Much more important to the manufacturer and to the consumer is the organoleptic alteration of different oils and fats not attributable to rancidity. Methods are known for inhibiting the effect, but much work remains to establish the reason for and the absolute means of overcoming it.

REFERENCES

1. Davies, W. L., J. Dairy Research *3*, 254-63 (1932).
2. King, Roschen, and Irwin, Oil and Soap *10*, 105-9 (1933).
3. Royce, H. D., Oil and Soap, *10*, 123-5 (1933).
4. King, Roschen, and Irwin, Oil and Soap, *11*, 204-7 (1934).
5. Robertson and Campbell, Oil and Soap *12*, 234-6 (1935).
6. Wiesehahn, C. A., Food Industries, *7*, 222-3, 275-6 (1935).
7. Roadhouse, C. L., Associated Bulletin (Inter. Assoc. Milk Dealers), *32*, 161-4 (1939).
8. Barnicoat and Palmer, New Zealand Dept. Scientific Industrial Research Annual Report, *13*, 21 (1939).
9. Greenbank and Holm, Industrial and Engineering Chem., *26*, 243 (1934).
   Greenbank and Holm, Industrial and Engineering Chem., *25*, 167 (1933).
   Greenbank and Holm, Industrial and Engineering Chem., *33*, 1058-60 (1941).
10. Coe and LeClerc, Cereal Chemistry, *9*, 519-22 (1932).
    Coe and LeClerc, Oil and Soap *15*, 230-6 (1938).
    Coe and LeClerc, Oil and Soap, *16*, 146-7 (1939).
    Coe and LeClerc, Oil and Soap, *18*, 241-7 (1941).
11. Gudheim, A. R., Oil and Soap *20*, 197-201 (1943).
12. Barton and Davies, Journal of the Society of Chem. Ind. *58*, 189-93 (1939).

Typha (Cattail) Seed Oil

J. R. CLOPTON and R. W. VON KORFF

Northern Regional Research Laboratory[1]

Peoria, Illinois

TYPHA is an ancient name for plants of the cattail or Reed Mace family (Typhaceae). Cattails are well known throughout North America, Europe, and Asia. About 17 different species are known, two of which are fairly common in the United States. They are *Typha latifolia* Linn, which is the common cattail growing in marshlands throughout the temperate regions of North America, and *Typha angustifolia* Linn, which occurs less frequently and is found mainly in the eastern coastal area. These two species may be distinguished from each other by the difference in width and shape of their leaves. *T. latifolia* has leaves ¾ to 1 inch broad while *T. angustifolia* has narrow leaves, ¼ to ½ inch wide, that are somewhat convex on the back. *Typha angustata* Linn is a species of cattail well known in the Orient, called "Pu-hwang."

Typha seeds are light brown in color and are very small, being approximately ¼ to ½ mm. thick and 1 to 1½ mm. long, tapering to a point at each end.

Composition of Seed and Oil

In view of the fact that considerable amounts of Typha seeds accumulate as a result of the use of cattail head fibers in industry, investigations regarding possible uses of the seed have been undertaken at this laboratory and elsewhere.

A review of the literature revealed two reports of work on Typha seed oil, both in Japanese journals (1, 2). Kimura (1) found seeds of the species *T. angustata* to contain 10% oil and reported palmitic and stearic acids. He also reported a typhasterol in the unsaponifiable matter. Later Sinozaki and Takumi (2) reported a number of characteristics of *T. angustata* seed oil as shown in Table I. They claim to have obtained 20% of oil from seeds of *T. angustata.*

Data collected as a result of studies at this laboratory on the oil extracted from seeds of *T. latifolia* are reported in Table I. The oil content of these seeds,[2] determined by petroleum ether extraction, was found to be 17.9% by weight.

Production

According to recent surveys, approximately 500,000,000 pounds of cattails, not including stems, are available annually in the United States.

[1]One of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture.

Cattail processing plants, with a capacity to handle in excess of 1,500,000 pounds of raw material annually, are being operated in Minnesota and Wisconsin. The fluffy, fibrous portion of the cattail head has been found suitable for use in the manufacture of numerous insulation and shock absorption materials. The seeds account for 35 to 40% of the total weight. With present capacity 600,000 pounds of seed are produced annually, with a possible yield of about 100,000 pounds of oil.

TABLE I.

Composition and Properties of Typha Seed Oil

Characteristics	*T. angustata* (Sinozaki and Takumi)	*T. latifolia*	
		Oil	Acids
Density	$0.9256^{25°/15°}$		
Refractive index	$1.4740^{25°}$	$1.4730^{29.5°}$	
Acid number		30.7	
Saponification value	193.96	186.0	
Iodine value	130.8	141.6[1]	143.8[1]
Acetyl value		10.8	
Reichert-Meissl value	0.22		
Polenske value	0.42		
Unsaponifiable matter, %	3.64	2.52[2]	
Thiocyanogen value		79.8[3]	81.6[3]
Linoleic acid, % (by isomerization)		69.2[4]	69.6[4]
Linolenic acid, % (by isomerization)		0.12[4]	0.20[4]
Linoleic acid, % (by CNS analysis)		69.5[3]	73.6[3]
Oleic acid, % (by CNS analysis)		14.2[3]	11.6[3]
Saturated acids + unsaponifiable, % (from CNS analysis by difference)		12.0	14.8

[1]A.O.C.S. 30-minute Wijs.

[2]A.O.C.S. procedure.

[3]A.O.C.S. 24-hour, 0.2 N$(CNS)_2$ solution.

