RELATION OF THE EFFECTS OF SEED WEIGHT TO ROOTS AND TOPS OF TWO VARIETIES OF SOYBEANS

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A survey of the literature gives evidence that considerable work has been done on the relation of seed weight to various phases of vegetative and reproductive plant growth. Little or nothing, however, has been done concerning the effects of seed weight on the relation between tops and roots. Also the effects of variation in seed weights to dry weight of tops and dry weight of roots has not been studied in detail.

The object of the present experiment was to investigate the relation between:

1. Seed weight, and dry weight of tops and dry weight of roots when variation in seed weight is small.
2. Seed weight, and dry weight of tops and dry weights of roots when variation in seed weight is greater.
3. The dry weight of tops and the dry weight of roots of plants, when the plants are grown from seeds of different weight groups.

Seeds of each of the two varieties of soybeans, *Soja max.* Piper var. Biloxi and Mandarin, were separated into three groups designated by the letters A, B, and C. The seed coats were removed in all cases because they are not available as a source of food for plant growth and play no part in photosynthetic activity. In the seeds designated by the letter A none of the food storage tissue was removed; in those seeds designated by the letter B approximately half of one cotyledon was severed; and in those seeds designated by the letter C one whole cotyledon was cut off. The seeds were then weighed accurately to one-tenth of a milligram.

The seeds were planted in sterilized, well mixed loam soil in 4½ inch pots. The pots containing the seeds were watered daily with sterile tap water until the epicotyls had appeared above the surface of the soil, after which time they were watered with unsterilized tap water. Watering of all plants was controlled and equalized as far as possible.

Fifty plants were used for each of the three sets, making one hundred fifty plants for each variety. The plants were taken down at the time the first flowers appeared; they were then cut at the collar and the tops and the root systems were individually reduced to oven dry weight and weighed to one-tenth of a milligram.

TABLE 1.—WEIGHTS AND CORRELATION COEFFICIENTS

Av. Dry Wt. Grams	Biloxi Soybeans				Mandarin Soybeans			
	A	B	C	ABC	A	B	C	ABC
Seed Weight...	0.2466	0.1859	0.1247	0.1835	0.1472	0.1246	0.0956	0.1296
(Standard Deviations)..	±0.0262	±0.0211	±0.0185	±0.0546	±0.0127	±0.0108	±0.0100	±0.0259
Top Weight....	1.8901	2.0001	1.5499	1.7980	0.7286	0.5519	0.3160	0.5322
Root Weight...	0.1732	0.1962	0.1422	0.1710	0.1240	0.0945	0.0587	0.0924
Growth Period (Days).....	35	35	35	35	30	30	30	30
Correlation Coefficients								
Seed Wt. with Dry Wt. of Tops.....	0.2466	—0.0156	—0.0676	0.3337	0.0687	—0.2482	—0.1186	0.6578
Seed Wt. with Dry Wt. of Roots.....	—0.0757	—0.1686	0.0401	0.1287	—0.0301	—0.0013	—0.2950	0.4709
Dry Wt. of Tops with Dry Wt. of Roots.....	0.2583	0.4732	0.3125	0.4879	0.4157	0.7713	0.6944	0.8082

Correlation coefficients were determined from the formula:

$$C = \frac{Sxy}{\sqrt{(Sx^2)\ (Sy^2)}}$$

in which C represents the correlation coefficient, x the deviations of the seed weights from the average, and y the deviations of the plant (top and root) weights from the average. A coefficient between 0 and plus 1 indicates a positive correlation; a value between 0 and minus 1 indicates a negative correlation. In this paper a negative correlation is indicated by a minus sign, a positive correlation by no sign. Table I gives the results.

The results of this experiment may be summarized as follows:

1. There is generally a higher correlation value between seed weight and dry weight of tops than between seed weight and dry weight of roots.

2. The value of the correlation coefficients between seed weight and the dry weight of tops or between seed weight and the dry weight of roots appears to be greater with a larger variation in weights among the seeds of a group. (Standard deviations from the mean seed weight and correlation coefficients of groups ABC as compared to standard deviations and correlation coefficients of groups A, B, and C. See table I).

3. The correlation value between the dry weight of tops and the dry weight of roots is higher when the plants are grown from lighter weight seeds (C or B as compared to A). The highest correlation values, however, exist when the plants from groups A, B, and C are considered as one group, i.e., group ABC.