

OBSERVATIONS ON THE CLIMATE OF JERUSALEM.

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RAIN.

THE following report on the rainfall at Jerusalem embodies the results of a series of observations made during twenty-two years, namely, from 1860-1 to 1881-2.

The instruments employed for measuring the rain have been of two kinds: (1) the old-fashioned float-gauge of Newman, and (2) Glaisher's gauge, as supplied by Negretti & Zambra. The chief disadvantage of the former instrument is that, in consequence of the float displacing by its weight a portion of the water in the cylinder, the reading is usually too low, or no indication at all may be given, when the quantity of rain has been very small. As a collector it has often proved more efficient than the other kind, when heavy rain and hail have fallen accompanied with much wind. The observations have been made with constant regularity at 9 o'clock a.m., except for a short period during the month of March, 1863, and the number of days during which rain fell in that month is not known.

During the first six seasons Newman's gauge was employed; during the remaining seasons Glaisher's. During four seasons the two gauges were placed side by side, and the readings of each carefully noted. The float-gauge showed 88·829 inches during this period, and Glaisher's gauge showed 93·250 inches, and these comparative measurements have been made use of for correcting the readings of the first six seasons, during which the float-gauge alone was employed.¹

The position of the instruments was in a garden within the city, about 2,500 feet above the level of the Mediterranean, open on all sides, the houses which bound it on the south and west being too far removed to influence the fall of rain into the pluviometers.

Palestine being one of those countries in which a long period of dry weather is regularly followed by one of rainy weather, it will be more practically useful to arrange this report according to seasons than according to years, notwithstanding that each season includes the later months of one year and the early months of the next.

1. The mean duration of each rainy season has been 188 days—the longest being 221 days, the shortest 126 days. The mean duration of each dry season has been 177 days, the longest being 211 days, the shortest 134 days. [Table I.]

2. In ten seasons the rains began between the 4th and 28th of October (inclusive); in twelve seasons between the 1st and 28th of November

¹ For this reason my report of the first five seasons, which was printed in the "Times" of August 16th, 1865, differs slightly from the present.

(inclusive). [Table I.] In four years there has been a slight fall of rain in the month of September, and it is remarkable that on each of these occasions the rainfall of the ensuing season was considerably below the average. [Table II.]

3. In eight years the last rain of the seasons fell between the 2nd and 29th of April (inclusive), and in fourteen years between the 1st and 27th of May (inclusive). A very little rain has sometimes fallen in June, [Table I.]

4. The mean number of days on which rain has fallen in each season has been 52—the highest being 71, the lowest 37. [Table II.]

5. The mean quantity of rain measured in each season has been 22·760 inches—the greatest quantity being 42·932 inches, the smallest 12·269 inches. [Table II.]

6. The mean quantity which has fallen in the several months included in the rainy season, and the mean number of rainy days in each month, are as follows :—

Months.	No. of rainy days.		Inches of rain.
October	1·50	·514
November	5·31	1·664
December	9·04	4·718
January	10·28	5·479
February	10·43	5·207
March	8·51	3·531
April	5·45	1·448
May	1·59	·199
		52·11	22·760

7. During the rainy seasons rain falls on one or more days, and is followed by one or more days of fine weather, and these fine days of the winter and early spring months are some of the most enjoyable that the climate of Palestine affords. The mean number of *rainy periods* in each season has been 23—the highest being 30, the lowest 16. These rainy periods seldom cover more than seven or eight days, and in some entire seasons it has not rained more than five or six consecutive days. Once it rained and snowed for fourteen days (in January, 1861), and once for thirteen days (in February, 1882). Table III has been drawn up to show the number of days in each *rainy period*, and the interval of fine weather which has followed.

8. The rainy season divides itself into three periods. First, that of the early rain, called by the peasants *el wasm el bedry*, “the early sign,” which moistens the land and fits it for the reception of the seed, and is consequently the signal for the commencement of ploughing. Second, the copious winter rain, which saturates the earth, fills the cisterns and pools, and replenishes the springs. Third, the latter or spring rain, which causes the ears of corn to enlarge, enables the wheat and barley to support the dry heat of the early summer, and without which the harvest fails.

Between the commencement of the early rain and the setting in of the heavy winter rain a considerable period elapses, and again between the termination of the winter rain and the close of the rainy season by the fall of the last of the spring rains, but these periods are usually broken by the occurrence of rainy days, so that it is often not easy to decide to which period a particular fall of rain should be assigned. Thus in the year 1881 the first rains of autumn fell on November 5th, and were separated by a period of thirty-six days from the heavy winter rains which began on December 18th, but this period was broken by the occurrence of three non-consecutive days on which rain fell; and at the end of the same season the heavy rains terminated on the 15th of April, and the period of thirty-six days which elapsed before the last spring rain fell was broken by the occurrence of four rainy days. The times of the commencement and termination of the heavy winter rains are as uncertain as those of the autumn and spring rains. As a rule, it may be considered that the autumn or early rains extend from the commencement of the rainy season in October or November until the middle of December, the winter rains from the middle of December until the middle or end of March, and the latter or spring rains from the middle of March until the termination of the rainy season in April or May.

9. Although rain may fall when the wind is blowing from any point of the compass, the copious rains are almost invariably brought from a western quarter. Of the 506 falls of rain included in this report, 8 were from the north, 14 from the north-east, 12 from the east, 10 from the south-east, 19 from the south, 238 from the south-west, 156 from the west, and 49 from the north-west. On 149 occasions an easterly wind immediately preceded the change which ushered in the rain. The direction of the wind frequently alters during the fall; if it passes to the north, the rain ceases; a change from any quarter towards the south-west usually indicates a continuance of rain. [Table IV.]

10. On 248 occasions the fall of rain commenced after a gradual fall of the mercury in the barometer during two or more days, on 144 occasions after a fall during one day, and on 114 after a slight rise. Not unfrequently, after a gradual diminution of the atmospheric pressure, rain begins to fall as the glass begins to rise. During the fall of rain, the mercury rose on 281 occasions, fell on 69, first fell and then rose on 132, and on 24 occasions remained steady until after the rain had ceased. It is during the severe and stormy rainy periods of the winter season that the glass commonly falls and afterwards rises. [Table V, A and B.]

11. It is popularly supposed that the atmosphere becomes warmer as the rain falls. This, however, is not usually the case. The sensation of increased warmth is caused by diminution in the amount of evaporation from the surface of the body when the air becomes saturated with moisture. On 369 occasions the temperature of the air became lower as the rain fell, on 90 it rose slightly, and on 47 remained stationary, or nearly so, until the rain ceased. [Table VI.]

12. In fourteen seasons snow has fallen, and eight seasons have passed

without snow. The last few days of December, the months of January and February, and the earlier part of March, are the periods for snow, but in 1870 there was a heavy fall (1·8 inch) on the 7th and 8th of April, a very remarkable and extraordinary occurrence. For the most part the snow is in small quantity, and soon melts, but very heavy snow-storms sometimes occur, and the snow may then remain unmelted in the hollows on the hill-sides for two or three weeks. The deepest snowfall was on the 28th and 29th of December, 1879, when it measured 17 inches where there was no drift. In February, 1874, it was $8\frac{1}{2}$ inches deep, and on the 14th of March, 1880, 5 inches. The drifts are sometimes exceedingly deep. [Table VII.]

13. It is remarkable that of twelve earthquakes registered during these twenty-two years, no less than nine have been experienced in the rainy season, namely, one in October, one in December, one in January, two in February, three in March, and one in April; eight were associated with storm, and four occurred during snow. In Table VIII the readings of the barometer before and after the earthquakes are noted, and the direction of the wind at the time of their occurrence. In nearly every instance they have been preceded or followed by an easterly wind.

14. The overflow of Beer Ayûb, in the Kidron Valley, is regarded by the inhabitants of Jerusalem as an indication that there will be no serious deficiency of water for drinking during the ensuing summer. Careful observations show that the overflow of this well does not depend so much on the quantity of rain which has fallen since the commencement of the season as upon a large quantity falling in a short time. Table IX shows the circumstances under which it has overflowed on every occasion during the period included in this report. On each of the four occasions on which rain has fallen in September there has been no overflow of Beer Ayûb in the following rainy season.

15. A very deficient rainfall is invariably followed by a deficient harvest, but a rainfall much above the average does not necessarily result in a proportionately large harvest. The conditions most favourable to a good yield of wheat and barley are a liberal supply of winter rain, falling on many days, with no prolonged intervals of fine and dry weather, and a copious fall of latter or spring rain. Taking the price of wheat as an indication of the quality of the harvest, we find that after the four years of lowest rainfall, the mean of which was 14 inches, the mean cost of a measure of wheat was 31 piastres; after the three years of highest rainfall the mean of which was 37 inches, the mean cost of a measure of wheat was 23 piastres; and after the four years of nearly average rainfall, the mean of which was 23 inches, the mean cost of a measure of wheat was only 18 piastres. When the previous part of the season has been favourable, the harvest may be said to depend entirely upon a sufficiency of the late rains, but a favourable latter rain cannot save the harvest if the corn has previously been extensively shrivelled by a long continuance of easterly winds, nor will the most promising harvest prove satisfactory unless a sufficiency of rain fall at the end of March or during the month of April.