[4]Quantitative Spectral Analysis of Fats. J. H. Mitchell, Jr., H. R. Kraybill, and F. P. Zscheile, Ind. Eng. Chem. Anal. Ed. *15*, 1, 1943.

Analysis of Typha seed revealed the following percentage composition:

ANALYSIS OF TYPHA SEED*

Components	Percentage by weight
Moisture and volatile matter at 100° C.	9.0
Crude protein (N x 6.25)	19.8
Crude fat	17.2
Ash	3.5
Crude fiber	15.5
Nitrogen-free extract	35.0
Total carbohydrates	50.5

*Data submitted by Mr. Harold Hamley, Burgess-Manning Company, Chicago, Illinois.

It is apparent from the above figures that present production facilities are consuming less than 1% of the cattails shown by the surveys to be available. It is clear that these figures allow for the entry of other firms into the processing of cattails. In the event all available cattails were to be processed each year, approximately 200,000,000 pounds of seed would be acquired. From this seed about 34,000,000 pounds of oil and approximately 166,000,000 pounds of extracted meal could be obtained.[2] The size of the seed may present some difficulties in extraction on a commercial scale.

Possible Uses

The relatively high linoleic acid content of Typha seed oil suggests that it may find use as a drying oil. Its drying properties could be improved by various treatments well known by the protective coating industries. Also it may be well suited for use in the manufacture of alkyds where the high acid value would not prove a disadvantage.

It was found that Typha seed oil has an unusually high acid number even though the value was determined on freshly extracted oil. The reason for the high acid number of this oil has not been determined. While it may be a normal condition in the oil, it may quite possibly be due to the weathering conditions to which the seeds are usually exposed before being harvested. Most of the cattails now being processed are harvested by hand during the winter when the marshlands are frozen and workmen can gain access to the plants. The seeds are therefore exposed to severe weather conditions, and, being very small, they afford little natural protection to the oils contained therein. A high acid number indicates that relatively high refining losses would occur during alkali refinement of Typha seed oil for edible purposes or other uses requiring a refined oil. It seems likely however, that sufficient uses could be found for this oil to make its production worthwhile.

Typha seeds have been used successfully as a cattle and chicken feed. The crushed and extracted seed meal might well be used for edible purposes. It is fairly rich in proteins and contains ample quantities of carbohydrates. In fact, its high carbohydrate content might make it a valuable source of starch and sugars.

[2]Courtesy of Mr. Harold Hamley, Burgess-Manning Company, Chicago, Illinois.

REFERENCES

1. Kimura, Y., Chinese Drug, "Pu-hwang." J. Pharm. Soc. Japan *50*, 843-50 (1930). C. A., *25*, 172 (1931).
2. Sinozaki, Y. and Takumi, S., "Puhwang" Seed Oil. J. Agr. Chem. Soc. Japan *17*, 553-8 (1941). C. A. *36*, 4361 (1942).

Use of Modified Rosins in Soap

B. S. VAN ZILE * and J. N. BORGLIN
Hercules Experiment Station
Hercules Powder Company, Wilmington 99, Delaware

WE have been unable to discover when and by whom rosin was first used in soap, but we all know that rosin has been used in the making of soap for a great many years. In the early days of its industrial use it was all gum rosin from the turpentine farms and seems to have been of poor quality. However, it did make possible the production of soap from some fats that would otherwise have been unfit for the making of soap. As time went on, the production of rosin came under better control and it was possible to grade the product according to color. But even then the control of quality was not too exact because of crude methods of production, and it required an expert properly to grade the material.

With the advent of wood rosin into the field, there became available rosins whose characteristics could be quite accurately controlled because of the solvent processes used in refining. However, even these rosins left something to be desired. While the addition of rosin increases the rate of solubility of soap made of high-titer fat and gives a soap that will lather freely, rosin still has some disadvantages when used in certain types of soap where color is important. Chief of these disadvantages is its susceptibility to oxidation with a consequent darkening of the color of the soap. Even a soap made from X grade rosin, while perfectly white when fresh, will darken to a brown color with age.

Knowing the beneficial properties that rosin imparts to soap but also realizing its inherent shortcomings, a number of chemists have been working for several years on the production of modified rosins that would retain the desirable properties and eliminate or mitigate the undesirable ones. We believe this end has been largely achieved in the production of certain modified rosins. It has been found that these modified rosins have properties peculiar to themselves and which can be advantageous when properly used in soap.

* Chairman, Committee D-12 on Soap and Other Detergents of the American Society for Testing Materials.

[1] Presented at 19th annual fall meeting of the American Oil Chemists' Society, Chicago, Nov. 7-9, 1945.

IT is the purpose of this paper to point out wherein these modified rosins differ from ordinary rosin and the advantages they offer when used as an ingredient in soap. A great deal of attention has been given to the improvement and stabilization of the color of rosin. To do this color bodies must be removed or destroyed and the rosin rendered less susceptible to oxidation. This can be accomplished by hydrogenation, dehydrogenation, or polymerization.

The tendency for rosin to oxidize with the resulting formation of color bodies is due to the presence of two ethylenic linkages, or double bonds. While these double bonds are quite readily oxidized, they also respond to hydrogenation. And whereas oxidation promotes color formation, hydrogenation destroys color bodies and makes their subsequent formation more difficult.

When the lighter grades of wood rosin are hydrogenated, the product is a clear, very light amber-colored solid that is quite difficult to oxidize. The rate of oxygen absorption will be discussed after dehydrogenated and polymerized rosins have been considered.