Research Report

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Project title: Analysis of 21 Soybean Meal Samples

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Background:

A study was completed to assess the apparent metabolizable energy and digestible amino acid content of various origins of soybean meal samples collected from the trade in Southeast Asia. This study was paid for by USSEC Southeast Asia and was conducted in the laboratories of University of New England and Bangkok Animal Research Centre (Ajinomoto). Northern Soy Marketing was approached in late 2021 to conduct additional assays on the samples at University of Missouri with logistics coordinated by Prof Seth Naeve at University of Minnesota. Results were subjected to regression and analysis to determine which of the chemical techniques might be useful in predicting amino acid and metabolizable energy.

Findings:

- 1. The units of trypsin inhibitor reported by University of Missouri were 2 to 2.5 x lower than expected. Averages were US meal: 0.91; Arg meal: 1.00 and Brazil meal 0.84. The individual values ranged between 0.68 and 1.23 TIU per mg compared to the reports of Ravindran et al 2014 with values between 1.66 and 3.12 TIU per mg and Ibanez et al 2019 with values between 1.19 and 5.23 TIU/mg sample. No relationships were found for TIA and lysine digestibility (R² = 0.08) or TIA and AMEn (R² = 0.0001)
- 2. Sucrose was found to be higher in US SBM than the others. The sucrose content of US SBM was 7.3% making it higher than SBM from both Argentina (6.8%) and Brazil (5.6%). A difference of 1.7% (17g/kg) of sucrose between the US and Brazil SBM is equivalent to 68 kcal/kg using a value of 4000 kcal/kg for sucrose. Sucrose content was found to be positively correlated to AMEn (R = 0.47) and negatively correlated to crude protein (R = 0.71). This suggests an energy advantage for meal with low crude protein and high sucrose.
- 3. The level of total lysine was correlated to crude protein (R = 0.75). This suggests that crude protein is can estimate total lysine and amino acid content of meal.

4. Lysine availability (or reactivity) was highest for US meal (96.4%) followed by Brazil (96.1%) and then Argentina meal (96.0%). A negative correlation was found between lysine availability and TIA (R = -0.21). A positive correlation was found between lysine availability and lysine digestibility (R = 0.21).

Introduction

Soybean meal (SBM) is the most common protein source in broiler diets. Protein quality and nutrient composition of SBM may vary according to processing and genetics of the soybeans and handling and storage conditions of both beans and meal. The application of heat in the form of steam is necessary to remove traces of hexane remaining from oil extraction and also serves to deactivate protease inhibitors such as trypsin inhibitor that affect amino acid digestibility. Soybeans contain sucrose that remains in SBM after oil extraction. Sucrose is highly digestible and contributes to the metabolizable energy in the meal of the meal. Soybeans grown in cool climates have more sucrose than those growing under warmer tropical climates. Soybeans respire during storage and metabolic changes both protein and carbohydrate are slowed by cold temperature. Because temperate and tropically grown beans have different ratios of the various amino acids to crude protein, laboratory analysis is necessary when comparing different origins of soybean meal. This information should be continually updated to keep feed formulations accurate and avoid deficiencies or excesses in the field. A study was conducted to examine the nutrient profile of 21 samples of SBM from various origins collected from commercial locations in the Asia Pacific region in 2021. Two outlier samples were analyzed but not included in the analysis. Five samples were from US origin, ten from Argentina and four from Brazil.

Materials and methods

Samples of soybean meal from US, Argentina and Brazil were collected from feed mills in Vietnam, Philippines, Thailand, Malaysia and Australia and shipped to the Bangkok Animal Research Centre (BARC) in Bangkok. There were 5 samples of USA, 10 samples of Argentina and 4 samples of Brazil soybean meal. Only Argentina meal was available from Australia. Aliquots of samples collected at BARC were sent to UNE in Australia for laboratory analysis.

Proximate, gross energy, carbohydrates, KOH-PS and amino acids

The nutrient composition including CP, dry matter, crude fiber and ash were analyzed by the standard methods (AOAC, 1994). Aliquots of SBM samples were also scanned in a Bruker MPS near infra-red spectrophotometer. Scans were sent to Adisseo for analysis using the PNE calibrations. Non-starch polysaccharides were analyzed by standard methods (Englyst and Hudson, 1987; Theander and Westerlund, 1993). Sucrose was analyzed by HPLC using a Mass Spec detector (in house method at Eurofins). The protein solubility test used a 0.2% KOH following the procedures of Araba and Dale (1990). Amino acids were tested in SBM, feeds and digesta using AOAC method 982.30 (1994).

In vivo studies

Apparent metabolizable energy (AME) and standardized ileal amino acid digestibility were determined the Bangkok Animal Research Centre in Thailand. Metabolizable energy as AME and AMEn was measured in 756 live Arbor Acres plus broilers with a total collection from 24 to 28 days of age using the substitution method described by Ravindran et al., (2014). Standardized ileal digestible amino acids followed the method of Ravindran et al 2014 with the exception that 0.3% chromic oxide was used instead of titanium dioxide as an indicator of digestibility. A protein free diet was fed to determine endogenous flow of amino acids that were used to calculate standardized ileal digestible amino acids.

Additional assays and regression

In addition to the assays conducted above, the samples were also analyzed for trypsin inhibitor, lysine availability or reactivity, protein dispersibility index, sucrose, sugars and KOH protein solubility. The data were examined for correlations using linear regression.

Formulation exercise

The Ross 308 (Aviagen 2019) nutrient recommendations were used to formulate starter, grower and finisher diets. The metabolizable energy values and SID amino acid values obtained above were applied to the SBM from US, Argentina and Brazil and offered to the Concept 5 least cost formulation program. Formulations were based on corn-SBM, minerals and vitamins and all

contained phytase. Formulations were examined for nutritional soundness and then the shadow price of each meal was retained to determine the "breakeven" price for each.

Results and discussion

Table 1 shows the crude protein, crude fat, crude fiber of the SBM samples conducted by wet chemistry and also NIRS using a Bruker MPA instrument and the Adisseo PNE calibrations. The wet chemistry results show all SBM samples were dehulled and of high quality. The Brazilian SBM was highest in crude protein being more than 1 percentage point higher as compared to US and Argentina meal. Residual crude fat content of Argentine SBM was lower than US and Brazilian meal while the crude fiber of Brazilian SBM was higher than Argentina with US being intermediate. The percentage of KOH-PS was higher in US SBM compared to Argentina meal but not significantly different than Brazilian meal. The results of the NIRS determination closely followed the wet chemistry for crude protein and crude fat and although were ranked the same as wet chemistry for crude fiber, the differences were not statistically significant. This highlights the accuracy and cost savings of using Adisseo PNE calibrations for crude protein and crude fat.

