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Differential absorption of anions by varieties of cotton.

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Earlier studies¹ have shown that the Egyptian and Upland types of cotton are differentiated with respect to certain physico-chemical properties of the leaf tissue fluids, such as osmotic concentration, specific electrical conductivity and hydrogen-ion concentration.² The higher specific electrical conductivity of the tissue fluids of the Egyptian, as compared with the Upland type of cotton, evidences for the absorption from the soil and the retention in solution of electrolytes as an important factor in the determination of the higher osmotic concentration of the Egyptian type. Analyses have shown³ that the chloride content is far higher in the Egyptian type.

We now note that these two types (closely enough related that at least first, second and third generation hybrids may be secured) are also characterized by differential absorption of sulphates.

Table I shows the mean chloride and sulphate contents of two series of about seventy analyses each on plants of Lone Star

¹ Harris, J. Arthur, Lawrence, Z. W., Hoffman, W. F., Lawrence, J. V., and Valentine, A. T., *J. Agric. Res.*, 1924, xxvii, 267-328.

² Harris, J. Arthur, Hoffman, W. F., and Johnson, A. H., *Science*, N. S., 1925, lxi, 65.

³ Harris, J. Arthur, Lawrence, J. V., and Lawrence, Z. W., *J. Agric. Res.*, 1924, xxviii, 695-704.

TABLE I.

Comparison of Chloride and Sulphate content of leaf tissue fluids of Pima Egyptian and Lone Star Upland cotton as grown at Sacaton, Arizona, during 1923.

	N	Mean content for Egyptian Cotton	Mean content for Upland Cotton	Difference between Egyptian and Upland Cotton.	
				Absolute difference and probable error	Ratio of absolute difference to probable error
First series of determinations: July 29 to August 14. Grams chloride per liter	68	2.4412 $\pm$.0406	1.0515 $\pm$.0239	+1.3897 $\pm$.0396	35.1
	67	12.5573 $\pm$.1022	16.2164 $\pm$.0801	-3.6791 $\pm$.1410	26.1
Sec'd series of determinations: August 18 to August 31. Grams chloride per liter	68	3.3088 $\pm$.0477	1.1434 $\pm$.0302	+2.1654 $\pm$.0520	41.7
	70	14.1642 $\pm$.1294	17.3357 $\pm$.1793	-3.1714 $\pm$.1750	18.2
					+79.6 -25.6
					+97.3 -20.1

Upland and Pima Egyptian cotton growing in immediate association, and hence under identical environmental conditions.⁴ The values are given in terms of grams per liter. The probable errors of the means have been calculated with due regard to the correlation between associated plants due to the influence of environmental conditions.

The differences between both chloride and sulphate content in Egyptian and Upland cotton are many times (18.2 to 41.7) as large as their probable errors, thus leaving no possible doubt as to the differentiation of these two varieties with respect to their absorption of both of these anions.

The point to be emphasized here is that the behavior of these two types with respect to these anions is not merely quantitative in the sense that the tissue fluids of one of the two varieties contains larger quantities of electrolytes. It is differential in the sense that one variety contains large quantities of chlorides, whereas the other contains larger quantities of sulphates.

The differentiation in the reaction of the two genetically differentiated types may be most clearly brought out by expressing the differences in chloride and sulphate content as a percentage of the actual concentrations of these anions. Since the two types differ materially in the quantities of sulphates and chlorides, the results of taking either of the types as a base in the calculation of both percentage differences will be to some extent misleading. It seems best, therefore, to take the average of the constants for the two varieties as a base in the determination of the percentage.

The relative differences show that in chlorides the Egyptian type is from 80 to 97 per cent higher than the average of the two types, whereas the Upland type is from 20 to 26 per cent higher in sulphates.

The fertility of the hybrids between the two types affords the possibility of an investigation of the behavior of the differential reaction to these two anions in inheritance. This investigation is now under way.

⁴ Full experimental and analytical details are given in the papers cited above, and in another by Harris, Hoffman and Hoffman, *J. Agric. Res.* (in press).