An Investigation of the Oil From the Seed of Sebastiana Lingustrina[1]

D. P. HANKS and W. M. POTTS, Agricultural and Mechanical College of Texas, College Station, Texas

THE shrub, *Sebastiana lingustrina,* is a native of the Southern United States. Small (6) stated that it is found from Georgia to Louisiana; however, the plants that this investigator found were located along the Neches River in East Texas and in the swampy lands near Diboll, Texas. This shrub is found only along stream banks and in marshy areas.

The plant grows to a height of five to six feet. It flowers in late May or early June, and the fruit begin to ripen in the middle of July. The fruit are three-lobed capsules, from five to eight millimeters in diameter, containing a seed in each lobe. When the fruit are ripe, the capsule bursts, and the seed are scattered. The seed vary from three to five millimeters in length.

Sebastiana lingustrina is of the order *Euphorbiaceae.* Since *Stillingia sebifera* is of the same order and bears seed similar to those of *Sebastiana lingustrina* and yields a good drying oil (5), it was thought advisable to investigate the oil from *Sebastiana lingustrina.*

Experimental Procedure

The procedure of Potts and Bolley (4) was used to separate the oil from the seed. The seed were cracked in a roll mill and processed again in the roll mill with the rolls set closer in order to pulverize the kernels. However the rolls were not set close enough to press out any of the oil. "Skellysolve F," a medium boiling petroleum ether, was used to extract the oil from the seed.

The methods of the Association of Official Agricultural Chemists were used for the determination of the characteristics shown in Table I.

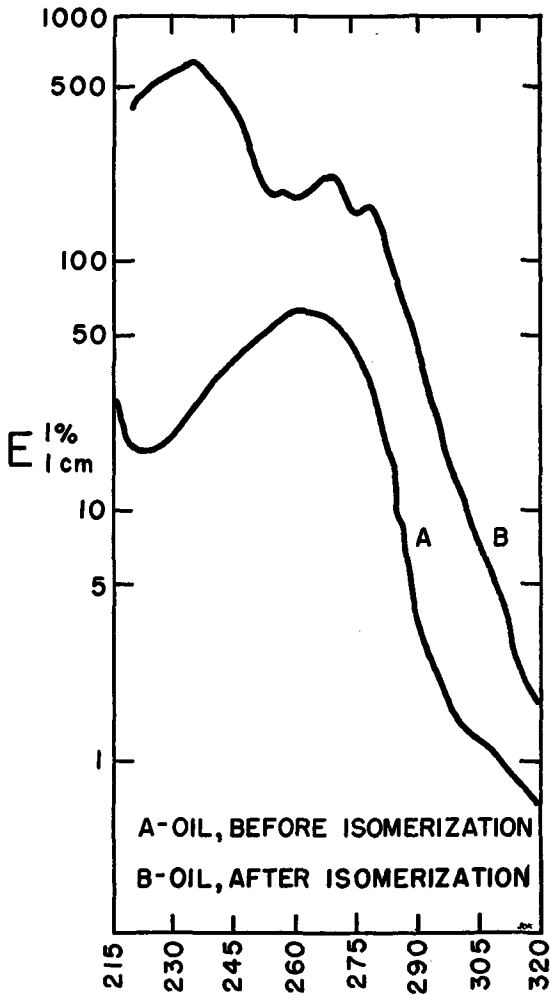
TABLE I

Characteristics

Constant	*Sebastiana lingustrina*
Refractive index @ 20°	1.4850
Specific gravity @ 25°	0.9347
Iodine value	191
Acid value	3.6
Acetyl value	15.4
Unsaponifiable residue	0.76%
Reichert-Meissl value	0.74
Polenske value	0.14
Saturated acids (%)	4.2
Unsaturated acids (%)	90.3
Saponification value	204.9
$E^{1\%}_{1cm.}$ @ 268 mμ	225
$E^{1\%}_{1cm.}$ @ 234 mμ	630

The methyl esters were prepared by interesterification, using the method of Norris and Terry (3). The esters of the saturated fatty acids were separated from the esters of the unsaturated fatty acids by the method of low temperature crystallization as described by Brown (2). A 10% solution of the fatty acid esters in acetone was placed in a well-insulated container with dry ice and acetone around it to keep

[1] Presented at the Spring Meeting, 1950, of the American Oil Chemists' Society in Atlanta, Ga. From the thesis of D. P. Hanks, submitted in partial fulfillment of the requirements for the M.S. degree at the Agricultural and Mechanical College of Texas.