The sucrose and non-starch polysaccharide content measured in the SBM samples are shown in Table 2. The sucrose content of US SBM was 7.3% making it higher than SBM from both Argentina (6.8%) and Brazil (5.6%). A difference of 1.7% (17g/kg) of sucrose between the US and Brazil SBM is equivalent to 68 kcal/kg using a value of 4000 kcal/kg for sucrose. Soluble NSP was lower in US SBM as compared to Brazilian SBM with Argentina SBM being intermediate. Insoluble NSP was higher in US SBM as compared to SBM from Brazil with Argentina meal being intermediate. Insoluble NSP correlates to hard fiber that could be expected to have a positive impact on gizzard function. The lower soluble NSP of US meal may reflect the fact that more of the sugars are in the form of sucrose and less are present as oligosaccharides.

The total amino acid content of analyzed SBM samples on an 88% DM basis is shown in Table 3. The content of lysine in US and Argentina meal are the same and higher than Brazil meal. Cystine, arginine and glutamic acid are higher in Brazil meal as compared to US and Argentina

meal. There are no differences in valine or methionine content between the meals. These differences confirm previous studies showing higher lysine in meal produced from temperate beans and high non-essential amino acids such as glutamic acid in meals produced from tropical beans. This indicates that amino acids should not be adjusted in the formulation matrix solely based on changes in crude protein content.

The apparent metabolizable energy content of meals is shown in Table 4. The results show the US SBM to have higher AME and AMEn values as compared to Brazil meal and Argentina meal. The average value measured for AME and AMEn across the meals is 2042 kcal/kg and 1873 kcal/kg on an 88% DM basis. While the relative difference between the values is precise the numbers are lower than expected and lower than those reported by Ravindran (2014), the soybean meal meta-analysis conducted by (Ibáñez et al., 2020) and previous BARC studies. For this reason, AME values were used (instead of AMEn values) for the formulation example. Correction to zero nitrogen retention is arbitrary and only done so that using values obtained in adult roosters (who do not retain nitrogen) using the true metabolizable energy technique can be easily used.

The SID amino acid coefficients are presented in Table 5 and the levels of SID amino acids used in formulation on an 88% dry matter basis are presented in Table 6. There is a tendency (P < 0.08) for US meal to be more digestible than Brazil meal. Methionine, cystine, threonine and valine are more digestible in US meal as compared to Brazil meal. Digestible lysine is higher in US meal compared to Brazil meal.

Figures 1, 2 and 3 show feed formulations based on corn and soybean meal for starter, grower and finisher using the Ross 308 nutrient specifications for male broilers (Aviagen, 2019). Prices of ingredients are given in the Cost\$/Tonne column in USD. All soybean meals were assigned a cost of USD 630/mt. The specifications for SID amino acids and AME were used to formulate the diets offering each of the SBM. For all formulations the US SBM was selected and the Brazil and Argentina SBM were rejected. The opportunity prices of the SBM are given in Table 7. With US SBM at USD 630/mt, Argentine meal would need to be USD 4.60 less expensive in starter

and grower diets and 7.80 less expensive in the finisher diet before it could be used. The Brazil meal would need to be 7.70 less expensive in starter and grower and \$14.70 less expensive than US meal in finisher feed.

Figure 3 shows the relationship between sucrose concentration and AMEn of meal and Figure 4 show the relationship between sucrose and KOH protein solubility in soybean meal.

Conclusion

A series of SBM samples were collected from the trade in the Asia Pacific region and analysed for nutritional quality by wet chemistry, NIRS and in vivo determination of metabolizable energy and SID amino acids and economic value using least cost feed formulation of broiler diets. The results indicated Brazilian SBM to be highest in crude protein but lowest in total lysine and lowest in sucrose content compared to the US and Argentina meals. The AME and AMEn were highest in US meal followed by Argentina and then Brazil. The AME and AMEn values were lower than expected based on application of the WPSA equation (Jansen, 1989) to predict based on proximate values. The coefficients of lysine digestibility were not different between the meals but the US meal had the highest coefficient of methionine and cystine digestibility. The content of SID amino acids was higher for lysine in US and Argentina meal as compared to Brazilian meal. Formulation of starter, grower and finisher diets showed an economic advantage for US meal being in the range of USD \$4.60 to \$15.70 over Argentina and Brazilian SBM.

Table 1. Crude protein, crude fat and crude fiber¹ and KOH-PS of soybean meals from different origins measured by wet chemistry and NIRS (%)

Item	United States (n = 5)		Argentina (n = 10)		Brazil (n = 4)	
	Mean	SD	Mean	SD	Mean	SD
Wet chemistry						
Crude protein	46.0 ^b	0.56	46.1 ^b	0.51	47.3a	1.37

Crude fat	1.39a	0.20	0.86^{b}	0.27	1.27a	0.38
Crude fibre	3.86 ab	0.21	3.38 ^b	0.37	4.52a	0.88
KOH-PS, %	81.5a	1.01	75.1 ^b	2.22	78.6a	3.32
NIRS						
Crude protein	46.0 ^b	0.50	46.1 ^b	0.51	47.0a	1.14
Crude fat	1.35a	0.40	1.12 ^b	0.22	1.61a	0.24
Crude fibre	4.09	0.33	3.67	0.44	4.26	0.80

ab mean values with different superscripts within rows are different (P < 0.05);
¹calculated on an 88 % DM basis
NIRS: Bruker MPA and Adisseo PNE calibrations
KOH-PS = Protein solubility in 0.2% potassium hydroxide

Table 2. Percent sucrose and NSP content of soybean meals from different origins

Carbohydrate	United (n = 5)		Argenti (n = 10		Brazil (n = 4)	
	Mean	SD	Mean	SD	Mean	SD
Sucrose	7.3a	0.4	6.8b	0.2	5.6c	0.3
Soluble NSP ²	0.6b	0.11	0.7ab	1.24	0.9a	1.3
Insoluble NSP ³	8.0a	0.2	7.8ab	0.5	7.3 ^b	0.4

Table 3. Total amino acid content of SBM from different origins

	United n =		Argen		Brazil $n = 4$		
	Mean	SD	Mean	SD	Mean	SD	
Lysine	2.91a	0.06	2.91a	0.06	2.65b	0.37	
Methionine	0.63	0.02	0.63	0.01	0.64	0.02	
Cystine	0.68^{b}	0.03	0.67b	0.02	0.72^{a}	0.02	
Threonine	1.79 ^b	0.04	1.84ab	0.02	1.88a	0.07	
Valine	2.22	0.05	2.26	0.05	2.31	0.05	
Arginine	3.23 ^b	0.08	3.28ab	0.07	3.40a	0.11	
Isoleucine	2.17 ^b	0.04	2.23ab	0.06	2.27a	0.05	
Glutamic	8.31b	0.22	8.58ab	0.23	8.76a	0.26	

 $^{^{}ab}$ mean values with different superscripts within rows are different (P $\!<\!0.05)$ 88% dry matter basis

 $^{^{\}rm ab}$ mean values with different superscripts within rows are different (P $\!<\!0.05)$ 88% DM basis

Table 4. Apparent metabolizable energy content of SBM from different origins

		United States $n = 5$		ntina 10	Brazil n = 4		
	Mean	SD	Mean	SD	Mean	SD	
AME	2115a	91	2042b	136	1971°	125	
AMEn	1901a	100	1844 ^b	134	1766c	122	