In Table X, the total rainfall, the number of rainy days, and the amount of latter rain, in each season, are placed for comparison in the same column with the price of wheat during the ensuing summer. In using this table it should be remembered that there has been a gradual rise of prices in Palestine during the last twenty years, and that other circumstances besides the rainfall of the season sometimes influence the price of corn.¹

16. In the Hebrew scriptures, whilst **מטר** is used as a generic term for rain, **גשם** appears to signify the pouring winter rain, **מורה** the early rain, and **מלקוש** the latter rain. In the well-known passage in Joel (ii, 23), the three are mentioned together, and the connection indicates the necessity of all three for the production of a fruitful harvest: "He will cause to come down upon you the heavy winter rain **גשם**, the early rain **מורה**, and the latter rain **מלקוש**, . . . and the floors shall be full of wheat;" and again in Hosea (vi, 3): "He shall come to us like the heavy winter rain **גשם**, like the latter rain **מלקוש**, and the former rain **יורה** upon the earth"—all that are required to fertilise it, neither being sufficient alone. The beautiful description of spring in the Song of Solomon (ii, 11, *et seq.*) is untrue to nature as rendered in our English translation. The flowers appear on the earth, and the time of the singing of birds comes at least six weeks before the rain is over and gone. It is when the heavy winter rain **גשם** ceases, and the warm spring weather commences, that the flowers appear, the birds begin to sing, and the voice of the turtle is heard, and it is during this pleasant period that the latter rains fall at intervals. (Cf. Gen. vii, 12, and Ezra x, 13.)

II. ATMOSPHERIC PRESSURE, TEMPERATURE, WINDS, CLOUDS, DEW.

Atmospheric Pressure.

1. Jerusalem is 2,500 feet above the level of the Mediterranean Sea, and the mean height of the barometer at 9 a.m. during twenty-one years, corrected for index error and reduced to 32° Fahr., has been 27·398. The highest reading during the period was 27·816, on the 31st December, 1879; the lowest, 26·972, on the 22nd April, 1863, and the 3rd February, 1865, so that the extreme range has been 0·844. The mean annual range has been 0·626. During the eight months in which rain falls, namely, October to May inclusive, the mean height of the mercury has been 27·428; and during the four summer months, when rain very seldom falls, namely, June to September inclusive, 27·331. The months of lowest pressure are July and August, when the mean reading has been 27·290. [Tables XI, XII, XIII.]

¹ War, for instance, and other political disturbances, which cause a larger number of young men than usual to be taken for soldiers. After a very bad harvest, the peasants are too poor to sow largely the ensuing season, and consequently the price of wheat never comes down to the average in one year, however good the crop may be.

2. The mean monthly range has been 0·305. The highest and the lowest readings have occurred in the winter or spring seasons. During the five months from December to April inclusive, the mean monthly range has been 0·423, and during the seven months from May to November inclusive, 0·222. [Table XIII.]

Temperature.

1. To carry on a continuous series of meteorological observations in Jerusalem is extremely difficult, owing to the delays and uncertainties involved in replacing broken or defective instruments, and although great and constant care has been taken to make regular observations, it has several times happened that for a long period one or more of the thermometers has been wanting. The following report on temperature is founded chiefly on observations made through eight successive years, namely, 1864 to 1871 inclusive, with only one short break which does not materially influence the result.¹

2. The mean temperature during this period was 62·8° Fahr. The coldest month is February, when the mean temperature was 47·9°. It rises month by month until August, when it was 76·1°, and then sinks again month by month until the following February. [Table XIV.]

3. Although the mean temperature is highest in August, the hottest days do not always occur in that month. The highest temperature during these eight years was on the 24th June, 1869, when it reached 103·5°. In May also and September the temperature sometimes rises to 100° or higher. The highest temperature observed during twenty-one years was on the 28th and 30th August, 1881, when it remained for some hours at 112°. The mean temperature during seven days, terminating on August 31st in that year, was 94·4°. [Table XIV.]

4. Although the mean temperature is lowest in February, the minimum of the year does not always occur in that month. The lowest temperature observed during twenty-one years was on the 20th January, 1864, when the minimum thermometer registered 25° Fahr., or 7° of frost. In February and October also, and once in April, a minimum of 32° and 30° has been noted. In Jerusalem frost generally occurs on five or six nights in the course of the winter, but it is rare for ice to remain throughout the day, except in cold situations sheltered from the sun. It will be remembered that the thermometrical observations are made in a garden within the city. It is no doubt often much colder on the hills outside. [Table XIV.]

5. The mean monthly range has been 39·9°. It is greatest in the spring, early summer, and autumn, less in July and August, and least in December, January, and February. From its maximum of 49·8°, in May, it sank to 37·3° and 38° in July and August, rose again to 44·8° in

¹ My warm thanks are due to Mr. Samuel Wiseman and Mr. Joseph elJemel, of the London Society's Mission to the Jews, for assistance in carrying on the observations.

October, again sank to 31 and 31·6 in December and January, and again rose through February, March, and April to its maximum in May. Thus there are in the course of the year two maxima and two minima of monthly range. [Table XIV.]

6. The mean daily range has been 19·5°. It is greatest in summer from May to October, having during these six months been 23·3°. During the six months from November to April it was 15·7°. The greatest mean daily range was in September, 24·1°; the least in January, 13°. [Table XIV.]

7. The climate of Jerusalem presents at different times the extremes of dryness and moisture. Not unfrequently during the rainy months the dry and wet bulb of the hygrometer stand at the same point, whilst in "sirocco" weather the difference is very great. The mean difference throughout the year at 9 a.m. has been 9·6°; during the six months from November to April, inclusive, 5·8°; and during the six months from May to October, inclusive, 13·1°. But 9 a.m. is not the driest hour of the day. When "sirocco" is prevalent the dry and wet bulb at noon, or a little later, sometimes differ 25 or even 30 or more degrees. On one extraordinary occasion, in August, 1881, there was for a few hours in the middle of the day a difference of 40°, the dry bulb marking 112°, and the wet bulb 72°, and on two or three days the difference was 35° at 9 a.m. [Table XIV.]

Winds.

1. In no country are the health and comfort of the inhabitants and the fruitfulness of the soil more immediately and obviously influenced by the character and direction of the wind than in Palestine. The north wind is *cold*, the south *warm*, the east *dry*, and the west *moist*; and the winds from the intermediate quarters partake of these characteristics in a degree corresponding to their nearness to the cardinal points; the north-east wind is cold and dry, the north-west cold and moist, the south-east hot and dry, and so on.

2. North and north-westerly winds prevail most in the summer months, when they are cool and refreshing, moderately dry, and accompanied by no clouds, or only a few cirri or cumuli. The northerly winds of winter are cold and sharp, and dry or moist according as they come from north-east or north-west. When from the latter quarter they are frequently accompanied by masses of cumulus, which have a very beautiful appearance against the deep blue of the sky. The coolness and sharpness of the north winds, even in the summer season, are much dreaded, especially by the inhabitants of the maritime plain, where they produce sore throats, fevers, and dysenteries. These winds are called *sumdwy*, i.e., heavenly, probably from the clear blue sky which accompanies them. North, north-west, and north-east winds have occurred on 182 days in the year at 9 a.m. [Table XV.]

Whenever during summer there is little wind for several days the heat becomes very great, the mercury in the barometer rises, and the air becomes almost as dry and destitute of ozone as in a *sirocco*, even though what little wind there is blows from a northerly quarter. Ordinarily

this condition is obviated by the springing up of a strong westerly breeze in the afternoon. This breeze is felt as early as 9 or 10 a.m. at Jaffa and other places along the coast, but does not usually reach Jerusalem before 2 or 3 p.m., sometimes not until much later. After sunset it subsides, but soon rises again, and continuing through a great part of the night refreshes the parched land with the abundance of moisture with which it is laden. From a sanitary point of view the value of this evening breeze can hardly be overrated. When it does not blow, or blows very gently, bringing no clouds, and not rising again after the lull which follows sunset, the nights are hot and depressing, there is no dew, and the mornings are wanting in freshness.

