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# THE FEEDING VALUE AND NUTRITIVE PROPERTIES OF CITRUS BY-PRODUCTS

## I. The Digestible Nutrients of Dried Grapefruit and Orange Cannery Refuses, and the Feeding Value of the Grapefruit Refuse for Growing Heifers.

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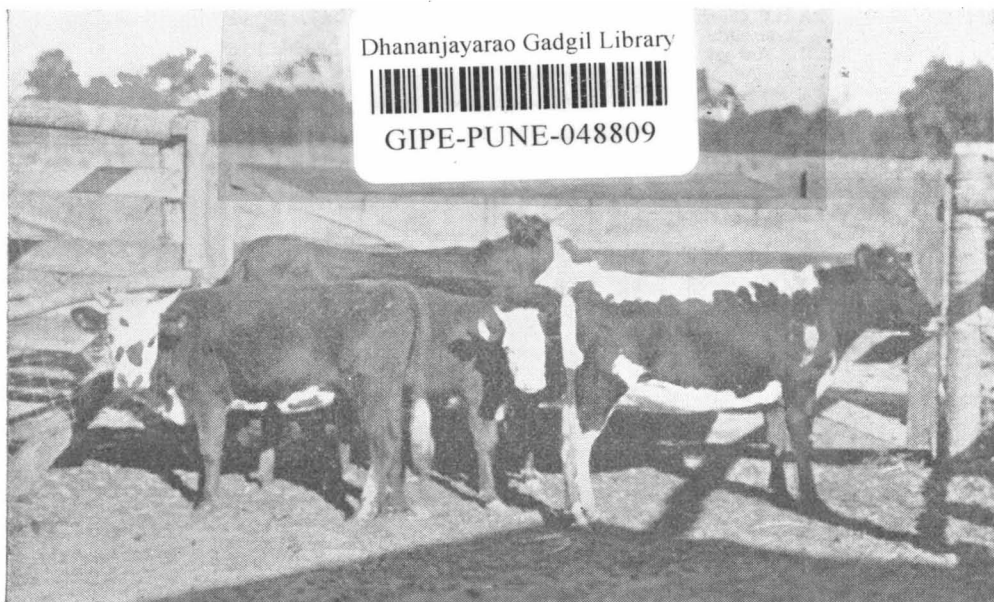


Figure 1.—These heifers show the good condition and gloss of the hair produced by 120 days on a ration of sugarcane or sorghum silage, dried grapefruit refuse, and cottonseed meal.

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## APPENDIX

TABLE A.—FEED INTAKE PER DAY OF STEERS USED IN DETERMINING THE DIGESTIBILITY OF THE BASAL RATION, OF DRIED GRAPEFRUIT CANNERY REFUSE, AND OF DRIED ORANGE PEEL.

Animal Number	Trial Number	Alfalfa Hay		Cottonseed Meal		Grapefruit Refuse		Dried Orange Peel	
		Amount pounds	Sample number	Amount pounds	Sample number	Amount pounds	Sample number	Amount pounds	Sample number
E-49 .....	21	8.0	855	1.0	856	.....	.....	.....	.....
E-50 .....	22	10.0	855	1.0	856	.....	.....	.....	.....
E-51 .....	23	10.0	855	1.0	856	.....	.....	.....	.....
E-52 .....	24	6.0	855	1.0	856	.....	.....	.....	.....
E-49 .....	25	4.0	855	1.0	1013	4.0	1014	.....	.....
E-50 .....	26	5.0	855	1.0	1013	5.0	1014	.....	.....
E-51 .....	27	5.0	855	1.0	1013	5.0	1014	.....	.....
E-52 .....	28	3.0	855	1.0	1013	3.0	1014	.....	.....
E-49 .....	33	4.0	1211	1.0	1213	.....	.....	4.0	1212
E-50 .....	34	5.0	1211	1.0	1213	.....	.....	5.0	1212
E-51 .....	35	5.0	1211	1.0	1213	.....	.....	5.0	1212
E-52 .....	36	3.0	1211	1.0	1213	.....	.....	3.0	1212

TABLE B.—THE DIGESTIBILITY OF THE NUTRIENTS OF THE ALFALFA HAY USED IN THE BASAL RATION AS DETERMINED WITH FOUR STEERS IN FOUR SUCCESSIVE FIVE-DAY PERIODS.

