with acetophenone. A mixed melting point showed that the two products are identical.

The diketone is not the primary product of the reaction between bases and the cyclopropane derivative. If the alcoholic solution containing the product of the reaction with sodium methylate is acidified with acetic instead of hydrochloric acid, and then allowed to evaporate it leaves an oil that contains no nitrogen but gives only a trace of copper derivative. When this oil is digested for a short time with a dilute solution of hydrochloric acid in methyl alcohol, and then shaken with copper acetate it gives the usual amount of copper derivative, showing that the oil contains an intermediate product which is turned into diketone by the action of mineral acids. All efforts either to isolate this product or to acquire more information about it were unsuccessful.

CAMBRIDGE, MASS.

[CONTRIBUTION FROM THE DEPARTMENT OF CHEMISTRY, KENTUCKY AGRICULTURAL EXPERIMENT STATION.]

THE COMPOSITION OF THE ASH OF CRAB GRASS (DIGITARIA SANGUINALIS) AS AFFECTED BY THE SOIL IN WHICH IT IS GROWN.

BY G. DAVIS BUCKNER.

Received June 4, 1919.

Plant nutrition teaches that the chemical composition of the ash of the same species of plant varies within wide limits when grown in different localities and under different conditions. Plants flourish when grown in soils of widely varying composition and seem to require no definite medium from which to secure the nourishment necessary for normal growth, provided it does not fall below a certain quantitative and qualitative level. The ash of plants grown in different soils will likewise have a variable composition.

In the prosecution of certain experiments in this laboratory it was found desirable to obtain a green plant which contained a large percentage of ash, the composition of which would satisfy given conditions. In the search for such a plant it was noticed that crab grass (*Digitaria sanguinalis*) grew and flourished in the middle of a limestone roadway. From other experiments it was reasoned that here at least would be conditions most favorable for the largest intake of calcium. The comparative analysis of a plant grown under such conditions and that of a sample of the same species grown under normal condition of garden soil would have an added interest. For these reasons plants were carefully selected with regard to form and size, and cut one inch above the ground, and from all external appearances they were similar. Both samples were immediately washed with distilled water to free them from extraneous material and were analyzed for calcium, magnesium, phosphorus, silicon and potassium. The results are shown in the following table:

TABLE I.—ANALYSES OF CRAB GRASS ASH.

	Grown in garden soil. G.	Grown in limestone roadway. G.	Percentage difference.
Wt. of air-dried sample	7.9833	7.8307	..
Wt. of ash of air-dried sample	1.6640	1.3695	..
	%.	%.	
Ash in the air-dried sample	20.84	17.49	—16.1
P_2O_5 in the ash	4.01	4.92	+22.7
SiO_2	14.60	14.50	..
CaO	3.75	5.40	+44.0
MgO	2.68	3.42	+27.6
K_2O	39.86	32.38	—18.8

It will be seen from these figures that the intake of inorganic material was not the same in the two specimens. It is interesting to note that the sample of grass grown in the middle of a comparatively new limestone roadbed which was from 4 to 5 inches in thickness contained approximately 16% less ash than did a similar sample grown in garden soil and that the quantity of K_2O was 18.8% less in the first mentioned. In opposition to this it is seen that the ash of the sample grown in the limestone contained 22.7% more P_2O_5, 44.0% more CaO and 27.6% more MgO. That the percentage of silica is approximately the same in these two samples is likewise worthy of note.

The outstanding feature in connection with the growth of these two samples of crab grass is that the absorption and retention of these different amounts of calcium, magnesium, phosphorus and potassium cause no observable difference in their external appearance.

LEXINGTON, KY.

[CONTRIBUTION FROM THE CHEMICAL LABORATORY OF THE OHIO STATE UNIVERSITY.]

THE OXIDATION OF ORGANIC COMPOUNDS WITH ALKALINE POTASSIUM PERMANGANATE.

Part I.—The Oxidation of Acetaldehyde. Part II.—The Oxidation of Glycol, Glycollic Aldehyde, Glyoxal, Glycollic Acid and Glyoxalic Acid.

BY WILLIAM LLOYD EVANS AND HOMER ADKINS.

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The problem of the alkaline oxidation with potassium permanganate of some of the simple alcohols, aldehydes, ethers, ketones and acids has been quantitatively studied by a number of investigators.[1] In much of the work which has been done on the alkaline oxidation of organic com-

[1] Nef, *Ann.*, **335**, 269 (1904); Denis, *Am. Chem. J.*, **38**, 561 (1907); Evans and Witzemann, THIS JOURNAL, **34**, 1086 (1912); Witzemann, *Ibid.*, **38**, 150 (1916); **39**, 2657 (1917); Evans and Day, *Ibid.*, **38**, 375 (1916); Evans and Day, *Ibid.*, **41**, 1267 (1919).