
[Read April 6, 1865.]

The least-known flora of Palestine is that of the Ghor or Jordan valley; and, as far as I am aware, the flora of the south of the Dead Sea valley was almost if not entirely unknown before my visit in January 1864, in company with the Rev. H. B. Tristram and his party. With the assistance of the Royal Society, and under the guidance of that distinguished traveller, I was enabled to stay several days in the least frequented and most dangerous part of the Dead Sea valley, and I propose with your leave to present to you this evening the results of my researches in that region.

General Character of the Vegetation near the Dead Sea.—The greater part of the western and southern shores of the Dead Sea, between Ain Terabeh and the oasis Ts Saffieh, is quite destitute of vegetation, except occasional patches of Lycium europaeum, Salvia aegyptiaca, Lagurus ovatus, and one or two composite plants which I have not been able to determine, owing to the state they were in at the time of our visit. At Ain Terabeh there is a dense thicket of reeds (Arundo donax) with a marsh of Salsolæ, Atriplex halimus, and here and there a clump of Tamarisks, probably T. Pallasii or a species very near it. Ain Terabeh was the only place where I found Ælæropus levis; but Dr. Hooker found this remarkable grass nearer the northern end of the sea. Beyond Ain Terabeh, travelling south, except at Engedi, Saffieh, and on the flat plain between the Zuweirah and Mahawwat Wadies, all the vegetation I observed, except that already mentioned, were a few tamarisks, one or two small Acacia trees (Acacia seyal), and a single specimen of Astragalus with purple flowers (near A. hypoglottis, Linn.). Our march was, however, very hurried and fatiguing whilst passing over these desert regions, and I speak from memory and not from notes.

The banks of the streams at Engedi are in many places covered with luxuriant vegetation, dense thickets of reeds (Arundo donax), Salix octandra, and Salvadoræ persica overhanging them, with here and there a patch of Typha latifolia, and an apparently new species of Pennisetum; whilst immense fronds of Maiden’s Hair Fern (Adiantum capillus Veneris) hang from the damp shady parts of the rocks. The general appearance of the oasis, however, is exceedingly desolate: the Arabs cultivate but little corn; and the
most conspicuous botanical objects in the landscape are groups of *Tamarix Pallasii, Moringa aptera, Acacia seyal, Zizyphus vulgaris*, and the curious and grotesque Asclepiad *Calotropis procera*, Br. *Retama monosperma*, Boiss., is also a common bush; but it flowers later, and was not a very conspicuous object in the vegetation at the time of our visit.

The oasis of Es Saffieh differs from that at Engedi in being better watered and therefore more fertile, and in being inhabited by settled and not by wandering tribes of Arabs. Unfortunately the curious Arab village had been sacked and burned the day before we arrived, by a lawless gang of Arabs from Petra; and all its unhappy inhabitants had flown, leaving their corn-crops, and indigo, and the dead bodies of those who had fallen in fight behind them. As the enemy were apparently still lurking about, our survey of the district was necessarily hasty and imperfect. *Zizyphus vulgaris* and *Salvadora persica* are both much more abundant at Saffieh, much more abundant than at Engedi, whilst *Calotropis*, although common, is much less common than at the latter place; with the exception of *Acacia seyal* and *Moringa aptera*, I saw no other trees and bushes at Saffieh, although I kept a sharp look-out, knowing at the time that Irby and Mangles had described the oasis as abounding in an almost infinite variety of shrubs and bushes.

The most curious and interesting locality in the south of the Ghor, however, is the delta-like flat which extends from the embouchures of the Zuweirah and Mahauwat Wadies to the shore of the Dead Sea, where I found 82 species of flowering plants, with few exceptions, quite peculiar to this limited region, as regards the Dead Sea valley and the rest of Palestine.

