FIELD & LABORATORY

Volume 3 November, 1934 Number 1

RAINFALL ON THE WESTERN FRONT DURING THE WORLD WAR

Edwin J. Foscue

Within the last fifty years many attempts have been made to produce rain by artificial means, but all have resulted in failures. The unusually dry summer of 1934 in central United States, from North Dakota to Texas, produced a new group of rainmakers and rain-making experiments. The details of their plans differed somewhat, but all worked on the so-called "concussion theory" that the detonation of high explosives in the upper atmosphere would produce rain. In each case claims were supported by the commonly accepted statement that rain always followed battles, and that the unusually heavy rain in France along the western front during the World War was due to the heavy bombardment. These claims are interesting, and if true might provide some support for the belief that explosions in the upper atmosphere would produce rain, but the climatological data fail to bear out the statement.

After following the progress of a rain-making experiment in the vicinity of Dallas, Texas, this past August, in which the "would be" rain-maker unfortunately lost his life[1], the author became interested in obtaining from climatological data the true story of rainfall on the Western Front during the World War. These data are tabulated and charted below. Table 1, gives the annual rainfall in inches for the five years of the War, together with the average for each

[1]The Dallas News, August 29, 1934.

of the six stations, for its total record. Table 2, gives the maximum and minimum rainfall for the same six stations with the year in which each record occurred. The data from Table 1 are also shown graphically at the bottom of figure 1, and the locations of the six stations and the battle field area on the Western Front are indicated on the map.

Table 1[2]

Name of Station	Length of Record	Annual Precipitation (inches)					
		Av.	1914	1915	1916	1917	1918
Nantes, France	50 years	28.58	37.57	39.85	37.35	26.34	28.51
Paris, France	57 "	23.65	25.04	26.14	28.20	22.94	23.14
Greenwich, England	90 "	24.58	24.24	31.04	30.28	26.42	28.80
Utrecht, Holland	82 "	29.28	31.92	35.63	35.18	31.29	35.76
Frankfurt, Germany	94 "	24.86	28.40	21.00	29.24	20.92	23.16
Berlin, Germany	80 "	23.30	25.28	23.80	24.92	19.86	23.56

Table 2[2]

Name of Station	Maximum and Minimum Annual Precipitation (inches)			
	Maximum	Year	Minimum	Year
Nantes, France	42.26	1930	16.34	1921
Paris, France	33.20	1930	11.12	1921
Greenwich, England	36.11	1903	12.76	1921
Utrecht, Holland	41.79	1852	15.90	1921
Frankfurt, Germany	35.60	1922	14.39	1921
Berlin, Germany	32.20	1926	14.48	1857

A study of the six charts reveals that the five years of the war (1914-1918) were not unusually rainy years as is commonly supposed. Paris, France, located nearer the battle field area than the other five stations shows that the first three years of the war were only slightly above normal, while the last two (the period when the American troops were in France) were below normal. Nantes, France, on the western coast reveals the same, although the average annual rainfall at that station is slightly higher. At Greenwich, England, 1914 was an average year, but the remaining years were slightly above normal. Utrecht, Holland, to the northeast of the war zone appears to have had a slight increase in rainfall during the war period. Frank-

[2]Clayton, H. Helm: WORLD WEATHER RECORDS, Smithsonian Miscellaneous Collections, Vol. 79, pp. 478-562, Vol. 90, pp. 206-227. Washington, 1927 and 1934.

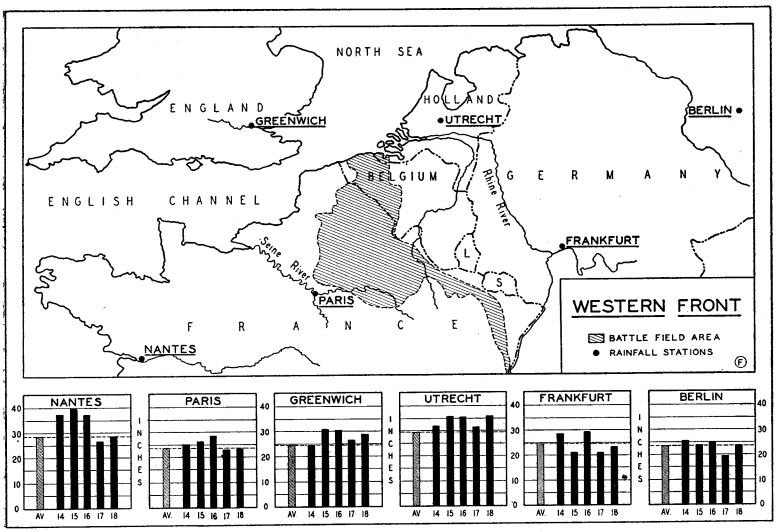

Fig. 1. The battlefield area of Northwestern Europe, and rainfall graphs of the six weather stations shown.

