

Report submitted to VTR

Heat stability test of VTR phytase

Principal Investigator

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Sponsor

VTR, China

Objective

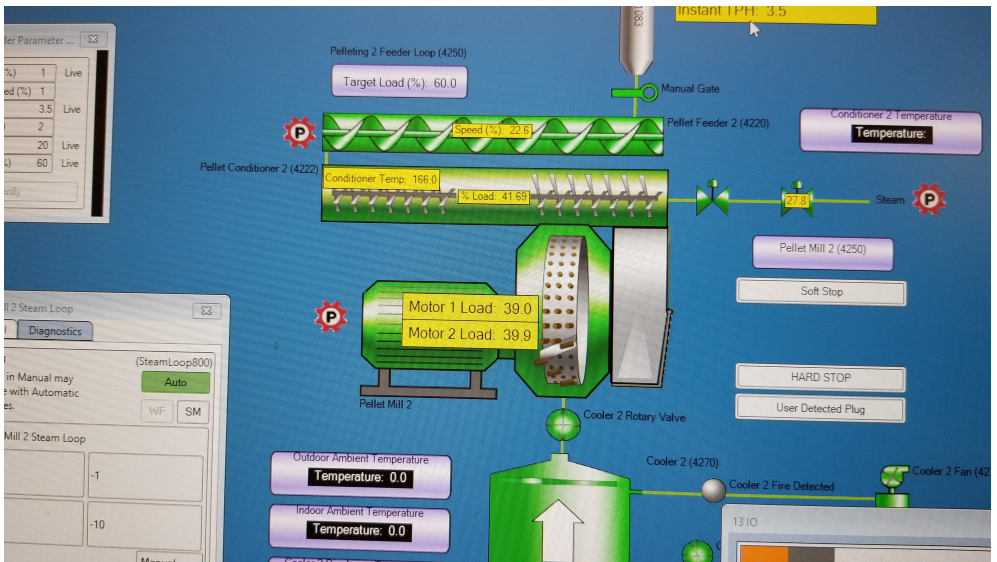
This study was to evaluate heat stability of 3 sources of phytase on their activity after pelleting at various temperatures.

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 ($P < 0.05$)



New Jersey Feed Laboratory, Inc.

Mailing Address:
PO Box 06650
Trenton, NJ 08650
Shipping Address:
1686 Fifth Street
Ewing, NJ 08638

CERTIFICATE OF ANALYSIS

NCSU Dept of Animal Science
 Attn: Sung Woo Kim
 116 Polk Hall, Box 7621
 Raleigh, NC 27695

PO No. : Sung Woo Kim

Order ID:	1809525
Received:	9/25/2018
Reported:	10/17/2018

	NJFL ID :
<u>A 75 P 1 9/25/18</u>	0918-3583
Phytase	1,000 FTU/kg
<u>A 75 P 2 9/25/18</u>	0918-3584
Phytase	1,100 FTU/kg
<u>A 75 P 3 9/25/18</u>	0918-3585
Phytase	1,150 FTU/kg
<u>A 75 P 4 9/25/18</u>	0918-3586
Phytase	1,160 FTU/kg
<u>A 75 P 5 9/25/18</u>	0918-3587
Phytase	1,090 FTU/kg
<u>A 75 M 1 9/25/18</u>	0918-3588
Phytase	1,070 FTU/kg
<u>A 75 M 3 9/25/18</u>	0918-3589
Phytase	1,140 FTU/kg
<u>A 75 M 5 9/25/18</u>	0918-3590
Phytase	1,100 FTU/kg
<u>A 85 P 1 9/25/18</u>	0918-3591
Phytase	207 FTU/kg
<u>A 85 P 2 9/25/18</u>	0918-3592
Phytase	295 FTU/kg

	NJFL ID :
<u>A 85 P 3 9/25/18</u>	0918-3593
Phytase	155 FTU/kg
<u>A 85 P 4 9/25/18</u>	0918-3594
Phytase	105 FTU/kg
<u>A 85 P 5 9/25/18</u>	0918-3595
Phytase	217 FTU/kg
<u>A 85 M 1 9/25/18</u>	0918-3596
Phytase	1,030 FTU/kg
<u>A 85 M 3 9/25/18</u>	0918-3597
Phytase	1,120 FTU/kg
<u>A 85 M 5 9/25/18</u>	0918-3598
Phytase	1,080 FTU/kg

Results are reported on as-received basis unless specified otherwise.