 $^{^{}abc}$ mean values with different superscripts within rows are different (P $\!<\!0.05)$ 88% dry matter basis

Table 5. Standardised ileal digestibility coefficients of SBM from different origins

		d States = 5	•	entina = 10		razil = 4
	Mean	SD	Mean	SD	Mean	SD
Lysine	0.875	0.017	0.865	0.161	0.846	0.241
Methionine	0.906a	0.022	0.875ab	0.266	0.853b	0.418
Cystine	0.841a	0.014	0.799ab	0.309	0.772b	0.631
Threonine	0.880^{a}	0.014	0.853ab	0.264	0.826b	0.470
Valine	0.891a	0.014	0.868ab	0.229	0.844b	0.398
Arginine	0.920	0.010	0.923	0.124	0.914	0.121
Isoleucine	0.892	0.014	0.874	0.183	0.855	0.351

 $^{^{\}mbox{\scriptsize ab}}$ mean values with different superscripts within rows are different (P $\!<\!0.05)$

Table 6. Standardised ileal digestibility of soybean meals from different origins

	United n=	~	Arge		Bra n =	
	Mean	SD	Mean	SD	Mean	SD
Lysine	2.55a	0.09	2.52a	0.08	2.25b	0.38
Methionine	0.57	0.03	0.55	0.02	0.55	0.03
Cystine	0.57	0.03	0.53	0.03	0.56	0.05
Threonine	1.57	0.05	1.57	0.05	1.55	0.12
Valine	1.98	0.06	1.95	0.07	1.95	0.08
Arginine	2.97	0.10	3.03	0.06	3.11	0.14
Isoleucine	1.93	0.05	1.95	0.07	1.94	0.08

 $^{^{}ab}$ mean values with different superscripts within rows are different (P $\!<\!0.05)$ 88% dry matter basis

EAA = essential amino acids; NEAA = non-essential amino acids

Figure 1

Product: 270 SBM starter Page: 1

Trial Formula Cost: 486.61/Tne 48.66/Ckg 0.4866/Kg Version: 1

INGREDIENT SOLUTION: (Unrounded)

Ingrenda Ingradient Name		Minimum		Cost	Rest	Low	High
IngrCode Ingredient Name	Pct	Pct	Pct :	\$/Tonne	Cost	Range	Range
1 Corn 3300-8.1	53.2652			319.00		19.40	338.20
173 SBM US 2115 46.0	39.5354			630.00		351.00	634.50
	3.7363			1126.00		1031.50	14289.90
	1.4088			85.00			1610.30
515 MonodicalP 21P/1				500.00			1055.20
704 D,L-methionine				2528.00			27683.50
701 L-lysine HCl 78.	0.2048			1630.00		354.20	
571 Salt	0.1661	0 1500		150.00	2 216	10.40	487.60
572 Na bicarb		0.1500		250.00	2.316	18.40	
663 Choline Cl 70% 709 L-threonine	0.0882 0.0784			1450.00 1678.00		225 20	28442.60 15790.30
614 UNE Mineral mix	0.0750	0.0750		1500.00		223.30	13/90.30
613 UNE Vitamin mix		0.0500		6000.00			
545 Phytase QB 5G (1	0.0100	0.0100	0.0100	15000.00			
						ΔŤ V	would Use
103 Rice bran 2735 1	Rej		5.0000	268.00	0.380	230.00	iou iu ose
159 SBM Brz 1971 47.	Rej				0.077		
92 Wheat Pollard 19	Rej		5.0000		0.197		
174 SBM Arg 2042 46.	Rej			630.00	0.046	625.40	

Figure 1. Starter diet

Product: 271 SBM grower

Trial Formula Cost: 472.85/Tne 47.28/Ckg 0.4728/Kg Version: 1

INGREDIENT SOLUTION: (Unrounded)

IngrCode Ingredient Name	Amount Pct		Maximum Cost Pct \$/Tonne	Rest Cost	Low Range	High Range
1 Corn 3300-8.1 173 SBM US 2115 46.0 439 Veg oil 8900 500 Limestone 515 MonodicalP 21P/1 704 D,L-methionine 701 L-lysine HCl 78. 571 Salt 572 Na bicarb 663 Choline Cl 70% 614 UNE Mineral mix 709 L-threonine 613 UNE Vitamin mix 545 Phytase QB 5G (1		0.1500 0.0750 0.0500 0.0100	319.00 630.00 1126.00 85.00 500.00 2528.00 1630.00 150.00 250.00 1450.00 1500.00 1678.00 6000.00	2.316 17.69 62.48	230.00 621.40 -270.50 -122.60 311.80 354.20 -269.30 18.40	14289.90 1610.30 61147.80 52613.80 15029.50 487.60
174 SBM Arg 2042 46. 159 SBM Brz 1971 47.	Rej Rej			0.046	625.40	

Figure 2. SBM grower diet

Product: 272 SBM finisher Page: 1
Trial Formula Cost: 465.52/Tne 46.55/Ckg 0.4655/Kg Version: 1

INGREDIENT SOLUTION: (Unro	unded)						
IngrCode Ingredient Name	Amount Pct	Minimum Pct		Cost \$/Tonne	Rest Cost	Low Range	High Range
515 MonodicalP 21P/1 701 L-lysine HCl 78. 704 D,L-methionine 571 Salt	0.2814 0.2761 0.1668			319.00 630.00 1126.00 85.00 500.00 1630.00 2528.00 150.00		341.70 300.60	17628.40 1632.10 728.60 4827.70 14376.30 495.00
572 Na bicarb 663 Choline Cl 70% 709 L-threonine 614 UNE Mineral mix	0.1500 0.0987 0.0874 0.0750	0.1500		250.00 1450.00 1678.00 1500.00		13.30 212.90	24621.00 8908.00
727 L-Arginine FB 613 UNE Vitamin mix 545 Phytase QB 5G (1	0.0719 0.0500 0.0100	0.0500 0.0100		12000.00 6000.00 15000.00			15693.70
103 Rice bran 2735 1 92 Wheat Pollard 19 159 SBM Brz 1971 47. 174 SBM Arg 2042 46.	Rej Rej Rej Rej		5.0000 5.0000		0.305 0.147	252.70 189.50	

Figure 3. Finisher diet

Table 7. Equivalent (shadow) prices USD/mt of SBM from different origins in broiler diets

SBM origin	Starter	Grower	Finisher
United States	630.00	630.00	630.00
Argentina	625.40	625.40	622.20
Brazil	622.30	622.30	615.30

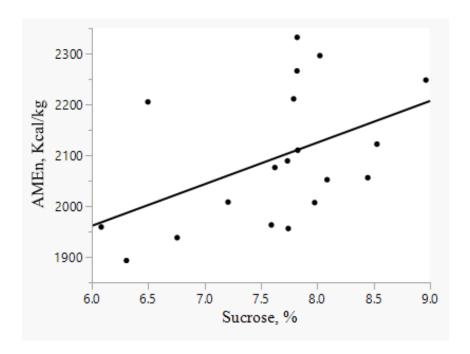


Figure 3. Linear relationship between sucrose concentration and AMEn of soybean meal ($r^2 = 0.22, P < 0.05$)

