U. S. DEPARTMENT OF AGRICULTURE
STATES RELATIONS SERVICE
A. C. TRUE, DIRECTOR

EXPERIMENT STATION RECORD

VOLUME XLIV

JANUARY–JUNE, 1921

GOVERNMENT PRINTING OFFICE
1922

Of all the fertilizers used, sodium nitrate stood first in activity and in the utilization of its nitrogen. Calcium nitrate gave almost as good results as sodium nitrate. Ammonium salts gave results within from 7 to 8 per cent as good as those given by nitrates on potatoes and above-ground crops, while on beets they gave yield increases within 35 per cent of those given by nitrates and showed a nitrogen utilization within 25 per cent. The better results given by sodium nitrate with beets is attributed in part to its sodium content. On soils rich in lime and relatively poor in clay constituents, the maximum results were obtained with the ammonia nitrogen when the ammonium salts were mixed with superphosphate. Maximum results were in general obtained from the ammonium salts when they were used alone and applied to summer crops before seeding. A sufficient lime content of the soil was also necessary.

The results obtained with lime nitrogen were more uncertain than those with ammonium salts and were on the average not so good. The effectiveness of lime nitrogen reached 75 per cent of that of sodium nitrate for above-ground crops and only 57 per cent for beets. There was considerable nonuniformity in its action. It was best applied several weeks before the growth of winter crops, and it was found inadvisable to add it to snow covered or too damp soil. Best results were obtained when it was thoroughly incorporated in the soil.

Liquid manure gave practically as good average results as the ammonium salts. Better results were obtained with beets than with above-ground crops.

The United States' search for natural deposits of soluble potash, H. D. RUHM (*Jour. Indus. and Engin. Chem., 12 (1920), No. 9, pp. 837–840, figs. 2*).—The author briefly reviews the history of the well-known natural deposits of soluble potash, particularly those in Germany, and apparently believing in the existence of similar deposits in the United States, urges that the Government investigate the potash resources of some of the eastern States where the potash can best be utilized.

Cooperative experiments for the composting of phosphate rock and sulphur, W. B. ELLETT and W. G. HARRIS (*Soil Sci., 10 (1920), No. 4, pp. 315–325*).—Experiments conducted at the Virginia Experiment Station to determine the changes that take place when phosphate rock is composted with clay loam soil, sulphur, and manure are reported.

Four compost mixtures were studied as follows: (1) Soil, rock phosphate, and sulphur, (2) soil and rock phosphate, (3) soil, manure, rock phosphate, and sulphur, and (4) soil, manure, and rock phosphate. It was found that the addition of sulphur to a compost of soil and rock phosphate increased the availability of the phosphoric acid, but not to the same extent as when manure was added to a compost of soil, rock phosphate, and sulphur. In the second and fourth compost mixtures described above, without sulphur, there was no appreciable increase in the availability of the phosphoric acid.

Sulphur oxidation was found to precede the increase of available phosphoric acid. The addition of phosphate to manure slowed up the fermentation, and there was a loss of only 57.8 per cent of dry matter and 48.21 per cent of nitrogen in two years. At the same time there was an increase in nitrate nitrogen and a loss in ammoniacal nitrogen. The addition of sulphur and phosphate to manure checked the fermentation to a greater extent than the phosphate alone, there being a loss of only 43.77 per cent of dry matter and 46.44 per cent of nitrogen in two years. Here, however, the increase in ammoniacal nitrogen was balanced by the loss in the nitrate nitrogen. All the Virginia soils tested had some sulfofying power, but there was a very great variation

while in clay they change but sluggishly, since clay takes up and parts with water with difficulty. (2) In view of the fact that the values of $\frac{R_4}{R_0}$, and therefore the values of the diffusivity of the soil are so dependent on the percolation of rain, it is possible that the values commonly given for the diffusivity of the surface layers of the earth need revision. (3) Underground temperatures are also considerably affected by (*a*) strong winds of low relative humidity, (*b*) the frequency and intensity of frost when the soil has no snow covering, (*c*) the depth of snow, (*d*) weather changes of long period. (4) The date of flowering of coltsfoot appears to bear little relation to the monthly mean values of temperature, but is closely related to the number of frosts on open soil not covered with deep snow. It is possible that good results would be obtained by comparing the phenological returns of the last 30 years with the accumulated temperature underground above the growing temperature for each plant considered."

The penetration of frost in the soil, V. ENGELHARDT (*Met. Ztschr. [Brunswick], 37 (1920), No. 11, pp. 305–312*).—This is an analysis of data bearing upon the rate, depth, and modifying conditions of frost penetration. The mathematical treatment of the subject by Neumann, Stefan, and Schreiber is also discussed.

Periodicity of winter temperatures in western Europe since A. D. 760, C. EASTON (*K. Akad. Wetensch. Amsterdam, Proc. Sect. Sci., 20 (1918), pt. 2, pp. 1092–1107, pl. 1*).—Data for the period 760 to 1916 are analyzed for 22½, 44½, and 89-year periods.

A general conclusion is that "increased and accelerated activity of the solar surface corresponds in general to the winter cold in western Europe setting in more forcibly and rapidly than usual; inversely a weakened and retarded activity of the sun corresponds to winters setting in later and more mildly in a later part of the period." Another conclusion is that all temperature averages since 1852 are higher than the true mean. Apparently only an 89-year series gives a true average.

The influence of forests on climate, T. WLISSIDIS (*Centbl. Gesam. Forstw., 44 (1918), No. 3–4, pp. 94–99*).—Reviewing briefly the observations and investigations on this subject, the author concludes that there is almost always a small difference between the climatic elements of forests and of the free air, but that forests have a wider beneficial influence on the climate than is shown by the measurement of differences in the climatic elements.

Carbonic acid and plant growth, F. BORNEMANN (*Kohlensäure und Pflanzenwachstum. Berlin: Paul Parey, 1920, pp. VI+110, figs. 11*).—This is a review of investigations, including those of the author, bearing on the relation of carbon dioxid to plant growth and on the conditions of culture and fertilization which determine the carbon dioxid content of the soil and air surrounding plants. The general conclusion is that notwithstanding the inexhaustible supply of carbon dioxid in the atmosphere there is ordinarily not enough of this gas in the plant environment for maximum growth, hence the importance of adopting methods of fertilizing or other means that will increase the supply of carbon dioxid available for plant use.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 7 (1920), Nos. 7, pp. [201], pls. 4, fig. 1; 8, pp. [201], pls. 4, fig. 1*).—These volumes contain brief summaries and detailed tabular statements of climatological data for each State for July and August, 1920, respectively.