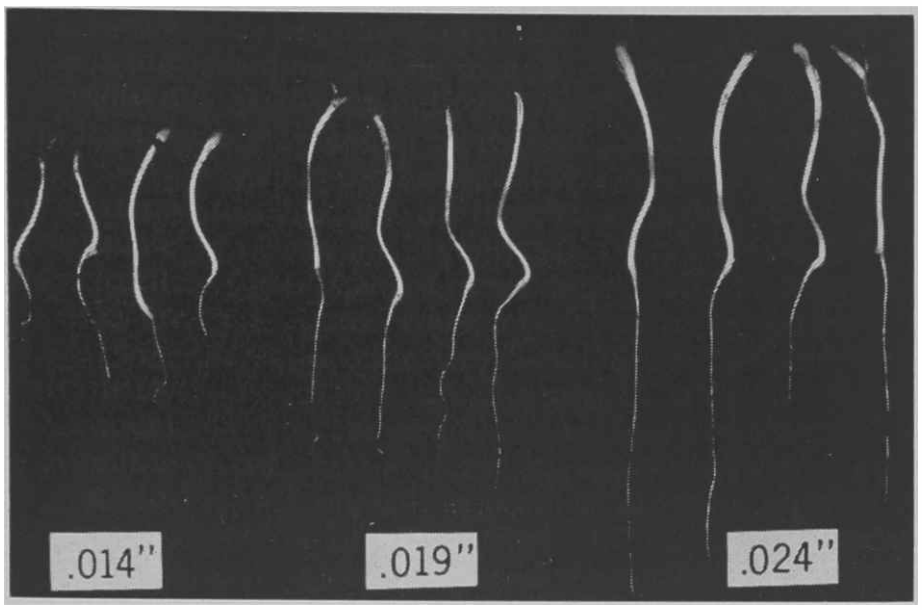


The effect of seed thickness (figures in photo at left are in inches) on the size of developing Great Lakes lettuce seedlings is illustrated. In addition, larger seedlings had a better developed primary and secondary root system. The seedlings from the larger seeds produced greener color in the seedlings.