The Zuweirah and Mahauwat Wadies are two very deep gorges formed by the drainage of the eastern portion of the plateau of Beersheba and the hills between it and the Dead Sea, and which enter the Ghor just north of, and on the west side of, Jebel Us-dum, about two miles from the Salt Lake. These two miles consist of a flat delta formed of tertiary deposits washed down and deeply channelled by occasional torrents, which, judging from appearances, must be rare and violent. The channels are exceedingly numerous, and vary from a few feet to many yards in breadth, and from two to eighteen feet in depth; and although at the time of our visit they were apparently perfectly dry even a foot or more beneath the surface, they were fringed with *Zizyphus vulgaris, Acacia seyal, Tamarix, Ochradenus*, and *Daemia cordata*; and the
beds of the channels were dotted over with low scrubby bushes of *Eugenia* and *Gymnocarpum*, and with showy tufts of *Cleome trinervia* and *Salvia controversa*. In fact, the whole of the 82 species which I found were, with few exceptions, confined to the channels or their immediate vicinity, and every plant seemed to be in flower; yet we had to send nearly two miles up the Zuweirah Wady for water, which existed only in deep rock-pools, the remains of former rains. The entire delta has a very desolate aspect. The Rose of Jericho (*Anastatica*) grows in its driest parts; but it is fringed at the edge of the lake by a bright green marsh of Salsola.

On examining the list of plants which I found in this region, it will be seen that the flora, although very different from the flora of the rest of Palestine, is essentially Mediterranean in type. Its affinities, however, are all with the florras of northern Africa, especially with the desert-floras of Upper Egypt and Nubia. It will also be found to be closely related with that of Aden in the south, and the Canaries in the west. The flora of this delta appears, moreover, to be precisely similar to that of Arabia Petraea; at least I am led to this belief by a comparison of it with the collection made there by Major M'Donald, now in the Herbarium at Kew.

It will be seen, on examining the lists I have appended to this paper, that, of the 94 species collected by myself in the south of the Dead Sea valley, 29 or 30 only are European plants; and these are chiefly weeds of a very wide distribution: why such plants as *Tribulus terrestris*, *Emex spinosus*, *Solanum nigrum*, and *Capsella bursa-pastoris* should form so large a part of the European element in this flora, I am unable to form any idea. With the exception of one or two, all these 29 or 30 species extend into northern India; many have a much wider distribution.

On the other hand over 50 species are decidedly African, not extending into Europe; and many of these are exceedingly local; not more than one-third extend into India; and those which do are chiefly natives of Sind and Afghanistan, affecting arid regions: and none of these African species seem to have a very wide distribution, with the exception of *Alruia javanica*.

Although two of the most remarkable forms of the southern Ghor, *Calotropis procera* and *Salvadora persica*, are Indian plants, yet these are equally common in Upper Egypt and Nubia; so that I do not think there is anything to warrant the ordinary belief that the flora of the south of the Ghor has an Indian type.

Excluding the exceedingly widely distributed European plants.
between 30 and 40 of the species of the southern Ghor extend into Sind, and about 13 are found in the Canary Isles: this appears to me a fact worthy of note, since these countries are upon the eastern and western limits of the North-African desert-flora.

The relation which the southern Ghor bears to that of the peninsula of Aden, seeing how little is known of the botany of central Arabia, seems to me a subject of special interest. Eleven of the most characteristic plants of the southern extremity of the Dead Sea valley are common to it and to the peninsula of Aden; and, considering how very limited the floras of the two localities are, this is not an unimportant number. In both places Reseda amblyocarpa seems to be by far the most common plant.

In both places the number of species and genera is small compared with the number of natural orders to which they belong. My 94 species belong to 33 orders, giving an average of rather more than three species to each.

The most numerous orders in the flora of the Dead Sea are—Cruciferae, containing 13 species;

<table>
<thead>
<tr>
<th>Order</th>
<th>Number of Species</th>
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<tbody>
<tr>
<td>Cruciferae</td>
<td>13</td>
</tr>
<tr>
<td>Leguminosae</td>
<td>6</td>
</tr>
<tr>
<td>Chenopodiaceae</td>
<td>6</td>
</tr>
<tr>
<td>Zygophyllaceae</td>
<td>5</td>
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</tbody>
</table>

whilst at Aden, according to Griffith’s Floricula, published in your ‘Transactions,’ there are

<table>
<thead>
<tr>
<th>Order</th>
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<tbody>
<tr>
<td>Leguminosae</td>
<td>11</td>
</tr>
<tr>
<td>Capparidae</td>
<td>9</td>
</tr>
<tr>
<td>Euphorbiaceae</td>
<td>7</td>
</tr>
<tr>
<td>Compositae</td>
<td>5</td>
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showing the much more decided tropical character of the latter flora.

