

## **Preliminary results of study on the use of corn and rye distillers dried grains with solubles in the laying hens nutrition**

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### **Abstract**

In the experiment on 132 brown Lohman hens (from 26 to 38 weeks of age) the effect of the different dietary levels of corn or rye distillers dried grain with solubles (DDGS) on laying performance and egg quality was studied. Experimental diets contained 0, 5, 10, 15 or 20% corn or rye DDGS. Diets with highest level of DDGS were not supplemented or supplemented with enzyme preparations with activity of xylanase and  $\beta$ -glucanase.

Used levels of corn DDGS had no significant effect on laying rate, feed conversion, Haugh units, eggshell percent and eggshell breaking strength. Yolk color was significantly increased, when corn DDGS was included in the diet. Inclusion level of 5, 10 or 15% of rye DDGS had no effect on laying performance and egg quality, but 20% of rye DDGS significantly decreased egg production. Addition of xylanase and  $\beta$ -glucanase to the diet with 20% of rye DDGS had beneficial effect on laying rate.

### **Introduction**

Distillers dried grains with solubles (DDGS) is a by-product of ethanol production. During this process grain starch is converted to ethanol and CO<sub>2</sub> and concentration of remaining nutrients increases by 2-3 times. The increase of fuel ethanol production has been observed and it resulted in enlarged quantity of DDGS entering the feed market in the last years. The high nutrient quality of DDGS obtained from modern ethanol industry is related to gentler than in previous decades drying conditions. Corn as a good source of readily fermentable starch is the main grain used in fuel ethanol production, but because of climatic and soil conditions in some regions also rye grain is used. Despite of the growth of it production, DDGS has been rarely included in poultry rations.

The aim of experiment was to optimize the level of corn or rye DDGS in diet for laying hens. The effect of increasing levels of both types DDGS in hen diets on laying performance and egg quality was studied.

### **Materials and Methods**

Experiment was carried out on 132 brown Lohman laying hens from 26 to 38 weeks of age, randomly allocated to 11 experimental groups, each containing 12 layers, individually caged on wire-mesh floor. Hens had constant access to feed and water. Used experimental diets contained different levels of corn or rye DDGS (Table 1).

During the experiment, feed intake, number and mass of laid eggs were registered and health of hens was observed. Using collected data, basic production parameters (laying performance, total eggs production, daily feed intake, and feed conversion per 1 kg of eggs) were calculated. At 32 and 38 weeks of age one egg from each hen was collected to determine the shell quality (shell thickness, shell density, shell percent in egg) using EQM, version 3.1 of egg quality assessment instrument operating. Another one was collected for measurements of shell breaking strength (using Instron 5542 with constant speed of head – 10 N/min).

Obtained data were subjected to statistical analysis using one-way factorial analysis of variance. The significance of differences between means was determined by Duncan's multiple range test.

Table 1. Composition of experimental diets (g/kg)

	Treatments										
	1(control)	2	3	4	5	6	7	8	9	10	11
Ground corn	350	300	290	260	250	250	300	290	280	260	260
Ground wheat	246.9	287.5	287.6	30.80	302.2	302.2	288	282.2	277.4	281.8	281.8
Soybean meal	230	190	150	110	75	75	190	155	120	85	85
<b>Corn DDGS</b>	–	<b>50</b>	<b>100</b>	<b>150</b>	<b>200</b>	<b>200</b>	–	–	–	–	–
<b>Rye DDGS</b>	–	–	–	–	–	–	<b>50</b>	<b>100</b>	<b>150</b>	<b>200</b>	<b>200</b>
Grass meal	30	30	30	30	30	30	30	30	30	30	30
Rapeseed oil	33	32	31	30	30	30	31.5	31	30	30	30
Limestone	89	89	89	89	89	89	89	89	89	89	89
Dicalcium phosphate	12	12	12	12	12	12	12	12.5	12.5	12.5	12.5
NaCl	3	3	3	3	3	3	3	3	3	3	3
L-Lys (78%)	–	0.5	1.5	2.3	3.2	3.2	0.5	1.3	2.2	2.9	2.9
DL-Met (99%)	1.1	1	0.9	0.7	0.6	0.6	1	1	0.9	0.8	0.8
Vitamin-mineral premix	5	5	5	5	5	5	5	5	5	5	5
NSP-hydrolyzing enzymes*	-	-	-	-	-	+	-	-	-	-	+

Calculated content of basal nutrients (g/kg):

Metabolizable energy (MJ/kg)	11.45
Crude protein	170
Lysine	7.80
Methionine	3.70
Ca	36.0
Total P	5.80
Available P	3.10

\*/ Ronozyme WX (endo-1,4- $\beta$ -xylanase activity of 1000 FSU/g) and Ronozyme VP (endo-1,3(4)- $\beta$ -glucanase activity of 50 FBG/g, also pentozanase, hemicellulase and pectinase activity). Each preparation was added to the diets in amount of 200 g/t.