The Effects of Seed Size on Lettuce Germination & Growth

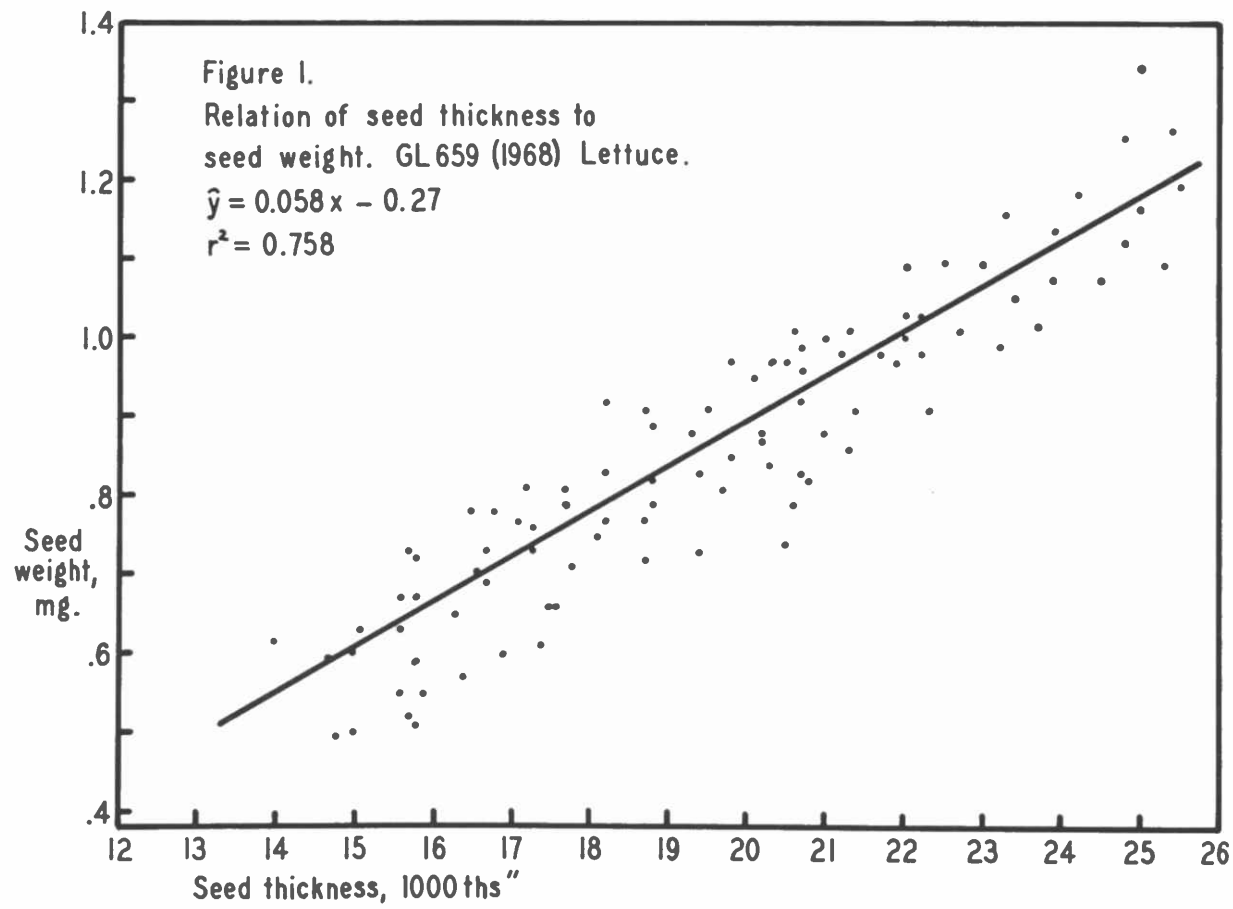
*by G. C. Sharples**

Experiments with single lettuce seeds enclosed in vermiculite tablets described in a preceding article[1] show great promise in solving the problem of precision planting to a stand, necessary for the development of a once-over mechanical lettuce harvest system. These same experiments indicate, however, that eventual success of the system may depend upon improved seed quality control.

Quickly apparent is the fact that such a system will greatly reduce, perhaps by a factor of 50, the quantity of seed required to plant a crop. To secure the largest possible stand of healthy plants, it is imperative that the seed used be of the highest quality obtainable. The introduction and now widely accepted use of mosaic-free seed constituted an important advance in lettuce seed quality improvement. In addition to seed-borne disease, certain physical seed characters may possibly be controlled for improved performance.

In general, germination rate and seedling vigor are known to be related with seed size or seed weight. For a given species and variety, the larger or heavier the seed, the greater will be the percent germination and the more vigorous will be the young growing seedlings. Tests at the University of Arizona Mesa Branch Experiment Station have shown this to be equally true for lettuce seeds.

Because it was relatively easy to measure with a machinist's bench gage, seed thickness was used to categorize nearly 20,000 Great Lakes 659 lettuce seeds into 15 size groups, each differing in average thickness by .001 inch. Seed thickness ranged from



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[1] *Harriott, B. L., Seed Tablets for Precision Planting Lettuce. Progressive Agriculture in Arizona, Volume XXII, Number 6, November-December, 1970, pp. 8.*

.012″ to .026″ and averaged a little less than .020″ at the thickest cross-section. Relatively few seeds fell into very thin and very thick categories so that most information was obtained from those ranging between .014″ and .024″ thick.

Up to 10 seeds from each thickness group were measured and weighed carefully to learn how seed weight varies with thickness. Figure 1 shows that nearly 76% of the variation in thickness was accounted for by differences in weight, a reasonably good correlation. Further measurements showed that seed length and seed width variations accounted for only 26% and 50%, respectively, of seed thickness differences. Detailed analysis indicated seed length and width variations were confined within relatively narrow limits compared to thickness. Beyond these limits, changes in seed weight probably were due almost entirely to differences in thickness. It was concluded that length and width measurements are relatively inefficient estimators of lettuce seed size.

Fifty seeds from each thickness category were allowed to germinate on moist filter paper in covered dishes. After 96 hours of growth at 78°F. seedlings were blotted dry and weighed to provide an estimate of vigor. Percent germination and seedling fresh weights in relation to seed thickness are shown in Figures 2 and 3. Each small circle on the graphs represents the mean of 6 independent tests. It is clear the germination rate of seeds up to about .018″ thick increased rapidly, while the fresh weight of 4-day-old seedlings increased in direct proportion to seed thickness at the rate of 0.8 mg for each .001″. Seedlings developing from thick, heavy seeds had noticeably greater stem and primary root lengths and diameters (photo), more strongly developed secondary root systems and greener color than those from thin, light seeds.