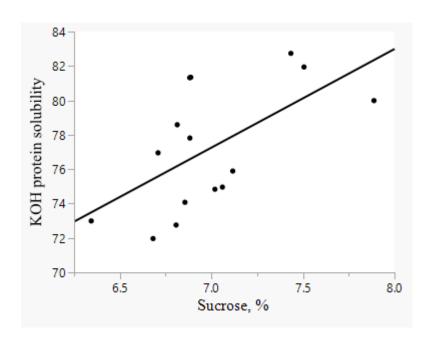


Figure 4. Linear relationship between KOH protein solubility and sucrose concentration of soybean meal ($r^2 = 0.29$, P < 0.05; analysis includes only US and Argentina SBM)

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Appendix:

University of Missouri Report with Sample key

Sample Ke Sample nur	y:											
Sample nur												
	nb UNE o	Bare code	origin Arg	shipping de SBM from	No. 11							
	2 SBM	T2	ARG	Vietnam I	AM212							
	3 SBM 4 SBM	T3 T4	Arg ARG	Vietnam2 Argentina1	AM212 AM212						H	
	5 SBM	T5	ARG	Argentina2	AM212							
	6 SBM 7 SBM	T6 T7	BRA US	Brazill US1 SBM	AM212 AM212						H	
	8 SBM	T8	US	USA2	AM212							
	9 SBM 10 SBM	T9 T10	US	USA3 USA4	AM212 AM212							
	11 SBM	T11	US	USA5	AM212							
	12 SBM 13 SBM	T14 T15	Bra Bra	SBM SBM	No. 12 No. 13						H	
	14 SBM	T16	Arg	soybean	No. 14							
	15 SBM 16 SBM	T17 T18	Arg Arg	soybean Soybean	No. 15 No. 16							
	17 SBM	T19	Bra	Soybean -	No. 17							
	18 SBM 19 SBM	T20	Arg	Soybean	No. 18 Extra							
	25 SBM	T21	US	ADM								
	26 SBM	T22	AR	ARG-	ARG-							
sender: Address:	Universi	diller-Garv	esota. Ag	ronomy an	d Plant (Date Received Jenetics						
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		0002173	000			Date of Repo	rt: Febru	ary 22, 2022				
	on: Soyb							Page 1 of 3				
zerijan	30,0							1420 1 013				
ESCL#	UM II	Fructose W/W%	Glucose W/W%	Sucrose W/W%	Lactose W/W%	Maltose W/W%			ESCL#	Sucrose W/W%		
16655 16656	T1 T2	0.04	0.24	6.27	0.00	0.68		1.A not used 2.U not used	16673 16674	5.44 6.49		
16657 16658	T3	0.07	0.29	6.97	0.00	0.65		A A	16655 16656	6.27 6.86	\Box	
16658 16659	T4 T5	0.13	0.22	6.31	0.10	0.61		A A	16656 16657	6.86		
16660 16661	T6	0.06	0.21	5.19	0.11	0.42		A	16658 16659	6.31		
16662	T7 T8	0.05	0.24	6.69 7.13	0.10	0.68		A A	16668	6.84		
16663	T9	0.07	0.31	6.34	0.00	0.81		A	16669	6.12		
16664 16665	T10 T11	0.06	0.28	6.97 6.85	0.00	0.86 0.74		A A	16670 16672	6.65		
16666	T12	0.06	0.22	5.37	0.12	0.51		A	16675	6.55		
16667 16668	T13	0.00	0.20	5.38 6.78	0.11	0.54 0.70		B B	16660 16666	5.19 5.37		
16669	T15	0.04	0.24	6.12	0.00	0.61		В	16667	5.38		
16670 16671	T16	0.04	0.24	6.65 4.84	0.12	0.72		B U	16671 16661	4.84 6.69		
16672	T18	0.03	0.25	6.21	0.09	0.69		U	16662	7.13		
16673 16674	T20 T25	0.09	0.26	5.44 6.49	0.13	0.33		U	16663 16664	6.34		
16675	T26	0.00	0.27	6.55	0.06	0.68		U	16665	6.85		
V/W%= ,ex	rams per i	00 grams of	sample.							Sucrose	SD	
lesults are	e expresse	d on an "as	is" basis u	wless other	rise indica	sted.		US		6.80	0.30	
								Arg Brazil		6.55 5.19	0.31 0.25	
	D. ***	dillan C	-									
sender: Address:	Universi	diller-Garv ty of Minn	esota, Ag	ronomy an	d Plant (Genetics						
	Room 4	11 Borlaug	Hall, 19	91 Upper B	uford Ci	rcle, St. Paul,	MN 55108	-6026				
Phone: Purchase	612-625- Order#:	5772 0002173	000									
								Base A. C.				
rescriptio	on: Soyb							Page 2 of 3				
Pec-	To a	Rhamnose		Ribose	Arabinoso	Xylose	Mannose	Glucose	04.			
ESCL#	UM II	W/W%	W/W%	W/W%	W/W%	W/W%	W/W%	W/W%	Origin			
16655	TI	0.23	0.16	0.10	1.19	0.58	0.58	4.46	A			
16656 16657	T2 T3	0.19	0.16	0.09	1.04	0.55	0.50	3.92 5.12	A A			
16658	T4	0.22	0.16	0.10	1.14	0.59	0.51	3.59	A			
16659 16660	T5 T6	0.27	0.18	0.12	1.40	0.75 0.76	0.90	5.50 4.25	A B			
16661	T7	0.15	0.14	0.09	0.88	0.46	0.44	3.53	U			
16662 16663	T8 T9	0.20	0.15	0.11 0.12	1.21	0.62 0.58	0.99	5.84 3.82	U			
16664	T10	0.26	0.17	0.10	1.25	0.56	0.51	5.06	U			
16665 16666	T11	0.26 0.27	0.18	0.12 0.11	1.30	0.67 0.80	0.72	5.31 3.74	U B			
16667	T13	0.29	0.18	0.11	1.42	0.74	0.70	3.95	В			
16668 16669	T14 T15	0.33	0.24	0.14 0.10	1.73	0.80 0.50	0.84	6.23 3.57	A A		-	
16670	T16	0.22	0.18	0.10	1.20	0.50	0.46	2.21	A			
	T17	0.27						3.78				
16671	Tie	0.27	0.18	0.11	1.38	0.87	0.94	3.67	В			
16671 16672 16673	T18 T20	0.36	0.28	0.15	2.09 1.06	0.87 0.98 0.62	0.94 0.94 0.72	3.67 6.49 3.44	B A A not used			
16671 16672	T18	0.36	0.28	0.15	2.09	0.87 0.98	0.94 0.94	3.67 6.49	B A			
16671 16672 16673 16674 16675	T18 T20 T25 T26	0.36 0.27 0.32 0.32	0.28 0.15 0.20 0.20	0.15 0.08 0.10 0.10	2.09 1.06 1.34	0.87 0.98 0.62 0.73	0.94 0.94 0.72 0.68	3.67 6.49 3.44 5.39	A A not used U not used			
16671 16672 16673 16674 16675	T18 T20 T25 T26	0.36 0.27 0.32 0.32 0.00 grams of	0.28 0.15 0.20 0.20	0.15 0.08 0.10 0.10	2.09 1.06 1.34 1.38	0.87 0.98 0.62 0.73 0.66	0.94 0.94 0.72 0.68	3.67 6.49 3.44 5.39	A A not used U not used			
16671 16672 16673 16674 16675 W/W%= gr	T18 T20 T25 T26 T26 rams per 1	0.36 0.27 0.32 0.32 0.32 00 grams of d on an "as	0.28 0.15 0.20 0.20 0.20 sample. is" basis n	0.15 0.08 0.10 0.10	2.09 1.06 1.34 1.38 ise indica	0.87 0.98 0.62 0.73 0.66	0.94 0.94 0.72 0.68 0.69	3.67 6.49 3.44 5.39 5.31	A A not used U not used			
