CHEMICAL COMPOSITION OF CASTOR BEAN OIL FROM SEED GROWN IN OKLAHOMA

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The analyses reported in this paper are of oil taken from seven varieties of castor beans each grown at five locations included within the central, northern, and western parts of the state (one sample was from a sixth location).

The purpose of these analyses was to compare the quality and yield of oil produced in Oklahoma with that produced elsewhere, and to make similar comparisons for different locations within the state. In addition, it was desired to secure similar data for various varieties.

METHODS

Ether extract: This value was secured by extracting in duplicate two-gram dried samples of the decorticated seeds with petroleum ether (Skellysolve F) in a drip extractor until the loss in weight on re-extraction was negligible. The values given in the tables for whole seeds disregarded the oil content of the testa since this was found to be less than one per cent. The samples were finely chopped for the first extraction and then reground before the second extraction.

The percentage of moisture was secured from the loss in weight of the two-gram samples in the fat tubes after drying over night at 105° C. Data in the tables are for the air-dry samples only.

Oil for analysis: The oil was cold pressed from the seeds in a Carver hydraulic press using the large cylinder that gave approximately 5,000 pounds per square inch of pressure. After pressing, the oil was centrifuged to remove suspended matter and then mixed with kaolin and filtered using suction. The filtered oil was clear and only faintly yellow when fresh but darkened on standing. These samples were used in determining the oil constants.

The methods of analyzing the oil were essentially those given in the A.O.A.C. (1940). The Hanus method for securing the iodine number was used because of its simplicity and the keeping quality of the solution. The directions were followed as given for the saponification number. However, for the acetyl value only 30 ml of oil were used in place of the 50 ml called for. The refractive index was secured with an Abbe refractometer at 40° C.

RESULTS

A summary of the data in the tables shows that there is little varietal difference and little difference in the content and quality of oil due to the edaphic or climatic factors found in various parts of Oklahoma. The variety U. S. No. 7 was consistently slightly lower in oil than the other varieties and oil yields on all varieties at Woodward were slightly higher. The high oil content (comparatively) at Woodward is noteworthy since other oil bearing seeds raised in this vicinity run below the national average (soybean and safflower).

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CONCLUSIONS

The value and quality of oil from castor bean seed grown in Oklahoma is the equal of any recorded in the literature. Accordingly it should fully meet the requirements of industry in this country. Furthermore any section of this state (among those tested) will grow castor beans with an oil content of as good quality and quantity as any other sections. From the same standpoint one variety is as good as another, with the possible exception of U. S. No. 7.

LITERATURE CITED

Association of Official Agricultural Chemists. Official and tentative methods of analysis. 5th ed. 757 p. 1940.

Jamieson, G. S. 1932. Vegetable fats and oils. 444 p. New York: Chemical Catalog Co., Inc.

TABLE I

A comparison of the chemical constants of castor bean oil from seed grown in Oklahoma and the average values from those grown in other regions as given by Jamieson (1932)

	Oklahoma	Jamieson
Decorticated seed %	75.2 — 79.9	70.0 — 80.0
Ether extract (oil) %	47.0 — 55.8	35.0 — 55.0
Refractive index	1.4720— 1.4733	1.4659— 1.4730
Saponification No.	178.9 —183.1	177.0 —187.0
Acetyl value	143.3 —152.1	143.0 —150.0
Iodine Number	80.0 — 85.9	82.0 — 90.0

TABLE II

A comparison of the chemical constants of oil taken from several varieties of castor beans each grown at different locations in Oklahoma (1941)

Location	Decorticated Seed		Ether Extract		Oil Analyses *b*			
	%	H_2O %	Decorticated Seeds	Whole *a* seeds	Ref. index	Sap. No.	Acetyl value	Iodine No.
Conner (Mo. seed)								
Stillwater	78.2	5.74	63.57	49.76	1.4724	179.34	150.17	82.02
Stillwater	78.0	4.41	63.79	49.75	1.4722	180.50	147.79	83.38
Perkins	78.5	6.23	63.74	50.04	1.4725	180.29	148.97	82.86
Arapaho	77.9	4.56	65.61	51.11	1.4725	180.70	146.54	83.36
Cherokee	78.9	4.96	62.29	49.15	1.4726	181.00	146.00	80.01
Greenfield	78.7	5.17	63.87	50.25	1.4727	180.13	148.84	82.43
Woodward	77.3	4.70	67.32	52.04	1.4730	180.36	148.68	81.68
Average	78.2	5.11	64.31	50.35	1.4726	180.33	148.14	82.25
Doughty No. 11								
Stillwater	76.3	4.33	63.90	48.76	1.4721	180.21	148.47	83.08
Perkins	76.6	6.80	66.61	51.07	1.4726	181.96	146.48	83.06
Cherokee	77.6	5.48	61.96	48.09	1.4724	180.69	145.93	83.04
Greenfield	77.0	4.76	62.32	48.02				
Woodward	77.0	3.97	69.68	53.58	1.4725	180.37	148.75	84.28
Average	76.9	5.07	64.89	49.90	1.4724	180.81	147.41	83.37
U. S. No. 7								
Stillwater	76.5	4.31	62.59	47.88	1.4720	179.77	148.70	82.68
Perkins	76.9	6.18	64.25	48.31	1.4716	183.13	146.44	82.79
Cherokee	78.1	5.18	60.18	47.01	1.4723	180.87	145.34	83.10
Greenfield	76.2	5.31	62.56	47.75	1.4730	179.75	147.75	83.13
Woodward	76.4	3.83	61.82	47.24	1.4730	180.51	146.05	82.46
Average	76.8	4.96	62.28	47.64	1.4724	180.81	146.86	82.83

