

Mixability, stability, and durability of granular L-tryptophan on pelleting process: Evaluated by CJ BIO Feed Application Process

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Introduction

The CJ BIO Feed Application refers a pilot feed pelleting system used to identify marketing points by evaluating mixability, stability, and durability properties of feed additives to produce feed pellets under variety of conditions depending on species of target livestock (Figure 1). Also, it can be performed before large-scale feed production in plants, which allows us to establish appropriate development strategies for new feed additive products.

CJ BIO Feed Application

Mixability and optimal particle sizes

There are two product development strategy that can be expected through the Feed application. The first is to improve the particle size by verifying the mixability for each product.

By comparing the mixability by product, you can check how well the additives are mixed in the feed. When the mixing level is lower than the normal range, the optimum particle size can be suggested.

Thermal stability and optimal addition amount

The second is the use of thermal stability verification data.

Compared with competitors' products, marketing effects can be expected through the excellent thermal stability of our developed products.

Considering the amount lost in the pellet processing process, we can provide accurate information on the amount of feed additives to add to achieve targeted dosage to customers.

Durability

The pellet durability index (PDI) is often used as an indicator of pellet quality, which measures resistance of pellets to degradation caused by pelleting and transportation.

The normal range for PDI in the pig industry is generally above 90. (Based on CJ 5 district data)

If the PDI is low, pellets would lose their particular shape and feed loss would occur during pellet production process and delivery. Thus, it is important to check whether the feed additives have negative effects on the PDI of feed pellet.

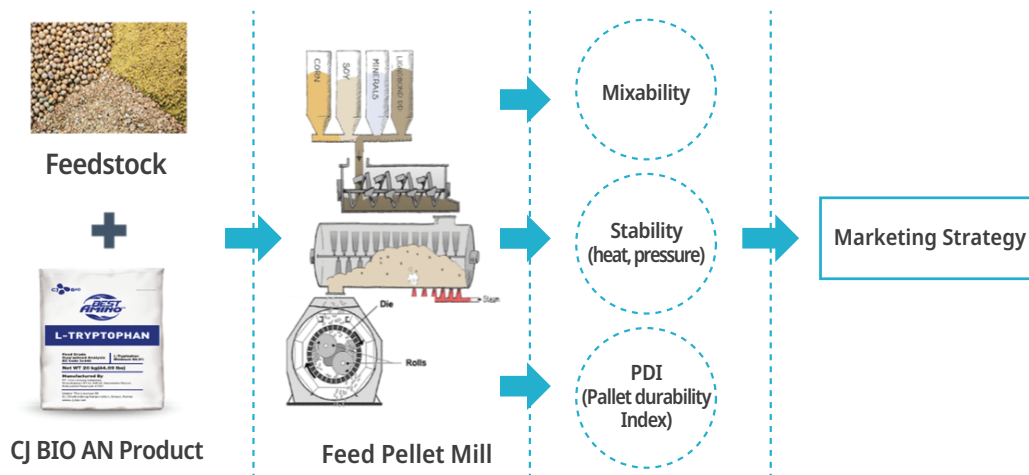


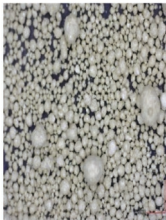
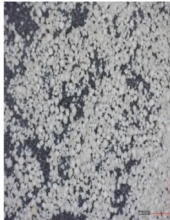
Figure 1. Feed application evaluation system

Mixability, stability, and durability of granular L-tryptophan evaluated by Feed Application

Design Test Groups

Feed pilot was conducted for two products including a competitor product (Table 1).

Table 1. Evaluation product information

Sample	TRP Pro	Competitor's Trp PD
Company (Lot No.)	CJ (CJ-210205)	Competitor's (2103TR011)
Type	Granules (including coryne strain and Ca(OH) ₂) 	powder 
Tryptophan Content (%)	60.2	98.8

The control diet to produce feed pellets was formulated based on weaning pig feed containing corn, soybean meal, soy protein, whey permeate, soybean oil, fish meal, SDPP, and L-tryptophan (Table 2).