furt, Germany, to the east of the war zone, shows 1914 and 1916 slightly above average, but 1915, 1917 and 1918 below average. Berlin, Germany, some distance east of the war zone shows 1914 and 1916 a little above average and the other years either average or below. It is interesting to note in Table 2 that the maximum annual rainfall for the six stations came during years of peace, and that the precipitation for those years was considerably higher than for any year during the World War, and also that the minimum rainfall for each station occurred during times of peace. The above data indicate that the rainfall of northwestern Europe was not affected by the great bombardment during the War. The war years were slightly wetter, or slightly drier than the average for each station, but the detonation of high explosives during the war seemingly had no influence upon the total precipitation.

When the American soldiers returned from France they described the heavy rainfall and the mud of the battlefield areas, undoubtedly associating those observed facts with the terrific cannonading of the war, and concluded that the rainfall had been much heavier than normal as a result of

bombardment. The troops that fought in northeastern France and Belgium certainly suffered from the damp climate, and the sticky mud of Flanders, but the mud of that area was nothing unusual. Because of the clayey subsoil, and the low lying terrain, any precipitation on the area stands for a long time before it disappears. Evaporation is low, and drainage almost impossible. During peace times transportation is confined to the paved and improved roads, and railroads of the area, but an army cannot limit its movements to roads. It must cover more or less the entire terrain, hence move over areas that will become muddy and remain so for long periods at a time. The mud of Flanders has been a factor of first importance with which military leaders have had to reckon since the time of the Roman conquest. Modern trench warfare aggravated conditions. Trenches and dugouts pierced the ground below the water table, which was almost at the surface, and immediately filled with water. Shell holes filled with water and could not be drained. The entire battlefield soon became an almost impassable morass. Johnson[3] says of the Flanders mud:

> Assaulting columns found it difficult to scramble out of the slippery trenches and were mowed down by enemy fire as they advanced slowly through a tenacious clay into which they sank more than ankle deep. Rifles became clogged so that they could not be fired; and when they were wrapped in cloth to keep the mechanism clean, were not ready for instant use. The wounded lay half buried in mud, and many suffocated. . . . . The effect of ever-present, everlasting mud on the morale of an army is a factor difficult to evaluate, but certainly not to be ignored. . . . . Cold, wet, tired, and disgusted, the unhappy fighter in Flanders would crawl into his straw-floored dugout, leaving his clay-coated shoes at the entrance, and lie shivering as he cursed the eternal mud which was by far his worst enemy.

From the above description one can easily understand why the American soldier felt that the rainfall of northeastern France and Belgium must have been heavier than usual during the war period, and why he naturally concluded that this *excessive* (*?*) rainfall was caused by bombardment. The man who fought in Flanders mud might be

---

[3]Johnson, Douglas W.: BATTLEFIELDS OF THE WORLD WAR, American Geographical Society, Research Series No. 3, pp. 24-25, New York, 1921.

excused for his belief that cannonading caused rainfall, but the author feels that the true story of the rainfall on the Western Front during the World War should be published so that man will not continue to believe in the fallacy. Climatological data reveal absolutely no correlation between rainfall during the World War and the detonation of high explosives.

MOLASSES-AGAR: A USEFUL MEDIUM FOR THE CULTIVATION OF THE GENUS MONILIA

Hardy A. Kemp and Sol Haberman

Species of the genus *Monilia* are easily cultivated between the temperatures of 22°C and 38°C on solid media of slightly acid reaction. After cultivating stock strains of *Monilia albicans* and *Monilia psilosis* on Sabouraud's medium, honey agar, and molasses agar, it was found that molasses agar afforded the best means for cultivating these *Oosporaceae*. This medium is simple in preparation, efficient, cheap, and practical. It consists of nutrient broth or nutrient agar and "sorghum" molasses. The results obtained by the use of this medium were very gratifying. In cultivating and isolating several species of *Monilia,* we used various percentages of molasses, (one, two, four, and eight per cent) in the substrate. Of these, the eight per cent molasses agar gave the best results, in that the high acidity hindered the growth of other organisms and permitted growth of the *Monilia.* The acid content of the various percentages of media ran as follows: The one per cent molasses agar 6.6 pH at 40°C., the two per cent molasses agar 6.52 pH at 40°C., the four per cent molasses agar 6.35 pH at 40°C., and the eight per cent molasses agar 6.085 pH at 40°C. The pH estimations were done with a Youden Hydrogen-ion Concentration Apparatus made by the Welch Company.