

NUTRIENTS IN GREEN SHOOTS OF TREES.

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The foods of browsing animals, both wild and domestic, have doubtless engaged the interest of many observers.

Especially, sheep and goats consume much of the succulent leafage of the second growths of forest trees, while the undergrowths of forest seedlings never survive the visitations of these animals, unless the species have particularly obnoxious flavors or principles.

In order to learn the comparative nutritive values in the succulent parts of some of these plants, the writer made numerous chemical analyses,¹ the results of which are given in Tables I and II.

The samples were collected between May 3d and 17th of a very "backward" season; the data therefore apply only to the first crop of shoots in the spring. Subsequent crops of shoots would doubtless vary within wide limits, dependent on moisture and other conditions. The material was collected early in the forenoon, the hour depending on the disappearance of the dew on the leaves, and only material of a certain "hardness" was taken. This "hardness" or shearing quality was taken as nearly uniformly for all samples as was possible.

Branches were cut and enclosed in an airtight case. These were immediately carried to the balance, where only the succulent shoots, i. e., new growth, was removed, and 200 gram samples were weighed out immediately. They were then placed in the sun to dry. By calculating the per cent. moisture of Table I to the moist sample and subtracting from the moisture as given in Table II, one may find the amount of water lost by drying in the sun. It will be seen that they vary from 65.9% to 81.45% in the amount of water driven off by air-drying in the sun. The time consumed in drying varied from two to five days, they being considered air-dry as soon as they would grind well in a drug mill. This mill was thoroughly cleaned after grinding each sample. The ground sample was immediately put into a bottle and tightly stoppered.

¹ Abstract from thesis, Ohio State University.

TABLE I.
PERCENTAGES CALCULATED TO AIR-DRY WEIGHT.

No.	NAME OF SPECIES.	Moisture. (Oven)	Protein. (N×6.25)	Ether Extr.	N-free Extr.	Crude Fibre	Ash.
1	<i>Tilia americana</i> L.	8.66	19.25	1.84	40.45	20.30	9.50
2	<i>Acer saccharum</i> Marsh.	8.72	16.62	2.22	49.26	17.16	6.02
3	<i>Acer saccharinum</i> L.	6.84	17.50	3.12	57.38	9.36	5.80
4	<i>Ulmus fulva</i> Michx.	7.76	27.56	2.46	38.08	15.40	8.74
5	<i>Celtis occidentalis</i> L.	6.98	28.00	2.48	36.78	15.64	10.12
6	<i>Robinia Pseudo-Acacia</i> L.	5.56	27.13	2.54	44.17	13.96	6.64
7	<i>Gleditsia triacanthos</i> L.	7.28	30.48	3.24	38.80	14.80	5.70
8	<i>Populus alba</i> L.	7.26	14.37	4.37	44.66	19.72	4.62
9	<i>Liriodendron Tulipifera</i> L.	7.44	18.81	3.44	45.48	17.23	7.10
10	<i>Fraxinus americana</i> L.	6.96	17.06	4.06	47.77	18.67	5.48
11	<i>Acer Negundo</i> L.	4.78	18.81	2.80	48.91	14.63	10.06
12	<i>Populus deltoides</i> Marsh.	5.78	16.18	4.02	49.30	16.60	8.12
13	<i>Sassafras variifolium</i> (Salisb) Ktze	8.84	25.81	4.14	44.24	10.67	6.30
14	<i>Liquidambra Styraciflua</i> L.	6.85	17.06	3.92	55.53	11.40	5.24
15	<i>Gymnocladus dioica</i> L. Koch	6.14	26.69	3.06	39.51	18.58	6.02
16	<i>Quercus alba</i> L.	6.28	17.94	3.84	45.83	21.61	4.50
17	<i>Quercus rubra</i> L.	5.52	19.25	3.82	42.42	24.29	4.70
18	<i>Fagus grandifolia</i> Ehrh.	5.04	16.69	3.82	47.35	19.26	4.84
19	<i>Platanus occidentalis</i> L.	4.96	22.75	2.83	44.28	18.44	6.74
20	<i>Morus rubra</i> L.	5.68	28.00	3.54	39.96	12.54	10.28
21	<i>Betula alba</i> , var. <i>papyrifera</i> Spach.	4.62	17.06	5.80	51.30	12.82	5.40
22	<i>Prunus serotina</i> Ehrh.	5.04	19.69	5.43	54.72	9.54	5.58
23	<i>Catalpa speciosa</i> Warder.	3.70	26.25	3.44	47.94	12.06	6.64
24	<i>Populus tremuloides</i> Michx.	4.62	22.75	8.41	46.19	13.71	4.32
DRY FEEDS (Wolfe*).							
	Red clover.....	16.5	13.5	2.9	37.1	24.0	6.0
	Peas (bloom).....	16.7	14.3	2.6	31.2	25.2	7.0
	Timothy.....	14.3	9.7	3.0	45.8	22.7	4.5
	Leaf feed.....	16.0	10.5	3.0	49.3	14.2	7.4
	Poplar leaves.....	16.0	10.8	8.7	39.6	17.4	7.5

*Wolfe, Emil; Landwirtschaftliche Fütterungslehre, 3rd Ed.