Table 2. Feed formulation (weaned pig)

Ingredient (%)	TRP Pro	Competitor's Trp PD
Corn	37.35	37.6
Soybean Meal, 44% CP	18	18
Soy protein concentrate	10	10
Whey permeate	24	24
Soybean oil	2	2
Fish meal	4	4
SDPP (Spray dried plasma protein)	4	4
Tryptophan	0.65	0.4
Total	100	100

Feed pilot was conducted under two heat treatment conditions (Table 3).

Table 3. Feed pellet processing condition

Contents	85°C	95°C
conditioner steam temperature	80 ~ 85°C	90 ~ 95°C
conditioner retention time	90s	90s
Feed temperature in conditioner	50 ~ 55°C	65 ~ 70°C
Pellet temperature	68 ~ 73°C	70 ~ 75°C
PDI (pellet durability index)	Over 90	Over 90

Evaluation Methods

Mixability – Analysis of L-tryptophan content in samples taken from the mixed feed pellets

Stability – Comparison of L-tryptophan content before and after pelleting

PDI – Measurement resistance of pellets to degradation using holmen pellet durability testers

Experimental Result

- Mixability

Mixability of TRP Pro and Competitor's Trp PD were not statistically different (Table 4).

Although the wide range of particle size distribution of the granular products compare to the powder products might result lower coefficient of variation (CV), the mixability of all tested L-tryptophan products were in acceptable range (CV < 10%) (Table 4).

Table 4. Feed pellet processing condition

Product name	CV (%)	Particle size (μm)
TRP Pro	3.1 ± 1.8	656.5 ± 172.3
Competitor's Trp PD	2.5 ± 1.3	125.9 ± 85.6

- Stability

Under the 85°C-degree pellet production condition, there is no statistically significant differences on stability (Figure 2).

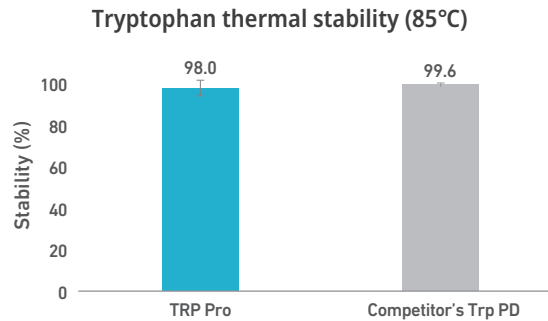


Figure 2. Thermal stability data (85°C)

However, the granular form of L-tryptophan product (TRP Pro) showed statistically significant higher thermal stability than the powder form product under the 95°C-degree pellet production condition (Figure 3).

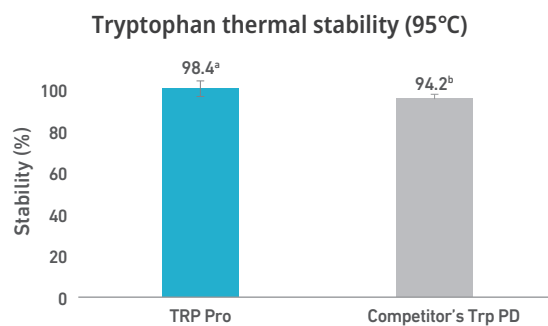


Figure 3. Thermal stability data (95°C)

- PDI (Pellet durability index)

The PDIs of all evaluated L-tryptophan products were 90 or higher, and there was no statistically significant difference, indicating that either the granular or the powder form of L-tryptophan does not alter the PDI of feed pellets under given conditions

Conclusion

There was no significant difference in the mixability of granulated L-tryptophan and powder product, and both products met international standards. Further investigations are required by manipulating the particle size to achieve maximum uniformity.

The granulated L-tryptophan showed higher thermal stability than powder products under harsh production conditions.

→ Based on the customer's pellet processing conditions, the harsher the conditions, the more effective the marketing of the thermal stability value of granular products can be expected.

REFERENCES

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