

## Rainfall in Palestine.

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THE annual rainfall in Palestine has an important bearing on the fertility of the country. This fact gives more than ordinary interest to the subject.

1. The year in Palestine may be divided roughly into two seasons: the rainy season and the dry season. The rainy season usually begins early in November, and ends in April. Its duration varies widely in different years. (See table below.)

2. The rainy season may be grouped in three periods: (1) the early rain, from early in November until about Dec. 15; (2) the winter rain, from Dec. 15 to about March 15; (3) the latter rain, from March 15 to the last of April or early in May. There is not a definite cessation of one and the beginning of the next period. The periods run into each other and overlap, leaving no marked separation between them. The "former" and the "latter" rain do not describe two rainy seasons, but two periods of the same season.

3. The rainy season is not all rainy, but includes many fair days. Rain falls one or more days, followed by an interval of fine weather. Rarely does it rain more than five days in succession, though it sometimes extends to ten or fifteen days. The number of days actually rainy varies in different years; not half of the days of the rainy season are actually rainy days; indeed, seldom does rain fall on one-third of the number of days included in the rainy season. (See table.)

4. The amount of rainfall is as variable as the length of the rainy season; one thing only is more uncertain, — the time of the coming of the rain during the season. Among the observations which have been taken are those of Dr. J. T. Barclay, 1846–1854; of Dr. McGowan for the same period (excepting 1849–50); and Dr. Thomas Chaplin, 1860–1882. All of these were taken at Jerusalem. The observations of the survey party of the English Palestine Fund, 1869–1881, were taken in different points in Western Palestine. This will account for the variations in its results as compared with those of Dr. Chaplin for some of the same years. For instance, Capt. Conder

of the Fund survey party states that, in 1872-73, "a continuous east wind prevailed, and scarce any rain fell until the end of February." Dr. Chaplin's tables, however, show that at Jerusalem the fall of rain up to the end of February for that season was nearly sixteen inches, of which ten inches fell in November and December. In the following year, the reports agree quite closely on the amount of rain that fell.

5. The average yearly rainfall, according to Dr. Barclay, for the eight years covered by his observations, was about sixty inches. His instruments were not the best, and not favorably situated for accurate measurements. He therefore rejected his record in favor of that made by Dr. McGowan of the Anglican Hospital at Jerusalem for seven of the same years covered by Dr. Barclay's observations. According to Dr. McGowan's record, the average yearly rainfall was 56.5 inches. These authorities appear to have been followed by most of the dictionaries and encyclopædias which make any note of the rainfall in Palestine.

6. These statements are far too large. The record of Dr. Chaplin at Jerusalem for twenty-two years (1860-1882) shows that the yearly rainfall was a fraction less than twenty-three inches. The English survey party give the yearly fall of rain for Palestine at about twenty-five inches. It is not possible to account for the wide difference between these and the reports of Drs. Barclay and McGowan by supposing that there has been a great decrease, such that the rainfall is now hardly one-third of the amount that it was a few years previous to the later observations. In 1870 Capt. Wilson, of the English survey, wrote, "The winter rainfall is much less than has been generally supposed, as, by a strange mistake, the rain-gauge was formerly read four times higher than it should have been." (See "Recovery of Jerusalem," p. 20.)

7. The record of Dr. Chaplin, for the twenty-two years, shows the greatest rainfall to be about forty-three inches, and the least a fraction less than thirteen inches in a year.

8. The various late tables consulted indicate that the amount of rainfall runs in cycles. The largest amount of fall is followed by a decrease for a time, and then by an increase, the cycles being about four to six years in duration. The highest point is reached not less than four times in the twenty-two years of Dr. Chaplin's tables.

9. The fall of rain at Jerusalem appears to be increasing. The fall there for the first eleven years of this record shows an annual average of a little more than twenty-one inches. The fall for the

second eleven years noted is an average of over twenty-six inches annually. Moreover, there appears from the detailed tables a similar increase of fall in snow the last eleven as compared with the first eleven years.

10. The facts are too few to warrant any important conclusions on the fertility of the land. The observations of the English survey, made in camp necessarily under not the most favorable circumstances, are valuable chiefly when supported by other records. It is very desirable to secure more detailed observations at different points in Palestine, and extending over a greater number of years. The missionaries at their several stations would no doubt cheerfully keep the record if furnished with the proper instruments.

Increased rainfall would indicate an increase of fertility and less necessity for irrigation. The climate of California, which resembles that of Palestine, has a rainfall at San Francisco of about twenty-two inches yearly; the rainfall on the Atlantic coast in the same latitude is about forty-two inches, while the fall in Pennsylvania and in the New England States is about forty inches, and in Oregon about forty-nine inches. Is it possible that the small gain in cultivation is increasing the rainfall in Palestine as it is supposed to do in the Western States of our country? The great American desert on the atlases of thirty years ago gradually diminished until it has disappeared. It is now suggested that cultivation has increased the rainfall so that there is greater fertility than formerly. The increased cultivation brings increase of rainfall, and increase of rainfall gain in cultivation. This is the theory, and it is held by some that in a few years irrigation may become unnecessary over large districts where it has been required. Wider facts respecting the rainfall in Palestine would aid in the solution of the problem as to its possible fertility.

I append a condensation of the extended tables of Dr. Chaplin.

RAINFALL AT JERUSALEM FOR TWENTY-TWO YEARS (1860-1882), <i>Showing the date of beginning and ending of the rainy season, its days of duration, number of days actually rainy, and amount of rainfall in inches (and decimals of an inch) for each year.</i>						<i>Mean average rainfall in each month of the rainy season for 21 seasons, 1861-1882, at Jerusalem.</i>		
YEAR.	Rainy Season began.	Rainy Season ended.	Days Duration of Rainy Season.	No. Days actually Rainy.	Inches of Rainfall.	Names of the Months.	Average No. of Rainy Days.	Average No. Inches Rainfall.
1860-1	Nov. 12	May 25	195	40	21.647	Oct.	1.50	.514
1861-2	14	April 29	167	44	24.262	Nov.	5.31	1.664
1862-3	1	28	179	22(?)	22.862	Dec.	9.04	4.718
1863-4	Oct. 13	26	197	43	20.338	Jan.	10.28	5.479
1864-5	Nov. 10	May 9	181	37	15.475	Feb.	10.43	5.207
1865-6	1	April 21	172	58	18.990	March.	8.51	3.531
1866-7	Oct. 4	May 12	221	65	26.737	April.	5.45	1.448
1867-8	Nov. 10	27	200	62	29.058	May.	1.59	.199
1868-9	2	7	187	61	24.916			
1869-70	15	April 22	159	43	12.269			
1870-1	Oct. 13	May 2	202	49	19.145		52.11	22.760
1871-2	23	24	215	53	18.481			
1872-3	6	3	210	46	18.942			
1873-4	24	April 5	164	71	39.512			
1874-5	Nov. 3	May 1	180	57	26.610			
1875-6	13	16	186	51	16.455			
1876-7	Oct. 9	April 28	202	41	13.700			
1877-8	20	May 7	200	68	42.932			
1878-9	Nov. 28	April 2	126	37	15.310			
1879-80	Oct. 28	May 2	188	55	23.565			
1880-1	17	21	217	56	26.585			
1881-2	Nov. 5	23	200	60	25.005			