The baking powder contained about 30 per cent. of burnt alum.

Therefore, there was introduced into 24¼ oz. of biscuit, 105.3 grains of burnt alum, or what is equivalent to 194.21 grains of common alum; and, as one biscuit would contain 3 grains of hydrate of alumina, a person eating four of these biscuits at a meal, would therefore introduce into his stomach 12 grains of hydrate of alumina.

IV.—Analyses of the Ashes of Certain Weeds.

By F. P. Dunnington.

With a view of obtaining some knowledge of the extent to which certain soils contain available, inorganic plant-food, I have undertaken, in the following analysis, to ascertain the comparative demands made by certain wide-spread and abundant weeds, for the main constituents of plant ashes, though, also, determining other constituents which have little bearing on the solution of this problem.

These plants were gathered just previous to flowering, each from a locality in which they were growing quite abundantly,* taking as a sample the whole previous growth of the season. Not having taken any special precautions to exclude the fine, clay dust of this locality, a small amount of alumina, iron, manganese and silica, is, no doubt, to be thus accounted for. Since some weeds are known in different localities by so different names, I give, also, the botanical names. The plants selected were the following:

1. Broom sedge (*Andropogon scoparius*), beard grass.
2. Wire grass (*Eleusine Indica*), dog's-tail grass.
3. Blue thistle (*Echium vulgare*), blue devils.
4. Potato-weed (*Solanum Carolinense*), horse nettle.
5. Purslane (*Portulaca oleracea*), pot-herb portulaca.
6. Sumach (*Rhus glabra*), common sumach.
7. Sassafras (*Sassafras officinale*).
8. Rag-weed (*Ambrosia artemesiæfolia*), bitter-weed.
9. Mullein (*Verbascum thapsus*), common mullein.
10. Dock (*Rumex obtusifolius*), broad-leaved dock.

The method adopted in these analyses was, with some few exceptions, uniform. The recently gathered plants were weighed, then allowed to slowly dry, at the common temperature, protected from dust, and re-weighed; of this, a weighed portion was heated to 110° C. until it ceased to lose weight, to determine moisture. From

* Blue thistle in flower, and not from a full patch.

20 to 50 grms of the air-dried specimens were, in small portions in porcelain crucibles, brought slowly to a low, red heat, and reduced to ashes. The impure ash was exhausted with water and then with dilute HNO_3, and the Cl determined in a fraction of this solution. The remaining portion of the ash was exposed to a red heat until all carbon was burnt off, and then exhausted with HCl and HNO_3, leaving only SiO_2 (the amount of which, when considerable, was verified by volatilization with NH_4F). The solutions obtained, united in proper proportion, were employed for the general analysis according to the usual methods. A definite fraction of this solution was treated with more than twice enough standard H_2SO_4 to unite with all the bases present, and then evaporated on the water bath until all HNO_3 and HCl were removed; the residue was then titrated with standard NaHO, thus determining the amount of acid required to neutralize the CaO, MgO, Na_2O and K_2O, not combined with the P_2O_5 and SO_3, of the ash (each molecule of P_2O_5 being precipitated in combination with two molecules of CaO or MgO). There was thus obtained, as a check on the analysis, the total relative number of molecules of the bases which had previously been weighed separately. The analyses afforded the following results, given in Table I. and Table II.:

TABLE I.—IN 100 PARTS FRESH PLANT.

	Broom Sedge.	Wire Grass.	Blue Thistle.	Potato Weed.	Purslane.
Water lost by drying in air.....	57.14	73.72	68.98	75.14	91.93
" " " at 110° C.	4.62	2.65	4.07	3.23	.96
Pure ash (excluding CO_2)......	2.24	2.45	4.69	2.17	1.52
Carbon dioxide (of ash)........	.42	.29	1.19	.47	.65
Organic matter (by difference)..	35.58	20.89	21.07	18.99	4.94
	100.00	100.00	100.00	100.00	100.00

	Sumach.	Sassafras.	Rag-weed.	Mullein.	Dock.
Water lost by drying in air.....	61.94	62.21	70.22	81.83	88.12
" " " at 110° C.	4.55	4.54	3.20	3.93	1.26
Pure ash (excluding CO_2).......	1.48	1.41	1.93	1.01	1.60
Carbon dioxide (of ash)........	.58	.39	.85	.39	.26
Organic matter (by difference)..	31.45	31.45	23.80	12.84	8.76
	100.00	100.00	100.00	100.00	100.00

TABLE II.—IN 100 PARTS PURE ASH (INCLUDING Fe_2O_3, Al_2O_3, Mn_3O_4 AND SiO_2).

