



Meta-analysis of laying hen trials evaluating effects of diets with or without Allzyme® SSF on performance

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Introduction

An enzyme complex manufactured by solid substrate fermentation, rather than through conventional liquid fermentation, and that also contains phytase, starch and non-starch polysaccharide enzymes is commercially available for use in laying hen diets (Allzyme® SSF, Alltech, Inc.). When included in laying hen feeds at a level of 0.015% (150 g/ton or 0.3 lb/ton), Allzyme® SSF is estimated to release 75 kcal ME/kg (34 kcal ME/lb.), 0.1% calcium and 0.1% available phosphorus, as well as 0.2% crude protein, 0.029% lysine, 0.011% methionine, 0.009% cysteine, 0.004% tryptophan, 0.014% threonine, 0.024% isoleucine and 0.022% arginine.

Objective

To determine how including Allzyme® SSF in layer diets affects production, based on a cross-section of studies conducted worldwide.

Methods

- A meta-analysis was conducted using 16 reports collected worldwide and containing 26 comparisons of how production was affected in negative control (nCON) versus Allzyme® SSF-supplemented (+SSF) laying hen diets; the data was evaluated using paired t-tests.
- Using the average responses, egg producers can calculate the benefit-cost ratios by parameter for the Allzyme® SSF supplement.

Results

Allzyme® SSF numerically improved two parameters (hen-day egg production and feed intake) and significantly improved four other parameters (egg weight, daily egg mass, feed/dozen eggs, and kg feed/kg eggs) (Tables 1 and 2):

- Hen-day egg production was improved ($P = 0.136$) by 1.09% actual (+1.29% relative) for +SSF compared with nCON diets.
- Egg weight was greater ($P = 0.006$) from hens fed +SSF rather than nCON diets (+0.89 g or +1.49%).
- Daily egg mass produced was greater ($P = 0.014$) for +SSF than for nCON hens (+1.74 g/hen/day or +3.47%).
- Feed intake was lowered by 0.50 g/hen daily (-0.44%) by using +SSF diets compared with nCON diets.
- Feed/dozen eggs was reduced ($P = 0.028$) by 0.027 kg/dozen (1.65%) for +SSF diets compared with nCON.
- Similarly, kg feed/kg eggs was reduced ($P = 0.004$) by 0.069 (3.04%) for +SSF diets compared with nCON.

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Meta-analysis of laying hen trials evaluating effects of diets with or without Allzyme® SSF on performance, cont'd.

Table 1. Meta-analysis of hen-day egg production, egg weight and daily egg mass in 16 laying hen trials worldwide, providing 26 comparisons of negative control (nCON) versus Allzyme® SSF (+SSF) supplemented diets.

Reference	Level of SSF (g/T1)	Hen-day egg (%) (vs 0)		Egg weight production (%)		Daily egg mass (g/hen/day)	
		nCON	+SSF	nCON	+SSF	nCON	+SSF
1	1,000	92.37	93.12	56.96	60.63	48.60	56.46
1	1,480	92.37	94.65	56.96	61.52	48.60	58.23
1	1,830	92.37	92.63	56.96	60.21	48.60	55.77
1	1,000	89.14	94.71	58.69	59.11	52.32	55.98
1	1,480	89.14	92.96	58.69	61.39	52.32	57.07
1	1,830	89.14	93.00	58.69	60.67	52.32	56.42
2	1,000	91.38	91.80	54.10	54.10	49.44	49.66
2	1,000	89.72	90.69	53.30	55.80	47.82	50.61
3	(300 U/kg)	80.40	86.60	61.70	61.70	49.61	53.35
3	(300 U/kg)	86.60	85.00	61.50	60.80	530.26	51.68
3	(300 U/kg)	86.50	85.30	61.10	61.10	52.85	52.46
4	150	75.63	74.83	54.80	55.57	41.45	41.58
4	150	81.68	80.06	60.08	61.73	49.07	49.42
5	150	75.66	74.50	55.33	55.75	41.84	41.55
5	150	81.95	90.05	59.90	62.12	49.11	49.78
6	200	94.60	95.45	63.60	63.30	60.17	60.42
7	150	86.30	85.65	56.70	56.23	48.93	48.16
8	150	71.27	79.64	63.39	62.77	43.81	49.99
9	150	80.86	76.65	65.69	66.29	53.12	50.81
10	150	88.56	88.74	60.60	59.28	53.67	52.61
11	150	69.00	72.00	66.00	66.00	45.00	47.00
12	150	84.20	85.40	64.00	65.00	53.89	55.51
13	150	90.60	82.20	65.00	66.00	58.89	54.25
14	200	78.44	78.57	62.38	62.42	48.94	49.03
15	200	88.00	87.59	54.44	54.43	47.91	47.68
16	150	78.80	81.23	64.75	64.26	51.02	52.20
Average		84.80	85.89	59.82 ^b	60.71 ^a	50.09 ^b	51.83 ^a
Diff.			+1.09		+0.89		+1.74
Diff., %			+1.29		+1.49		+3.47
P value			0.136		0.006		0.014