The average germination rate of the seed lot used in these tests was 83.5% and the average 4-day-old seedling weighed 9.93 milligrams. Simple arithmetic shows that if all seeds less than .018″ thick (about 27% of the total) were to be eliminated from the lot, the average germination rate of the remaining seeds would be increased by almost 15% and seedling fresh weight would be increased by 20%.

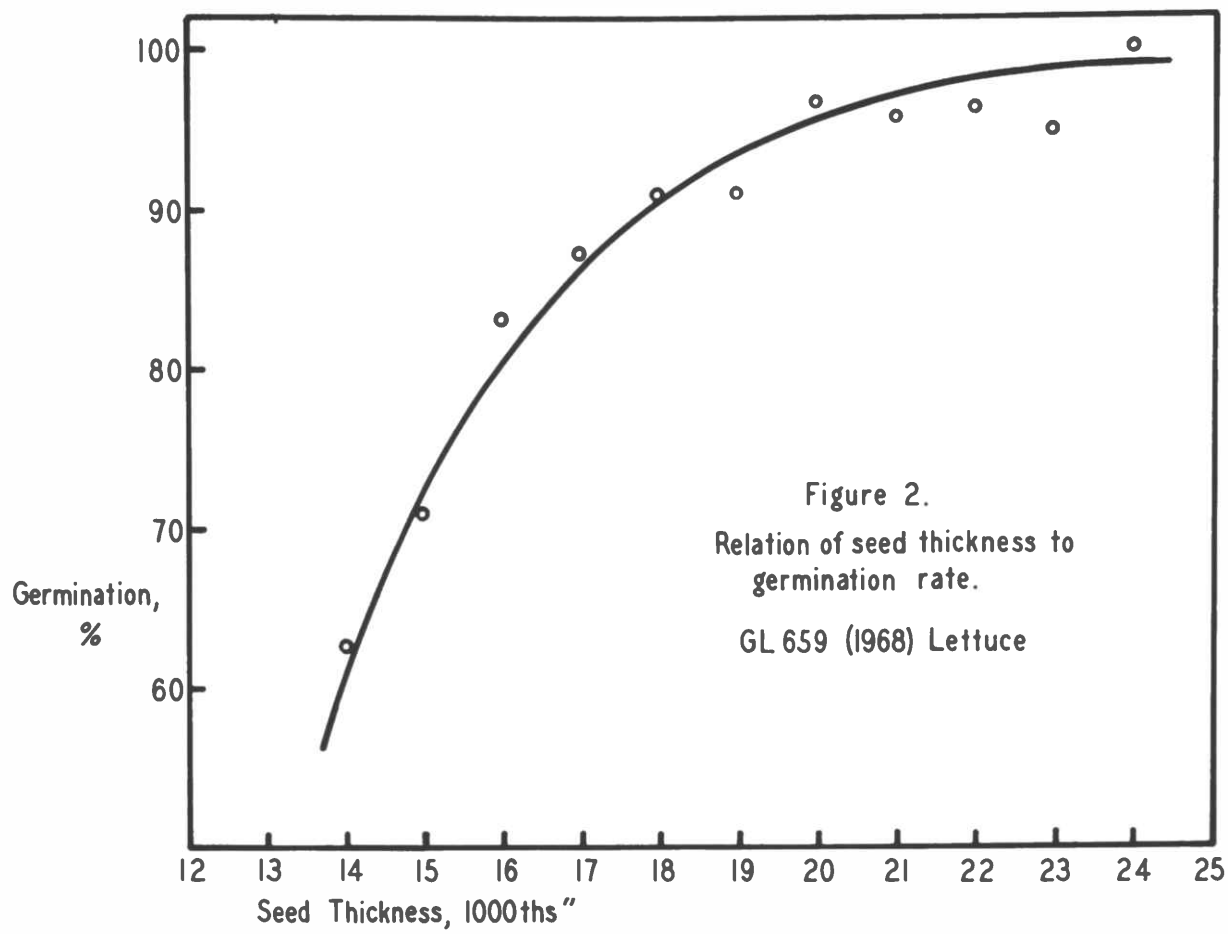

Figure 2.
Relation of seed thickness to germination rate.
GL 659 (1968) Lettuce

These results were obtained under idealized laboratory conditions where temperature and available moisture were closely controlled. Projected tests will further study the effect of seed thickness upon germination and seedling growth in soil under greenhouse conditions with both tableted and naked seed. It is hoped that sufficient seed eventually will be available so that small scale field tests may be conducted to learn the effects of seed thickness upon uniformity of growth and head size.

