

BYPRODUCT FEEDSTUFFS USED IN PACIFIC NORTHWEST ANIMAL PRODUCTION

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The ability of livestock to use byproduct feeds to produce high quality animal products for human consumption benefits agricultural industries by providing an outlet for waste products and benefits the livestock producer through a reduction in feed costs. The use of byproduct feedstuffs is especially important in the Pacific Northwest where feed costs can be high and the number of available by-products large.

Many reviews of alternative feedstuffs and their composition exist. Some of these include a Western Regional Extension Publication (1980), the tables published in Feedstuffs Reference Issue each year (2001) and publications like DePeters et al. (1999) and MacGregor's Directory of Feed and Feed Ingredients (*www.hoards.com*). These reviews serve as reference points for general nutrient values and should not be used as actual composition values. The chemical composition of a byproduct feed can vary tremendously, year to year, location to location and load to load. Additionally, changes in the manufacturing of a given byproduct can have a large impact on its composition. For example, apple pomace can be found with or without rice hulls. Without information from the supplier as to the specific process used at the plant a person considering the addition of apple pomace to a diet could incorrectly estimate the contribution of the byproduct to the diet.

The name of the byproduct does not clarify whether the information in composition tables is applicable to the actual byproduct being evaluated. Many times the product is referred to by several names and the composition given in a table is not appropriate. For example potato byproduct can consist many components from the industry including variable amounts of peel, chips and slivers, cull potatoes and clarifier.

Other considerations include the potential for chemical residues, e.g. herbicides, defoliant or pesticides, in a byproduct. Most total quality assurance management practices currently used in the livestock industries include guidelines concerning the presence of chemical residues in feedstuffs.

The purpose of this paper is to provide a summary of the composition of many of the byproducts found in the Pacific Northwest. The tables that follow are the

result of recent analysis of many of the common byproducts used and reflect the variation that can be found. Note the range of values and coefficient of variation for a single byproduct is large (Tables 1 and 2). Note also that the chemical composition of a byproduct sometimes varies greatly from state to state (Table 3). It is essential that a chemical analysis of a byproduct be conducted prior to use to ensure the diet contains the appropriate nutrient content. We have included an abbreviated list of service laboratories that conduct feed analysis (Table 4). The authors wish to acknowledge the assistance of several groups including the Animals Sciences Departments at Oregon State University, Washington State University and the University of Idaho, Agri Beef Co. and the Northeast Dairy Herd Improvement Cooperative for assistance in compiling tables.

Table 1. Chemical composition of byproduct feedstuffs found in the Pacific Northwest