One of the most important differences between the climate of the hill district and that of the low western coast of Palestine is in connection with this daily wind from the sea. Although felt nearly every day on the coast, it does not always reach the hills, and hence in very hot weather, when Jerusalem (for instance) is almost insupportable from a severe easterly wind, Jaffa may be comparatively cool and pleasant. In traversing the plain also this wind loses much of its moisture, and it is only after it has been blowing with considerable force for some hours that its refreshing qualities are fully experienced. The struggle for the mastery which sometimes takes place when a current of hot, dry, heavy air from the east meets this moist sea breeze is extremely interesting to witness. Neither being strong enough to overcome the other, the lighter west wind occasionally rises above the eastern current, and clouds may be seen floating towards the east, whilst the lower stratum of air is moving westward, and this may continue some time before a fusion takes place and equilibrium is established (see below). Sometimes a violent disturbance occurs, whirlwinds are produced, clouds and pillars of dust arise, and an hour or more may elapse before the west wind prevails, for it is always the west wind that obtains the victory after these severe contests. At other times the change to a westerly wind is so silent as to pass unnoticed, except in consequence of the change in the quality of the air. The lassitude occasioned by extreme heat suddenly begins to pass away, the spirits revive, exertion again becomes a pleasure, and a glance at the vane shows that a westerly wind is already established. It is very curious, if one happens to be looking out, to see the weathercock suddenly turn round without apparent cause, and almost immediately to feel the refreshing influence of cooler and moister air. The wind has blown direct from the west fifty-five times in a year at 9 a.m. Though most frequent in July and August the west wind is more equally distributed over the several months than any other wind. [Table XV.]

3. Easterly winds are common in autumn, winter, spring, and the month of May. In summer they are rare; on a mean of sixteen years it has blown from an eastern quarter on 101 days in the year at 9 a.m.; from June to September, inclusive, on three days in each month; from October to May, inclusive, on eleven days in each month. [Table XV.] But it is not uncommon during the hot weather for an easterly wind to

blow for three or four hours in the middle of the day, and in the evening to give way to the westerly wind which continues until 10 or 11 o'clock next morning, so that the register made at 9 a.m. does not show all the easterly winds that have occurred.

In winter the east wind is accompanied by a clear blue sky, with perhaps a few cirri. It is dry, stimulating, and, if not too strong, very agreeable. But in the warmer months it is unpleasant and depressing from its great heat and dryness, and the haze and dust which occasionally accompany it. It is when the wind blows from the south-east that it acquires the peculiarities which Europeans usually signify by the term *sirocco*. At such time the sky may be cloudless, or with some cirrus and stratus, the temperature is high, 84° to 90°, or higher, the air destitute of ozone, and extremely dry, the difference between the wet and dry bulb being often as much as 24° or even 28° or 30°. There may be calm, but sometimes the wind amounts to 1 or 1.5, and veers between east, south-east, and south. The more the wind tends to the south, the more dull and overcast is the sky, and the more disagreeable to the feelings the state of the atmosphere; the more it tends to the east, the clearer is the sky and the stronger and fresher the breeze. The worst kind of *sirocco* dries the mucous membrane of the air passages, producing a kind of inflammation resulting in catarrh and sore throat; it induces great lassitude, incapacitating for mental as well as bodily exertion, in those who walk or work in it; headache, with a sense of constriction as if a cord were tied round the temples, oppression of the chest, burning of the palms of the hands and soles of the feet, accelerated pulse, thirst, and sometimes actual fever. It dries and cracks furniture, loosening the joints of tables and chairs, curls the covers of books and pictures hung in frames, parches vegetation, sometimes withering whole fields of young corn. Its force is not usually great, but sometimes severe storms of wind and fine dust are experienced, the hot air burning like a blast from an oven, and the sand cutting the face of the traveller who has the misfortune to encounter it. This kind of air has a peculiar smell, not unlike that of the neighbourhood of a burning brick-kiln. Sometimes the most remarkable whirlwinds are produced, especially in the western plain near the hills, by the meeting of a strong east or south-east wind with a wind from the west or north. Clouds of sand fly about in all directions, now taking the traveller in front, now behind, and now on the side, and the gusts of wind are so violent as to blow weak persons from their horses, and to overturn baggage animals. The cold *sirocco* of winter often blows with much force, and when it comes from a few degrees north of east, it is so cold and piercing as sometimes to kill those who are exposed to it without sufficient clothing, instances of which occurred in 1867.

A great number of observations have been made with a view of determining the amount of ozone in the atmosphere in different states of the weather, and these repeated experiments have shown that none is to be detected during the prevalence of the *sirocco* wind. It was thought the extreme dryness of the air might prevent the chemical reaction, but the

result was the same when the paper was kept moistened. The west, north-west, and especially the south-west currents of air are those most richly charged with ozone.

The following is a note of a summer *sirocco* written at the time of its occurrence:—"At 9 a.m. on August 24th, 1877, a brisk wind was blowing direct from the east, there was considerable haze and dust, and high up towards the north-east some cirro-cumulus. In the course of the morning cumulus increased, and became mingled with the haze. At sunset it was 3. The dry bulb at 9 a.m. was 96°, wet bulb 63°; at 11 a.m., dry bulb 102°, wet bulb 66°; at noon, dry bulb 103·3°, wet bulb 66·5°. About 5 p.m. a rainbow was observed, and a few drops of rain were said to have fallen a little west of the city. During this remarkable day a very dry, and consequently heavy, stratum of heated air was driven with considerable force from the east, and was met (probably in the western plain) by a moist current from the sea; they did not immediately mingle, but the light moist air passed onwards towards the east over the heavy stratum of hot dry air, the velocity of both being impeded. The wind below continued east all day, sinking gradually from a force of 0·5 to 0·2, and eventually to 0·0, and in the evening a light soft breeze sprang up from west-south-west which passed round to west soon after sunset. The next morning the two strata of air had commingled, the sky was clear, excepting some haze in the horizon, temperature very high, 97·5° at 9 a.m., rising to 107° at noon, and the difference between the wet and dry bulb had gone down to 34°. At noon the wind, which until then had been north-east, passed by way of north to west." The termination of a late autumn *sirocco* is different. "November 4th, 1868. After *sirocco* had prevailed for more than thirty days, the wind suddenly changed on October 30th, by way of south to west, a breeze sprang up bringing cumuli and loose masses of nimbus; much dew was deposited during the night, and there were a few drops of rain. Two gusty cloudy days followed, the atmosphere becoming more and more hazy from fine dust, and on the evening of November 2nd a heavy, long-continued shower of rain fell, preceded by thunder. The next day there was more rain, and by the morning of the 5th upwards of an inch had been measured. During the days preceding the rain the barometer and thermometer both fell—the former gradually, the latter more suddenly. At 9 a.m. on October 30th the temperature was 88°, at 9 a.m. on the 31st 66°, and on the 3rd November it had fallen to 53°, a difference of 35° in four days."

It is an old and common saying that a *sirocco* always lasts three days, but like many other popular sayings this is only partially true. A *sirocco* may last three days, or it may last twenty or even thirty days. Thus in 1868 there was *sirocco* almost every day from 28th September until the weather began to break up for rain on October 30th. During the continuance of *sirocco* there is frequently a partial change in consequence of the sea-breeze of the afternoon reaching the hills, and the vane is often found pointing to north or north-west at 9 a.m. It occasionally happens that the air has all the qualities of a bad *sirocco* when the wind is blowing from a

northerly or westerly quarter. No doubt the *sirocco* storms are often of the nature of cyclones, and these instances are probably sometimes due to the returning current of a wind which originally proceeded from some point between south and east. But the peculiarities of this wind, its heat, its dryness, and its deficiency in ozone, are probably of telluric origin; and it appears that whenever a very high temperature prevails for some days without wind, the quality of the air in contact with the surface of the earth becomes modified, and a wind springing up from any quarter may then have for a time the properties of the true *sirocco*—the *simoom*, or poisonous wind, which usually comes from the interior of Arabia.

4. The mean force of the wind at 9 a.m. has been 0·46 on a mean of ten years. It is greatest in February, March, and April, in which the mean has been 0·65, and least in August, September, and October, when the mean has been 0·30. During the winter months the force of the wind sometimes amounts to 3·5 or 4, on a scale of 0—6, but it is very seldom that damage of a serious nature is done to trees or buildings. The mean number of days on which there was calm at 9 a.m. has been 108 in a year, the greatest number being in the five months from September to January inclusive, when the mean in each month was eleven days. As in all mountain districts, absolute calm is rare for any length of time, and a very delicate instrument might perhaps have detected some movement of the air on many of the days entered as calm. [Table XVI.]

Clouds.

1. As in other warm countries, clouds are in Palestine a very important element of the climate. Their presence is beneficial in three ways—they are at once a cause and a sign of moisture in the air; by intercepting the rays of the sun they produce shade which moderates the heat; and by the evaporation of the water of which they are composed the temperature of the atmosphere is lowered. The mean annual amount of cloud at 9 a.m. on a mean of sixteen years has been 2·8. The amount is smallest in July and August (0·6 and 0·9); it rises gradually through the autumn to its maximum in the winter months, and then falls again gradually to its minimum in July. On the same mean, 140 days in the year have been cloudless at 9 a.m., the maximum number being in July (21·5), and the minimum in February and March (5·1 and 5·5). [Table XVII.]

Dew.