None of the plants peculiar to Aden were found by me in the Dead Sea valley; and I know of only one well-marked species peculiar to this region and to the north of Arabia and the adjacent deserts of Suez and Persia, the Cleome trinervia, Fresen., which is the most characteristic plant of northern Arabia.

Lastly, I may mention that I found two most distinct varieties of Bugonia common about the Zuweirah and Mahauvat Wadies—one, the F. sinaitica of Boissier, a creeping plant, and the other the common Levant species; these plants, growing side by side in abundance without any intermediate forms, seem to me to point to two distinct species of Bugonia, however wide their distribution and variation may be.
I. The Desert-Flora of Zuweirah and Mahauwat Wadis.

**Cruciferae.**
1. Mathiola ocycaeras, DC.
2. Mathiola sinuata.
4. Notoceras canariense, R. Br.
5. Farsetia ,egyptiaca, Turcz.
6. Nasturtium coronopifolium, DC.
7. Anastatica hierochuntina, L.
8. Neslia paniculata.
10. Enarthrocarpus strangulatus, Boiss.
11. Hesperis, sp.
12. Erucaria, sp.
13. Carrichtera vella, DC.

**Capparidæ.**
   Probably the same as quinquenervia, DC.
15. Cleome trinervia, Fresen.

**Resedaceæ.**
17. —— amblyocarpa, Fresen.
18. Oligomeris glaucescens, Camb.
19. Ochradenus buccatus, DC.

**Tamaricinæ.**
20. Tamarixtennifolia, DC.?} affines
21. —— Pallasi, Desv.? } sp.
22. Reanumuria palestina, Boiss.
   Probably the same as vermicularis, L.

**Zygophyllaceæ.**
23. Fagonia crctica, L.
24. —— sinnatina, Boiss.
25. Nitraria tridentata, Desf.
27. Tribulus terrestris, L.

**Rutaceæ.**
28. Ruta tuberculata, L.

**Azoidæ.**
29. Azoon canariense, L.

**Rhamnaceæ.**
30. Zizyphus vulgaris, L.

**Leguminosæ.**
32. Astragalus, sp. resembling gum-mifer.
33. Lottononis Leoborden, Boiss.
34. Trigonella hamosa, L.
35. Acacia seyal, L.
36. Vicia narbonensis, L.

**Compositæ.**
37. Anvillea Garcini, DC.
38. Asteriscus pygmaeus, Cass.
39. —— graveolens, DC.
40. Pulicaria undulata, DC.
41. Pyrethrum anriculatum, Boiss.
42. Zollikofaria chondrilloides, DC.
43. Pieridium tingitanum, Desf.
44. Microchychus judicaiulis, Less.
45. Trichogynæ cauliflora, DC.
46. Senecio Deaisneci, DC.
47. Leyssera capillifolium, DC.

**Cuscutaceæ.**
48. Cuscuta, sp.

**Solanaceæ.**
49. Solanum nigrum, L.

**Boraginæ.**
50. Heliotropium luteum, Pers.
51. —— hispidum, Forsk.
52. Trichodesma, sp.
53. Onosma syriaæ, Labill.? A small variety.

**Asclepiadæ.**
54. Dæmæ cordata, R. Br.
55. Lycium europæum, L.

**Labiateæ.**
56. Salvia egptiaca, L.
57. —— controversa, Pen.
58. Lavandula multifida, L.

**Scrophularinæ.**
59. Verbascum undulatunm, Lam.
60. Scrophularia variegata, Bieb.
   probably a var. of canina.
61. Antirrhimum orontium.
62. Linaria floribunda, Boiss.
63. —— sp.
Plantagineæ.
64. Plantago, sp.
65. Statice pruinosa, Delil.

Plumbagineæ.
66. Aëra javanica, Juss.

Amaranthaceæ.
67. Rumex vesicularis, L.

Polygonææ.
68. Echinopsilon muricatus, Moq.
69. —, sp.
70. Salicornia fruticosa, L.
71. Sueda, sp.
72. Atriplex halimus, L.
73. Salsola, sp.
74. Juncus maritimus, L.
75. Aristida plumosa, L.
76. —— Adscensionis, L.
77. Andropogon, sp.
78. Schismus minutus, R. S.
79. æluropus lavis, Trim.
80. Panicum Tenerifæ, R. Br.
81. —— turgidum, Førk.
82. Pennisetum cenchroides, Reich.