Animal Number	Trial Number	5-Day Period Number	Coefficients of Digestibility			
			Crude Protein	Crude Fiber	N-Free Extract	Crude Fat
			percent	percent	percent	percent
E-49	21	I	63.19	46.58	72.45	0.37
		II	63.44	39.53	69.06	-4.99
		III	64.09	33.03	79.63	-1.95
		IV	64.80	24.98	68.83	-12.70
		Average	63.88	36.03	69.11	-4.82
E-50	22	I	59.11	45.71	72.28	0.23
		II	62.86	40.00	69.51	2.01
		III	61.12	24.78	61.43	-20.62
		IV	59.45	18.90	65.86	-10.57
		Average	60.64	32.35	67.27	-7.24
E-51	23	I	62.90	47.77	73.91	-12.58
		II	63.67	49.09	72.49	12.80
		III	63.83	50.93	73.05	7.10
		IV	62.45	42.73	69.95	1.94
		Average	63.21	47.63	72.35	2.31
E-52	24	I	62.34	43.63	77.57	6.82
		II	58.69	36.15	68.18	-0.52
		III	59.32	28.45	69.78	-3.94
		IV	55.29	15.72	63.67	-12.00
		Average	58.91	30.99	69.80	-2.41
Average "I" periods.....			61.88	45.92	74.05	-1.29
Average "II" periods.....			62.16	41.19	69.81	2.32
Average "III" periods.....			62.09	34.30	70.97	-4.85
Average "IV" periods.....			60.50	25.58	67.08	-8.33
Grand average.....			61.66	36.75	69.63	-3.04

TABLE C.—THE DIGESTIBILITY OF THE NUTRIENTS OF DRIED GRAPEFRUIT CANNERY REFUSE AS DETERMINED WITH FOUR STEERS IN FOUR SUCCESSIVE FIVE-DAY PERIODS.

Animal Number	Trial Number	5-Day Period Number	Coefficients of Digestibility			
			Crude Protein percent	Crude Fiber percent	N-Free Extract percent	Crude Fat percent
E-49	25	I	-11.01	45.09	91.07	36.22
		II	17.43	20.26	90.90	57.87
		III	61.80	108.06	95.67	108.46
		IV	29.62	96.64	90.79	93.49
		Average	24.46	67.51	92.11	74.01
E-50	26	I	20.69	76.53	92.13	85.52
		II	4.37	55.94	90.32	81.27
		III	36.47	66.47	93.49	101.75
		IV	15.76	96.31	93.62	86.59
		Average	19.32	73.81	92.39	88.78
E-51	27	I	26.86	88.53	94.85	68.27
		II	34.13	60.32	91.52	61.29
		III	37.54	74.68	93.14	93.53
		IV	33.74	100.60	93.23	94.13
		Average	33.07	81.04	93.19	79.31
E-52	28	I	22.81	95.91	94.11	90.80
		II	21.57	42.19	91.64	54.44
		III	21.27	29.16	90.58	75.91
		IV	24.26	87.63	91.81	80.36
		Average	22.48	63.72	92.04	75.38
Average "I" periods.....			14.84	76.52	93.04	70.20
Average "II" periods.....			19.38	44.68	91.10	63.72
Average "III" periods.....			39.27	69.59	93.22	94.91
Average "IV" periods.....			25.85	95.30	92.36	88.64
Grand average.....			24.83	71.52	92.43	79.37

TABLE D.—THE DIGESTIBILITY OF THE NUTRIENTS OF DRIED ORANGE PEEL AS DETERMINED WITH FOUR STEERS IN FOUR SUCCESSIVE FIVE-DAY PERIODS.

