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ferences were obtained in seed sets between materials, probably none of them significant. All seed sets were good. The interesting effect was on seed size. Seeds formed under Kraft paper were 23.8% larger for barley and 84.4% larger for wheat than the average weight of seed formed under the other enclosures.

The Kraft paper bags were too heavy and caused several of the heads they enclosed to blow down in heavy winds. These were straightened up and tied to other culms but were not discovered soon enough in barley to avoid reducing seed size in 2 or 3 of the heads. The most adversely affected pollinated head was therefore omitted in determinations of seed weight. It is expected that in future tests, seed size increases for barley under Kraft paper or comparable material as compared with the commonly used glassine paper will approach that shown here for wheat.

The shade provided by the brown Kraft paper may be the reason why seeds formed under Kraft paper enclosures were so much larger.

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AN ELEMENTARY ANALOG COMPUTER TO AID COTTON BREEDERS IN MAKING SELECTIONS[1]

J. B. Pate, P. R. Ewald, and E. N. Duncan[2]

COTTON breeders must evaluate progenies for a number of characteristics. Field selection for agronomic type is carried out visually, but final selection is based on laboratory values for gin, seed, and fiber properties. Laboratory values for these properties are expressed as percents, indices, inches, etc. Selecting plants or progenies requires integration of these data to choose the above-average individuals. Usually this integration is a personal evaluation of the over-all properties of a plant or progeny with limitations and weightings applied according to the judgment of the breeder.

The selection procedure followed in the program at this station has been generally as discussed above. In scanning the property data, relatively large weightings are assigned to lint percent and fiber length, since yield in part depends upon lint percent and price per pound depends partially on staple length. An attempt is made to hold strength and fineness within limits acceptable to mills, with more emphasis on strength than fineness. Other laboratory values are noted and held within limits.

[1] Cooperative investigations of the Crops Research Division, ARS, USDA and the Tennessee Agricultural Experiment Station, Knoxville, Tennessee. Received June 23, 1961.

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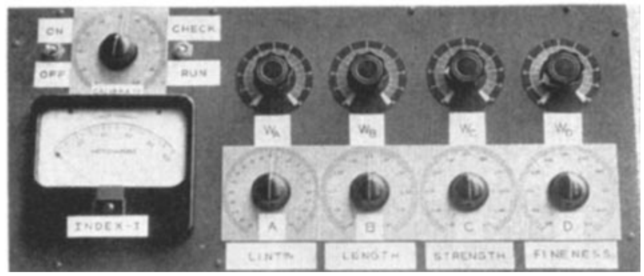

Figure 1—Front view of analog computer.

Weightings may be arrived at by judgment of the breeder or by statistical approaches. A net worth or selection index for a plant or progeny can be calculated after deciding which laboratory properties are to be evaluated and the weightings for each determined. Ordinary desk calculating machine methods of computing index values are laborious and time consuming. Electronic digital computers can do the job rapidly, but most cotton breeding projects are not extensive enough to justify programming.

D. M. Simpson, prior to his retirement in 1957, initiated development work on an elementary computer that can be used for rapid integration of laboratory data. The computer described was constructed to integrate raw data for four property values; lint percent, fiber length, strength, and fineness. Any desired weighting can be assigned to each of these, and the capacity of the computer could be increased if more than four properties need to be integrated. A front view of the computer is shown in Figure 1, and the wiring diagram is shown in Figure 2. The computer can be constructed using about $50 worth of conventional electronic components. The variable resistors are 4-watt wire wound potentiometers and the fixed resistors are precision (1%) wire wound types. The computer is easily assembled with hand tools.

The purpose of the computer is to obtain an index I (read directly on the meter) which is the sum of a number of specific property values of a plant or progeny (A, B, C, D . . .) each of which is multiplied by a weighting factor (W_A, W_B, W_C, W_D . . .) depending on its relative importance. The computer performs the function by summing electrical currents to give the desired relation: $I = W_AA + W_BB + W_CC + W_DD$. The summing operation is automatic after the computer is calibrated as detailed in Figure 2 and the dials are set to previously determined weighting factors and property values.

The computer and personal evaluation methods of selection were compared by using a segregating population of 88 plants ranging from 36.0–44.5 in lint percent, .94–1.24 in length (U.H.M.), 1.49–2.19 in strength (T_1), and 385–624 in fineness (A). Computer indices for all 88 plants were obtained by using 5 combinations of relative weightings for the 4 properties. Ranges in computer indices for the five weightings are presented graphically in Figure 3. Total ranges for the five weightings were similar, but indices for individual plants varied considerably depending upon the weightings. Twenty-five plants (28%) had been selected by the personal evaluation process before any thought was given to using this population for comparing the 2 selection methods. The personal range in computer indices for the 25 plants selected was almost as wide as the total range. Among the 25 plants selected were some with low computer indices regardless of the weightings assigned.

