Effects of special compound enzyme for layer on growth performance of laying hens

1 Experimental purpose

In this experiment, the effect of compound enzymes on the performance of laying hens was evaluated at different levels of addition. The optimal addition amount of the special enzymes for layer in actual production was screened out, and the economic benefits generated by adding complex enzymes were evaluated.

2 Experimental materials

Special compound enzyme for layer, supplied by Jinan Bestzyme Bio-Engineering Co., Ltd.

3 Experimental design

Use single factor experiment design in this experiment. Randomly divide a total of 1152 healthy Hy-line variety brown aged 350 days into 4 treatment groups, with 4 replicates in each treatment group and 72 chickens in each treatment. The control group use the basal diet (ME:2698.5 kcal/kg). The specific experimental design is shown in Table 1. Before the test, the data of two weeks before the experiment were statistically analyzed. According to the analysis results, the layers were regrouped to eliminate errors. After 2 days of pre-feeding, the trial period begins and the trial period is 28 days. The production formula of the test is shown in table 2.

Table 1 Test Groups and Diet Composition

Group	Diet composition
Control group	Basal diet
Test 1	Control group+100 g/t compound enzymes
Test 2	Control group+200 g/t compound enzymes
Test 3	Control group+300 g/t compound enzymes

Table 2 Test material production formula

Group	Control	Test 1	Test 2	Test 3
Corn	64.8	64.8	64.8	64.8

Soybean meal (46)	21.5	21.5	21.5	21.5
Oil	0.9	0.9	0.9	0.9
Stone powder	8.5	8.5	8.5	8.5
Medical stone	1.3	1.3	1.3	1.3
Compound enzymes for layer	0	0.01	0.02	0.03
Enzyme				
Premix	3	3	3	3
Total	100	100.01	100.02	100.03
Energy	2698.5	2698.5	2698.5	2698.5
Protein	15.37	15.37	15.37	15.37

4 Experimental diets and nutrient levels

Formulated the test diet by the test plant according to the test material formula. Nutritional level is omitted.

5 Feeding management

Feed the laying hens normally, free feeding and drinking, immunization and feeding management according to routine immunization procedures, and data collection and recording on time.

6 Determination index

6.1 Determination of Egg Production Performance Index

Measuring indicators and records: Record the number of eggs , egg weight and number of broken eggs every day during the repeated; Statistics the remaining feed, calculate the average feed intake and feed conversion rate according to the repeated unit, and determine the shell color, yolk color every two weeks.

Determination index and method:

(1)Determination of feeding intake

At 7:30 a.m. on the experiment first day, clean up all the feed in the feed tank, and then add the corresponding experimental diet. At 7:30 a.m. on the 8th, 15th, 22nd, 29th, 36th and 43rd day of the experiment, clean up the remaining feed in the feeding tank and weight. Record the weekly feed intake in detail. Calculate the average daily feed intake (ADFI) of the experimental laying hens at 1-8 d, 8-15 d, 15-22 d, 22-29 d, 29-36-43 d, and 1-43 d.

(2)Statistics of average egg weight, average daily laying rate, unqualified egg rate, sand egg rate, break egg rate and FCR during the test

Collect eggs regularly once a day, record the weight of eggs and the number of damaged eggs in the repetition unit. At the same time, record the number of broken eggs, spotted eggs, sand eggs and white shell eggs when collecting eggs. Calculate the average egg weight, average laying rate and FCR in 1~8 d, 8~15d, 15~22 d, 22~29 d and 1~29 d, and calculate the rate of egg breaking, sand eggs and unquailed eggs of experiment laying hens in 1~29 d.

6.2 Determination of egg quality

Randomly select five eggs form each replicate on the 14th and 28th day of the experiment to determine the egg quality. The indexes of determination are yolk color and shell color. The specific determination method is as follows:

Egg yolk color: Break the eggs that have measured the egg type index and put them on a clean plate. Place the eggshell in a basin with clean water to measure the thickness of the eggshell. Then color the yolk on the plate with Roche's colorimetric fan to record the yolk color value.

