Carbohydrate Metabolism of Johnson Grass

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JOHNSON grass, Sorghum halepense, is considered by many in the South to be a serious noxious weed very difficult to control or exterminate because of its extensive system of underground stems or rhizomes. A number of publications have appeared throughout temperate and tropical regions on methods for its control or eradication (2, 3, 6, 7, 10, 11, 12, 14, 19). However, by means of its network of rhizomes and roots, the plant is ideal for retarding soil erosion and has been used successfully for this purpose in Texas (1). In addition to rendering this valuable service the grass has been grown and utilized for hay and pasture in many of the southern states (1, 4, 5, 9, 16, 20), Cuba (13), and the Mediterranean countries (15). The scope of its usefulness as a source of feed and industrial raw material could probably be broadened to such an extent that its agronomic advantages would overshadow its disadvantages. Considered in this light, the plant would rank high in stamina and productivity. In a fertile soil, it makes rapid growth, attains a height of over 6 feet, and produces seed in less than two months after sprouting.

The purpose of this investigation was to correlate with various stages of growth those substances in the plant included in the fraction called "plastic carbohydrate" by Pantanelli (15)—sucrose, reducing sugars, and starch and dextrins.

EXPERIMENTAL PROCEDURE

In the early spring of 1946 a sample of Johnson grass rhizomes was taken from a fence row for analysis and pot planting. This was about 3 weeks before sprouts began to appear in the parent stand. The rhizomes were cut into sections of 5 to 5.5 inches, each section having three nodes and a dry weight of 2 to 2.5 grams. Two of these sections were planted about 2 inches deep in each of 20 2-gallon pots of soil. A balance was attempted so that all pots initially contained an equal quantity of rootstock in 5 kilograms of virgin Maury silt loam from the Experiment Station farm.

After planting, the pots were numbered at random, placed in the greenhouse, and watered often enough to keep the soil moist. Sprouts had appeared in all the pots in 8 days. One month later, after the weather had moderated so that late frosts were improbable, the pots were moved out into the open.

Approximately 1 kilogram of the sections of rhizomes cut for planting was heated in an air oven at 80 °C until fairly brittle. Drying to constant weight was completed in a vacuum oven at 60 °C and 50 mm Hg. The sample was then ground to pass a 20-mesh screen, thoroughly mixed, and duplicate 5-gram samples were weighed for analysis. Using the semimicro method of Shaffer and Somogyi (17) as modified by Heinze and Murnek (8), the content of reducing sugar, total sugar, and starch and dextrins were determined on the oven-dry basis.

As the plants reached progressive stages of development the pots were emptied two at each stage in numerical order. Whole plants were harvested intact by re-