1. During the fine weather of the winter months dew falls in Palestine from the same causes and under the same circumstances as in Europe, the moisture contained in the atmosphere being deposited when the night is favourable to the radiation of heat from the surface of the earth. But in the summer months, when the whole country is arid, and there is no water to evaporate, the copious dews are brought entirely by the westerly winds from the sea. If no westerly breeze, or a very light one, springs up

towards evening, there is no dew. The heavy dews of summer which modify the climate so remarkably differ from ordinary dew in the manner of their deposition, *being in great part precipitated in the air in the form of mist before being deposited on the earth.*¹ On summer evenings a few clouds are commonly to be seen in the western horizon soon after sunset. Later in the evening they increase in number, become lower and looser, and sweep past at no great elevation, and often with considerable velocity. After midnight, or earlier, they become still more abundant and still lower, brushing the tops of the hills as they pass, and depositing much of their moisture upon them. Although dew may fall; even in summer, in the usual way on clear nights, the surest sign of a copious deposition is the appearance of clouds with a westerly wind after sunset. Frequently there is a visible moisture in the atmosphere, which yet does not amount to mist or cloud, but produces only a haziness in the horizon, which is indicative of a damp night. Dew is most copious in spring, and in September and October, except during *sirocco* weather, when there is none. It may be noted that clouds and a westerly wind at sunset and afterwards are not always indications of a very damp night. The dew deposited as a result of this condition early in the evening may, if the wind should fall or change to east, entirely evaporate before morning. It is the continuance of the westerly wind through the night that brings abundance of dew. During the prevalence of *sirocco*, and especially when *sirocco* is just commencing or terminating, the sky is sometimes obscured at night by masses of cirro-cumulus and some stratus intermixed, and when this is the case there is usually no dew. But should a wind spring up from the west, and bring cumulus and mist from the sea, a deposit of dew takes place.

After a very dewy night the sky at daybreak is obscured—and often houses, trees, &c., also—by a thick mist, the ground, plants, stones, and especially tents, being wet as if rain had fallen. As the sun rises the mist begins to clear, and large masses of loose flocculent clouds are formed, between which the bright blue sky is here and there visible. These masses of cloud become smaller and denser as the heat increases, forming beautiful cumuli, which in their turn disappear and give place to the dull blue sky usual in summer. The time at which these morning clouds entirely disappear depends on their amount and the heat of the weather. Frequently the sky is quite clear by 9 o'clock, and it is rare for more than one or two masses of cumulus to remain later than 10 or 11 o'clock, but during the day, when the wind is not easterly, a little light cloud may sometimes be seen to form in the sky, and after growing for a time gradually but quickly disappear, to be soon followed by another. This "one cloud" often attracts the attention of the traveller, and becomes an object of

¹ "Aristotle supposed dew to be a species of rain, formed in the lower atmosphere in consequence of the moisture which had been carried up during the day by evaporation being condensed by the cold of the night into minute drops."—"Penny Cyclop." Art. Dew.

interest to him as he goes on his way, and not improbably it suggested to St. James that beautiful simile of human life, "What is your life? It is even a vapour (*ἀρμύρο*) that appeareth for a little time and then vanisheth away."

NOTE.

The unhealthy period of the year, the period in which the climatic diseases of the country, such as ophthalmia, fevers, and dysentery, are most prevalent, extends from May to October inclusive. Six things strongly characterise this period. 1. Almost entire absence of rain; 2. Low atmospheric pressure with small range; 3. High temperature with great daily range; 4. Great dryness of the atmosphere; 5. A very small amount of cloud; and 6. Except at the beginning and end of the period, a minimum of easterly winds.

TABLE I.—Showing date of commencement and termination of rains, and the duration of the rainy and dry seasons.

Seasons.	Date of		Duration of	
	Commencement.	Termination.	Rainy Season.	Following Dry Season.
			days	days
1860-1	November 12th	May 25th	195	172
1861-2	November 14th	April 29th	167	185
1862-3	November 1st	April 28th	179	167
1863-4	October 13th	April 26th	197	197
1864-5	November 10th	May 9th	181	175
1865-6	November 1st	April 21st	172	165
1866-7	October 4th	May 12th	221	181
1867-8	November 10th	May 27th	200	158
1868-9	November 2nd	May 7th	187	191
1869-70	November 15th	April 22nd	159	173
1870-1	October 13th	May 2nd	202	173
1871-2	October 23rd	May 24th	215	134
1872-3	October 6th	May 3rd	210	173
1873-4	October 24th	April 5th	164	211
1874-5	November 3rd	May 1st	180	195
1875-6	November 13th	May 16th	186	145
1876-7	October 9th	April 28th	202	174
1877-8	October 20th	May 7th	200	204
1878-9	November 28th	April 2nd	126	208
1879-80	October 28th	May 2nd	188	167
1880-1	October 17th	May 21st	217	167
1881-2	November 5th	May 23rd	200	..
		Means ..	188·5	176·9

TABLE II.—Showing the number of days on which rain fell, and the amount of rain in each month during 22 rainy seasons, from 1860-1 to 1881-2.

Seasons.	1860-1		1861-2		1862-3		1863-4	
Months.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.
September ..	..	..	..	..	..	..	..	..
October ..	..	..	..	..	..	..	7	1·900
November ..	2	·105	3	·184	9	2·957	1	·190
December ..	7	2·191	13	7·763	7	2·587	12	7·125
January ..	14	9·663	14	12·409	10	9·109	8	6·890
February ..	7	6·495	7	2·270	7	2·402	5	1·503
March ..	5	2·402	3	·633	?	3·695	4	1·082
April ..	1	·316	4	1·003	7	2·112	6	1·648
May ..	4	·475	..	..	..	..	..	..
Totals ..	40	21·647	44	24·262		22·862	43	20·338
Seasons.	1864-5		1865-6		1866-7		1867-8	
Months.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.
September ..	2	·091	..	..	..	..	..	..
October ..	..	..	..	..	5	1·745	..	..
November ..	4	2·645	11	1·560	8	1·835	4	2·240
December ..	7	1·648	11	5·450	13	2·970	10	6·975
January ..	7	4·541	14	5·055	11	9·245	9	3·565
February ..	8	5·084	9	3·175	12	6·067	18	10·925
March ..	5	·422	9	3·460	8	2·135	7	3·285
April ..	3	·765	4	·290	3	2·010	13	1·928
May ..	3	·370	..	..	5	·730	1	·140
Totals ..	37	15·475	58	18·990	65	26·737	62	29·058
Seasons.	1868-9		1869-70		1870-1		1871-2	
Months.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.
September ..	..	..	1	·270	..	..	..	..
October ..	..	..	..	..	4	2·290	2	1·580
November ..	7	1·186	6	1·470	1	·010	1	·100
December ..	13	8·047	5	1·165	4	1·450	13	6·489
January ..	15	7·715	9	1·235	9	2·443	6	3·105
February ..	12	3·265	1	·690	11	4·415	17	5·349
March ..	4	1·945	9	3·990	16	6·747	7	1·430
April ..	8	2·363	13	3·719	3	1·100	4	·420
May ..	2	·395	..	..	1	·190	3	·108
Totals ..	61	24·916	43	12·269	49	19·145	53	18·481

Seasons.	1872-3		1873-4		1874-5		1875-6	
Months.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.
September ..	..	..	..	..	..	..	1	·030
October ..	4	·310	1	·010	..	..	..	..
November ..	7	3·390	7	4·410	6	2·510	6	1·120
December ..	7	6·235	13	9·300	6	1·435	9	3·190
January ..	4	·130	15	8·430	14	6·790	7	3·420
February ..	10	6·032	12	7·215	12	4·085	10	4·140
March ..	11	1·935	20	10·017	14	10·520	7	2·270
April ..	2	·890	3	·130	4	1·040	8	1·965
May ..	1	·010	..	..	1	·230	4	350
Totals ..	46	18·942	71	39·512	57	26·610	51	16·455

Seasons.	1876-7		1877-8		1878-9		1879-80	
Months.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.
September ..	..	..	..	..	2	·790	..	..
October ..	1	·080	5	2·180	..	..	3	·815
November ..	7	1·690	11	5·015	1	·025	5	·685
December ..	3	·490	13	7·345	4	3·000	6	4·235
January ..	9	1·595	14	13·390	6	·980	15	5·995
February ..	13	8·750	13	11·490	6	2·265	12	4·035
March ..	5	·885	7	2·350	17	7·520	7	5·635
April ..	3	·210	2	·510	3	1·520	6	2·065
May ..	..	..	3	·652	..	..	1	·100
Totals ..	41	13·700	68	42·932	37	15·310	55	23·565

Seasons.	1880-1		1881-2		Mean of 22 seasons.	
Months.	Days.	Inches.	Days.	Inches.	Days.	Inches.
September ..	..	..	..	..	..	..
October ..	1	·400	..	..	1·50	·514
November ..	5	·860	5	2·430	5·31	1·664
December ..	15	12·995	8	1·720	9·04	4·718
January ..	3	1·275	11	3·075	10·28	5·479
February ..	12	4·430	16	12·590	10·43	5·207
March ..	10	4·355	4	·970	8·51	3·531
April ..	8	2·205	12	3·650	5·45	1·448
May ..	2	·065	4	·570	1·59	·199
Totals ..	56	26·585	60	25·005	52·11*	22·760

* 21 seasons.

TABLE III.—Showing the number of days in each rainy period, and the interval of fine weather following.

