

were observed: Peppergrass, red clover, pansy, yarrow, common ragweed, smartweed, dandelion, and white sweet clover. Chickweed also was common, but scarcely deserves mention, as it is not only one of our hardiest plants, but also one of our few wild everbloomers. Although there occurred days in the first half of December with mean temperature freezing or below, this month brought no severe cold until after the 15th, on which date, however, a snow cover arrived. Thereafter, to the end of the month, from one-half inch to more than 4 inches of snow lay on the ground. Protection from cold, however, no longer served to postpone the time for cessation of blooming. Besides, the pressure of the snow for so long doubtless was not without its ill effects. Consequently, on January 1, 1921, but two species besides the ubiquitous chickweed were found in blossom, namely, dandelion—one head partly open—and peppergrass. The snow cover disappeared on this date, and fresh-appearing foliage—abundant in many instances—of the following plants was noted: Yarrow, dock (*Rumex* sp.), dandelion, white clover, sweet clover, red clover, evening primrose, narrow-leaved plantain, bouncing Bet, motherwort, hollyhock, chickweed, goldenrod, nettle, mullein, common ragweed, peppergrass, cinquefoil (undetermined species), tall crowfoot, common plantain, and several others.

From January 1 to January 11, 1921, the ground was bare, temperature fell to freezing or below almost every night. The result was that when the tract was next visited, about the middle of the month, only in sheltered spots was any green vegetation to be found.

Notes made in the autumn of 1921 show that while November of that year was almost as mild as November of 1920, a very thick deposit of frost on the 2d, minimum temperature 30°, had a decidedly prejudicial effect upon the vegetation of the tract. Nine species were still in bloom on the 6th, but there was a rapid decline in floral and vegetal activities thereafter. On November 25 a few sickly blossoms of four species were found. These were mallow, yarrow, dandelion, and peppergrass. The state of the foliage of all species was also quite in contrast to that noted on the same date of the previous year. Now, green leaves could be discerned only in unexposed places, whereas in the last week of November, 1920, vegetation was actually flourishing.

Temperature and the snow cover were practically the only meteorological factors considered in these studies. Questions as to flowering and fruiting as controlled by length of day were not taken up. In this connection, however, it is interesting to note the status of asters and goldenrods, which are usually thought of as the very latest of fall flowers. No asters were found in bloom upon the area on the date the study was begun, or thereafter; and goldenrod flowers had ceased to be abundant at that time. Another circumstance bearing on growth as related to length of day is that some ragweeds found on November 25, 1920, were stunted, but bore an abundance of both staminate and pistillate flowers. This ragweed is an annual, and the seeds from which these late plants sprang doubtless had been dropped shortly before and, meeting the proper conditions for germination and growth, had begun to develop. It has been pointed out (see Garner and Allard, Yearbook, Department of Agriculture, 1920) that "late planting \* \* \* may lead to dwarfing in growth but abundant flowering and fruiting."

To return from this digression, and to sum up:

The prolonged activities of wild plants in November, 1920, in the vicinity of Grand Haven, Mich., were due

not so much to the mildness of the autumn as to the fact that a snow cover protected vegetation during periods in which the temperature was low enough to destroy exposed plant life.

#### TEMPERATURE AND THE BLOOMING OF CHERRY TREES.

S. Aoki and Y. Tazika, meteorologists in the Central Meteorological Observatory in Tokio, Japan, have an interesting article in the *Journal of the Meteorological Society of Japan*, April, 1921, on the correlation between the air temperature and the date of blooming of certain cherry trees located in the Observatory grounds.

The period covered by the records is from 1900 to 1921. The average date of blooming is April 2, while the date varied from March 25 in 1913 and 1920 to April 8 in 1917.

The correlation between the mean temperature for 30 days from February 16, and the date of blossoming; gives a coefficient of  $-0.94$ , with a probable error of only  $\pm 0.015$ .

The correlation between the mean temperature for 20 days from February 16 and the date of blossoming, gives a coefficient of  $-0.80 \pm 0.054$ .

The ability to determine the probable date of blossoming of cherries or other fruit from 10 to 15 days in advance would be of considerable value in making preparation for spraying. The experience in Japan indicates that this will be possible wherever the records of temperature and blossoming dates are long enough to furnish data for calculating the necessary mathematical equations.—*J. W. S.*

#### RELATION OF TEMPERATURE TO CITRUS SCAB.

The result of some interesting experiments by Prof. H. S. Fawcett in connection with the relation of temperature to infection and growth of the citrus scab fungus is given in the *Journal of Agriculture Research*, May 16, 1921, Vol. XXI, No. 4. In some previous work it was found that abundant moisture was present when bad infection took place, but seasons were encountered when scarcely any infection occurred when moisture and growth appeared to be ideal for an outbreak. Consequently these later experiments were prosecuted to determine what influence the temperature might have.

The tests were made in greenhouse experiments on sour-orange seedlings, with artificially inoculated plants, at temperatures varying from 12° to 42.5° C.

The inoculation temperatures that resulted in infection of growing plants under conditions of rapid growth and abundant moisture were 16°, 18.5°, 19°, 20°, 21° and 23° C. No infection was obtained under the same conditions at temperatures under 16° and above 23° C. Detached leaves floated in water with the scab fungus were infected at 16°, 18.5°, 21°, 24.5°, and 27.5° C.

This limited range of temperature at which infection of a susceptible host took place under the presumably favorable conditions of the experiment appears to explain the great difference observed in the occurrence and severity of scab from year to year; it also apparently explains the difference of previous inoculation experiments not hitherto understood.

The conditions necessary for scab infection indicated by these experiments are (1) viable spores of the fungus, (2) young citrus leaves of a susceptible species, (3) moisture, and (4) temperatures between 16° and 23° C.—*J. B. K.*