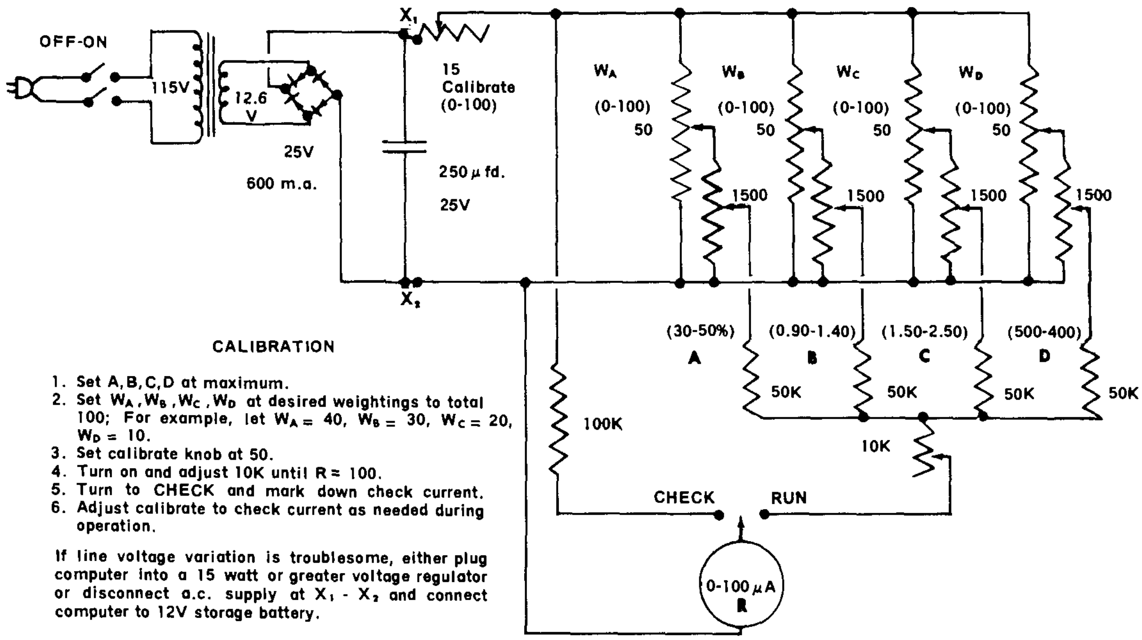

Figure 2—Wiring diagram and operating instructions for analog computer.

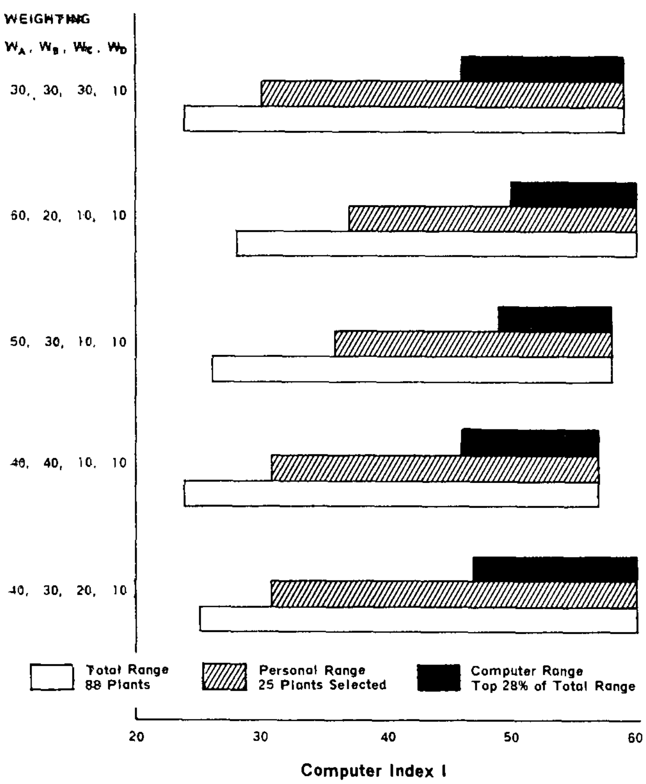

Figure 3—Ranges in computer indices for 5 weightings in a segregating population of 88 plants.

Those plants with low computer indices were, in most instances, outstanding for a single property, showing a strong bias to select such plants in a personal evaluation method of selection. Computer selection ranges which would include 28% (at least 25 plants) of the population are presented. These ranges were relatively narrow with some variation among weightings, and indicate that computer selection would be considerably more effective than personal evaluation in identifying outstanding plants.

Experience with the computer indicates that it would be of considerable value to breeders in speeding up selection work. Once weightings are assigned, data can be rapidly processed by clerical or sub-professional workers. The computer is flexible, and a breeder could select for different purposes in the same materials by assigning different weightings. Automatic selection of plants or progenies with the highest indices is rapidly made.

EFFECT OF 2,4-D ON THREE WINTER WHEAT VARIETIES GROWN IN OREGON[1]

Dean G. Swan and Charles R. Rohde[2]

MOST of the winter wheat grown in eastern Oregon is sprayed with 2,4-dichlorophenoxyacetic acid (2,4-D) for annual weed control. These applications vary considerably in rate, formulation, date of application, and stage of wheat growth. This experiment was initiated to determine if winter wheat varieties respond differentially to formulations of 2,4-D applied at several rates and stages of plant growth.

In general it has been found that wheat, oats, and barley were most susceptible when the 2,4-D was applied at the early stages of growth. Varietal differences also were most pronounced when spraying was done at the early stages of growth. The ester form was observed to be more injurious to the crop than the amine salt form.

The experiment was conducted in 1956 and 1957 at the Pendleton Branch Experiment Station near Pendleton, Oregon. Omar, Brevor, and Burt, winter wheat varieties

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