16671 16672 16673 16674 16675 W/W%= gr Results are	T18 T20 T25 T26 T26 e expresse Dr. Jill Universi	0.36 0.27 0.32 0.32 0.00 grams of don an "as	0.28 0.15 0.20 0.20 0.20 "sample. is" basis n	0.15 0.08 0.10 0.10	2.09 1.06 1.34 1.38 rise indica	0.87 0.98 0.62 0.73 0.66	0.94 0.94 0.72 0.68 0.69	3.67 6.49 3.44 5.39 5.31 ber 10, 2021	A A not used U not used			
16671 16672 16673 16674 16675 W/W%= gr Welesults are Sender: Address:	T18 T20 T25 T26 T26 T26 Dr. Jill Universi	0.36 0.27 0.32 0.32 0.0 grams of d on an "as selfiller-Garvey ty of Minn 11 Borlaug	0.28 0.15 0.20 0.20 0.20 "sample. is" basis n	0.15 0.08 0.10 0.10	2.09 1.06 1.34 1.38 rise indica	0.87 0.98 0.62 0.73 0.66	0.94 0.94 0.72 0.68 0.69	3.67 6.49 3.44 5.39 5.31 ber 10, 2021	A A not used U not used			
16671 16672 16673 16674 16675 WW%= gr Wesults are Sender: Address:	T18 T20 T25 T26 T26 T26 T27 T26 T27 T27 T27 T28	0.36 0.27 0.32 0.32 0.32 0.0 grams of d on an "as diller-Garv ty of Minn 11 Borlaug	0.28 0.15 0.20 0.20 sample. is "basis n	0.15 0.08 0.10 0.10	2.09 1.06 1.34 1.38 vise indica d Plant Cuford Ci	0.87 0.98 0.62 0.73 0.66 Date Received	0.94 0.94 0.72 0.68 0.69	3.67 6.49 3.44 5.39 5.31 ber 10, 2021	A A not used U not used			
16671 16672 16673 16674 16675 W/W%= gr Zesults are Sender: Address: Phone:	T18 T20 T25 T26 T26 T26 Dr. Jill Universi Room 4 612-628- Order #:	0.36 0.27 0.32	0.28 0.15 0.20 0.20 sample. is "basis n	0.15 0.08 0.10 0.10	2.09 1.06 1.34 1.38 vise indica d Plant Cuford Ci	0.87 0.98 0.62 0.73 0.66	0.94 0.94 0.72 0.68 0.69	3.67 6.49 3.44 5.39 5.31 ber 10, 2021 -6026 ary 22, 2022	A A not used U not used			
16671 16672 16673 16674 16675 W/W%= gr Zesults are Sender: Address: Phone:	T18 T20 T25 T26 T26 T26 T27 T26 T27 T27 T27 T28	0.36 0.27 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32	0.28 0.15 0.20 0.20 sample. is "basis a in csota, Ag Hall, 19	0.15 0.08 0.10 0.10 0.10 viless others	2.09 1.06 1.34 1.38 vise indica d Plant Cuford Ci	0.87 0.98 0.62 0.73 0.66 Date Received cenetics role, St. Paul, Date of Repo	0.94 0.94 0.72 0.68 0.69	3.67 6.49 3.44 5.39 5.31 ber 10, 2021	A A not used U not used			
16671 16672 16673 16674 16675 WW94= gp Results are Sender: Address: Purchase Description	T18 T20 T25 T26 T26 Dr. Jill Universi Room 4 612-625- Order #:	0.36 0.27 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.31 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32	0.28 0.15 0.20 0.20 sample. is "basis n in esota, Ag Hall, 19	0.15 0.08 0.10 0.10 0.10 mless others	2.09 1.06 1.34 1.38 vise indica d Plant Cuford Ci	0.87 0.98 0.62 0.73 0.66 Date Receives cenefics reck, St. Paul, Date of Repo	0.94 0.94 0.72 0.68 0.69 WN 55108 Trypsin	3.67 6.49 3.44 5.39 5.31 ber 10, 2021 1-6026 ary 22, 2022 Page 3 of 3	B A A not used U not used A			
16671 16672 16673 16674 16675 WW%= gy Zesults are Sender: Address: Phone: Purchase Description	T18 T20 T25 T26 T26 Dr. Jill Universi Room 4 612-625 Order #:	0.36 0.27 0.32 0.32 0.30 0.39 0.30 0.30 0.30 0.30 0.30 0.30	0.28 0.15 0.20 0.20 sample. is "basis a in csota, Ag Hall, 19	0.15 0.08 0.10 0.10 0.10 0.10 wless others ronomy an 91 Upper B Mannitol W/W%	2.09 1.06 1.34 1.38 vise indica d Plant Cuford Ci	0.87 0.98 0.62 0.73 0.66 bated. Date Receives Genetics rcke, St. Paul, Date of Repo	0.94 0.94 0.72 0.68 0.69 1: Decem MN 55108 Trypsin Inhibitor TIU/g	3.67 6.49 3.44 5.39 5.31 ber 10, 2021 1-6026 ary 22, 2022 Page 3 of 3	B A A not used U not used A	rasil, USA		
16671 16672 16673 16674 16675 WW%= gy essults are iender: urchase Pescription	T18 T20 T25 T26 T26 T27 T26 T26 T26 T27 T26 T27 T27 T27 T27 T28	0.36 0.27 0.32 0.32 0.32 0.32 0.30 00 grams of d on an "as diller-Garvy of Minn 11 Borlaug 5772 0002173i Xylitol W/W%	0.28 0.15 0.20 0.20 0.20 sample. is basis n in esota, Ag Hall, 19 Sorbitol W/W% nd	0.15 0.08 0.10 0.10 0.10 0.10 wless others ronomy an 91 Upper B Mannitol W/W%	2.09 1.06 1.34 1.38 vise indica d Plant Cuford Ci	0.87 0.98 0.62 0.73 0.66 Date Receiver irrelies crele, St. Paul, Date of Repo Protein Dispersibility W/W% 14.96	0.94 0.94 0.72 0.68 0.69 I: Decem MN 55108 Trypsin Inhibitor Titing 935	3.67 6.49 3.44 5.39 5.31 ber 10, 2021 1-6026 ary 22, 2022 Page 3 of 3	B A A not used U not used A A	rasil, USA		
16671 16672 16673 16674 16675 WW94= gr Results are Sender: Address: Phone: Purchase Description	T18 T20 T25 T26 T26 T27 T26 T27 T26 T27 T27 T27 T27 T27 T27 T3	0.36 0.27 0.32 0.32 0.32 0.32 0.30 0.30 0.30 0.30	0.28 0.15 0.20 0.20 0.20 sample. is "basis a rin esota, Ag Hall, 19 000 Sorbitol W/W% ad nd	0.15 0.08 0.10 0.10 0.10 0.10 wless others ronomy an 91 Upper B Mannitol W/W%	2.09 1.06 1.34 1.38 vise indica d Plant Cuford Ci	0.87 0.98 0.62 0.73 0.66 Date Receiver irrelies rele, St. Paul, Date of Repo Protein Dispersibility W/W% 14.96 14.90	0.94 0.94 0.72 0.68 0.69 I: Decem MN 55108 Trypsin Inhibitor TIU/g 935 715 888	3.67 6.49 3.44 5.39 5.31 ber 10, 2021 1-6026 ary 22, 2022 Page 3 of 3	B A A not used U not used A A not received A A not ask A A A A A A A A A A A A A A A A A A A	raál, USA		