—	1860-1		1861-2		1862-3		1863-4	
	Days of		Days of		Days of		Days of	
	rain.	interval.	rain.	interval.	rain.	interval.	rain.	interval.
	1	6	1	7	1	15	1	2
	1	11	1	7	4	1	2	9
	1	3	1	7	2	2	3	1
	2	9	1	1	1	3	1	9
	1	2	6	1	1	4	1	22
	1	1	1	3	1	4	1	7
	1	1	1	2	1	2	7	9
	1	22	1	4	1	2	2	1
	3	3	2	1	1	11	2	6
	14	4	5	4	3	5	4	4
	2	7	5	7	1	10	3	7
	1	3	4	5	1	5	1	12
	1	16	1	2	6	2	1	3
	1	12	1	1	4	2	1	2
	1	2	1	10	1	5	1	2
	3	22	2	5	1	1	2	13
	1	19	3	12	1	8	3	21
	1	1	2	17	(P)2	?	1	16
	2	11	1	20	1	3	1	1
	1	..	2	7	1	9	1	4
	..	..	2	..	3	1	1	3
	..	..	..	..	2	..	3	..

Rainy periods..	20	..	21	..	22	..	22	..
Rainy days ..	40	..	44	..	..	..	43	..
Dry days ..	155	..	123	..	..	..	154	..
Duration of rainy season } days	195	..	167	..	179	..	197	..

TABLE III—*continued.*

—	1864-5		1865-6		1866-7		1867-8	
	Days of		Days of		Days of		Days of	
	rain.	interval.	rain.	interval.	rain.	interval.	rain.	interval.
	1	11	3	10	1	15	1	1
	1	2	2	4	3	1	3	19
	2	9	4	1	1	7	2	7
	2	3	2	12	3	7	2	1
	3	1	3	11	2	4	3	9
	1	8	8	6	2	5	3	13
	1	14	7	2	1	9	4	1
	1	2	2	3	4	4	2	3
	3	11	2	1	3	8	2	6
	3	6	1	2	3	2	1	1
	2	9	1	4	1	1	3	3
	1	5	2	6	3	4	1	3
	3	1	2	1	6	13	6	2
	1	2	1	6	3	3	8	7
	1	2	2	6	2	3	2	1
	1	3	5	6	2	3	3	13
	1	1	1	2	1	1	2	5
	1	8	1	3	2	8	5	3
	1	8	4	9	6	10	3	8
	1	16	1	4	2	2	2	1
	1	1	2	15	2	8	3	31
	2	18	2	..	3	2	1	..
	2	3	..	..	1	8	..	..
	1	..	..	..	3	28	..	..
	..	..	..	..	5	..	..	..
Rainy periods ..	24	..	22	..	25	..	22	..
Rainy days ..	37	..	58	..	65	..	62	..
Dry days ..	144	..	114	..	156	..	138	..
Duration } of rainy } days season	181	..	172	..	221	..	200	..

TABLE III—*continued.*

—	1868-9		1869-70		1870-1		1871-2	
	Days of		Days of		Days of		Days of	
	rain.	interval.	rain.	interval.	rain.	interval.	rain.	interval.
	2	1	1	3	1	7	2	28
	2	9	4	6	1	5	1	7
	1	3	1	1	2	2	2	9
	1	4	1	7	1	42	5	1
	1	6	2	9	1	3	1	1
	4	3	2	16	3	16	2	1
	1	2	2	3	3	1	2	5
	4	1	1	8	1	6	1	5
	2	6	1	1	3	10	2	10
	2	12	2	1	4	3	2	4
	2	3	1	1	1	9	2	7
	4	1	1	2	1	1	4	1
	4	2	1	8	4	2	5	3
	1	1	1	22	3	3	3	4
	1	1	3	11	11	1	5	6
	3	1	2	2	3	9	1	14
	1	4	4	8	2	8	4	8
	2	1	2	2	1	9	4	7
	5	4	5	4	2	16	1	5
	1	7	2	1	1	..	1	17
	4	13	4	..	..	..	1	7
	1	5	..	..	..	..	1	12
	2	13	..	..	..	..	1	..
	2	3	..	..	..	..	..	..
	3	3	..	..	..	..	..	..
	2	10	..	..	..	..	..	..
	1	2	..	..	..	..	..	..
	1	5	..	..	..	..	..	..
	1	..	..	..	..	..	..	..
Rainy periods..	29	..	21	..	20	..	23	..
Rainy days ..	61	..	43	..	49	..	53	..
Dry days ..	126	..	116	..	153	..	162	..
Duration of rainy season } days	187	..	159	..	202	..	215	..

TABLE III—*continued.*

—	1872-3		1873-4		1874-5		1875-6	
	Days of		Days of		Days of		Days of	
	rain.	interval.	rain.	interval.	rain.	interval.	rain.	interval.
	1	14	1	19	2	5	3	5
	3	14	1	5	1	6	1	2
	2	1	3	2	1	1	1	4
	5	26	3	15	1	7	1	5
	1	12	6	1	1	2	1	4
	6	14	3	4	1	7	1	2
	1	7	4	2	2	2	4	3
	2	6	4	5	1	13	1	2
	1	2	3	2	2	6	1	5
	1	6	2	6	1	1	1	2
	2	6	2	1	2	1	2	9
	1	1	3	1	5	8	1	5
	3	1	2	1	2	1	3	2
	2	3	1	2	2	3	1	10
	1	7	1	2	3	2	4	2
	3	4	1	1	3	5	3	5
	3	1	1	1	1	2	2	7
	3	6	3	2	4	3	1	4
	1	3	1	4	3	4	1	1
	2	16	1	3	1	1	3	2
	1	14	5	2	2	1	2	5
	1	..	5	5	6	6	1	14
	..	..	4	1	1	7	2	3
	..	..	1	1	4	4	4	3
	..	..	7	4	2	4	2	22
	..	..	2	1	2	21	1	7
	..	..	1	..	1	..	3	..
Rainy periods..	22	..	27	..	27	..	27	..
Rainy days ..	46	..	71	..	57	..	51	..
Dry days ..	164	..	93	..	123	..	135	..
Duration of rainy season } days	210	..	164	..	180	..	186	..

TABLE III—*continued.*

—	1876-7		1877-8		1878-9		1879-80	
	Days of		Days of		Days of		Days of	
	rain.	interval.	rain.	interval.	rain.	interval.	rain.	interval.
	1	28	1	2	1	1	5	4
	1	6	3	1	1	22	1	11
	4	8	1	7	1	1	1	7
	2	20	1	3	2	20	1	15
	1	1	1	1	1	4	1	6
	1	8	3	10	3	3	1	4
	1	1	3	1	2	4	1	2
	2	8	3	8	1	6	3	3
	3	6	2	1	2	3	8	2
	1	5	3	8	2	3	1	3
	3	3	5	1	1	11	2	1
	1	3	2	1	3	1	1	2
	7	4	3	4	9	3	3	15
	4	8	2	7	3	3	5	2
	1	2	4	2	1	4	4	1
	2	10	3	1	4	..	2	3
	1	1	1	3	..	..	1	11
	1	13	2	4	..	..	7	21
	1	2	4	2	..	..	1	6
	1	20	2	2	..	..	3	9
	1	4	4	2	..	..	2	5
	1	..	2	1	..	..	1	..
	..	..	1	4	..	..	..	..
	..	..	2	4	..	..	..	..
	..	..	1	14	..	..	..	..
	..	..	2	4	..	..	..	..
	..	..	2	18	..	..	..	..
	..	..	2	12	..	..	..	..
	..	..	2	4	..	..	..	..
	..	..	1	..	..	..	..	..
Rainy periods..	22	..	30	..	16	..	22	..
Rainy days ..	41	..	68	..	37	..	55	..
Dry days ..	161	..	132	..	89	..	133	..
Duration of rainy season } days	202	..	200	..	126	..	188	..

TABLE III—*continued.*

—	1880-1		1881-2	
	Days of		Days of	
	rain.	interval.	rain.	interval.
	1	31	3	12
	1	5	1	6
	1	3	1	6
	5	3	1	12
	5	2	5	6
	1	9	1	1
	1	1	1	3
	3	1	1	9
	3	13	10	8
	2	10	13	11
	1	9	3	17
	2	3	2	5
	4	3	1	3
	2	3	1	3
	4	6	6	6
	4	5	4	7
	1	4	2	6
	3	4	1	1
	2	17	1	18
	8	21	2	..
	1	8	..	..
	1	..	..	..
Rainy periods..	22	..	20	..
Rainy days ..	56	..	60	..
Dry days ..	161	..	140	..
Duration } days of rainy season }	217	..	200	..

TABLE IV.—Showing connection of rain with direction of wind.