Eggshell color: Measure the eggshell color with 3nh chromatic meter.

6.3 Assessment of laying hens excrement and breeding environment

Record diarrhea, excrement color and environmental odor of henhouse of control group and experimental group.

6.4 Calculation of economic benefits index

Compare the comprehensive economic benefits of the control group and the experimental group according to the data of health status, diarrhea, death and drug use.

7 Test results and analysis

7.1 Effects of different levels of compound enzymes for layer on the growth performance of laying hens

From table 3, we can see that from the statistical point of view, the control group and the treatment group is not significant (P>0.05). From the data, for the average egg production rate, compared with control group, test 1, test 2, test 3 increased by 1.88%、0.76%、2.32% respectively, test

3 is best. For FCR, compared with the control group, test 1, test 2, test 3 reduced by 1.29%、0.86%、2.15%, test 3 is best. For average daily feed intake, compared with the control group, test 1, test 2, test 3 reduced by 0.18%, 0.18%, 0.18% respectively. For the egg breaking rate, compared with the control group, test 3 increased by 11.36%. We can learn that adding special compound enzyme for layer can improve the egg production rate, reduced FCR and feed intake, the increasing of enzyme dosage can improve the egg production rate and reduce FCR, 300 g/t experimental group has the highest egg production and the lowest FCR. At the same time, adding special compound enzyme for layer in low dosage cans not reduce the egg breaking rate, but it can reduce the egg breaking rate significantly at the dosage of 300 g/t.

Table 3 Effects of different levels of compound enzymes for layer on the growth performance of laying hens

Group	Average daily egg production rate (%)	Average egg weight (g)	Average daily feed intake (g)	FCR	Egg breaking rate (%)
Control	77.58±4.60	66.19±0.52	119.28±0.28	2.33±0.15	0.44±0.18
Test 1	79.04±3.01	65.72±0.20	119.07±0.42	2.30±0.10	0.50±0.18
Test 2	78.17±3.98	66.18±0.81	119.06±0.10	2.31±0.13	0.46±0.30
Test 3	79.38±5.05	65.95±0.73	119.07±0.05	2.28±0.14	0.39±0.21

7.2 Effect of compound enzymes for layer on egg quality

7.2.1 The 14th day of experiment, effect of compound enzymes for layer on egg quality

As we can see from table 4, the addition of compound enzymes for layer in the diet at the 14th day of the test has no significant effect on egg yolk color. For the eggshell strengthen, compared with the control group, test 1, test 2, test 3 increased by 32.24%, 20.52%, 18.1% respectively, the test 1 is best. For eggshell brightness value, compared with the control group, test 3 increased by 55.07%, test 1 and test 2 reduced eggshell brightness, test 3 increased eggshell brightness. For eggshell redness value, compared with control group, test 1, test 2, test 3 showed a decreasing trend. For the eggshell yellowness value, the test 2, test 3 group increased by 55.81% and 11.63% respectively, and the test 2 has the highest yellowness value. For the uniformity, compared with the control group, the test 1 has the best uniformity of eggshells. We can see that the addition of special compound enzymes for layer for 14 days can enhance the eggshell strength (best in the 100 g/t group), and

improve the eggshell brightness (best in the 300 g/t group) and eggshell yellowness value (best in the 200 g/t group).

Table 4 Effects of different levels of compound enzymes for layer on egg quality（14 d）

Group	Average egg yolk color	Average strength (N)	Eggshell brightness (ΔL)	Eggshell redness value(Δa)	Eggshell yellowness value(Δb)	Eggshell uniformity ΔE
Control	10.56±0.10	26.02±6.81	0.69±2.27	-0.34±1.39	-1.29±0.85	4.02±0.97
Test 1	10.66±0.22	34.41±3.18	-0.38±1.27	-1.34±1.98	-0.61±0.43	2.10±1.19
Test 2	10.55±0.15	31.36±3.98	0.66±3.61	-1.40±2.17	-2.01±1.70	4.51±2.71
Test 3	10.28±0.13	30.73±4.99	1.07±1.87	-1.62±1.16	-1.44±1.04	4.11±2.36

Note: ΔL is positive white, negative is black; Δa is positive red, negative is green; Δb is positive yellow, negative is blue; the smaller the ΔE value is, the less the total color difference with the standard sample is.