a These values were secured by calculation using the decorticated percentages given in this table.
b Run on cold pressed oil.

TABLE II

A comparison of the chemical constants of oil taken from several varieties of castor beans each grown at different locations in Oklahoma (1941)

Location	Decorticated Seed		Ether Extract		Oil Analyses [b]			
	%	H_2O %	Decorticated Seeds	Whole [a] seeds	Ref. Index	Sap. No.	Acetyl value	Iodine No.
Kentucky No. 38								
Stillwater	76.4	4.64	62.20	47.52	1.4730	179.97	147.66	83.57
Perkins	76.3	5.55	64.59	49.29	1.4726	179.75	147.72	83.37
Cherokee	77.6	4.82	62.52	48.52	1.4730	180.63	145.59	83.56
Greenfield	76.3	4.81	64.22	49.00	1.4730	181.33	147.09	84.03
Woodward	75.6	5.19	64.07	48.44	1.4728	178.94	149.23	83.61
Average	76.4	5.00	63.52	48.55	1.4729	180.12	147.45	83.51
Conner (Texas seed)								
Stillwater	78.8	4.35	63.94	50.38	1.4728	178.92	147.98	85.93
Perkins	77.7	6.04	65.00	50.51	1.4729	180.26	149.25	82.94
Cherokee	78.8	5.03	63.21	49.81	1.4733	181.76	145.09	83.65
Greenfield	79.5	5.05	66.02	52.49	1.4729	181.74	146.89	84.32
Woodward	77.5	3.84	69.92	54.12	1.4728	180.50	148.02	83.36
Average	78.9	4.86	65.62	51.46	1.4729	180.64	147.45	84.04
U. S. No. 4								
Stillwater	77.9	5.52	64.17	49.99	1.4730	179.17	146.98	83.50
Perkins	76.9	6.38	63.25	49.54	1.4730	180.70	147.52	83.60
Cherokee	78.0	4.69	61.87	48.26	1.4721	181.66	143.31	84.04
Greenfield	77.4	4.88	65.61	50.78	1.4728	179.93	146.78	83.81
Woodward	77.7	4.46	63.46	49.31	1.4725	180.63	145.53	83.47
Average	77.6	5.19	63.67	49.58	1.4727	180.42	146.02	83.68
San Benito								
Stillwater	79.9	5.81	63.94	49.81	1.4728	179.07	150.81	82.91
Perkins	77.2	5.54	66.67	51.47	1.4729	179.49	150.47	82.84
Cherokee	78.9	4.64	62.72	49.49	1.4726	181.37	143.96	83.37
Greenfield	78.8	5.20	63.08	49.69	1.4729	179.24	149.35	83.55
Woodward	78.0	3.66	69.41	54.14	1.4730	180.49	150.47	83.54
Average	78.2	4.97	65.16	50.92	1.4728	179.93	149.01	83.24

[a] These values were secured by calculation using the decorticated percentages given in this table.
[b] Run on cold pressed oil.

TABLE III

An average of the oil analyses of several varieties of castor beans grown at different locations in Oklahoma (1941)

Decorticated Seed		Ether Extract		Oil Analyses [b]			
%	H_2O %	Decorticated Seeds	Whole [a] Seeds	Ref. Index	Sap. No.	Acetyl Value	Iodine No.
			Stillwater				
77.6	4.89	63.51	49.23	1.4725	179.62	148.57	83.38
			Perkins				
77.2	6.10	64.87	50.03	1.4725	180.80	148.12	83.07
			Cherokee				
78.3	4.97	62.11	48.61	1.4726	181.14	145.03	82.97
			Greenfield				
77.7	5.03	63.95	49.71	1.4728	180.35	147.78	83.54
			Woodward				
77.07	4.23	66.53	51.27	1.4728	180.26	148.10	83.11

[a] Run on cold pressed oil.

[b] These values were secured by calculation using the decorticated percentages given in this table.