Seasons.	Number of rainy periods.	Direction of wind during rainfall								Easterly wind preceding.
		N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	
1860-1	20	..	1	..	..	..	2	16	1	7
1861-2	21	..	1	1	..	1	7	11	..	6
1862-3	22	1	..	2	..	2	7	10	..	8
1863-4	22	..	1	2	..	..	10	9	..	7
1864-5	24	1	1	..	1	2	10	5	4	7
1865-6	22	..	2	..	1	1	11	2	5	12
1866-7	25	..	1	..	..	3	18	3	..	10
1867-8	22	1	..	..	..	..	14	7	..	5
1868-9	29	..	..	1	1	1	17	5	4	5
1869-70	21	..	1	..	..	..	10	6	4	8
1870-1	20	..	..	..	..	..	15	3	2	6
1871-2	23	..	1	1	..	..	13	7	1	5
1872-3	22	..	..	1	..	1	7	8	5	4
1873-4	27	1	1	..	1	1	9	12	2	5
1874-5	27	3	..	1	..	1	11	9	2	9
1875-6	27	..	..	1	2	3	13	5	3	7
1876-7	22	..	..	..	1	..	10	11	..	5
1877-8	30	..	2	1	..	1	13	9	4	9
1878-9	16	1	1	..	..	1	7	1	5	3
1879-80	22	..	..	..	1	1	13	3	4	7
1880-1	22	..	1	1	1	..	11	7	1	8
1881-2	20	..	..	..	1	..	10	7	2	6
Totals ..	506	8	14	12	10	19	238	156	49	149

TABLE V.—Showing connection of rainfall with barometric changes.

Seasons.	Number of rainy periods.	A Rain began after			B During the rain the mercury			
		Gradual fall of mercury.	Fall of one day only.	Slight rise	Rose.	Fell.	First fell then rose.	Remained steady.
1860-1	20	11	2	7	9	4	3	4
1861-2	21	9	8	4	6	8	6	1
1862-3	22	5	11	6	12	4	4	2
1863-4	22	14	2	6	12	4	5	1
1864-5	24	11	5	8	13	5	4	2
1865-6	22	4	14	4	8	3	8	3
1866-7	25	8	12	5	12	1	12	..
1867-8	22	9	10	3	6	6	9	1
1868-9	29	13	8	8	14	4	9	2
1869-70	21	12	6	3	15	2	4	..
1870-1	20	11	7	2	14	2	4	..
1871-2	23	15	3	5	18	1	4	..
1872-3	22	10	3	9	17	1	3	1
1873-4	27	13	7	7	7	6	13	1
1874-5	27	12	11	4	17	3	6	1
1875-6	27	14	8	5	17	2	5	3
1876-7	22	15	4	3	15	2	4	1
1877-8	30	10	10	10	16	3	10	1
1878-9	16	8	4	4	13	1	2	..
1879-80	22	13	4	5	13	3	6	..
1880-1	22	15	4	3	16	1	5	..
1881-2	20	16	1	3	11	3	6	..
Totals.	506	248	144	114	281	69	132	24

TABLE VI.—Showing connection of rainfall with temperature.

Seasons.	Number of rainy periods.	With the fall of rain the temperature		
		Fell.	Rose.	Remained unchanged.
. 1860-1	20	13	6	1
1861-2	21	16	4	1
1862-3	22	11	9	2
1863-4	22	13	8	1
1864-5	24	18	1	5
1865-6	22	15	3	4
1866-7	25	20	2	3
1867-8	22	14	4	4
1868-9	29	21	5	3
1869-70	21	16	2	3
1870-1	20	14	4	2
1871-2	23	16	5	2
1872-3	22	16	4	2
1873-4	27	21	4	2
1874-5	27	23	1	3
1875-6	27	21	5	1
1876-7	22	18	4	..
1877-8	30	22	6	2
1878-9	16	12	1	3
1879-80	22	17	5	..
1880-1	22	17	4	1
1881-2	20	15	3	2
Totals	506	369	90	47

TABLE VII.—Snow.

Seasons.	
1860-1	January 5th and 11th ; February 1st and 2nd, deep.
1861-2	None.
1862-3	January 24th, February 22nd, 1 inch.
1863-4	None.
1864-5	None.
1865-6	None.
1866-7	None.
1867-8	February 14th, 16th, 21st, 22nd, 26th and 27th.
1868-9	None.
1869-70	April 7th and 8th, 1·8 inch.
1870-1	February 19th.
1871-2	None.
1872-3	February 18th.
1873-4	December 26th, 3 ins.; January 10th, 23rd, 31st; February 6th and 7th, 8½ ins.; February 28th; March 1st, 3rd, 6th, 17th, and 18th, 4½ ins.
1874-5	January 10th and 29th; March 9th and 27th, 8½ inches.
1875-6	February 4th.
1876-7	February 8th and 17th.
1877-8	January 28th; February 15th, 16th, and 17th, 5 inches.
1878-9	None.
1879-80	December 28th and 29th, 17 ins.; March 11th and 14th, 5 ins.
1880-1	March 20th.
1881-2	January 22nd; February 3rd, 4 inches; February 10th, 1½ inch.

TABLE VIII.—Earthquakes.

Year.	Date.	Hour of day.	Barometer at		Wind.	Weather.
			previous 9 a.m.	next 9 a.m.		
1863	April 22nd	10.45 p.m.	26·972	27·308	W.	Changing with severe sandstorm from east to west.
1864	September 24th	8.15 p.m.	27·522	27·484	W.	Clear.
	March 24th	2.30 a.m.	27·472	27·466	E.	Changed from east to west in afternoon.
1868	January 24th	3.50 p.m.	27·572	27·522	W.	Changed to east next day.
	February 19th	midnight	27·262	27·252	W.	Rain and snow followed.
	October 7th	7.30 p.m.	27·527	27·552	W.	Storm, thunder and rain, changing from sirocco.
1870	June 24th	7 p.m.	27·472	27·442	W.	Clear and still.
1873	June 29th	2.30 a.m.	27·472	27·522	W.	Clear and still.
1874	March 3rd	1.40 a.m.	27·472	27·350	S.W.	Snowstorm.
1877	February 15th	7.15 a.m.	27·472	27·390	S.W.	Snow followed.
	March 14th	6.15 a.m.	27·352	27·286	N.W.	Changed from east on day previous.
1879	December 31st	9 a.m.	27·512	27·816	N.	Snow.

Table IX.—The overflow of Beer Ayūb.

Seasons.	Date of overflow.	Inches of rains which fell before.	No. of consecutive days rain immediately before.	Inches of rain which fell on these days.	Rainfall of the season. Inches.
1860-1	Jan. 24th, 1861	8·2	4	5·7	21·647
1861-2	Jan. 2nd, 1862	10·6	3	3·5	24·262
1862-3	Jan. 26th, 1863	10·9	5	5·6	22·862
1863-4	Jan. 9th, 1864	12·2	3	3·6	20·388
1864-5	Did not flow		..	..	15·475
1865-6	{ Jan. 9th, 1866	9·8	4	3·2	} 18·990
	{ March 1st, 1866	15·2	4	2·1	
1866-7	{ Jan. 9th, 1867	9·9	7	4·6	} 26·737
	{ Jan. 26th, 1867				
1867-8	Feb. 3rd, 1868	14·3	2	1·6	29·058
1868-9	Dec. 13th, 1868	8·3	2	3·6	24·916
1869-70	Did not flow		..	..	12·269
1870-1	March 9th, 1871	14·5	7	3·4	19·158
1871-2	Dec. 16th, 1871	7·6	3	5·9	18·481
1872-3	Dec. 26th, 1872	9·7	3	5·6	18·942
1873-4	Dec. 27th, 1873	10·4	1	2·4	39·512
1874-5	Feb. 5th, 1875	12·7	2	1·9	26·610
1875-6	Did not flow		..	..	16·445
1876-7	Feb. 10th, 1877	10·7	6	6·7	13·700
1877-8	Dec. 31st, 1877	14·5	1	2·1	42·932
1878-9	Did not flow		..	..	15·310
1879-80	{ Jan. 7th, 1880	7·4	5	1·7	} 23·565
	{ March 13th, 1880				
1880-1	Doubtful		..	..	26·585
1881-2	Feb. 5th, 1882	12·7	6	5·5	25·005

TABLE X.—To show connection of price of wheat with rainfall.

Seasons	1860-1	1861-2	1862-3	1863-4
No. of rainy days	40	44	..	43
Total rainfall inches	21·6	24·2	22·8	20·3
Latter rain inches	2·975	1·475	4·112	1·675
Price of wheat piastres	17	16	12	18

TABLE X—*continued.*

Seasons	1864-5	1865-6	1866-7	1867-8
No. of rainy days	37	58	65	62
Total rainfall inches	15·4	18·9	26·7	29·0
Latter rain inches	1·135	2·436	4·649	3·913
Price of wheat piastres	23	21	18	22
Seasons	1868-9	1869-70	1870-1	1871-2
No. of rainy days	61	43	49	53
Total rainfall inches	24·9	12·2	19·1	18·4
Latter rain inches	3·417	5·499	3·760	1·628
Price of wheat piastres	18	28	25	18
Seasons	1872-3	1873-4	1874-5	1875-6
No. of rainy days	46	71	57	51
Total rainfall inches	18·9	39·5	26·6	16·4
Latter rain inches	1·555	6·352	6·830	2·315
Price of wheat piastres	24	24	18	17
Seasons	1876-7	1877-8	1878-9	1879-80
No. of rainy days	41	68	37	55
Total rainfall inches	13·7	42·9	15·3	23·5
Latter rain inches	·935	2·952	3·025	4·755
Price of wheat piastres	34	25	39	29

NOTE.—A measure of wheat weighs about 48 lbs. English. A piastre is about twopence.