	DM	CP	CF	NDF	ADF	TDN	Ca	P	Ash	Fat
Almond Hulls ^b	89.9	4.9	34.9	26.1	18.9	57	0.21	0.12		1.78
Apple Pomace ^{ab}	11.2 – 18.4	5.5 – 9.6		50.6 –	41.6 –		0.11 –	0.15 –		
Bakery Byproduct ^{abc}	83.3 – 90.8	12.8 –		66.6	59.8	69	0.42	0.17		
		14.1		6.5 – 13.3	1.9 – 7.3	89	0.16 –	0.17 –	3.27	3.01 – 9.47
Barley ^{bc}	89.9 – 91.7	11.9 –		19.2 –	6.3 – 9.2	83	0.06 –	0.35 –	2.22 – 3.33	1.52 – 2.36
		12.0		25.8			0.45	0.69		
Batter ^c	20.1 – 95.7	0.99 –	0.28 –				0.09 –	0.26 –	1.59 – 4.64	0.16 – 42.7
		2.66	3.71				0.12	0.36		
Beans ^a	8.5	20.6		35.8						
Barley Distiller's Grains, Dried	87.4	26.0		39.8	19.5					
Barley Distiller's Grains, Dehulled	93.6	35.0								
Beet Pulp ^{bc}	60.8 – 93.9	9.4 – 12		47.1 –	26.5 –	78	0.94 –	0.09 –	6.84 – 7.90	0.31 – 1.22
				52.5	27.3		1.13	0.12		
Bluegrass Seed Screening Pellets ^c	84.8	9.2 – 11.2		53.2 –	33.9 –				9.85	
				76.0	43.4					
Bluegrass Straw Pellets ^c	83.1 – 91.1	6.8 – 11.8		51.7 –	30.8 –				7.36 –	
				75.6	43.3				11.20	
Bluegrass Straw ^{bc}	78.2 – 92.2	3.3 – 9.7		66.1 –	34.7 –				4.27 – 7.72	
				82.7	47.0					
Blood Meal	90.9	98.1		2.2	0.22					
Bread ^{bc}	75.8 – 84.0	4.0 – 14.8		8.7 – 18.9	1.2 – 2.9	89	0.04 –	0.17 –	1.69	3.72 –
							0.05	0.29		43.76
Brewer's Grains ^b	93.9	17.1		22.2	11.6	71	0.13	0.47	3.59	1.64
Buckwheat ^c	87.8	15.6		18.9	13.0	75	0.31	0.46	3.50	
Canola Meal ^{abc}	89.0 – 92.2	21.8 –	9.3 –	22.3 –	15.1 –	69	0.69 –	0.54 –	7.63 – 8.27	2.39 –
		43.5	12.3	44.3	35.2		0.86	0.86		17.45
Carrots ^c	6.3	10.9		24.1	23.4	82	0.60	0.32		
Corn Distiller's	89.5	31.7		34.5	9.75					
Corn Gluten Meal ^c	90.3	69.9		6.1	7.3	84	0.09	0.45	4.43	0.37
Cottonseeds, whole ^{bc}	88 – 93.5	18.3 –	23.6	49.2 –	36.1 –	98	0.16	0.62 –	3.53 – 3.86	13.49 –
		24.1		57.5	46.3			0.67		19.41

	DM	CP	CF	NDF	ADF	TDN	Ca	P	Ash	Fat
Distiller's Grains ^{abc}	90.9 – 91.9	27.5 – 31.5	6.8	34.1 – 46.7	18.6 – 26.1	88	0.15 – 0.27	0.71 – 0.78	4.38	10.05
Feather Meal ^a	91.3	84.9	0.8							9.8
Fries ^c	28.2 – 41.4	6.35 – 9.60	1.02 – 1.97				0.02 – 0.10	0.29 – 0.38	3.78 – 5.60	16.6 – 22.9
Grain Screenings ^a	90.5	12.5	4.7	48.3	31.6		0.50	0.26	13.87	2.34
Hi-Moisture Shell Corn ^a	71.9	10.0		8.6	3.0	87	0.01	0.38		
Mill Run ^c	84.5 – 89.4	16.1 – 19.5	2.29 – 11.2				0.08 – 0.19	0.84 – 1.10	3.9 – 5.0	2.7 – 3.8
Molasses ^{ab}	70.4 – 70.6	11.7 – 39.7		0.1 – 1.5	0 – 0.7	72	0.54 – 4.7	0.08 – 3.68		
Oats ^c	90.0	13.5		20.6	9.4	77	0.52	0.40		
Potato Byproduct ^{abc}	5.1 – 55.4	5.6 – 26.8		5.5 – 48.3	5.5 – 32.9		0.05 – 0.57	0.20 – 0.32	10.17	7.04 – 14.53
Potato Slurry ^c	15.9 – 25.5	5.2 – 13.5	3.2 – 6.6				0.07 – 0.44	0.13 – 0.48	2.5 – 10.3	0.74 – 15.73
Poultry Litter ^a	93.4 – 94.7						4.01 – 4.37	1.53 – 1.75		
Ryegrass Seed Screening Pellets ^c	93.0	8.9 – 11.2		43.2 – 56.6	29.6 – 36.2				13.32	
Shelled Corn ^{ab}	89.1 – 89.5	9.3 – 9.5		6.5 – 11.7	1.9 – 3.9	86 – 88.7	0.02	0.25 – 0.32	1.25 – 1.52	3.36 – 3.52
Small Grains ^a	94.4	22.9	7.2	30.0	10.7	82	0.13	0.55		2.78
Soybean Hulls ^a	90.3	30.1		29.0	22.3	71	0.50	0.48	5.89	10
Soybeans, extruded ^b	91.4	36.1		29.6	14.1	94	0.74	1.08		
Vegetable Byproduct ^{ac}	13.7 – 16.6	23.0 – 26.5		24.4 – 28.8	9.1 – 20.7		0.41	0.40		
Wet Brewer's Grains ^{abc}	20.9 – 33.4	17.7 – 31.3	13.9	30.9 – 57.9	13.8 – 28.2	71	0.24 – 0.48	0.54 – 0.72	4.04	7.79 – 9.87
Wheat Midds ^{abc}	89.2 – 90.6	17.0 – 18.1		33.9- 39.4	10.0 – 12.1	83	0.13- 0.24	0.73 – 1.04	4.78 – 4.91	4.08 – 4.41
Wheat Silage ^b	32.7	12.5		57.3	36.6	63.3	0.43	0.27		
Wheat ^a	89.5 – 92.3	8.6 – 13.4	7.9	31.6	27.3	88	0.09	0.25		2.88
Whey ^c	9.9 – 15.3	37.4		0.57			0.47	1.09	0.39	
Yeast ^c	17.3	41.8		50.2	13.5	79	0.33	0.81	0.47	0.54