Animal Number	Trial Number	5-Day Period Number	Coefficients of Digestibility			
			Crude Protein percent	Crude Fiber percent	N-Free Extract percent	Crude Fat percent
E-49	33	I	49.40	107.98	90.60	-92.42
		II	60.43	102.92	92.98	-75.91
		III	33.24	48.82	84.43	-5.12
		IV	34.13	82.99	89.40	51.65
		Average	44.30	90.18	89.35	-30.45
E-50	34	I	18.85	90.57	84.72	60.41
		II	27.14	73.63	87.29	-12.01
		III	29.19	87.81	86.35	1.56
		IV	30.47	87.65	88.21	-2.77
		Average	26.41	84.92	86.64	11.80
E-51	35	I	30.16	91.60	88.25	30.22
		II	30.83	85.74	82.65	17.25
		III	29.99	101.26	86.55	-4.14
		IV	33.86	78.82	88.09	4.00
		Average	31.21	89.36	86.38	11.84
E-52	36	I	40.04	108.51	90.84	33.99
		II	55.75	114.32	91.50	21.71
		III	51.01	116.25	93.45	48.80
		IV	30.64	105.55	90.81	28.09
		Average	44.36	111.16	91.65	33.15
Average "I" periods.....			34.61	99.67	88.60	8.05
Average "II" periods.....			43.54	98.65	88.61	-25.72
Average "III" periods.....			35.86	88.54	87.70	10.28
Average "IV" periods.....			32.28	88.75	89.13	20.24
Grand average.....			36.57	93.91	88.51	6.59

TABLE E.—THE WEIGHT AND COMPOSITION OF FECES FROM STEERS DURING DIGESTION TRIALS.

Animal Number	Trial Number	5-Day Period Number	Fresh Excreta grams	Total Crude Protein percent	Dry Matter percent	Composition of Dry Matter				
						Ash percent	Crude Protein percent	Crude Fiber percent	N-Free Extract percent	Crude Fat percent
<b>BASAL RATION</b>										
E-49	21	I	36,365	2.766	22.59	20.93	10.47	38.12	26.27	3.81
		II	36,785	2.739	23.25	15.30	10.59	41.50	28.73	3.88
		III	37,655	2.634	23.27	11.20	9.90	44.60	30.56	3.68
		IV	39,363	2.477	22.99	10.42	10.09	48.22	27.34	3.93
E-50	22	I	47,644	2.838	23.62	26.26	10.76	35.22	24.27	3.49
		II	48,141	2.758	21.11	12.48	11.40	42.93	29.39	3.80
		III	51,947	2.488	21.30	10.57	10.65	44.39	30.52	3.87
		IV	57,406	2.337	20.62	8.78	10.14	49.33	28.08	3.67
E-51	23	I	42,602	2.910	23.86	20.63	12.06	37.57	25.39	4.35
		II	43,284	2.812	21.32	14.19	12.31	40.38	29.39	3.73
		III	42,923	2.824	20.56	12.80	12.14	40.77	30.14	4.15
		IV	47,077	2.662	20.66	11.73	11.12	42.89	30.29	3.97
E-52	24	I	31,016	2.613	21.83	26.94	10.55	37.94	21.22	3.35
		II	34,917	2.507	19.13	13.75	11.09	42.59	28.97	3.60
		III	36,588	2.362	18.20	10.28	10.68	47.58	27.73	3.73
		IV	44,219	2.116	17.71	10.84	10.57	47.28	27.90	3.41
<b>BASAL RATION PLUS DRIED GRAPEFRUIT REFUSE</b>										
E-49	25	I	31,805	3.460	20.91	16.44	14.70	37.38	28.06	3.42
		II	30,636	3.175	21.14	11.75	13.54	42.54	28.98	3.19
		III	21,523	3.595	22.30	12.74	13.57	37.57	32.83	3.29
		IV	24,342	3.772	22.69	13.65	14.23	34.89	34.11	3.12
E-50	26	I	35,857	3.237	20.28	16.21	13.95	36.46	30.31	3.07
		II	42,433	2.951	18.43	15.59	14.01	37.47	30.01	2.92
		III	30,921	3.467	22.64	13.57	13.75	39.82	29.95	2.91
		IV	35,292	3.367	19.00	15.03	15.01	35.54	31.11	3.31
E-51	27	I	32,451	3.470	21.12	16.55	14.56	36.31	29.02	3.56
		II	36,441	2.978	19.96	12.37	13.73	39.47	30.96	3.47
		III	36,196	2.945	19.16	13.51	14.19	38.59	30.63	3.08
		IV	33,783	3.219	18.98	12.81	14.60	36.26	33.01	3.32
E-52	28	I	22,428	3.338	23.16	20.77	14.75	32.76	28.78	2.94
		II	23,211	3.243	20.17	11.43	13.91	40.97	30.29	3.40
		III	23,378	3.224	21.34	13.01	14.11	40.57	29.43	2.88
		IV	20,978	3.545	20.54	12.92	15.15	35.94	32.73	3.26
<b>BASAL RATION PLUS DRIED ORANGE PEEL</b>										
E-49	33	I	27,570	3.266	20.51	16.99	15.01	33.62	29.73	4.65
		II	23,944	3.593	22.40	16.44	15.59	33.82	29.34	4.81
		III	30,621	3.221	20.99	11.25	15.25	38.47	31.79	3.24
		IV	29,823	3.292	18.44	11.63	14.42	38.96	31.85	3.14
E-50	34	I	39,322	3.289	21.60	22.70	14.75	30.01	29.36	3.18
		II	38,845	3.188	19.80	15.58	15.22	35.80	29.97	3.43
		III	38,629	3.170	19.22	14.02	15.82	34.78	31.97	3.41
		IV	37,720	3.225	18.79	12.81	15.54	36.46	31.57	3.62
E-51	35	I	36,400	3.347	20.92	19.47	14.85	33.31	29.34	3.03
		II	37,883	3.204	20.78	15.38	14.83	33.12	33.61	3.06
		III	35,533	3.432	20.31	14.14	16.07	33.53	32.69	3.57
		IV	35,418	3.371	20.27	12.31	15.42	37.48	31.29	3.50
E-52	36	I	23,876	3.133	20.25	25.09	15.16	30.19	26.67	2.89
		II	19,741	3.472	20.82	14.46	16.85	34.49	30.66	3.54
		III	19,700	3.575	19.94	13.67	17.32	35.73	29.90	3.38
		IV	22,628	3.470	18.36	12.77	17.08	35.65	31.07	3.43

