

Phosphates in Cane Juice.

By

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[The following article, reprinted from the *Transactions of the Society of Chemical Industry*. (*Journal of the Society of Chemical Industry*, 46, 14, 1st April, 1927, pp. 143T-144T), describes an investigation carried out in the Chemical Laboratories of the Sugar Technology Department of the College, and at the Usine Ste. Madeleine, Trinidad. The authors are fourth year students of the College, and have received their technical training under Professors Scott and Hardy. The results of their work have important bearing on a fundamental problem in cane juice clarification, and should prove of considerable value to those in charge of the chemical control of cane-sugar factories.—ED.]

FOLLOWING upon the suggestions of various workers on the chemistry of cane-sugar manufacture that the presence of adequate quantities of phosphate in sugar-cane juices is essential for efficient defecation, a modification of the Pemberton-Neumann molybdate method is described in this paper as being applicable to the chemical control of sugar factories. Particular attention has been paid to the reduction of the time required for the procedure, for it is evident that the assay of juices and other products should be capable of completion in as short a time as is consistent with a fair degree of accuracy. It has been found possible, by means of the procedure described, to obtain a reasonably accurate result in 30 minutes, whilst six determinations conducted simultaneously may be completed in the course of an hour.

H. Walker¹ has indicated that some idea of the phosphate requirements of sugar-cane soils may be obtained from the phosphate content of crusher juices, fixing as a preliminary standard 0.020 g. P_2O_5 per 100 c.c. of juice. He makes use of the uranium acetate method in his determinations, but the authors have found that,

whilst perfectly concordant results are obtained by this procedure the values obtained are invariably low, even when the experiments are carried out on pure phosphate solutions of known concentration. McAllep and Bomonti² have fixed a standard of 0.030-0.035 g. P_2O_5 per 100 c.c. as being the minimum requisite for efficient defecation. It must be borne in mind that this figure will vary with every juice, depending on the purity and the nature of the impurities present. Bond³ conducted a series of determinations on certain juice components, notably phosphates, but, owing to disturbing influences, he was unable to correlate the data he obtained with the laws of equilibrium. Farnell⁴ studied the optimum conditions for the precipitation of calcium phosphate, considering the factors (a) time, (b) temperature, (c) reaction, and (d) initial phosphate concentration. He concluded that the amount of phosphate in cane juice affects (1) ease of clarification, (2) optimum pH for good clarification, (3) buffer action, and (4) increase in acidity on heating and settling.

The uranium acetate method.⁵

Attempts were first made to determine the concentration of phosphate in pure solution by the uranium acetate method. A solution of dipotassium phosphate ($K_2HPO_4 \cdot 2H_2O$), containing 2.500 g. P_2O_5 per 100 c.c., was prepared as accurately as possible, and analysed by the Pemberton-Neumann method. An average of four results showed that the solution contained 2.460 g. P_2O_5 per 100 c.c., whilst a similar average based on the uranium method showed only 2.12 g. P_2O_5 per 100 c.c. Other determinations with the uranium method also gave low results.

Modified Pemberton-Neumann method.—The solutions required are: (A) Molybdate solution⁶: 250 g. of ammonium molybdate dissolved in