Abbreviations: DM=Dry matter; CP=Crude protein; CF=Crude fiber; NDF=Neutral detergent fiber; ADF= Acid detergent fiber; TDN=Total digestible nutrients; Ca=Calcium; P=Phosphorus; ^{abc}Data collected from ^aOregon, ^bIdaho, or ^cWashington

Table 2. Average composition of Cull French Fries (n=4)

Item	DM, %	CP, %	CF, %	EE, %	Ash, %	Ca, %	P, %	K, %
Mean	35.9	7.4	1.55	19.4	4.6	0.05	0.32	0.98
Std Dev	3.4	0.99	0.37	2.0	0.63	0.03	0.03	0.31
C.V., %	9.5	13.5	23.9	10.6	13.8	55.6	8.7	31.7
High	41.4	9.60	1.97	22.9	5.60	0.10	0.38	1.50
Low	28.2	6.35	1.02	16.6	3.78	0.02	0.29	0.37

Potato Slurry (n=60)

Item	DM, %	CP, %	CF, %	EE, %	Ash, %	Ca, %	P, %	K, %
Mean	19.8	9.1	4.72	4.2	5.25	0.16	0.26	1.07
Std Dev	2.19	2.5	0.80	2.79	2.0	0.08	0.09	0.46
C.V., %	11.0	27.2	17.3	65.4	36.7	44.8	35.3	43.5
High	25.5	13.52	6.59	15.73	10.3	0.44	0.48	2.12
Low	15.9	5.16	3.17	0.74	2.5	0.07	0.13	0.35

Poultry Litter (n=8)

Item	DM, %	Ca, %	P, %	K, %
Mean	94.0	4.19	1.64	2.21
Std Dev	0.6	0.18	0.11	0.08
High	94.7	4.37	1.75	2.29
Low	93.4	4.01	1.53	2.12

Wet Brewers Grains (n=9)

Item	DM, %	CP, %	CF, %	EE, %	Ca, %	P, %	K, %
Mean	26.6	26.0	13.93	8.83	0.31	0.59	0.11
Std Dev	3.7	4.9			0.11	0.03	0.03
High	33.4	31.3			0.48	0.66	0.13
Low	21.4	17.7			0.24	0.54	0.07

Canola Meal (n=13)

Item	DM, %	CP, %	CF, %	EE, %	Ash, %	Ca, %	P, %	K, %
Mean	90.5	33.7	9.95	7.1	7.95	0.79	0.95	1.35
Std Dev	1.2	8.4		4.47		0.07	0.28	0.13
High	92.2	43.5		17.45		0.86	1.26	1.48
Low	89.0	21.8		2.39		0.69	0.54	1.20

