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The accumulation of chlorides in the leaf tissue fluids of Egyptian cotton with the march of the season.

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Among the physiological problems presented by the phenomenon of the differential absorption and tolerance in solution of chlorides and sulphates by the Egyptian and Upland types of cotton[1] is that of the change in the concentration of these anions with the march of the season. This problem is in reality twofold: (*a*) change in the concentration in one and the same organ with its development and senescence, and (*b*) the possible change in the concentrations found in the (leaf) tissues at as nearly as possible comparable stages of maturity at earlier and later periods in the development of the organism as a whole. The present discussion is limited to the latter phase.

The more mature cotton plant does not lend itself readily to controlled laboratory experimentation. For this and other reasons a statistical method of attack seems desirable. The problem presents some difficulties, since concentrations based on unit volumes of tissue fluid may obviously be influenced by (*a*) errors of judgment or the errors of random sampling in the collection of leaves at earlier and later periods,[2] and by (*b*) the turgidity of the tissues at the time of collection of samples grown in field cultures.

Table I shows the mean concentration of chlorides in terms of grams per liter of leaf tissue fluids from samples from the same plants in a first and second series of analyses[3] of the number (N)

[1] Harris, J. Arthur, Hoffman, W. F., and Lawrence, J. V., PROC. SOC. EXP. BIOL. AND MED., 1925, xxii, 350-352.

[2] Both sets of determinations were based on random samples of mature leaves. Slight differences in the maturity of the collections of leaves might influence the averages.

[3] In the experiment of 1922 the first series of samples was taken from July 25 to Aug. 9, whereas the second series was taken Aug. 28 to Sept. 4. In the experiment of 1923 the first series was taken July 29 to Aug. 14, whereas the second series was taken Aug. 18 to Aug. 31.

indicated based on cottons grown in the Gila River Valley in southern Arizona.[4]

Since the determinations of the first and second series may be expected to be correlated, because of the influence of the individuality of the plants and of variation in the environmental conditions to which they are exposed, it is necessary to consider the correlation between the first and second determinations in calculating the probable errors of the difference between them. The formula is

$$E_{(2\text{-}1)} = .6745\,\sigma_{(2\text{-}1)}/\sqrt{N}$$

when N is the number of pairs of determinations and

$$\sigma^2_{(2\text{-}1)} = \sigma^2_1 + \sigma^2_2 - 2r_{12}\,\sigma_1\,\sigma_2$$

σ being the standard deviation of the chloride content of the first or second series as denoted by the subscript, and r_{12} the corre-

TABLE 1. Comparison of chloride content of first and second series of determinations on Egyptian and Upland cotton.

	N	Mean chloride content and probable error	Correlation between first and second series	Absolute difference between first and second series		Percentage difference
				Difference and probable error	Diff. / *E.* Diff.	
Experiment of 1922						
Pima Egyptian						
First series	67	4.6716±.0613				
Second series	67	5.2164±.0636	.702	+.5448±.0482	11.29	11.66
Meade Upland						
First series	66	3.1553±.0597				
Second series	66	2.8106±.0515	.801	—.3447±.0359	9.60	10.92
Acala Upland						
First series	69	3.6920±.0455				
Second series	69	3.4638±.0489	.665	—.2283±.0338	5.89	6.18
Experiment of 1923						
Pima Egyptian						
First series	69	2.4239±.0405				
Second series	69	3.2899±.0508	.684	+.8659±.0375	23.11	25.73
Lone Star Upland						
First series	66	1.0341±.0213				
Second series	66	1.1628±.0308	.628	+.1288±.0240	5.36	12.45
Fi Hybrid						
First series	90	0.8333±.0212				
Second series	90	1.1083±.0273	.795	+.2750±.0166	16.61	33.00

[4] The materials are the same as those considered in another connection by Harris, J. Arthur, Lawrence, J. V., and Lawrence, Z. W., *J. Agr. Res.*, 1924, xxviii, 695.

lation between them. The coefficients in the second column of constants show that there is a rather high correlation between the first and the second determination on the same group of plants. These do not require discussion further than to note that they have been used in determining the probable errors of the differences by the formula indicated above.

The absolute differences show that in the experiments of both years, Pima Egyptian cotton has a materially higher chloride content in the second series than in the first series of determinations. The differences are clearly significant in comparison with their probable errors. They amount to about 12 per cent of the first average in the experiment of 1922, and to about 36 per cent of the average of the first series of determinations in the experiment of 1923.

In the case of the Upland varieties there seems to be a slight but significant decrease in the chloride content (amounting to about 6 and 11 per cent in the two varieties, Acala and Pima) in the experiment of 1922, but a slight increase in chloride content in the Lone Star Upland variety grown in 1923.

The results seem to indicate an increase in the magnitude of the chloride concentration of the plant as a whole with the advance of the season in the case of the Egyptian plants, but to leave such a change open to question in the case of the associated Upland plants.

It is interesting to note that the type (Egyptian) which has been shown[5] to be characterized by the highest chloride content also shows most clearly an increase in the concentration of this anion with the march of the season.

The single series of determinations made in 1923 on the F_1 hybrid between Pima Egyptian and Lone Star Upland cotton indicates an increase in the chloride content of the hybrid very similar to that in the Upland parent.

These investigations are being continued.

[5] Harris, Lawrence and Lawrence, *Loc. cit.*

ERRATUM: In Dr. A. A. Horvath's paper [97(2620) December, 1924] on "The Action of Ammonia upon the Lungs," "per cents" should read "per mille".