* indicates the marked result was carefully rechecked.

Respectfully Submitted,

Ian Cartwright, vice pres.



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PO No. : Sung Woo Kim

Order ID:	1809530
Received:	9/25/2018
Reported:	10/17/2018

Q 75 P 1 9/25/18	NJFL ID : 0918-3667
Phytase	653 FTU/kg
Q 75 P 2 9/25/18	0918-3668
Phytase	656 FTU/kg
Q 75 P 3 9/25/18	0918-3669
Phytase	676 FTU/kg
Q 75 P 4 9/25/18	0918-3670
Phytase	631 FTU/kg
Q 75 P 5 9/25/18	0918-3671
Phytase	631 FTU/kg
Q 75 M 1 9/25/18	0918-3672
Phytase	916 FTU/kg
Q 75 M 3 9/25/18	0918-3673
Phytase	863 FTU/kg
Q 75 M 5 9/25/18	0918-3674
Phytase	905 FTU/kg
Q 85 P 1 9/25/18	0918-3675
Phytase	365 FTU/kg
Q 85 P 2 9/25/18	0918-3676
Phytase	349 FTU/kg

Q 85 P 3 9/25/18	NJFL ID : 0918-3677
Phytase	346 FTU/kg
Q 85 P 4 9/25/18	0918-3678
Phytase	341 FTU/kg
Q 85 P 5 9/25/18	0918-3679
Phytase	301 FTU/kg
Q 85 M 1 9/25/18	0918-3680
Phytase	869 FTU/kg
Q 85 M 3 9/25/18	0918-3681
Phytase	933 FTU/kg
Q 85 M 5 9/25/18	0918-3682
Phytase	901 FTU/kg

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116 Polk Hall, Box 7621
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PO No. : Sung Woo Kim

Order ID:	1809583
Received:	9/27/2018
Reported:	10/17/2018

	NJFL ID :
<u>V 75 P 1 9/27/18</u>	0918-4039
Phytase	1,190 FTU/kg
<u>V 75 P 2 9/27/18</u>	0918-4040
Phytase	1,100 FTU/kg
<u>V 75 P 3 9/27/18</u>	0918-4041
Phytase	1,110 FTU/kg
<u>V 75 P 4 9/27/18</u>	0918-4042
Phytase	995 FTU/kg
<u>V 75 P 5 9/27/18</u>	0918-4043
Phytase	1,140 FTU/kg
<u>V 75 M 1 9/27/18</u>	0918-4044
Phytase	1,210 FTU/kg
<u>V 75 M 3 9/27/18</u>	0918-4045
Phytase	1,230 FTU/kg
<u>V 75 M 5 9/27/18</u>	0918-4046
Phytase	1,330 FTU/kg
<u>V 85 P 1 9/27/18</u>	0918-4047
Phytase	940 FTU/kg
<u>V 85 P 2 9/27/18</u>	0918-4048
Phytase	1,030 FTU/kg

	NJFL ID :
<u>V 85 P 3 9/27/18</u>	0918-4049
Phytase	1,040 FTU/kg
<u>V 85 P 4 9/27/18</u>	0918-4050
Phytase	1,050 FTU/kg
<u>V 85 P 5 9/27/18</u>	0918-4051
Phytase	1,160 FTU/kg
<u>V 85 M 1 9/27/18</u>	0918-4052
Phytase	1,350 FTU/kg
<u>V 85 M 3 9/27/18</u>	0918-4053
Phytase	1,280 FTU/kg
<u>V 85 M 5 9/27/18</u>	0918-4054
Phytase	1,480 FTU/kg

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NCSU Dept of Animal Science
Attn: Sung Woo Kim
116 Polk Hall, Box 7621
Raleigh, NC 27695
PO No. : Sung Woo Kim

Order ID:	1810003
Received:	10/1/2018
Reported:	10/17/2018

	NJFL ID :
<u>QB Extra 10/1/18</u>	<u>1018-0004</u>
Phytase	5,610 FTU/gm
<u>V Extra 10/1/18</u>	<u>1018-0005</u>
Phytase	7,650 FTU/gm
<u>AP Extra 10/1/18</u>	<u>1018-0006</u>
Phytase	23,600 FTU/gm

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