1: A change in concentration of the product allowed lower inclusion rates in references 4 through 16. Note that the amount released was always 0.1% for Ca and 0.1% for available P.

Table 2. Meta-analysis of feed intake, feed/dozen eggs and feed/kg eggs in 15 laying hen trials worldwide, providing 24 comparisons of negative control (nCON) versus Allzyme® SSF (+SSF) supplemented diets.

Reference	Level of SSF (g/T1)	Feed intake (g/hen/day)		Feed (kg)/dozen eggs		Feed (kg)/eggs (kg)	
		nCON	+SSF	nCON	+SSF	nCON	+SSF
1	1,000	115.1	114.5	1.495	1.476	2.150	2.050
1	1,480	115.1	114.9	1.495	1.457	2.150	1.920
1	1,830	115.1	114.3	1.495	1.481	2.150	2.070
1	1,000	116.3	116.8	1.566	1.480	2.170	1.980
1	1,480	116.3	115.4	1.566	1.490	2.170	2.000
1	1,830	116.3	115.7	1.566	1.493	2.170	2.020
3	(300 U/kg)	128.0	128.0	1.910	1.774	2.580	2.399
3	(300 U/kg)	126.0	126.0	1.746	1.779	2.366	2.438
3	(300 U/kg)	126.0	126.0	1.803	1.773	2.460	2.402
4	150	86.27	86.54	1.730	1.750	2.680	2.630
4	150	88.57	88.80	1.630	1.670	2.280	2.270
5	150	108.3	108.5	1.718	1.748	2.640	2.620
5	150	110.7	111.0	1.621	1.479	2.260	2.240
6	200	112.0	112.0	1.421	1.408	1.864	1.849
7	150	111.1	111.8	1.545	1.552	1.960	1.970
8	150	108.0	107.7	--	--	2.465	2.154
9	150	119.7	116.0	1.770	1.820	2.290	2.290
10	150	115.9	111.7	1.570	1.510	--	--
11	150	99.00	105.0	1.722	1.750	2.207	2.216
12	150	114.9	108.9	1.640	1.540	2.132	1.962
13	150	134.0	129.0	1.770	1.760	2.275	2.378
14	200	116.3	115.8	1.778	1.769	2.376	2.362
15	200	111.2	110.9	1.517	1.519	2.322	2.326
16	150	109.3	111.4	1.664	1.645	2.142	2.133
Average		113.3	112.8	1.641 ^a	1.614 ^b	2.272 ^a	2.203 ^a
Diff.			-0.50		-0.027		-0.069
Diff., %			-0.44		-1.65		-3.04
P value			0.281		0.028		0.004

1: A change in concentration of the product allowed lower inclusion rates in references 4 through 16. Note that the amount released was always 0.1% Ca and 0.1% available P.

Conclusions

The overall results of the meta-analysis revealed that +SSF diets numerically increased hen-day egg production, decreased feed intake, significantly increased egg weight and daily egg mass and reduced feed/dozen eggs and kg feed/kg eggs.

Supplementation with Allzyme® SSF at at 150 g/ton (0.3 lb/ton) of feed is recommended to improve the productive performance of laying hens.