TABLE XI.—Showing the mean and the maximum and minimum height of barometer and monthly range, during each month of 21 years. Obs. at 9 a.m.

Years.	January.				February.				March.				April.			
	Mean reduced to 32°	Highest.	Lowest.	Monthly range.	Mean reduced to 32°	Highest.	Lowest.	Monthly range.	Mean reduced to 32°	Highest.	Lowest.	Monthly range.	Mean reduced to 32°	Highest.	Lowest.	Monthly range.
1861	27·405	27·630	27·127	·503	27·566	27·782	27·142	·640	27·406	27·596	27·166	·430	27·420	27·592	27·200	·392
1862	27·448	27·622	27·232	·390	27·443	27·546	27·255	·291	27·452	27·618	27·330	·288	27·420	27·598	27·150	·448
1863	27·480	27·672	27·125	·547	27·488	27·606	27·322	·284					27·341	27·552	26·972	·580
1864	27·472	27·722	27·242	·480	27·430	27·658	27·112	·546	27·411	27·656	27·350	·306	27·306	27·522	27·110	·412
1865	27·431	27·660	27·342	·318	27·332	27·572	26·972	·600	27·393	27·600	27·372	·228	27·412	27·632	27·370	·262
1866	27·435	27·740	27·200	·540	27·437	27·738	27·284	·454	27·400	27·656	27·312	·344	27·357	27·630	27·242	·288
1867	27·466	27·692	27·272	·420	27·507	27·722	27·392	·330	27·317	27·554	27·172	·382	27·339	27·566	27·272	·294
1868	27·456	27·722	27·272	·450	27·383	27·772	27·252	·520	27·363	27·600	27·222	·378	27·361	27·622	27·200	·422
1869	27·447	27·772	27·202	·572	27·464	27·710	27·232	·478	27·324	27·536	27·202	·334	27·404	27·652	27·321	·331
1870	27·464	27·742	27·350	·392	27·456	27·670	27·200	·470	27·399	27·514	27·100	·404	27·389	27·722	27·230	·492
1871	27·451	27·712	27·390	·322	27·454	27·772	27·322	·450	27·416	27·582	27·246	·336	27·347	27·562	27·272	·290
1872	27·450	27·710	27·342	·368	27·448	27·700	27·272	·428	27·379	27·672	27·222	·450	27·355	27·548	27·282	·266
1873	27·512	27·770	27·284	·486	27·426	27·742	27·272	·470	27·315	27·552	27·112	·440	27·397	27·692	27·232	·460
1874	27·436	27·772	27·072	·700	27·426	27·746	27·160	·586	27·371	27·658	27·140	·518	27·402	27·610	27·360	·250
1875	27·468	27·706	27·092	·614	27·368	27·664	27·172	·492	27·335	27·686	27·082	·604	27·418	27·592	27·232	·360
1876	27·519	27·772	27·030	·742	27·426	27·660	27·322	·338	27·353	27·540	27·122	·418	27·396	27·584	27·882	·302
1877	27·448	27·712	27·122	·590	27·439	27·692	27·234	·458	27·458	27·730	27·286	·444	27·346	27·592	27·192	·400
1878	27·469	27·704	27·308	·396	27·442	27·740	27·212	·528	27·420	27·672	27·272	·400	27·344	27·620	27·322	·298
1879	27·487	27·694	27·372	·322	27·489	27·672	27·418	·254	27·338	27·616	27·154	·462	27·415	27·624	27·402	·222
1880	27·497	27·754	27·348	·406	27·429	27·650	27·422	·428	27·378	27·634	27·156	·478	27·349	27·622	27·208	·414
1881	27·505	27·746	27·322	·424	27·329	27·578	27·047	·481	27·419	27·698	27·170	·528	27·369	27·656	27·222	·434
2	Mean height reduced to 32°	27·465			..	27·437	..		..	27·382	..		..	27·351		
	Mean of all highest	..	27·715		..	27·684	..		..	27·618	..		..	27·604		
	Mean of all lowest	..	27·240		..	27·211	..		..	27·209	..		..	27·241		
	Mean monthly range	..	·475		..	·453	..		..	·408	..		..	·362		

TABLE XI—continued.

Years.	May.				June.				July.				August.			
	Mean reduced to 32°	Highest.	Lowest.	Monthly range.	Mean reduced to 32°	Highest.	Lowest.	Monthly range.	Mean reduced to 32°	Highest.	Lowest.	Monthly range.	Mean reduced to 32°	Highest.	Lowest.	Monthly range.
1861	27·421	27·538	27·262	·276	27·397	27·538	27·247	·291	27·333	27·412	27·230	·212	27·349	27·422	27·275	·147
1862	27·774	27·566	27·410	·156	27·400	27·506	27·302	·204	27·379	27·462	27·314	·148	27·378	27·432	27·312	·120
1863	27·470	27·572	27·362	·210	27·405	27·522	27·320	·202	27·360	27·422	27·308	·114	27·399	27·522	27·272	·250
1864	27·4·8	27·612	27·342	·270	27·328	27·556	27·322	·234	27·279	27·454	27·333	·121	27·000	27·492	27·320	·172
1865	27·353			·344	27·466			·261	27·289			·150	27·277			·187
1866	27·374	27·542	27·382	·160	27·317	27·542	27·267	·275	27·267	27·472	27·296	·176	27·281	27·492	27·300	·192
1867	27·345	27·592	27·262	·330	27·345	27·622	27·352	·270	27·276	27·522	27·252	·270	27·295	27·472	27·322	·152
1868	27·395	27·620	27·392	·228	27·308	27·522	27·362	·160	27·282	27·472	27·272	·200	27·3·6	27·516	27·327	·189
1869	27·378	27·642	27·364	·278	27·387	27·622	27·384	·238	27·306	27·494	27·330	·164	27·319	27·548	27·322	·226
1870	27·411	27·720	27·418	·302	27·331	27·542	27·350	·192	27·255	27·482	27·302	·180	27·279	27·542	27·302	·240
1871	27·379	27·772	27·382	·390	27·319	27·534	27·372	·162	27·256	27·522	27·222	·300	27·292	27·508	27·324	·184
1872	27·378	27·610	27·364	·246	27·376	27·630	27·382	·248	27·281	27·482	27·342	·14	27·281	27·472	27·270	·202
1873	27·384	27·612	27·362	·250	27·373	27·570	27·392	·178	27·262	27·522	27·302	·220	27·314	27·518	27·392	·126
1874	27·417	27·612	27·334	·278	27·354	27·622	27·350	·272	27·242	27·464	27·308	·156	27·301	27·508	27·362	·146
1875	27·401	27·566	27·306	·260	27·319	27·562	27·296	·266	27·276	27·510	27·302	·208	27·321	27·570	27·322	·248
1876	27·383	27·660	27·402	·258	27·386	27·572	27·422	·150	27·282	27·450	27·366	·084	27·308	27·552	27·352	·200
1877	27·417	27·622	27·422	·200	27·397	27·622	27·422	·200	27·328	27·530	27·400	·130	27·356	27·592	27·382	·210
1878	27·352	27·572	27·252	·320	27·326	27·542	27·322	·220	27·188	27·490	27·272	·218	27·271	27·482	27·272	·210
1879	27·404	27·644	27·422	·222	27·301	27·514	27·272	·242	27·268	27·462	27·302	·160	27·285	27·472	27·322	·150
1880	27·370	27·598	27·284	·314	27·331	27·582	27·330	·252	27·284	27·506	27·282	·224	27·317	27·534	27·334	·200
1881	27·371	27·562	27·382	·180	27·382	27·628	27·382	·246	27·296	27·552	27·296	·256	27·281	27·476	27·332	·144
Mean height reduced to 32°	27·397				..	27·359	..		..	27·285	..		..	27·295		
Mean of all highest	..	27·611			..	27·567	..		..	27·385	..		..	27·505		
Mean of all lowest	..	27·355			..	27·342	..		..	27·301	..		..	27·320		
Mean monthly range	..	·260			..	·227	..		..	·182	..		..	·185		

TABLE XI—continued.