OIL OF *SEBASTIANA LINGUSTRINA.*

FIG. 1. Ultraviolet absorption of oil of *Sebastiana lingustrina.*

the temperature at −25° to −30° C. The solution was kept at this temperature for a minimum of eight hours with constant stirring. The precipitate contained the saturated esters and the filtrate, the unsaturated esters. The acetone solution was filtered directly from the cooling bath with a modified inverted Buchner funnel, which had been previously cooled to the temperature of the bath.

The saturated fatty esters and the unsaturated fatty esters were fractionated on a Todd column. The iodine value of each fraction was determined as well as a spectrophotometric analysis to determine the components present. The ultraviolet absorption was also determined on the original oil and the alkali isomerized oil. The fractions were isomerized, or conjugated, by the method of Brice and Swain (1), using 11% potassium hydroxide in glycerol for a period of 30 minutes. The fractions thus treated were dissolved in spectral grade methanol and the light absorption determined against a blank, using a Beckman D U

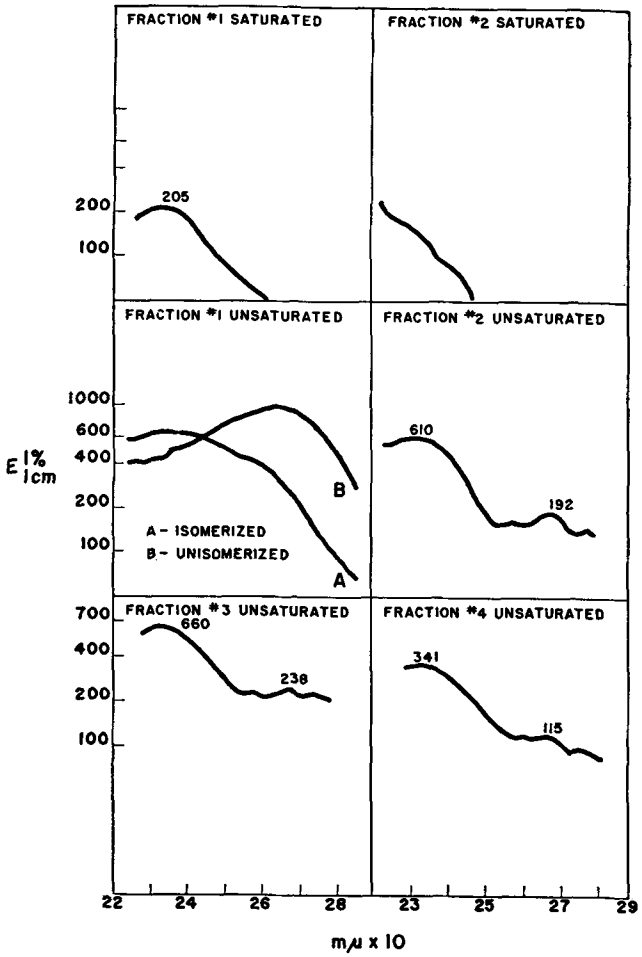


FIG. 2. Ultraviolet absorption of fractions. Run No. 1.

spectrophotometer. The mono-unsaturated acids are calculated as oleic acid, the diene as linoleic acid, and the triene as linolenic acid.

Discussion

From 1.77 kg. of seed 0.658 kg. of oil were obtained. Thus the seed contain about 37% oil, a value which is probably low since it was noted that many of the seed were immature and others had no kernels.

The ultraviolet absorption obtained on the original oil shows a single peak at 268 mμ. This peak suggests the presence of a diene in conjugation with the carboxyl group. From the spectrographic data on the fractions it was noted that the unknown constituent occurs in the lowest boiling fraction of the unsaturated portion of the esters. It was also noted that conjugation was destroyed upon alkali conjugation. The iodine value on this fraction is not significant since conjugated systems do not add iodine in the same ratio as non-conjugated systems. An equivalent weight determination on this fraction showed a weight of 193 which would indicate it is a 12-carbon acid. Also from personal correspondence with B. A. Brice and experimental work done by R. T. Holman of the A & M College of Texas the peak at 268 mμ on the unisomerized oil indicates the presence of a diene in conjugation with the carboxyl group. At this time the investigator only postulates that this unknown constituent is 2,4-dodecadienoic acid; however further work must be done to substantiate it.

