

The general opinion is that winter grains should be covered by snow during cold weather and more especially when freezing and thawing conditions prevail. The results of studies in Ohio by the writer and by students taking the advanced course in Agricultural Meteorology at the Ohio State University show little to substantiate this opinion, at least during part of the winter.

A correlation between the number of days with snow on the ground from December to March, inclusive, and the yield of wheat in Fulton County, Ohio, gave a coefficient of only -0.14 , ± 0.14 . A correlation between the yield of wheat and the number of days in March with freezing weather, while the ground was bare, gave a coefficient of only -0.01 . A correlation of the yield with the number of days during the whole winter with the ground bare and the temperature below 20° produced a coefficient of -0.28 , ± 0.14 . The last gives a slight relation, but the others indicate no real effect of the lack of a snow covering on the yield.

In the spring of 1915 Mr. Harry Roads made a correlation between the number of days with freezing and thawing weather during the whole winter in Clinton County, Ohio, and the yield of wheat, and got a correlation coefficient of only -0.18 , or less than two times the probable error. The period covered was 28 years. He did not take the snow covering into account, but as this county is in southern Ohio where there is generally no great amount of snow-covering it shows that freezing and thawing conditions do not have so great an effect upon the yield of wheat as has been thought.

On the other hand, there is some evidence to indicate that wheat has a better prospect if it is not covered by snow during the month of January. A correlation by J. T. Cox between the number of days without a snow-cover when the temperature was below freezing in January and the yield of wheat in Wayne County, Ohio, gave a coefficient of $+0.49$, probable error ± 0.11 . He found also that a large temperature range in January was beneficial.

Table 1 showed that a heavy snowfall in January was somewhat beneficial, while the above indicates that a

snow-covering in that month may be detrimental. The explanation may be that a heavy snowfall in January melting quickly, as well as freezing and thawing weather while the ground is bare in this month, disintegrates the soil particles and settles the earth around the dormant roots and makes the plants better able to withstand later unfavorable conditions when they begin to develop.

Heaving is one of the most common causes of damage which usually occurs in the spring and is due to alternate freezing and thawing. It is possible, also, that a heavy snow-cover in January produces conditions favorable for smothering the grain, either from a very deep accumulation of snow, or, what is most common, the formation of an ice sheet from the partially melted snow.

The whole subject of winter damage to grains, whether by heaving, smothering, freezing of plants, or physiological drought, and the part that a snow-cover or lack of it, plays is worthy of a most thorough study. The facts given above, although based on too little data, may indicate the direction that the investigation should take.

PROTECTIVE POWER OF SNOW.

"The following observation [at Falling Royd, Hebden Bridge, Yorkshire, England] shows the remarkable extent to which a covering of snow protects the ground and plant life from intense cold. About 6 p. m. on the 13th of January a minimum thermometer was placed on the ground in the center of my lawn here, the temperature then being only a few degrees below freezing. Snow then fell to the depth of $1\frac{1}{2}$ inches. At 11 p. m. the snow had ceased falling, and it was a bright starlight night and very cold. A second minimum thermometer was then placed on the top of the snow. No more snow fell in the night. In the morning the two thermometers recorded the following minimum temperatures: On the top of the snow, 2° F. below zero; under the snow, 24° F., or a difference of 26 degrees."

A. R. Crossley (in Symons's Meteorological Mag., Feb., 1918, 53:20).