Years.	September.				October.				November.				December.			
	Mean reduced to 32°	Highest.	Lowest.	Monthly range.	Mean reduced to 32°	Highest.	Lowest.	Monthly range.	Mean reduced to 32°	Highest	Lowest.	Monthly range.	Mean reduced to 32°	Highest.	Lowest.	Monthly range.
1861	27·428	27·522	27·332	·190	27·511	27·592	27·422	·170	27·549	27·672	27·394	·278	27·421	27·534	27·216	·318
1862	27·445	27·502	27·416	·086	27·499	27·572	27·402	·170	27·442	27·570	27·398	·172	27·482	27·782	27·272	·510
1863	27·471	27·558	27·372	·186	27·530	27·622	27·352	·270	27·502	27·710	27·442	·268	27·413	27·670	27·200	·470
1864	27·384	27·602	27·386	·216	27·454	27·670	27·522	·148	27·428	27·658	27·342	·316	27·448	27·716	27·372	·344
1865	27·388			·227	27·486			·248	27·435			·208	27·444	27·612	27·306	·306
1866	27·351	27·572	27·396	·176	27·437	27·622	27·432	·190	27·427	27·648	27·322	·326	27·468	27·677	27·392	·285
1867	27·354	27·586	27·372	·214	27·447	27·658	27·472	·186	27·476	27·742	27·362	·380	27·402	27·722	27·240	·482
1868	27·394	27·567	27·432	·135	27·457	27·692	27·477	·215	27·459	27·706	27·356	·350	27·473	27·770	27·182	·588
1869	27·368	27·566	27·362	·204	27·505	27·722	27·504	·218	27·499	27·746	27·420	·326	27·523	27·758	27·364	·394
1870	27·401	27·612	27·342	·270	27·447	27·622	27·342	·280	27·543	27·800	27·456	·344	27·492	27·712	27·362	·350
1871	27·373	27·542	27·372	·170	27·403	27·622	27·412	·210	27·461	27·672	27·452	·220	27·483	27·712	27·318	·394
1872	27·350	27·540	27·374	·166	27·441	27·656	27·452	·204	27·464	27·720	27·404	·316	27·470	27·732	27·150	·582
1873	27·378	27·600	27·422	·178	27·456	27·632	27·440	·192	27·432	27·658	27·334	·324	27·467	27·722	27·120	·602
1874	27·385	27·668	27·430	·238	27·457	27·650	27·472	·178	27·458	27·662	27·322	·340	27·490	27·708	27·340	·368
1875	27·409	27·602	27·404	·198	27·452	27·668	27·372	·296	27·428	27·652	27·322	·330	27·471	27·710	27·442	·268
1876	27·383	27·610	27·392	·218	27·427	27·618	27·442	·176	27·449	27·672	27·372	·300	27·511	27·692	27·312	·380
1877	27·420	27·642	27·436	·206	27·450	27·716	27·406	·310	27·452	27·658	27·372	·286	27·453	27·686	27·280	·406
1878	27·322	27·542	27·302	·240	27·425	27·622	27·434	·188	27·539	27·722	27·512	·210	27·523	27·708	27·394	·314
1879	27·385	27·580	27·410	·170	27·480	27·690	27·466	·224	27·493	27·672	27·452	·220	27·459	27·816	27·242	·574
1880	27·398	27·594	27·412	·182	27·488	27·702	27·478	·224	27·493	27·706	27·340	·366	27·426	27·690	27·290	·400
1881	27·374	27·584	27·364	·220	27·456	27·650	27·484	·166	27·441	27·662	27·322	·340	27·451	27·770	27·342	·428
Mean height reduced to 32°	27·388				..	27·462	..		..	27·470	..		..	27·465		
Mean of all highest	..	27·579			..	27·649	..		..	27·685	..		..	27·709		
Mean of all lowest	..	27·386			..	27·438	..		..	27·384	..		..	27·291		
Mean monthly range	..	194			..	·212	..		..	·296	..		..	·417		

TABLE XII.—Showing the mean height, maximum and minimum height, and annual range of barometer during 21 years. Obs. at 9 a.m.

Years.	Mean height reduced to 32°.	Highest in the year.	Lowest in the year.	Yearly range.
1861	27·443	27·782	27·127	·655
1862	27·438	27·782	27·150	·632
1863	27·439	27·672	26·972	·700
1864	27·367	27·722	27·110	·612
1865	27·392	27·660	26·972	·688
1866	27·379	27·740	27·200	·540
1867	27·380	27·742	27·172	·570
1868	27·386	27·772	27·182	·590
1869	27·410	27·772	27·202	·570
1870	27·405	27·800	27·110	·690
1871	27·388	27·772	27·246	·526
1872	27·389	27·732	27·150	·582
1873	27·393	27·770	27·112	·658
1874	27·394	27·772	27·072	·700
1875	27·388	27·710	27·082	·628
1876	27·401	27·772	27·030	·742
1877	27·413	27·730	27·122	·608
1878	27·385	27·740	27·212	·528
1879	27·400	27·816	27·154	·662
1880	27·396	27·754	27·156	·598
1881	27·389	27·770	27·097	·673
21 years ..	27·398	27·816	26·972	·844

Mean annual range, ·626

TABLE XIII.—Showing mean height of barometer, reduced to 32°, at 9 a.m. during the several months of the year, and the monthly range. Mean of 21 years.

Months.	Barometer reduced to 32°.	Monthly range.
January	27·465	·475
February	27·437	·453
March	27·382	·408
April	27·351	·362
May	27·397	·260
June	27·359	·227
July	27·285	·182
August	27·295	·185
September	27·388	·194
October	27·462	·212
November	27·470	·296
December	27·465	·417
Year	27·396	·305

TABLE XIV.—Showing the maximum and minimum temperature, mean temperature, mean monthly and daily range, &c., during the several months of the year. Mean of 8 years.

Months.	Highest in the period.	Lowest in the period.	Mean monthly range.	Mean daily range.	Mean Temperature.	Hygrometer.		
						Dry bulb mean 9 a.m.	Wet bulb mean 9 a.m.	Difference.
January ..	74·8	25·0	31·6	13·0	48·4	48·4	44·5	3·9
February ..	79·0	30·0	32·9	13·4	47·9	48·5	44·3	4·2
March ..	88·0	33·9	42·0	16·9	55·7	57·8	50·5	7·3
April ..	86·0	30·6	44·6	18·7	58·4	61·1	52·3	8·8
May ..	103·0	43·0	49·8	23·1	69·3	73·4	59·1	14·3
June ..	103·5	47·8	44·0	22·5	72·8	77·6	63·0	14·6
July ..	98·2	49·0	37·3	23·1	73·8	78·4	65·4	13·0
August ..	101·0	61·3	38·0	23·6	76·1	79·5	65·7	13·8
September ..	100·0	42·0	41·4	24·1	71·5	74·9	64·0	10·9
October ..	96·5	32·0	44·8	23·6	68·6	73·0	60·8	12·2
November	89·2	34·5	41·5	18·7	59·9	61·6	54·2	6·4
December	73·6	36·8	31·0	13·9	51·4	52·0	47·3	4·7
			39·9	19·5	62·8	65·5	55·9	9·6

TABLE XV.—Showing the number of days on which the wind blew from certain directions during the several months of the year at 9 a.m. Mean of sixteen years.

Months.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
January ..	1·25	5·00	5·25	2·00	1·62	6·00	4·68	5·18
February ..	1·12	2·75	4·18	2·37	1·43	5·93	4·43	6·00
March ..	1·25	2·25	3·87	4·31	1·25	6·06	5·81	6·18
April ..	2·43	1·50	3·75	4·81	1·37	4·68	4·62	6·81
May ..	4·18	3·18	3·12	4·12	0·68	2·00	3·68	10·00
June ..	4·25	1·87	1·50	1·62	0·50	3·00	4·18	13·06
July ..	3·00	0·81	0·31	0·37	0·31	1·87	6·31	17·93
August ..	3·81	1·37	0·37	0·50	0·56	2·62	6·18	15·56
September ..	6·62	1·87	1·18	0·68	0·75	1·18	4·68	13·00
October ..	4·62	3·75	4·62	2·93	0·75	2·62	2·43	9·25
November	2·50	5·06	6·56	1·81	0·68	4·18	3·93	5·25
December	1·25	3·31	5·50	3·12	1·93	6·31	4·06	5·50
Year ..	36·28	32·72	40·21	28·64	11·83	46·45	54·99	113·72

TABLE XVI.—Showing the mean force of the wind at 9 a.m. and the mean number of calm days in each month. Mean of 10 years.

Months.	Mean force of wind at 9 a.m. 0—6	Mean number of calm days at 9 a.m.
January	0·47	10·7
February.. ..	0·67	7·6
March	0·65	5·9
April	0·63	6·5
May	0·49	6·8
June	0·41	8·3
July	0·40	7·3
August	0·32	9·1
September ..	0·33	10·3
October	0·27	12·3
November	0·41	11·5
December	0·50	11·7
Year	0·46	108·0

TABLE XVII.—Showing the mean amount of cloud and the mean number of cloudless days at 9 a.m. in the several months of the year. Mean of 16 years.

Months.	Mean amount of cloud. 0—10	Mean number of cloudless days.
January	4·4	6·8
February.. ..	4·8	5·1
March	5·0	5·5
April	3·7	8·9
May	2·4	11·8
June	1·1	18·5
July	0·6	21·5
August	0·9	18·0
September ..	1·2	17·5
October	2·3	12·2
November	3·5	8·0
December	4·6	6·7
Year	2·8	140·0