Silicon Dioxide as the carrier, it will not contain fermented protein and crude fat. Fermented protein and crude fat are contained only when fermented feed and emulsified fat are used as the carrier.

Among them, the specific explanation of "reaction speed of stone powder": some acidifiers on the market react with stone powder at a fast speed, and the bag rises quickly with more gas. While FSA react with stone powder at a low speed, and the bag rises slow with less gas. That is to say: when the acidifier is not well coated or not coated, the bag will swell faster and have more gas; When the acidifier is well coated, the bag will swell slowly and the air will be less.

Among them, the specific explanation of "natural etching coated": the cell walls of plants will be etched and damaged after the feed is crushed, soaked, enzymatic hydrolyzed and fermented. When the liquid organic acid is mixed with the enzymatic hydrolysis fermented feed, in the process of frying and drying, the liquid organic acid will enter the enzymatic hydrolysis fermented feed cells through the etched damaged plant cell wall, and then through the emulsification fat to block the "etching entrance", thus naturally cause the "etching coated". Figuratively speaking, "natural etching coated" is: just like when oil fry with rice, oil will permeate into the rice.

**Tab. 1 Main nutritional ingredients of FSA**

| Item                                      | Index | Item   | Index | Item                                | Index                |
|---|-------|--|-------|-------------------------------------|----------------------|
| Moisture/%                                | ≤10.0 | Crude protein/%                              | ≥10.0 | Soluble saccharides/%               | ≥0.50                |
| Total acid (in the case of lactic acid)/% | ≥60.0 | Small peptides and dissociated Amino acids/% | ≥0.25 | Lysine/%                            | ≥0.21                |
| Citric acid/%                             | ≥35.0 | Crude fat/%                                  | ≥3.0  | Methionine/%                        | ≥0.15                |
| Lactic acid/%                             | ≥5.0  | Crude fiber/%                                | ≤8.0  | Threonine/%                         | ≥0.19                |
| Acetic acid/%                             | ≥2.0  | Crude ash/%                                  | ≤12.0 | Tryptophan/%                        | ≥0.06                |
| Propanoic acid/%                          | ≥1.0  | Calcium/%                                    | ≤3.0  | Total probiotics cfu/g              | ≥0.1×10 <sup>4</sup> |
| Butyric acid/%                            | ≥1.0  | Total phosphorus/%                           | ≤3.0  | Small molecular nutrition content/% | ≥40.0                |

**Tab. 2 Contents of main nutrients of FSA (mean measured value)**

| Item                                       | Unit    | Content   | Item                                      | Unit                  | Content   |
|--|---------|-----------|---|-----------------------|-----------|
| DE   | kcal/kg | 3800-3970 | Crude ash                                 | %                     | 8.57-9.82 |
| ME   | kcal/kg | 3580-3690 | Calcium                                   | %                     | 0.85-1.02 |
| Moisture                                   | %       | 4.5-8.9   | Total phosphorus                          | %                     | 1.25-1.62 |
| Total acid (in the case of lactic acid)    | %       | 62.8-65.9 | Soluble saccharides                       | %                     | 1.15-2.05 |
| Citric acid                                | %       | 38.9-40.5 | Lysine                                    | %                     | 0.65-0.75 |
| Lactic acid                                | %       | 8.2-9.5   | Methionine                                | %                     | 0.27-0.35 |
| Acetic acid                                | %       | 2.4-4.2   | Threonine                                 | %                     | 0.48-0.62 |
| Propanoic acid                             | %       | 1.1-3.0   | Tryptophan                                | %                     | 0.19-0.23 |
| Butyric acid                               | %       | 1.2-2.6   | Total probiotics                          | 10 <sup>5</sup> cfu/g | 1.70-1.85 |
| Crude protein                              | %       | 12.8-13.7 | Total bacillus subtilis                   | 10 <sup>5</sup> cfu/g | 0.60-1.06 |
| Small peptides and dissociated Amino acids | %       | 1.9-2.5   | Total bacillus licheniformis              | 10 <sup>5</sup> cfu/g | 0.35-0.72 |
| Crude fat                                  | %       | 4.5-5.2   | Total lactic acid bacillus coagulans      | 10 <sup>5</sup> cfu/g | 0.95-1.22 |
| Crude fiber                                | %       | 4.5-5.2   | Soluble small molecular nutrition content | %                     | 52.1-55.6 |

**Tab. 3 digestible amino acid content of FSA (mean measured value of piglets)**

| Item       | Unit | Content   | Item       | Unit | Content   |
|------------|------|-----------|------------|------|-----------|
| Lysine     | %    | 0.55-0.67 | Histidine  | %    | 0.36-0.42 |
| Methionine | %    | 0.21-0.27 | Isoleucine | %    | 0.60-0.67 |
| Cystine    | %    | 0.25-0.29 | Leucine    | %    | 1.39-1.48 |
| Threonine  | %    | 0.41-0.52 | PHE        | %    | 0.74-0.82 |
| Tryptophan | %    | 0.15-0.17 | Tyrosine   | %    | 0.50-0.54 |
| Arginine   | %    | 0.91-1.03 | Valine     | %    | 0.73-0.81 |