Whole Cottonseeds (n=6)

Item	DM, %	CP, %	CF, %	EE, %	Ash, %	Ca, %	P, %	K, %
Mean	89.2	22.5	23.63	17.5	3.86	0.16	0.62	1.24
Std Dev	1.2	1.7		1.91				
High	90.4	24.1		19.41				
Low	88.0	20.8		15.59				

Mill Run (n=13)

Item	DM, %	CP, %	CF, %	EE, %	Ash, %	Ca, %	P, %	K, %
Mean	87.1	17.4	8.99	3.3	4.6	0.12	0.96	1.17
Std Dev	1.27	0.96	1.99	0.33	3.5	0.03	0.09	0.14
C.V., %	1.5	5.5	22.2	9.98	7.6	27.8	9.74	12.8
High	89.4	19.5	11.2	3.8	5.0	0.19	1.10	1.33
Low	84.5	16.1	2.3	2.7	3.9	0.08	0.84	0.78

Potato By-Product (n=11)

Item	DM, %	CP, %	EE, %	Ash, %	Ca, %	P, %	K, %
Mean	30.3	16.2	7.04	10.17	0.36	0.26	1.40
Std Dev	25.2	10.6			0.20	0.06	1.00
High	55.4	26.8			0.57	0.32	2.40
Low	5.1	5.6			0.16	0.20	0.40

Table 3. Variation in composition by state

Item	Oregon	Idaho	Washington
Bread			
DM, %	---	84.0	75.8
CP, %	---	4.0	14.8
NDF, %	---	18.9	8.7
ADF, %	---	1.2	2.9
EE, %	---	4.38	3.78
Ca, %	---	0.04	0.05
P, %	---	0.29	0.17
Bakery Byproduct			
DM, %	88.0	83.3	90.8
CP, %	13.0	12.8	14.1
NDF, %	6.5	13.3	6.8
ADF, %	1.9	7.3	2.5
EE, %	9.5		3.0
Ca, %	0.21	0.16	0.45
P, %	0.17	0.22	0.69
Potato Byproduct			
DM, %	22.3	30.3	29.6
CP, %	10.8	16.2	7.3
NDF, %	12.9	28.4	5.5
ADF, %	9.2	20.0	5.5
EE, %		7.0	14.5
Ca, %	0.17	0.36	0.05
P, %	0.28	0.26	0.24
Apple Pomace			
DM, %	18.4	11.2	---
CP, %	9.6	5.5	---
NDF, %	66.6	50.6	---
ADF, %	59.8	41.6	---
Ca, %	0.11	0.42	---
P, %	0.17	0.15	---

Table 4. Analytical Laboratories for Feed Analyses

We make no endorsement by listing a laboratory; conversely, omission of a laboratory does not indicate that it is unsuitable. Another source for locating commercial laboratories is the yellow pages of your local telephone directory.

A & L Western Agricultural Laboratories

1311 Woodland Ave., Suite 1
Modesto, CA 95351-4732
Ph: 209-529-4080
Fax: 209-529-4736

Portland Office

10220 SW Nimbus Ave., Bldg. K-9
Portland, OR 97223
Ph: 503-968-9225
Fax: 503-598-7702

AGRI-CHECK, INC.

323 Sixth Street
PO Box 1350
Umatilla, OR 97882
Ph: 541-922-4894 or 800-537-1129

Agri-Test, Inc.

2043 Kimberly Road
PO Box 4
Twin Falls, ID 83303-0004
Ph: 208-734-2303 or 800-632-0842

AM Test, Inc.

14603 NE 87th St.
Redmond, WA 98052
Ph: 425-885-1664

Analytical Sciences Laboratory

Holm Research Center
University of Idaho
Moscow, ID 83844-2203
Ph: 208-885-7081; Fax: 208-885-8937
Website: www.academic.uidaho.edu/asl/

Antech

501 NE Thompson Mill Road
Corbett, OR 97019
Ph: 503-695-2135

Bar Diamond, Inc.