7.2.2 The 28th day of experiment, effect of compound enzymes for layer on egg quality

Table 5 shows that the addition of special compound enzymes for layer in the diet at 28th day of the test, for the strength of eggshell, compared with the control group, the test 2 group increased by 3.3%. For the brightness value of eggshell, compared with the control group, the test 1, test 2 and test 3 groups increased the brightness value of eggshell, and the test 2 group is the best. For the redness value of eggshell, compared with the control group, the test 1, test 2, test 3 groups increased the redness value of eggshell, test 3 group is the best. For the yellowness value of eggshell, the test 1, test 2, test 3 groups all reduced the yellowness value of eggshell; for the uniformity, the test 1, test 2, test 3 all reduced the uniformity. The result showed that the addition of special compound enzymes for layer in diet for 28 days enhanced the strength of eggshell (200 g/t group is the best), increased the brightness of eggshell (200 g/t group is the best) and the redness value of eggshell (300 g/t group is the highest).

Table 5 Effects of different levels of compound enzymes for layer on egg quality（28 d）

Group	Average egg yolk color	Average strength (N)	Eggshell brightness (ΔL)	Eggshell redness value (Δa)	Eggshell yellowness value (Δb)	Eggshell uniformity ΔE
Control	10.37±0.34	34.50±1.17	-0.35±2.23	-0.65±0.74	-0.01±0.86	3.26±0.62
Test 1	10.31±0.45	32.68±4.47	1.48±3.20	-0.60±1.56	-0.03±1.05	4.19±0.61

Test 2	11.02±0.05	35.64±3.45	1.65±2.26	-0.50±1.35	-0.55±1.01	4.00±2.57
Test 3	10.65±0.37	28.55±3.31	1.37±2.37	0.29±0.61	-0.45±0.91	3.62±1.41

Note: ΔL is positive white, negative is black; Δa is positive red, negative is green; Δb is positive yellow, negative is blue; the smaller the ΔE value is, the less the total color difference with the standard sample is.

7.4 Economic benefit analysis

Table 6 shows that, compared with the control, the profit increase of 100, 200 and 300 g/t special compound enzymes for layer per 10,000 laying hens for one month is 1589, 1073 and 2588 yuan respectively. Table 6 shows that the profit per 10,000 laying hens increases by 1515 and 999 yuan respectively, compared with 200 g/t and 100 g/t. In conclusion, 300 g/t of special compound enzymes for layer has the best economic benefit.

Table 6 Economic benefit analysis (10,000 laying hens 30 days)

Item	Control	Test 1	Test 2	Test 3
Feed/egg ratio	2.33	2.3	2.31	2.28
Price of egg, yuan/kg	8.2	8.2	8.2	8.2
Price of feed, yuan/kg	2	2	2	2
Pure benefit, yuan/10,000	54753	56343	55827	57342
Net added value, yuan/10,000		1589	1073	2588

Note: Other costs (drug, vaccine, etc.) are the same for each treatment. The above data is calculated according to feed cost, egg price, and FCR. The profit is for reference only. Net value added = pure benefit of treatment group - pure benefit of blank group; pure benefit = price of egg - feed cost.

8 Experimental results

(1) Special compound enzymes for layer can increase egg production rate and reduce FCR. The addition of 300g/t has the lowest FCR and the best economic benefits.

(2) Special compound enzymes for layer can improve the brightness and redness of eggshells, and 300 g/t is the best addition.

(3) Special compound enzymes for layer can improve the strength of eggshell, and the best dosage is 200g/t.

9 The application of special compound enzymes for layer

According to the above test conclusions, the application of special compound enzymes for layer is as follows:

Object	Laying hens
Optimum dosage	300g/t for complete feed
Effect	1. Reduce the feed/egg ratio by more than 0.02 2. Improved eggshell color and eggshell strength 3. 50,000 chicken farms can increase the income of about 130,000 yuan per year