Looking into the future, energy conservation, environmental protection and food

safety are the trend of history. On December 15, 2017, the ministry of agriculture of the People's Republic of China (MOA) issued Notice no. 2625 for the "Standard for safe use of feed additives". The ministry of agriculture of the People's Republic of China (MOA) issued Notice no. 2625, which explicitly limits the amount of mineral elements to be added, especially Zinc, Copper and Silicon. Among them, the maximum amount of Silica ( $\text{SiO}_2$ ) in the full-price compound feed is 20g/kg or 20kg/T. Looking into the future, the carrier Silica ( $\text{SiO}_2$ ) in "acidifier", will definitely become the technical burden of feed formulators. FSA can substitute "acidifier", will definitely become the best raw material and preferred product for feed formulators to prepare low-silicon feed.

In terms of the palatability of the feed, the pigs have developed a good sense of smell and taste, and they will chew when feeding. The feed needs to be clean and free of impurities. Mr. Chen Jiazhao of Fengze, Fujian Province found in many experiments that: "Silica", "talc powder" and "bentonite" and other feed carriers can inhibit the intake of livestock and poultry. Traditional "mixed acidifier," all take "Silica" as the simple adsorption carrier, all of them are not roasted and dried, mostly are not coated, or poor coated, it will have bad taste, inhibit feed intake, damage oral cavity and digestive tract after enter to the mouth, and injury the gastrointestinal mucosal after enter to the stomach, quickly release imbalance, few enter into the back of intestines. At present, the traditional "mixed acidifier" has not seen "natural etching coated" products. Studies have shown that phosphoric acid in phosphoric acid acidifier is released quickly in the stomach, which is difficult to enter the intestine or little in the intestine. To some extent, it burns the oral mucosa and gastric mucosa of piglets, inhibits the secretion of gastric acid, causes imbalance of intestinal flora, damages intestinal health, and reduces the intake of pigs. On the contrary, FSA is a kind of natural "etching coated" product, which is released slowly and little in the stomach, and can "go through the stomach to the intestine", which really plays the role of acidifying the intestinal tract. It is not surprising that the actual feeding effect is better.

In addition, studies in Europe and the United States have also found that some inorganic acid acidifiers may have obvious effects in a short term feeding, but due to damage to intestinal health and imbalance of flora, as the same situation of zinc oxide and antibiotics, side effects are very large both in the late stage of short-term feeding and after long-term feeding, the growth of livestock and poultry will be significantly inhibited. As a result, feed companies and farms in Europe and the United States are almost all adding organic acids.

Should be mentioned: FSA is an effective compound organic acid acidifier, enzymatic hydrolysis fermented feed as carrier, sour and sweet flavor, mainly used for young livestock, poultry and aquatic animal feed, especially for creep feed, conservation feed, milking sow feed, broiler feed and fish & shrimp feed, the application effect is very obvious.

FSA is divided into four types: 1) ultra-sweet type, namely "FSA-CT"; 2) high-sweet type, namely "FSA-GT"; 3) high-acid type, namely "FSA-HA"; 4) common type, namely "FSA-PT". The basic nutrients of the three types of FSA (CT, GT, PT), are completely consistent, including the total content of oligoses. The main difference lies in the molecular weight and sweetness of functional oligoses. The total organic acid content of FSA-HA is higher than that of above three types.

Domestic pigs and ruminants are very sensitive to smell and taste, and prefer sweet and sour. Therefore, FSA-CT and FSA-GT are mainly used in the feed for domestic pigs and ruminants. Its functional oligoses have small molecular weight, high sweetness and it has high sweet taste.

Poultry and aquatic animals are relatively insensitive to smell and taste, sweet and sour. Therefore, FSA-PT is mainly used for poultry and aquatic animal feed. Its functional oligoses have relatively large molecular weight, general sweetness, relatively low sweetness.

The acidifier should not be added too much in the premix. Therefore, FSA-HA is mainly suitable for premix. Its total organic acid content is high, the dosage is relatively small.

#### **Dosage of FSA:**

- ✓ Anthony pig creep feed: 5-8 kg/ton;
- ✓ Piglet conservation feed: 4-6 kg/ton;
- ✓ Milking sow feed: 3-5 kg/ton;
- ✓ Calf & lamb feed: 3-5 kg/ton;
- ✓ Meat & egg-laying poultry feed: 3-5 kg/ton;
- ✓ Aquatic animal feed: 4-6 kg/ton