The ultraviolet absorption on the conjugated oil shows the presence of 42.2% linoleic acid and 43.4% linolenic acid. These values are somewhat higher than the values obtained from the individual fractions. This is due to some polymerization which will naturally occur during fractionation. From the method of Brice and Swain (1), using ultraviolet absorption on the fractions, it was calculated that the oil contained 11.9% oleic acid, 38.9% linoleic acid, 34.9% linolenic acid, 9.7% saturated acids, and 4.6% postulated 12 carbon acid. The accompanying graphs of the ultraviolet absorption and the iodine values of Table II were the basis for these calculations.

TABLE II

Fractionation Data

Fraction	Iodine No.	Temperature, °C.	Weight, g.
Run I			
1. Saturated	76	166-171	5.1
2. Saturated	21	185-	1.6
1. Unsaturated	120.5	96	3.5
2. Unsaturated	179.8	166-171	10.4
3. Unsaturated	196.8	174	49.8
4. Unsaturated	135	180-	5.7
Run II			
1. Saturated	75	166-171	5.3
2. Saturated	22.6	185-	1.5
1. Unsaturated	120.1	96	3.5
2. Unsaturated	181.5	166-171	10.6
3. Unsaturated	195.4	174	49.1
4. Unsaturated	130	180-	5.5

Summary

The seed of *Sebastiana lingustrina* have been collected and investigated. They contain about 37% oil, the physical and chemical characteristics of which were determined.

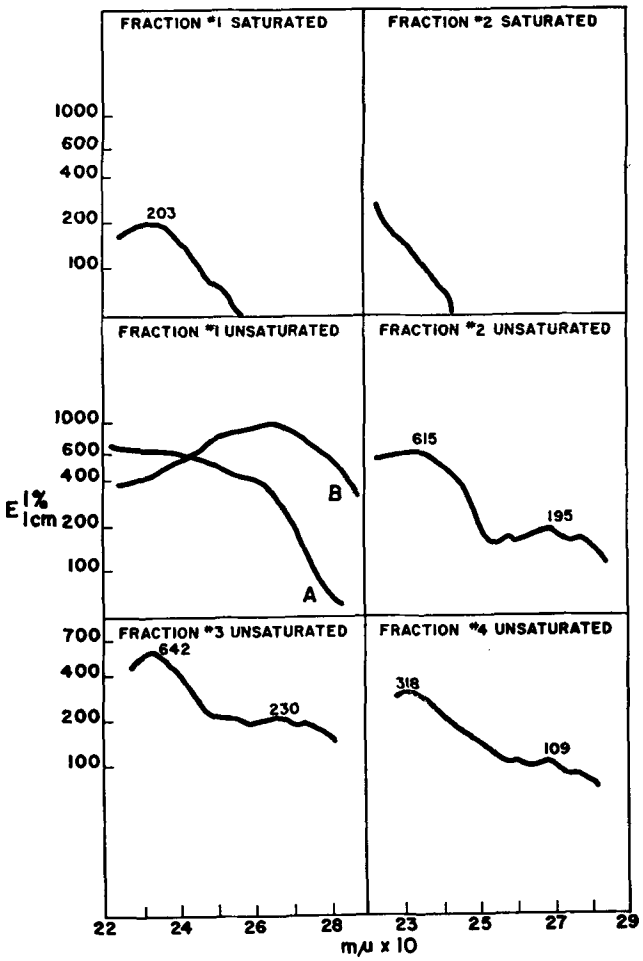


FIG. 3. Ultraviolet absorption of fractions. Run No. 2.

Analyses of the component fatty acids were made by interesterification to form esters, which were separated into principally saturated and unsaturated fractions by low temperature crystallization. Each of these fractions was fractionated on a Todd column. The resulting fractions were examined spectrophotometrically and the percentage of each acid was calculated.

The oil of *Sebastiana lingustrina* contains an unusual fatty acid, probably 2,4-dodecadienoic acid.