16671 16672 16673 16674 16675 WW%= gr desults are fender: utdress: Phone: Purchase Pescription ESCL.# 16655 16657 16658	T18 T20 T25 T25 T26	0.36 0.27 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32	0.28 0.15 0.20 0.20 0.20 sample: s "basis n in esota, Ag Hall, 19 00 Sorbitol W/W% nd nd nd nd	0.15 0.08 0.10 0.10 0.10 0.10 Indexs others Mannitol W/W% ad ad ad ad ad	2.09 1.06 1.34 1.38 vise indica d Plant Cuford Ci	0.87 0.98 0.62 0.73 0.66 Date Receives renefics rele, St. Paul, Date of Repo Protein Dispersibility W/W% 14.90 14.90 14.90 14.90 14.90	0.94 0.94 0.72 0.68 0.69 I: Decem MN 55108 Trypsin Inhibitor TIUg 935 715 888 975	3.67 6.49 3.44 5.39 5.31 ber 10, 2021 1-6026 ary 22, 2022 Page 3 of 3	B A A not used U not used A A not used A A not as A A A A A A A A A A A	rasil, USA		
16671 16672 16673 16674 16675 16675 16675 16675 16675 16675 16655 16656 16657 16658	T18 T20 T25 T26 T26 T27 T26 T27 T26 T27 T27 T27 T27 T3 T4 T3 T3	0.36 0.27 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32	0.28 0.15 0.20 0.20 0.20 sample. is basis a in essota, Ag Hall, 19 000 w/w% nd nd nd nd	0.15 0.08 0.10 0.10 0.10 0.10 Mannitol W/W% nd nd nd nd nd	2.09 1.06 1.34 1.38 vise indica d Plant Cuford Ci	0.87 0.98 0.62 0.73 0.66 Date Receiver renefits Protein Dispersibility WWW 14.96 14.90 15.76 15.76	0.94 0.94 0.72 0.72 0.68 0.69 S: Decem MN 55108 Trypsin Inhibitor TIU/g 935 715 888 975 1.033 903	3.67 6.49 3.44 5.39 5.31 ber 10, 2021 1-6026 ary 22, 2022 Page 3 of 3	B A A not used U not used A A not ased A A A A A A A A A A A A A A A B B	razil, USA		
16671 16672 16673 16674 16675 16675 16675 16675 16675 16657 16657 16657 16659	T18 T20 T25 T26 T26 T26 Dr. Jill Universi Room 4 612-625 Order #: T1 T2 T3 T4 T3 T4 T5 T6 T7	0.36 0.27 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32	0.28 0.15 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.2	0.15 0.08 0.10 0.10 0.10 0.10 Wless otherwise Mannitol W/W% Md Md Md Md Md Md Md Md Md M	2.09 1.06 1.34 1.38 vise indica d Plant Cuford Ci	0.87 0.98 0.62 0.73 0.66 Date Receives cinetics role, St. Paul, Protein Dispersibility W/W% 14.96 14.96 15.97 14.20 15.76 15.76	0.94 0.94 0.72 0.68 0.69 1: Decem MN 55108 rt: Febru Trypsin Inhibitor TIU/g 935 715 888 975 1,033 903 884	3.67 6.49 3.44 5.39 5.31 ber 10, 2021 1-6026 ary 22, 2022 Page 3 of 3	B A A A not used U not used A A A A A A A A A B B U U	radil, USA		
16671 16672 16673 16674 16675 16676 16675 16675 16675 16675 16696 16697 16696 16691 16691 16691 16691 16691 16691 16691 16691	T18 T20 T25 T26 T26	0.36 0.27 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32	0.28 0.15 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.2	0.15 0.08 0.10 0.10 0.10 0.10 Mess others Tronomy an Upper B Mannitol W/W% Rd	2.09 1.06 1.34 1.38 vise indica d Plant Cuford Ci	0.87 0.98 0.62 0.73 0.66 Date Receives Ciencific Strete. St. Paul, Date of Repo Bispersibility W/W% 14.96 14.96 14.96 15.76 15.06 18.49 16.16	0.94 0.94 0.72 0.68 0.69 15: Decemmin 55100 Trypsin Inhibitor TIU/g 935 715 1,033 938 884 1,176 681	3.67 6.49 3.44 5.39 5.31 ber 10, 2021 1-6026 ary 22, 2022 Page 3 of 3	B A A A A A A A A A A B B U U U	radil, USA		
16671 16672 16674 16675 16674 16675 16674 16675 16676 16675 16676 16675 16676 16676 16675	T18 T26 T25 T26	0.36 0.27 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32	0.28 0.15 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.2	0.15 0.08 0.10 0.10 0.10 0.10 Mannitol W/W% nd	2.09 1.06 1.34 1.38 vise indica d Plant Cuford Ci	0.98 0.98 0.62 0.73 0.66 Date Receives renefics receives receive	0.94 0.72 0.68 0.69 0.69 1i: Decem MN 55108 Trypsin Inhibitor TIU/g 935 1,033 903 1,176 681 1,176	3.67 6.49 3.44 5.39 5.31 ber 10, 2021 1-6026 ary 22, 2022 Page 3 of 3	B A A A not used U not used A A A A A A A A A A A B U U U U U U U U	radil, USA		
16671 16672 16673 16674 16675 16676 16675 16675 16675 16675 16696 16697 16696 16691 16691 16691 16691 16691 16691 16691 16691	T18	0.36 0.27 0.32 0.32 0.32 0.32 0.32 0.32 0.32 0.32	0.28 0.15 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.2	0.15 0.08 0.10 0.10 0.10 0.10 Mannitel W/W% Rd	2.09 1.06 1.34 1.38 vise indica d Plant Cuford Ci	0.87 0.98 0.62 0.73 0.66 Date Receives Ciencific Strete. St. Paul, Date of Repo Bispersibility W/W% 14.96 14.96 14.96 15.76 15.06 18.49 16.16	0.94 0.72 0.68 0.69 0.69 1: Decem MN 55100 Trypsia Inhibitor ITIU/g 935 715 888 715 1,033 891 1,176 681 903	3.67 6.49 3.44 5.39 5.31 ber 10, 2021 1-6026 ary 22, 2022 Page 3 of 3	B A A A A A A A A A A B B U U U	rsdi, ISA		