	Broom Sedge.	Wire Grass.	Blue Thistle.	Potato Weed.	Purslane.
SiO_2	40.19	22.41	47.91	2.39	2.46
Cl	4.34	9.05	2.42	4.32	4.26
SO_3	2.67	12.10	2.23	11.93	3.20
P_2O_5	4.53	5.96	2.78	22.31	5.19
K_2O	31.40	34.56	16.65	23.04	60.89
Na_2O	1.23	6.09	1.41	1.19	3.52
CaO	11.50	7.34	22.44	18.40	10.67
MgO	3.45	3.81	3.49	16.47	9.47
Al_2O_3	.20	.22	.56	.11	.49
Fe_2O_3	.64	.21	.51	.55	.54
Mn_3O_4	.83	.29	.14	.26	.27
Deduct O replaced by Cl	—.98	—2.04	—.54	—.97	—.96
	100.00	100.00	100.00	100.00	100.00

	Sumach.	Sassafras.	Rag-weed.	Mullein.	Dock.
SiO_2	3.31	4.60	3.16	3.26	4.36
Cl	.81	.23	3.39	3.27	9.50
SO_3	7.94	10.89	8.00	7.32	8.27
P_2O_5	8.66	12.00	7.99	6.15	7.08
K_2O	44.18	33.36	31.40	50.12	52.67
Na_2O	2.03	6.11	.80	3.33	7.25
CaO	24.75	22.30	33.78	19.06	8.63
MgO	6.04	6.88	11.75	5.53	3.46
Al_2O_3	1.15	1.26	.00	1.15	.45
Fe_2O_3	.99	1.52	.37	1.01	.45
Mn_3O_4	.32	.91	.14	.54	.02
Deduct O replaced by Cl	—.18	—.06	—.78	—.74	—2.14
	100.00	100.00	100.00	100.00	100.00

Undoubtedly in some, if not all, of these plants, a portion of the silica is essential; but to obtain a better view of the amounts of the remaining, more important, constituents, the above results have been re-calculated, excluding the SiO_2 together with the Al_2O_3, Fe_2O_3 and Mn_3O_4, as no doubt the main portion of these latter has been derived from adherent dust.

TABLE III.—IN 100 PARTS PURE ASH (EXCLUDING Fe_2O_3, Al_2O_3, Mn_3O_4 AND SiO_2).

	Broom Sedge.	Wire Grass.	Blue Thistle.	Potato Weed.	Purslane.
Cl	7.48	11.77	4.76	4.47	4.43
SO_3	4.59	15.75	4.38	12.34	3.32
P_2O_5	7.79	7.75	5.46	23.08	5.40
K_2O	54.02	44.96	32.72	23.82	63.27
Na_2O	2.13	7.93	2.77	1.24	3.66
CaO	19.78	9.54	44.11	19.03	11.08
MgO	5.93	4.95	6.87	17.03	9.84
Deduct O replaced by Cl	—1.72	—2.65	—1.07	—1.01	—1.00
	100.00	100.00	100.00	100.00	100.00

	Sumach.	Sassafras.	Rag-weed.	Mullein.	Dock.
Cl	.85	.26	3.51	3.47	10.03
SO_3	8.43	11.89	8.31	7.78	8.73
P_2O_5	9.18	13.07	8.30	6.54	7.48
K_2O	46.90	36.37	32.59	53.30	55.60
Na_2O	2.19	6.66	.83	3.54	7.65
CaO	26.24	24.32	45.07	20.27	9.11
MgO	6.40	7.49	12.21	5.88	3.66
Deduct O replaced by Cl	—.19	—.06	—.82	—.78	—2.26
	100.00	100.00	100.00	100.00	100.00

UNIVERSITY OF VIRGINIA, Dec., 1879.

V.—CONTRIBUTIONS FROM THE CHEMICAL LABORATORY OF THE UNIVERSITY OF MICHIGAN.

By ALBERT B. PRESCOTT.

I. ALUMINATES OF POTASSIUM AND SODIUM IN SOLUTION.

The composition of certain solid aluminates of metals of the alkalies and alkaline earths, was well established long ago. Also, there are recorded observations of the action of water upon alkali aluminates, either effecting complete solution, or partial dissociation. Not finding statements of the proportions of potassium hydrate and sodium hydrate, necessary to dissolve precipitated aluminium hydrate, the writer instituted determinations of these data, in order to show the atomic ratio of K and Na, to Al, in the aluminate solutions, with different quantities of water, in the conditions of re-dissolved precipitate so common in chemical operations.*

* These operations for determination of potassium aluminate and sodium aluminate, were entrusted to the execution of Mr. J. N. Ayres.