### Results and Discussion

The chemical composition of used DDGS is shown in Table 2. Both types of DDGS were characterized by relatively high level of protein and low level of phosphorus in comparison with literature data (Raw Material Compendium, 1994; Tables of DDGS Composition, 2005).

Table 2. Chemical composition of DDGS used in experiment (g/kg)

	Dry matter	Crude protein	Crude fat	Crude fibre	Lys	Met	Ca	P	Total NSP	Arabino-xylans	$\beta$ -glukan	Calculated ME (MJ/kg)
Corn	92.0	354	32.2	31.5	6.13	7.27	0.81	3.37	265	215	3.20	10.85
Rye	94.2	338	35.7	34.4	6.11	6.58	0.65	2.33	290	233	11.7	10.86

Inclusion level of corn DDGS to the diet had no effect on egg production, Haugh units and eggshell quality (Table 3). Lumpkins et al. (2005) observed, that Hy-Line hens fed the commercial diet with 15% of corn DDGS had numerically lower egg production and suggested that level of 10 to 12% of DDGS may be used in diets for laying hens. Roberson et al. (2005) reported, that in general 15% of corn DDGS had no effect on laying performance, but when hens were 52-53 weeks of age egg production was decreased linearly as DDGS was increased in the diet. Observed in our experiment tendency for increase of feed intake in

layers fed diet with corn DDGS agrees with the results of study of Alenier and Comb (1981), who suggested that hens prefer the diet contained 10% DDGS as compared to corn-soybean diet.

Eggs of hens fed the diet contained corn DDGS was characterized by higher yolk color in Roche scale and 5% of dietary corn DDGS was sufficient to improve yolk color. Roberson et al. (2005) noted, that yolk color can be increased quickly with a diet contained 10% corn DDGS and by two months with 5% DDGS diet.

Use of 5, 10 or 15% of rye DDGS in the diet had no negative effect on performance, but laying rate was decreased by the highest level (20%) of rye DDGS. Addition of enzymes to the diet with 20% of rye DDGS enabled to obtain similar to control group results. Higher than in corn DDGS content of NSP polysaccharides, especially water soluble arabino-xylans, was probably the reason of negative influence of highest level of rye DDGS.

Table 3. Effect of DDGS on laying performance and egg quality

Item	Number of group											SEM
	1	2	3	4	5	6	7	8	9	10	11	
Laying rate (%)	98.2b	98.2b	97.6b	98.6b	98.8b	97.8b	97.6b	99.0b	96.7b	94.4a	96.9b	0.283
Total eggs production in the experiment (kg/hen)	5.27bc	5.36c	5.10bc	5.36c	5.38c	5.1bc	5.38c	5.27bc	5.15bc	4.87a	5.07ab	0.031
Feed intake (g/hen/day)	114abc	117cd	115bc	116cd	117cd	118d	117cd	114abc	112ab	111a	112ab	0.414
Feed conversion (kg/kg of eggs)	1.95	1.95	1.99	1.93	1.95	2.05	2.00	1.93	1.97	2.05	2.00	0.012
Haugh units	75.9	73.4	76.2	77.8	76.9	76.4	74.4	76.2	76.5	80.2	79.5	0.731
Yolk color in Roche scale (points)	5.2a	6.1bc	6.2bc	6.8c	6.6c	6.7c	5.0a	5.3a	5.7ab	5.3a	5.3a	0.097
Eggshell percent (%)	10.5	11.0	11.3	10.9	10.6	11.1	10.5	10.5	10.9	11.1	11.2	0.073
Eggshell breaking strength (N)	43.5	44.6	45.1	43.8	42.6	43.5	43.7	41.3	41.3	44.2	44.0	0.378

a, b, c - values in the same rows with different letters differ significantly ( $P \leq 0.05$ )

## Conclusions

Results of study indicate, that both used types DDGS are useful feed ingredient in laying hens diets. Corn DDGS could be successfully fed at 20% level of inclusion with no negative effects on egg production and egg quality. For rye DDGS this level is lower and amounted 15%, but addition of NSP-hydrolyzing enzymes reduces the decrease in laying performance, observed when hens are fed the diet contained 20% of rye DDGS.

## References

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