Bar Diamond Lane
PO Box 60
Parma, ID 83660-0060
Ph: 208-722-6761
Fax: 208-722-6686
Email: info@bardiamond.com
Website: www.bardiamond.com/laboratory.html

Basin Agri-Serve

22109 Stateline Road
PO Box R
Merrill, OR 97633
Ph: 541-798-5112
Fax: 541-798-5114

Braun Intertec, Inc.

PO Box 17126
5405 N. Lagoon
Portland, OR 97217-0126
Ph: 800-783-6985

Brookside Laboratories, Inc.

308 S. Main Street
New Knoxville, OH 45871
Ph: 419-753-2448
Fax: 419-753-2949

Cascade Analytical, Inc.

3019 GS Center Road
Wenatchee, WA 98801
Ph: 509-662-1888 or 800-545-4206
Fax: 509-662-8183
Email: cascade@nwi.net
Website: www.cascadeanalytical.com

Columbia Laboratories, Inc.

PO Box 40
Corbett, OR 97019
Ph: 503-695-2287

Custom Dairy Services

8895 Guide Meridian
Lynden, WA 98264
Ph: 360-354-4344

Dairy One Forage Lab

730 Warren Road
Ithaca, NY 14850
Ph: 607-257-1272

Dellavalle Laboratory, Inc.

1910 W. McKinley, Suite 110
Fresno, CA 93728-1298
Ph: 559-233-6129
Fax: 559-268-8174
Email: ndellavalle@dellavallelab.com

Food Products Laboratory, Inc.

12003 NE Ainsworth Circle
Portland, OR 97220
Ph: 503-253-9136 or 800-375-9555
Fax: 503-253-9019

Hibbs-Analytical Laboratories

2808 Cassia
Boise, ID 83705
Ph: 208-343-7830

KHDS Analytical Services

PO Box 249
Bay City, OR 97107
Ph: 503-377-2250

Kuo Testing Laboratories, Inc.

337 South First Avenue
Othello, WA 99344
Ph: 509-488-0112
Fax: 509-488-0118
Email: kuotest@atnet.net
Website: www.kuotesting.com

Laucks Testing Laboratory

940 South Harney Street
Seattle, WA 98108
Ph: 206-767-5060
Fax: 206-767-5063

MEI-Charlton, Inc.

2233 SW Canyon Road
Portland, OR 97201-2499
Ph: 503-228-9663
Fax: 503-228-4065
Email: info@meic.com
Website: www.meic.com

Northwest Laboratories of Seattle, Inc.

241 Holden Street
Seattle, WA 98108-4359
Ph: 206-763-6252
Fax: 206-763-3949
Email: info@nwlabs1896.com
Website: www.nwlabs1896.com

Northwest Agricultural Consultants

2545 West Falls
Kennewick, WA 99336
Ph: 509-783-7450

Soil Search Labs

42125 S. Morton Road
Kennewick, WA 99337
Ph: 509-585-8875
Fax: 509-586-0958
Email: soilsrch@gte.net

Soiltest Farm Consultants, Inc.

2925 Wapato Drive
Moses Lake, WA 98837
Ph: 509-765-1622
Fax: 509-765-0314
Website: www.soiltestlab.com

Stukenholtz Laboratory, Inc.

Addison Avenue East
Box 353
Twin Falls, ID 83303-0353
Ph: 208-734-3050 or 800-759-3050
Fax: 208-734-3919

Tuttle Labs

602 W. Ainsworth
PO Box 508
Pasco, WA 99301
Ph: 509-547-3422

USAg Analytical Services, Inc.

1320 E. Spokane Street
Pasco, WA 99301
Ph: 509-547-3838
Fax: 509-547-8645

Western Laboratories, Inc.

PO Box 1020
Parma, ID 83660
Ph: 208-722-6564 or 800-658-3858
Fax: 208-722-6550