The Effect of Fertilizers on the Chemical Composition and Quality of Dew-Retted Hemp Fiber

LYLE E. HESSLER

The quality of hemp fiber is correlated with its chemical composition. In general, dew-retted hemp fiber contains about 70% cellulose, which leaves 30% of material classed largely as encrustants. These latter constituents vary with the variety, growing conditions, and degree of retting. As shown in a previous paper by the author (1), the ultimate strength of the fiber as tested depends on the degree of retting or how far the removal of encrustants is allowed to proceed. Other workers (2) have shown the effect on tensile strength of the selective removal of encrusting material from the cellulose part of the fiber.

In hemp culture, plants grown on soil where the nitrogen level is high tend to produce weak, coarse fiber. Tobler (3) has shown in work on flax that nitrogen increases the cross section area of a single fiber, thickens the fiber wall, and loosens the fiber bundles. According to Schneider (3), anatomical formations of hemp are influenced by the nutrition of the plant, and potassium has a tendency to balance this formation. A study of the effect of fertilizers on fiber composition and quality, the correlation of quality with the constituents of the fiber, and the correlation of encrusting materials with cellulose content is presented in this paper.

MATERIALS AND METHODS

The fiber for this work was obtained from an experiment conducted by the Division of Cotton and Other Fiber Crops and Diseases, in cooperation with the Illinois Experiment Station, on a farm at Mt. Morris, Ill. Six replications having all possible combinations of nitrogen, phosphorus, and potassium in the ratio of 9-36-36 were used. All fertilizers were applied at the rate of 300 pounds per acre. The hemp was dew-retted and the fiber broken out by machine.

The procedure for determining fiber constituents was the same as that used in the paper already cited (1) with one exception. Since the values for pectic substances by the decarboxylation method are known to be high because of carbon dioxide liberated from other sources in the long boiling period with 12% hydrochloric acid, a more accurate value was obtained by running a blank on hemp fiber free from pectic substances.

Combing with a wire brush, as described in a previous paper (1), was dispensed with in preparing the fiber for breaking strength determinations. Before breaking,