#### **The following are some points need to paid attention in the use of FSA:**

1. FSA "equivalent substitution" principle. Due to total acid of FSA and part of "mixed feed acidifier" on the market" is the same, that is to say, both in stimulating animal feed intake, promoting the growth of livestock, poultry and fish & shrimp, promoting the sow's lactation, acidified animal intestines, restraining and sterilizing bacteria, preventing and treating diarrhea of piglets, preventing and treating enterovirus syndrome of poultry, preventing and treating the serious illness of "belly" of fish and shrimp, curing intestinal and purifying water and other aspects of ability and effect is the same, therefore, if the dosage of acidifier in the customer's existing feed formula is relatively small, FSA can substitute at the same amount. That is, if the dosage of acidifier in the existing feed formula of the customer is 1-3kg/ ton, FSA will be added and used according to 1-3kg/ ton. At this point, the feeding effect of feed will not be reduced, or even better.
2. The addition of 15-30kg/ ton of FSA in creep feed can substitute: 10-20kg of

organic acid acidifier, 2-3 kg of fish meal (fish solubles condensed), 3-5kg of whey powder and 5-8kg of fermented soybean meal, etc., and probiotics and oligoses can be reduced or discontinued. As long as the substitutions are well designed, the results are almost always good. This has been proven in many large enterprises. In addition, if a large amount of stone powder and zinc oxide are added to the creep feed, the amount of FSA should be increased.

3. The addition of 10-20kg/ ton of FSA in conservation feed can substitute: 8-15kg of organic acid acidifier, 2-3 kg of fish meal (fish solubles condensed), 3-5 kg of whey powder and 6-10 kg of fermented soybean meal, etc., and probiotics and oligoses can be reduced or discontinued. As long as the substitutions are well designed, they are almost always effective in anti-diarrhea, promoting growth and improving feed intake. This has been proven in many large enterprises.

4. The addition of 5-10kg/ ton of FSA in milking sow feed can substitute: 3-6kg of organic acid acidifier, 2-3 kg of fish meal (fish solubles condensed) and 3-5kg of fermented soybean meal, etc., and probiotics and oligoses can be reduced or discontinued. As long as the substitutions are well designed, the effect of promoting lactation and increasing feed intake is all good and there is no doubt about it. This has been proven in many large enterprises. Because lactating sows have a strong memory, postpartum feeding FSA, to promote lactation and improve the intake of food is often not satisfied. It is recommended that lactating sows start feeding FSA one week or three days before the antenatal, and the increase of feeding intake is very obvious.

5. The addition of 5-10kg/ ton of FSA in meat & egg-laying poultry feed can substitute: 3-6kg of organic acid acidifier, 2-3 kg of fish meal (fish solubles condensed) and 3-5kg of fermented soybean meal, etc., and probiotics and oligoses can be reduced or discontinued. As long as the substitutions are well designed, the effects of promoting growth and increasing feed intake are all good and there is no doubt about it. This has been proven in many large enterprises.

6. The addition of 10-20kg/ ton of FSA in aquatic animal feed can substitute: 8-15kg of organic acid acidifier, 3-5kg of fish meal (fish solubles condensed) and 6-10kg of fermented soybean meal, etc., and probiotics and oligoses can be reduced or discontinued. As long as the substitutions are well designed, the effects of disease resistance, growth promotion and dietary stimulation are almost always good. This has been proven in many large enterprises.

7. FSA is five feedstuffs asynchronous enzymatic hydrolysis and synchronous fermentation acidification of mixed bacteria and high sugar medium. It is well known that as long as it is a dried feed product, its color will vary slightly from batch to batch. The same is true for FSA. In general, FSA tastes obvious sour and sweet, presents fermentation fragrance, no mold, agglomeration, damaged by insects or odors, light

yellow or brown yellow, color batch slightly different, but does not affect the quality of the product.

#### 8. Description of mycotoxin, acid value, peroxide value and crude fat detection methods

FSA is enzymatic hydrolysis fermented and emulsified product, without purification, the enzymatic hydrolysis fermentation of bacteria, lactic acid and other secondary metabolites and all sorts of small molecular nutrition product cause serious interference on the test results of FSA's crude fat, mycotoxins, acid value and peroxide value, especially the interference detection is particularly serious after the lactic acid is reduced the pH.

If mycotoxin is detected by ELISA, the pH value of FSA sample must be adjusted to be neutral. Otherwise, the error of detection result is very big, will be several times higher, even dozens of times. If the customers find it hard to believe, they can detect the mixed organic acid acidifiers on the market, and they will definitely find that the mycotoxin is very high. It can be confirmed that acidic pH value will seriously interfere with the detection of mycotoxin and other indicators in FSA.

In order to accurately detect mycotoxin in FSA, it is recommended that customers or testing agencies use "determination of aflatoxin in national standard feed by immunoaffinity column purification - high performance liquid chromatography (GB/T 30955-2014)" to detect the content of various mycotoxins in FSA. It has been proved that the national standard method can effectively eliminate the interfering substances in fermented products, and the detection results are very accurate.

In order to accurately detect the acid value of FSA, it is suggested that customers or testing agencies must adopt "national standard for food safety determination of acid value in food (GB5009.229-2016)" to detect the acid value of FSA.

In order to accurately detect the peroxide value of FSA, it is suggested that customers or testing agencies must adopt the "national standard for food safety determination of peroxide value in food (GB5009.227)" to detect the peroxide value of FSA.

In order to accurately detect crude fat in FSA, it is suggested that customers or testing agencies must adopt the B method in "determination method of crude fat in feed (GB/T 6433-2006)" to determine the crude fat content in FSA.

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