

Report submitted to VTR

Heat stability test of VTR phytase

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Sponsor

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Objective

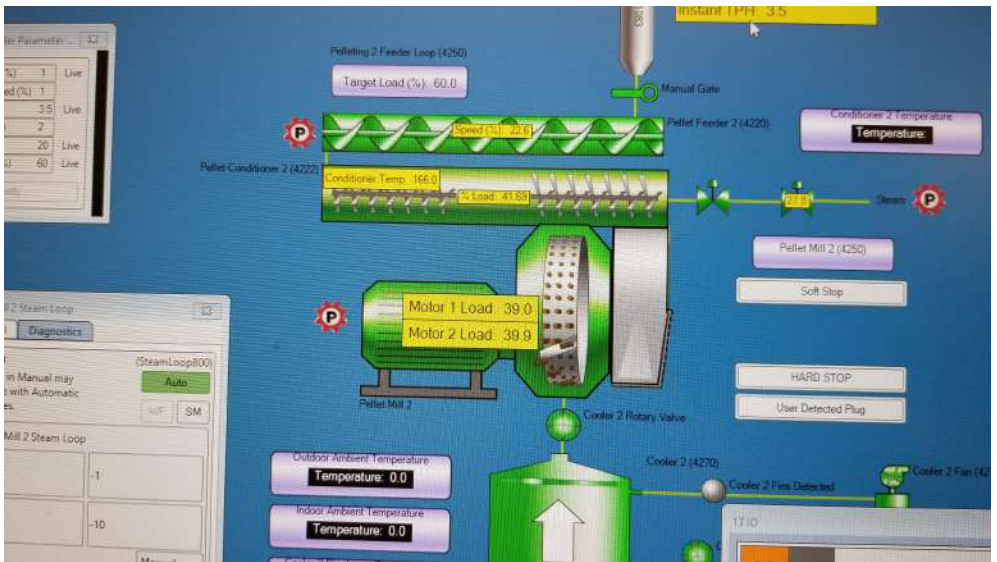
This study was to evaluate heat stability of 3 sources of phytase on their activity after pelleting at various temperatures.

Project Description

The treatments of this study were based on a 3 x 2 factorial arrangement. First factor was 3 sources of phytase and the second factor was 2 different pelleting temperatures (75 and 85°C). Six batches (1 ton each) of corn (450 um) and soybean meal based diets (Table 1) were mixed with various phytase (VTR, AB Vista, and DuPont) and pelleting temperatures (temperature 75 and 85°C). Phytase was coded according to: A (AextraPhy from Dupont), Q (QuantumBlue from ABVista, and V (from VTR). 1,000 IU phytase were added to kg of feed based on calculated value:

- 200 mg per kg of VTR and Quantum Blue (200 g/MT; 0.02%; ABVista)
- 50 mg per kg of AextraPhy (50 g/MT; 0.005%; Dupont)

After pelleting, 5 samples (2 kg each) from each batch were collected. Therefore there were a total of 30 pellet samples and 30 mash samples collected from this study. All pellet and mash samples were used for phytase activity test in duplicates.



Result

Actual pelleting temperature for 75°C treatment was 74.3°C in the conditioner and 80.3°C for hot pellet. Actual pelleting temperature for 85°C treatment was 85.6°C in the conditioner and 89.2°C for hot pellet. Actual pelleting temperature between 2 treatments were different at P value < 0.001 (Table 2).

In 3 phytase products, actual phytase activities are shown in Table 3. V (VTR) contained higher phytase activity than Q (ABVista) considering the target phytase activity was the same. A (Dupont) had significantly higher phytase activity than Q and V as this product was in a concentrated form. When these are supplemented to diets targeting 1,000 U/kg feed based on estimated phytase activity in the products, the actual phytase activities were different ($P < 0.001$). V had the highest ($P < 0.001$) followed by A and then Q.

When pelleting was conducted at 75°C, phytase activity in A and V was greater ($P < 0.001$) than Q (Table 3). This could be due to a fact that phytase activity in A and V before pelleting was higher than Q. However, when recovery rate (heat stability) of phytase at 75°C was calculated, A showed the highest ($P < 0.001$) at 99.7% followed by V (88.1%). Q showed the lowest ($P < 0.001$) at 75.9%.

When pelleting was conducted at 85°C, phytase activity in V was the greatest ($P < 0.001$) at 1107 U/kg and far higher than Q (340 U/kg) and A (196 U/kg). When recovery rate (heat stability) of phytase at 85°C was calculated, V showed the highest ($P < 0.001$) at 76.2%. Recovery rate of Q was 37.8% and greater ($P < 0.001$) than A (18.2%).



Conclusion

Phytase (AstraPhy) from Dupont can be an excellent phytase supplement when pelleting is done at 75oC or lower. However, if pelleting is done at higher than 75oC, phytase activity will dramatically reduce.

Phytase (QuantumBlue) from ABVista does not seem to have effective heat stability when diets were pelleted at 75oC or 85oC.

Phytase from VTR can be an excellent phytase supplement when pelleting is done at 75oC or even at 85oC. It seems that activity of phytase from VTR was minimally affected compared with two other phytase sources we tested.



Table 1. Diet composition

Item, %	
Corn, yellow dent (4-02-861)	66
Poultry fat (4-09-319)	1.29
Soybean meal, dehulled (5-04-612)	10
Corn DDGS, > 6 and < 9% Oil (5-02-843)	20
L-Lys HCl	0.45
L-Thr	0.08
L-Trp	0.03
Limestone, ground (6-02-632)	1.1
Vitamin premix	0.03
Mineral premix	0.15
Salt	0.22
Dicalcium phosphate (NCSU2014)	0.65
Total	100.00
Calculated composition	
DM, %	89.14
ME, Kcal/kg	3382.05
NE, kcal/kg	2455.24
SID Lys, %	0.85
SID M+C, %	0.48
SID Trp, %	0.15
SID Thr, %	0.52
Ca, %	0.60
STTD P, %	0.27
Total P, %	0.48

- 1,000 IU phytase were added to kg of feed based on calculated value
 - 200 mg per kg of VTR and Quantum Blue (200 g/MT; 0.02%; ABVista)
 - 50 mg per kg of AxtraPhy (50 g/MT; 0.005%; Dupont)
- For each phytase, pelleting will be done at 75°C and 85°C

Table 2. Actual temperature measured in conditional and hot pellet

Temperature, °C	75	85	SEM	<i>P</i> value
Conditioner	74.3	85.6	0.6	< 0.001
Hot pellet	80.3	89.2	0.3	< 0.001

Table 3. Phytase activity and heat stability (recovery)

Phytase	A	Q	V	SEM	<i>P</i> value
Phytase, U/g	23,600	5,610	7,650		
Before pelleting, U/kg	1,090 ^b	898 ^c	1,313 ^a	26	< 0.001
75°C					
Conditioner, °C	73.6	75.9	73.5	1.3	0.393
Hot pellet, °C	79.9	80.4	80.7	0.4	0.470
FTU, U/kg	1,100 ^a	649 ^b	1,107 ^a	25	< 0.001
Recovery, %	99.7 ^a	72.6 ^c	88.1 ^b	2.2	< 0.001
85°C					
Conditioner, °C	85.6	85.4	85.8	0.5	0.805
Hot pellet, °C	88.7	89.1	89.8	0.6	0.453
FTU, U/kg	196 ^c	340 ^b	1,044 ^a	28	< 0.001
Recovery, %	18.2 ^c	37.8 ^b	76.2 ^a	2.4	< 0.001

^{abc} Means lacking a common superscript with a row differ ($P < 0.05$)