Practical use of this information for the development of a precision lettuce planting system must await improvements in currently used devices for seed grading. There appears the need for a mechanical seed sizing device which can provide with greater accuracy than is now attainable the necessary quantity of only heaviest seeds.

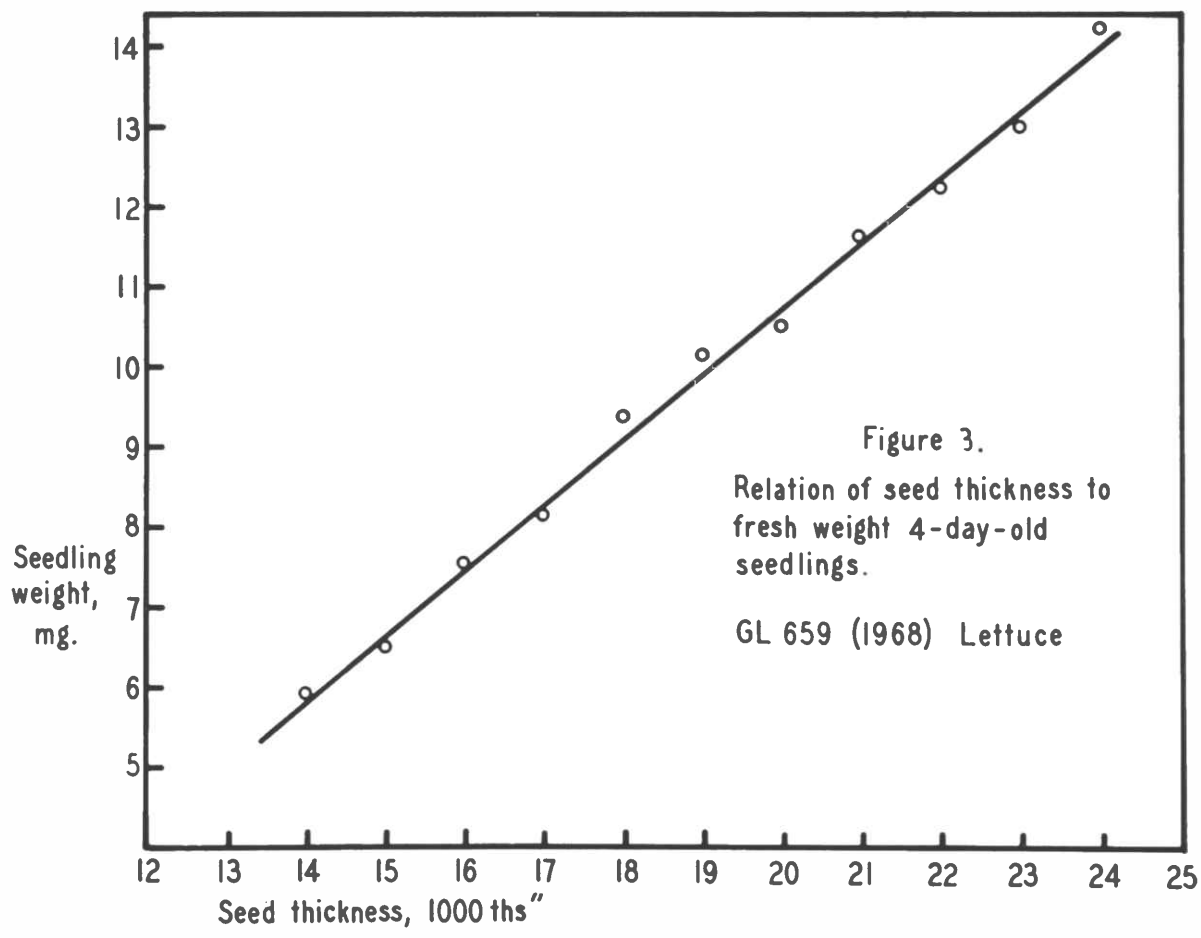

Figure 3.
Relation of seed thickness to fresh weight 4-day-old seedlings.
GL 659 (1968) Lettuce