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16671 16672 16673 16674 16673 16674 16673 16674 16675 16666 16670 16670 16671 16672 16675 16670 16671 16672 16671	T18 T20	0.36 0.27 0.32 0.32 0.32 0.32 0.32 0.30 0.30 0.30	0.28 0.15 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.2	0.15 0.08 0.10 0.10 0.10 0.10 0.10 0.10 0.10	2.09 1.06 1.34 1.38 vise indica d Plant Cuford Ci	0.87 0.98 0.62 0.73 0.66 Date Receives credits credits Date of Repo Protein Dispersibility WWW 14.96 14.90 15.97 14.20 15.76 15.06 18.49 16.16 16.16 16.16 16.16 16.16 16.16 16.16 16.16 16.16 16.17 17.37 18.48 12.46 14.47	0.94 0.72 0.68 0.69 1: Decemmon Stine Stin	3.67 6.49 3.44 5.39 5.31 ber 10, 2021 1-6026 ary 22, 2022 Page 3 of 3	B A A A DO USED TO SECULD TO SECUED TO SECUED TO SECULD TO SECULD TO SECULD TO SECUED	radi, USA		
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Purchase O	rder #:	00021730	000			Date of Repo	rt: Febru	ary 22, 2022	
Description	Savba	n Maal						Page 3 of 3	
Description	Soybea	iii Mieai				Protein	Trypsin	rage 5 01 5	
		Xylitol	Sorbitol	Mannitol		Dispersibility			
ESCL#	UM ID	W/W%	W/W%	W/W%		W/W%	TIU/g	Origin: A	rgentina, Brazil, US
16655	T1	nd	nd	nd		14.96	935		A
16656	T2	nd	nd	nd		14.90	715		A
16657	T3	nd	nd	nd		15.97	888		A
16658	T4	nd	nd	nd		14.20	975		A
16659	T5	nd	nd	nd		15.76	1,033		A
16660	T6	nd	nd	nd		15.06	903		В
16661	T7	nd	nd	nd		18.49	884		U
16662	T8	nd	nd	nd		16.16	1,176		U
16663	T9	nd	nd	nd		16.68	681		U
16664	T10	nd	nd	nd		14.01	903		U
16665	T11	nd	nd	nd		17.37	1,08		U
16666	T12	nd	nd	nd		16.41	917		В
16667	T13	nd	nd	nd		20.03	695		В
16668	T14	nd	nd	nd		16.67	863		A
16669	T15	nd	nd	nd		13.48	1,226		A
16670	T16	nd	nd	nd		12.46	1,046		A
16671	T17	nd	nd	nd		14.47	842		В
16672	T18	nd	nd	nd		12.98	1,159		A
16673	T19	nd	nd	nd		13.07	658		A not used
16674	T20	nd	nd	nd		18.85	1,001		U not used
16675	T21	nd	nd	nd		15.20	1,186		A
						itor units per gr ated.	ram.		
				nless otherv	vise indica	ated.	ram.		
		on an "as i	s" basis u	nless otherv Protein	vise indica	ated.	am.		
		on an "as i	s" basis u	nless otherv Protein Dispersibili	vise indico Trypsin (Inhibito)	ated.	cam.		
		on an "as i	s" basis u	nless otherv Protein	vise indica	ated.	ram.		
		on an "as i	s" basis u I ESCL #	Protein Dispersibilit W/W%	Trypsin (Inhibitor TIU/g	ated.	ram.		
		on an "as i	I ESCL #	nless otherv Protein Dispersibili	vise indico Trypsin (Inhibito)	ated.	am.		
		Summary 1.not used	s" basis u ESCL #	Protein Dispersibilit W/W%	Trypsin (Inhibitor TIU/g	ated.	am.		
		Summary 1.not used 2.not used	ESCL #	Protein Dispersibilit W/W% 13.07 18.85	Trypsin (Inhibitor TIU/g 658 1,001	ated.	am.		
		Summary 1.not used 2.not used A	ESCL # 16673 16674 16655	Protein Dispersibilit W/W% 13.07 18.85 14.96	Trypsin (Inhibitor TIU/g 658 1,001 935	ated.	am.		
		Summary 1.not used 2.not used A	ESCL # 16673 16674 16655 16656 16657 16658	Protein Dispersibilit W/W% 13.07 18.85 14.96 14.90 15.97 14.20	Trypsin (Inhibitor TIU/g 658 1,001 935 715	ated.	am.		
		Summary 1.not used 2.not used A A A	ESCL # 16673 16674 16655 16656 16657 16658 16659	Protein Dispersibilit W/W% 13.07 18.85 14.96 14.90 15.97 14.20 15.76	Trypsin (Inhibitor TIU/g 658 1,001 935 715 888 975 1,033	ated.	am.		
		Summary 1.not used 2.not used A A A A	ESCL # 16673 16674 16655 16656 16657 16658 16659	Protein Dispersibility/W% 13.07 18.85 14.96 15.97 14.20 15.76 16.67	Trypsin (Inhibitor TIU/g 658 1,001 935 715 888 975 1,033 863	ated.	am.		
		Summary 1.not used 2.not used A A A A A	ESCL# 16673 16674 16655 16656 16659 16668 16669	Protein Dispersibilit W/W% 13.07 18.85 14.96 14.90 15.97 14.20 15.76 16.67 13.48	Trypsin (Inhibitor TIU/g 658 1,001 935 715 888 975 1,033 863 1,226	ated.	am.		
		Summary 1.not used 2.not used A A A A A A	16673 16674 16655 16656 16656 16659 16668 16669 16670	Protein Dispersibility/W% 13.07 18.85 14.96 14.90 15.97 14.20 15.76 16.67 13.48 12.46	Trypsin (Inhibitor TIU/g) 658 1,001 935 715 888 975 1,033 863 1,226 1,046	ated.	am.		
		Summary 1.not used 2.not used A A A A A A A A A A	ESCL # 16673 16674 16655 16656 16657 16658 16669 16669 16670	Protein Dispersibility/W% 13.07 18.85 14.96 14.90 15.97 14.20 15.76 16.67 13.48 12.46 12.98	Trypsin (Inhibitor TIU/g 658 1,001 935 715 888 975 1,033 863 1,226 1,046 1,159	ated.	am.		
		Summary 1.not used 2.not used A A A A A A A A A A A A A A A A A A A	ESCL # 16673 16674 16655 16656 16657 16658 16669 16670 16672 16675	Protein Dispersibilit W/W% 13.07 18.85 14.96 14.90 15.97 14.20 15.76 16.67 13.48 12.46 12.98 15.20	Trypsin (Inhibitor TIU/g 658 1,001 935 715 888 975 1,033 863 1,226 1,046 1,159 1,186	ated.	am.		