TABLE II.
PERCENTAGES CALCULATED TO GREEN WEIGHT.

No	COMMON NAME.	Moisture. (Air+Oven)	Protein. (N×6.25)	Fat.	N-free Extract.	Fibre. (Crude)	Ash.
1	Basswood.....	77.71	4.63	.44	9.86	4.95	2.31
2	Sugar maple.....	75.40	4.47	.59	13.27	4.62	1.62
3	Soft maple.....	68.23	5.96	1.06	19.56	3.19	1.97
4	Red elm.....	79.10	6.24	.56	8.62	3.48	1.97
5	Hackberry.....	79.20	6.25	.55	8.22	3.49	2.26
6	Black locust.....	76.15	6.85	.64	11.15	3.52	1.67
7	Honey locust.....	77.88	7.19	.77	9.25	3.52	1.35
8	White poplar.....	71.71	4.38	1.33	13.62	6.01	2.93
9	Tulip tree.....	80.88	3.88	.81	9.39	3.55	1.46
10	White ash.....	76.60	4.29	1.02	12.00	4.69	1.36
11	Box elder.....	80.61	3.80	.56	9.90	2.96	2.03
12	Cottonwood.....	73.94	4.47	1.11	13.63	4.47	2.24
13	Sassafras.....	82.31	5.00	.80	8.58	2.07	1.22
14	Sweet gum.....	75.64	4.46	1.02	14.52	2.98	1.37
15	Ky. coffee tree.....	82.54	4.95	.56	7.34	3.45	1.12
16	White oak.....	68.13	6.00	1.29	15.58	7.35	1.43
17	Red oak.....	75.86	4.91	.97	10.83	6.20	1.20
18	Beech.....	72.69	5.66	1.03	13.61	5.53	1.39
19	Sycamore.....	77.04	5.49	.68	10.69	4.45	1.62
20	Mulberry.....	82.08	5.31	.67	7.58	2.38	1.95
21	Birch.....	70.86	5.21	1.77	16.58	3.91	1.64
22	Wild cherry.....	70.51	6.11	1.68	16.99	2.96	1.73
23	Catalpa.....	82.13	4.86	.63	8.89	2.23	1.23
24	American aspen.....	71.18	6.87	2.54	13.95	4.14	1.38
*WOLFE'S DATA.							
	Meadow grass.....	80.0	3.5	.8	9.7	4.0	2.0
	Timothy grass.....	70.0	3.4	1.1	16.3	8.0	2.2
	Clover (bloom).....	80.4	3.0	.6	8.9	5.8	1.3
	Peas (bloom).....	81.5	3.2	.6	7.6	5.6	1.9
	Beans (bloom).....	87.3	2.8	.3	5.1	3.5	1.0
	Poplar leaf.....	55.0	5.8	4.6	21.3	9.3	4.0

*Wolfe, Emil: Loc. cit.

These ground samples were subjected to analysis according to the method of the A. A. O. A. C. for feed stuffs. In order to compare with other similar feeds, data from the Analyses of Wolfe¹ are added at the bottom of each table. The figures in all cases represent per cent., those in Table I being calculated to sun-dry sample, while those in Table II are calculated to green weight as collected.

From these tables it will be seen that these shoots compare very favorably with the other green feeds usually fed, and especially numbers 4, 5, 6, 7, 16 and 22 show a favorable protein content. By the aid of such data, it should not be difficult to explain why animals can live almost indefinitely on such food, while in the dry condition they compare favorably with most of the common concentrates fed to stock. The leguminous species No. 6 and No. 7, as well as others, are of especial interest in this connection.

Wolfe uses a digestion coefficient which varies from approximately 55% to 70% for the various valuable constituents. Doubtless these, too, would show a high degree of digestibility.

No determinations of the amids have been made as yet, nor have the shoots of later dates in the season been used. These two points, along with an investigation of the nitrogen-free extract now in progress may be embodied in a later report.

¹ Loc. cit.