

UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

SUGARCANE FOR SIRUP PRODUCTION

By E. W. BRANDES, *principal pathologist in charge*, S. F. SHERWOOD, *senior biochemist*, and B. A. BELCHER, *assistant agronomist*, *Division of Sugar Plant Investigations, Bureau of Plant Industry*¹

CONTENTS

	Page		Page
Introduction.....	1	Storing cane for planting.....	31
Varieties of sugarcane.....	3	Storing cane in windrows.....	31
How better varieties are obtained.....	4	Storing cane by banking.....	32
Grouping of varieties.....	4	When to store.....	32
Varieties recommended for sirup pro- duction.....	11	Diseases of sugarcane.....	33
Selection of sugarcane land.....	12	Red rot.....	34
Light sandy lands and heavy clay lands.....	13	Mosaic.....	35
Peat soils.....	13	Chlorotic streak.....	36
Drainage.....	14	Root diseases.....	37
Manurial requirements.....	14	Red stripe.....	38
Commercial fertilizers.....	14	Brown stripe.....	38
Application of fertilizers.....	15	Pokka boeng.....	38
Organic manures.....	16	Other diseases.....	39
Crop rotation.....	17	Insect pests of sugarcane.....	39
Preparation of the land.....	18	Sugarcane moth borer.....	40
Terracing.....	19	The mealybug.....	40
Furrowing.....	20	Aphis maidis.....	41
Planting.....	20	Sugarcane beetle.....	41
Quantity to plant.....	22	Supplies and equipment required for growing cane and making sirup.....	42
Cultivation.....	25	Labor and work-animal requirements.....	43
Plant-cane crop.....	25	Marketing the sirup.....	45
Ratoon-cane crop.....	26	Utilization of by-products.....	46
Harvesting.....	27	Leaves and tops.....	46
Yields.....	29	Bagasse.....	47
Plant-cane crop.....	29	Skimmings.....	48
Ratoon-cane crop.....	30	Recapitulation of important points.....	48
Sirup.....	30		

INTRODUCTION

The northern limit of the range for growing sugarcane commercially for sirup is where the cane remains immature, imparting an obnoxious green taste to the sirup or gives a prohibitively small yield due to the short season. With present varieties of cane this restricts the profitable production of sugarcane sirup in the United States to the Southern States, mainly those bordering the Gulf of Mexico. The requirements for growing sugarcane for the manufacture of sugar are even more exacting than for sirup, and in only a portion of this area, chiefly southern Louisiana and parts of Florida and Texas, can sugar be made in ordinary times at a profit. In great contrast to the extensive sugar plantations with large, expensive sugar mills, the sirup industry is dependent almost exclusively on small farm enterprise, and thousands of farmers are engaged in the production of sirup for the market or for home use. Notwithstanding the relatively small units, ranging from a fraction of an acre to 10 or 20 acres, the aggregate of land devoted to the culture of sugarcane for sirup is roughly equal to that used for sugar production.

¹This circular replaces Farmers' Bulletin 1034, *Growing Sugarcane for Sirup*, by P. A. Yoder, parts of which have been extensively revised and incorporated herein.

Table 1 indicates the extent of the cane-sirup industry in terms of gallons produced, by States.

TABLE 1.—*Sugarcane sirup production by States¹ for certain years from 1899 to 1938*

State	1899	1909	1919	1929	1930	1937	1938 ²
	<i>Gallons</i>	<i>Gallons</i>	<i>Gallons</i>	<i>Gallons</i>	<i>Gallons</i>	<i>Gallons</i>	<i>Gallons</i>
Georgia.....	3, 226, 367	5, 533, 520	10, 640, 000	4, 785, 000	3, 640, 000	5, 425, 000	4, 389, 000
Louisiana.....	1, 552, 641	4, 125, 083	3, 672, 000	5, 773, 000	6, 208, 000	8, 210, 000	7, 395, 000
Alabama.....	2, 672, 438	3, 078, 531	8, 480, 000	2, 106, 000	2, 160, 000	3, 770, 000	2, 500, 000
Mississippi.....	1, 413, 219	2, 920, 519	6, 675, 000	3, 247, 000	1, 800, 000	4, 495, 000	4, 482, 000
Florida.....	1, 687, 452	2, 533, 096	4, 590, 000	1, 860, 000	1, 530, 000	1, 872, 000	2, 090, 000
Texas.....	888, 637	2, 246, 774	2, 421, 000	868, 000	852, 000	708, 000	875, 000
South Carolina.....	805, 064	881, 558	1, 369, 000	590, 000	590, 000	420, 000	380, 000
Arkansas.....	44, 819	286, 637	336, 000	106, 000	54, 000	175, 000	110, 000
North Carolina.....	1, 957	21, 677	(3)	(3)	(3)	(3)	(3)
Arizona.....	438	1, 040	(3)	(3)	(3)	(3)	(3)
New Mexico.....	(3)	5, 038	(3)	(3)	(3)	(3)	(3)
Oklahoma.....	(3)	56	(3)	(3)	(3)	(3)	(3)
Total.....	12, 293, 032	21, 633, 529	38, 183, 000	19, 335, 000	16, 834, 000	25, 135, 000	22, 221, 000

¹ The figures for 1899 and 1909 are from the Bureau of the Census, U.S. Department of Commerce; those for all other years are from the Bureau of Agricultural Economics, U.S. Department of Agriculture. The latter figures are more comprehensive in that they include reports from the small sirup makers.