		Summary 1.not used 2.not used A A A A A A A B	ESCL # 16673 16674 16655 16656 16657 16658 16669 16670 16672 16675 16660	Protein Dispersibility/W% 13.07 18.85 14.96 14.90 15.97 14.20 15.76 16.67 13.48 12.46 12.98 15.20	Trypsin (Inhibitor TIU/g 658 1,001 935 715 888 975 1,033 863 1,226 1,046 1,159 1,186 903	ated.	am.		
		Summary 1.not used 2.not used A A A A A A B B B	16673 16674 16655 16656 16657 16658 16659 16669 16670 16672 16675 16660 16660	Protein Dispersibility/W% 13.07 18.85 14.96 14.90 15.97 14.20 15.76 16.67 13.48 12.46 12.98 15.20 15.06 16.41	Trypsin (Inhibitor TIU/g 658 1,001 935 715 888 975 1,033 863 1,226 1,046 1,159 1,186 903 917	ated.	am.		
		Summary 1.not used 2.not used A A A A A A B B B B	16673 16674 16655 16656 16656 16658 16659 16669 16670 16672 16675 16660 16660	Protein Dispersibility W/W% 13.07 18.85 14.96 14.90 15.97 14.20 15.76 16.67 13.48 12.46 12.98 15.20 15.06 16.41 20.03	Trypsin (Inhibitor TIU/g 658 1,001 935 715 888 975 1,033 863 1,226 1,046 1,159 1,186 903 917 695	ated.	am.		
		Summary 1.not used 2.not used A A A A A B B B B B	16673 16674 16655 16656 16657 16658 16659 16668 16660 16670 16672 16660 16660 16667	Protein Dispersibilit W/W% 13.07 18.85 14.96 14.90 15.97 14.20 15.76 16.67 13.48 12.46 12.98 15.20 15.06 16.41 20.03 14.47	Trypsin (Inhibitor TIU/g 658 1,001 935 715 888 975 1,033 863 1,226 1,046 1,159 1,186 903 917 695 842	ated.	am.		
		Summary 1.not used 2.not used A A A A A B B B B B U	16673 16674 16655 16656 16657 16658 16659 16668 16670 16672 16675 16660 16660	Protein Dispersibilit W/W% 13.07 18.85 14.96 14.90 15.97 14.20 15.76 16.67 13.48 12.46 12.98 15.20 15.06 16.41 20.03 14.47 18.49	Trypsin (Inhibitor TIU/g 658 1,001 935 715 888 975 1,033 863 1,226 1,046 1,159 1,186 903 917 695 842 884	ated.	am.		
		Summary 1.not used 2.not used A A A A A B B B B B U U	16673 16674 16655 16656 16657 16658 16659 16668 16670 16672 16675 16666 16667 16671	Protein Dispersibilit W/W% 13.07 18.85 14.96 14.90 15.97 14.20 15.76 16.67 13.48 12.46 12.98 15.20 15.06 16.41 20.03 14.47 18.49 16.16	Trypsin (Inhibitor TIU/g) 658 1,001 935 715 888 975 1,033 863 1,226 1,046 1,159 1,186 903 917 695 842 884 1,176	ated.	am.		
		Summary 1.not used 2.not used A A A A B B B B U U U	16673 16674 16655 16656 16657 16658 16659 16668 16670 16672 16675 16660 16660 16660 16661 16661	Protein Dispersibilit W/W% 13.07 18.85 14.96 14.90 15.97 14.20 15.76 16.67 13.48 12.46 12.98 15.20 15.06 16.41 20.03 14.47 18.49 16.16 16.68	Trypsin (Inhibitor TIU/g) 658 1,001 935 715 888 975 1,033 863 1,226 1,046 1,159 1,186 903 917 695 842 884 1,176 681	ated.	cam.		
		Summary 1.not used 2.not used A A A A B B B B U U U U	16673 16673 16674 16655 16656 16657 16658 16659 16668 16670 16672 16675 16660 16666 16667 16661 16661	Protein Dispersibilit W/W% 13.07 18.85 14.96 14.90 15.76 16.67 13.48 12.46 12.98 15.20 15.06 16.41 20.03 14.47 18.49 16.16 16.68 14.01	Trypsin (Inhibitor TIU/g) 658 1,001 935 715 888 975 1,033 863 1,226 1,046 1,159 1,186 903 917 695 842 884 1,176 681 903	ated.	am.		
		Summary 1.not used 2.not used A A A A B B B B U U U	16673 16674 16655 16656 16657 16658 16659 16668 16670 16672 16675 16660 16660 16660 16661 16661	Protein Dispersibilit W/W% 13.07 18.85 14.96 14.90 15.97 14.20 15.76 16.67 13.48 12.46 12.98 15.20 15.06 16.41 20.03 14.47 18.49 16.16 16.68	Trypsin (Inhibitor TIU/g) 658 1,001 935 715 888 975 1,033 863 1,226 1,046 1,159 1,186 903 917 695 842 884 1,176 681	ated.	am.		
		Summary 1.not used 2.not used A A A A B B B B U U U U	16673 16673 16674 16655 16656 16657 16658 16659 16668 16670 16672 16675 16660 16666 16667 16661 16661	Protein Dispersibilit W/W% 13.07 18.85 14.96 14.90 15.76 16.67 13.48 12.46 12.98 15.20 15.06 16.41 20.03 14.47 18.49 16.16 16.68 14.01	Trypsin (Inhibitor TIU/g) 658 1,001 935 715 888 975 1,033 863 1,226 1,046 1,159 1,186 903 917 695 842 884 1,176 681 903	ated.	SD SD		
Results are e		Summary 1.not used 2.not used A A A A B B B B U U U U	16673 16673 16674 16655 16656 16657 16658 16659 16668 16670 16672 16675 16660 16666 16667 16661 16661	Protein Dispersibilit W/W% 13.07 18.85 14.96 14.90 15.76 16.67 13.48 12.46 12.98 15.20 15.06 16.41 20.03 14.47 18.49 16.16 16.68 14.01 17.37	Trypsin (Inhibitor TIU/g) 658 1,001 935 715 888 975 1,033 863 1,226 1,046 1,159 1,186 903 917 695 842 884 1,176 681 903 1,08	PDI	SD		
		Summary 1.not used 2.not used A A A A B B B U U U U U U	16673 16673 16674 16655 16656 16657 16658 16659 16668 16670 16672 16675 16660 16666 16667 16661 16661	Protein Dispersibilit W/W% 13.07 18.85 14.96 14.90 15.76 16.67 13.48 12.46 12.98 15.20 15.06 16.41 20.03 14.47 18.49 16.16 16.68 14.01 17.37	Trypsin (Inhibitor TIU/g) 658 1,001 935 715 888 975 1,033 863 1,226 1,046 1,159 1,186 903 917 695 842 884 1,176 681 903 1,08	PDI 16.54	SD 1.66		