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[Received September 8, 1950]

Properties of Some Newly Developed Nonionic Detergents

THOMAS H. VAUGHN, H. R. SUTER, LESTER G. LUNDSTED, and M. G. KRAMER, Research and Development Division, Wyandotte Chemicals Corporation, Wyandotte, Michigan

NONIONIC synthetic detergents are receiving increasingly wide recognition because of their versatility and excellent compatibility characteristics. Classification, general chemical and physical properties and applications have been adequately described (1, 2, 3).

Of particular interest has been the employment of nonionic detergents in the textile industry (4) and for the washing of synthetics, wool, and cotton. For the latter application, formulations containing nonionic compounds have been used successfully for both household and commercial laundering. This success has been attributed in part to the excellent suspending properties of the nonionics.

A New Series of Nonionics

Typical nonionic detergent molecules contain a hydrophobic unit usually derived from fatty acids, fatty alcohols, alkyl phenols, or mercaptans combined with a hydrophilic group which is, in most cases, a polyethylene glycol chain introduced into the structure by condensation of ethylene oxide with the hydrophobic base. These materials are not ionizable, and their characteristics are, to a considerable extent, dependent on the balance between hydrophobic and hydrophilic groups. A low complement of ethylene oxide to the hydrophobic base usually results in a liquid. Introduction of larger amounts of ethylene oxide into the molecule results in pasty or solid products, which generally have relatively poor detergency properties because of an overbalance in the direction of the hydrophilic portion of the molecule. Previous efforts to obtain a solid product of acceptable surface-active and detergency properties have failed in that the melting point was too low to permit flaking.

These laboratories have recently developed a series of nonionics ranging from liquids to hard solids by employing a hydrophobic unit not previously used in the manufacture of nonionics. As with other nonionics, variations in properties have been achieved by choice of the molecular weight of the hydrophobic unit and by adjustment of the hydrophilic-hydrophobic ratio. The physical, surface-active, and detergency properties of this series are such as to adapt the products to a wide variety of applications and, in fact, to permit true tailoring of formulations.

The properties of this new series of nonionic detergents have been described in detail (5). It is the purpose of this paper to present briefly the general properties and to discuss at greater length the detergency aspects of the new development. For ease of reference these products will be referred to by their trade name "Pluronic."[1] Each member is further designated by a letter and a two-digit number, the first digit of which designates the relative molecular weight of the hydrophobic unit and the second digit, the relative hydrophilic-hydrophobic ratio. "L" designates a liquid, "P" a paste, and "F" a solid of sufficiently high melting point to permit flaking. Pluronics L62, L64, and F68 comprise a series in which the molecular weight of the hydrophobic unit is constant while the hydrophilic component is increased. Pluronics L44 and L64 have the same hydrophilic-hydrophobic ratio, but Pluronic L64 contains a hydrophobic unit of higher molecular weight.

Four of these products will be surveyed to illustrate the variation of physical, surface-active, and detergency properties with chemical composition.

Physical Properties

The physical properties of this newly developed series of nonionic detergents, all of which contain 100% active agent, are given in part in Table I. The softening point of Pluronic L44 is slightly lower than that of Pluronic L64, as expected because of its lower molecular weight. Similarly the softening point increases from —32°C. for Pluronic L62 to 51-54°C. for Pluronic F68. The melting point of Pluronic F68 is such as to permit flaking to produce a free-flowing dustless product.

The flaked product is relatively non-hygroscopic. By comparison with the data in Table I a typical commercial alkylarylsulfonate containing 40% active agent gained 6.2% in weight.

[1] ®, Wyandotte Chemicals Corporation, Wyandotte, Michigan.

TABLE I

Physical Properties of Pluronic Detergents

	Pluronic			
	L62	L64	F68	L44
Form	Liquid	Liquid	Flake	Liquid
Odor	Slight	Slight	Slight	Slight
Softening point, °C	—32	—6	51-54[a]	—11
pH, 0.25% soln., at 25°C	6.5-7.5	6.5-7.5	6.5-7.5	6.5-7.5
Moisture pickup, 7 days, 80% R.H., room temp., %	3.0	3.4	3.6	1.7
Solution rate, time to form a 2% solution at 25°C., minutes	11.5[b]	3.5	4.5	0.5
Solubility in water at 25°C., weight, %	0.5	∞	∞	∞

[a] Melting point by capillary tube method. [b] Determined at 22°C.