² 1938 figures are preliminary and subject to revision.

³ Figures not available.

Sirups are produced in considerable quantities from the saps of sorgo (sweet sorghum) and maple trees and from cornstarch by a chemical process. In addition, sugarcane molasses, which is a by-product in the manufacture of sugar, is used for similar sweetening purposes and in cooking. Comparison of the quantity of cane sirup produced in 1931 with that of other sirups and molasses used as human food in the United States is shown in the following tabulation:

	<i>Gallons</i>
Cane sirup ²	14, 359, 000
Sorgo sirup ²	17, 818, 000
Corn sirup and mixtures of corn and other sirup ³	81, 686, 000
Maple sirup ²	2, 186, 000
Maple sugar as sirup ²	202, 000
Cane molasses (consumed as food) ²	5, 168, 000
Total.....	121, 419, 000

The most direct competitors of sugarcane sirup are corn sirup, made by acid hydrolysis of cornstarch, and sorgo sirup, prepared by concentrating the crushed-out juices of stalks of sorgo in essentially the same manner as cane sirup is made from the juices of sugarcane stalks.

Sorgo is not sugarcane, yet the two names have often been confused. This confusion has arisen through the loose use of the term "cane" or even the term "sugarcane" to designate varieties of sorgo used in making sirup. Sorgo is raised from seed, while sugarcane, a distinctly different though closely related plant, is propagated commercially by means of "seed cane" or sections of the stalk. In the Tropics and even in southern Florida sugarcane occasionally produces seedstalks bearing true seeds. The seeds, however, are not suitable for use in growing ordinary commercial crops of cane. They are exceedingly small and germinate very poorly. The seedlings require a much longer time to develop into full-grown plants than do

² Reported by Bureau of Agricultural Economics, U.S. Department of Agriculture.

³ Computed from preliminary figures reported by the Bureau of the Census, U.S. Department of Commerce.

the sprouts from "eyes" or buds on the seed cane. Moreover, the plants raised from true seeds do not come true to type and are usually inferior to the parent plant. However, the occasional production of seeds is useful to the plant breeder. It offers him the opportunity of selecting new types of sugarcane and has proved valuable in the United States in permitting the development of sugarcane varieties that resist diseases.

Within the last two decades an accidentally imported disease of sugarcane known as mosaic caused damage to the sugarcane industry estimated at over \$100,000,000 before it was brought under control by substituting resistant varieties introduced or bred by the Bureau of Plant Industry of the United States Department of Agriculture. Complete reconstitution of the sugar industry has resulted from the use of the resistant varieties, with yields restored to normal. The new varieties occupied practically all of the 294,000 acres of land used for sugar production in 1938, and a rapid shift to the new varieties had taken place in the sirup belt extending from Florida to Texas.

VARIETIES OF SUGARCANE

Sugarcane varieties propagated vegetatively, that is, from seed cane or portions of the stalk, do not tend to run out or degenerate from planting in that fashion over long periods of time. It is a fact, however, that the popular old varieties are gradually disappearing from culture. The explanation lies in the prevalence of diseases of the sugarcane plant, particularly mosaic, to which these varieties are specially susceptible, so that with the spread of the diseases the old varieties give way to more resistant ones. Within the past decade the varieties that were the backbone of the industry have been almost completely supplanted over wide areas in the South. In isolated places, however, these old varieties continue to maintain favor with cane planters, mainly because the diseases have not penetrated to the localities where they are still grown.

For sirup making in the Southern States sugarcane should possess the following qualities: (1) Early maturity; (2) a large yield of stalks; (3) a high percentage yield of juice; (4) juice having a large proportion of solids, mostly sugar; (5) light-colored stalks (green or yellow) which do not impart a dark color to the sirup; (6) resistance to disease, both during growth and while in winter storage for spring planting; (7) good germinating and stooling qualities; (8) good ratooning qualities, that is, coming up freely from the stubble after the first year; (9) strong, erect habit of growth, not readily lodging in storms; and (10) a fairly soft stalk, relatively low in fiber. In addition, it is desirable for the sugarcane to have a measure of resistance to cold, so that it is not necessary to harvest and windrow all the cane immediately after the first moderate freeze in early winter.

Viewing the requirements as a whole, it is readily seen that a difficult task confronts the plant breeder in attempting to combine these desirable qualities in one plant. Such attempts have been made by the Department of Agriculture, however, with enough success to point the way to eventual development of varieties better suited to conditions in the present sirup area.