TABLE F.—THE COMPOSITION OF FEEDS USED IN DIGESTION AND FEEDING TRIALS.

Kind of Feed	Sample Number	Dry Matter	Composition of Dry Matter							
			Crude Protein	Crude Fiber	N-Free Extract	Crude Fat	Ash	Ca	Mg	P
		percent	percent	percent	percent	percent	percent	percent	percent	percent
Alfalfa Hay, No. 1 .....	855	92.93	14.03	33.18	43.73	1.83	7.23	1.317	0.126	0.396
	1211	90.41	15.59	35.20	39.10	1.59	8.52	1.290	.118	.225
Sugarcane Silage .....	1373	23.93	3.34	39.39	50.78	1.76	4.73	.343	.195	.181
	1374	23.32	3.27	36.98	50.68	2.46	6.61	.365	.242	.167
Sorghum Silage .....	1377	24.17	3.12	29.30	59.40	3.13	5.05	.211	.254	.175
Cottonseed Meal .....	856	93.55	41.69	12.24	32.78	7.27	6.02	.230	.172	1.097
	1014	93.44	43.74	9.00	34.27	6.60	6.39	.241	.184	1.121
	1213	89.74	43.11	11.74	30.93	7.53	6.69	.236	.187	1.208
	1375	89.62	43.22	13.33	30.03	6.81	6.61	.241	.161	1.175
	1378	91.12	41.93	14.94	29.43	7.08	6.62	.225	.147	1.149
Grapefruit Refuse .....	1013	91.77	5.38	13.01	75.84	1.16	4.61	.787	.288	.100
	1376	90.54	5.49	12.28	76.25	1.89	4.09	.689	.352	.097
	1379	89.86	5.64	11.93	75.67	1.77	4.99	.746	.378	.107
Dried Orange Peel .....	1212	86.05	6.79	12.37	75.24	0.80	4.80	.725	.252	.107

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