IN THE potato chip industry, it is well recognized that certain varieties are much better suited for chip making than others. In general, Russet Rural and Kennebec are best, Pontiac and Green Mountain extremely poor, with a large number of varieties ranging in all degrees of quality between them.

It is also well recognized that within a variety there are great differences between various shipments of potatoes, or between the tubers even within the same hill. Numerous papers have presented evidence on the cause of these variations, and have attempted explanations for the objectionable discolorations that occur when the potato slices are fried (3, 11, 12). In general, there is agreement that discoloration is unusual in the absence of a considerable concentration of reducing sugars in the tubers. Yet content of reducing sugars, by itself, has not seemed a complete answer, and various suggestions have been made concerning the reaction between nitrogenous compounds and the sugars to produce dark brown colors (2, 8, 10). High specific gravity has been associated with good chip quality, within a variety (7).

It has been shown (4, 5, 6) that removal of sugars from the slices by suitable treatment can result in light colored chips, while coloration can be regained to any desired degree by adding glucose to the previously sugar-free slices. In this manner, chips of the desired color can be made from any tuber. Maleic hydrazide sprays have been shown to improve chip color slightly (9).

**EXPERIMENTAL PROCEDURE**

Potatoes were grown at Lake City, Mich., in 1950, 1951, and 1952 and at East Lansing in 1951. The soil type, preplanting preparations, planting and growing methods were similar in all three years and at both locations. A modified randomized block design with four replications was used. Normal irrigation and 1,000 pounds of 3-12-12 was used per acre, if not otherwise specified. The several analyses of fertilizers were used at the rate of 1,000 pounds per acre. The plots were divided as to water supply, some receiving only rainfall and others supplemental irrigation. This supplemental irrigation was at two rates: normal, in which irrigations were made for a period of two hours at each time (1-acre-inch) and twice normal, in which the sprinklers ran for four hours. Five such supplemental irrigations were given.

Potatoes in all plots were harvested in the latter part of September. After harvest, a random sample of 10 to 40 U.S. No. 1 tubers from each replicate of each treatment of each variety was taken for subsequent analyses. The specific gravity determinations were made on the tubers by the brine floatation method (1) which separated the tubers into five specific gravity groups (below 1.064, 1.064-1.070, 1.070-1.076, 1.076-1.088, and over 1.088).

Tubers was taken for frying. The slices were either strung on thread to preserve their identity. A standard frying (9) was used with a uniform amount of oil, initial temperature (385°F.), a standard size of sample (2 grams) and, as nearly as possible, a standard temperature removal (350°F. ± 5°F.). Slices high in moisture and, gravity) fried more slowly than those higher in moisture and cooled the fat to a lower temperature before cutting the thermostatic temperature control on the cooker.

Approximately 20,000 tubers were classified into specific gravity groups, and approximately 15,000 were fried and scored for potato chips. Statistical analyses of experimental results were performed.

**RESULTS**

**Lake City 1950 Crop**

Three varieties were grown with three dates of planting. At harvest, 40 tubers were taken at random from each plot and divided into five specific gravity groups from each replicate were taken from the root of each variety. These tubers were stored for two weeks at 41°F. followed by a month at room temperature. A sample from each tuber was then taken for the picric acid test for reducing sugars. Figure 1 shows the results. It may be seen from the table that there is a very close relationship between color of potato chips, date of planting, and picric acid test. Early planted potatoes were lower in reducing sugars and produced lighter colored chips than did tubers from later plantings. Varietal differences shown are characteristic.

**Lake City 1951 Crop**

Several varieties were planted on three dates and were taken and divided into specific gravity groups. Table 1 shows the percentage distribution. About 1,500 tubers from each plot were stored at 41°F. for two months by storage at room temperature for one month and sampling, frying, and scoring for chip color.

In table 2 are shown the average chip color specific gravity ratings for the various varieties from the three dates of planting.

It may be seen from the table that early planted tubers had an average high specific gravity and light colored chips in the better varieties. There were exceptions in association of high specific gravity and light colored chips even within a variety. Tubers from late-planted dates are generally darker chips even within a specific gravity group than did those from early planted plots. The specific gravity group does not appear to be the only factor in determining the quality of these tubers.