At Engedi I also found

1. Moringa aptera, DC.
2. Calotropis procera, Br.
3. Salix octandra, DC.
4. Arundo donax, L.
5. Salvadoræ persica, L.
6. Forskahlea, sp.
7. Zizyphus lotus, DC.
8. Loranthus aeneus, DC.
9. Pennisetum, sp.
10. Typha latifolia, L.
11. Abutilon muticum, DC.
12. —— denticulatum, DC.

And these plants, except Forskahlea and Moringa and the three Malvaceæ, were observed by me at Es Sallīch. Except Moringa aptera and Loranthus aeneus, these are all Indian species. Salix octandra extends into Afghanistan. They are all also Egyptian, including both Moringa and Loranthus.

II. List of Plants found in the Wadics at the south of the Dead Sea, which occur in

1. The Canary Islands.
1. Fagonia crotica*.
2. Notoceras canariense.
3. Gymnocarpum fruticosum.
4. Azoon canariense.
5. Trichogyne caulisflora.
7. Salvia aegyptiaca.
8. Pennisetum cenchroides.
10. Atriplex halimus.
11. Statice pruinosa.

2. The Flora of Aden.
1. Fagonia crotica.
2. Abutilon denticulatum.
3. Reseda ambyloecarpa.
4. Cleome droserifolia.
5. Zizyphus lotus.
7. Salvadoræ persica.
8. Aëra javanica.
10. Aristida Adscensionis.
11. —— plumosa.

* The species in Italics are found in Europe.
3. **Europe.**

*1. Notoceras canariense.*
*2. Matthiola sinuata.*
*3. Fagonia cretica.*
*4. Neslia paniculata.*

*5. Capsella bursa pastoris.*
*7. Tribulus terrestris.*
*8. Retama retam.*

*10. Zollikoferia chondrilloides.*
*11. Trichogyne cauliflora.*

*12. Inula guttata.*
*13. Solanum nigrum.*
*14. Lycium europaeum.*

*15. Salvia controversa.*
*16. Lavandula multifida.*

*17. Serophularia canina.*
*18. Antirrhinum orontium.*

*19. Verbascum undulatum.*
*20. Rumex vesicarius.*


*22. Balanophora cocinea.*
*23. Typha latifolia.*

*24. Juncus maritimus.*

*25. Arundo donax.*

*26. Pennisetum cenchroides.*

*27. Panicum Tenerifae.*

4. **Africa, but not in Europe.**

†1. Matthiola oxyceurs.
†2. Zilla myagroides.
†3. Anastatica heliophila.

†4. Farsetia aegyptiaca.
5. Brassica Ancheri.

†6. Enarthrocarpus strangulatus.
7. Nasturtium coronopifolium.

†8. Cleome drosimilis.

10. Oligomeris glaucoscens.
†11. Ochradenus bacatius.
12. Tamarix tenuifolia.

†13. — Pallasii?
14. Fagonia sinaica.
15. Nitraria tridentata.
16. Ruta tuberculata.

†17. Abutilon denticalatum.
†18. — muticum.
†19. Sida asiatica.

‡20. Gymnocarpum fruticosum.
21. Reaumuria palestina.
22. Azon canariense.
23. Moringa aptera.
24. Lotononis Leobordea.
25. Trigonella hamosa.
26. Acacia seyal.

* These species have all a very wide distribution, especially the Capsella, Tribulus, Solanum, Emex, and Juncus, which are worldwide.
† These species extend into Northern India.
‡ Gymnocarpum fruticosum, and Pieridium tingitanum, extend into Sicily.
List of Orders and Number of Species in each.

13 Cruciferae. 2 Asclepiadaceae.
11 Compositae. 1 Moringaceae.
10 Gramineae. 1 Rhamnaceae.
 6 Leguminosae. 1 Salvadoraceae.
 6 Chenopodiaceae. 1 Loranthaceae.
 5 Zygophyllaceae. 1 Plantaginaceae.
 5 Scrophulariaceae. 1 Plumbaginaceae.
 6 Rosaceae. 1 Amaranthaceae.
 4 Boraginaceae. 1 Urticaceae.
 3 Tamarissiaceae. 1 Polygouneae.
 3 Labiate. 1 Amentaceae.
 2 Capparidaceae. 1 Typhaceae.
 2 Solanaceae. 1 Juncaceae.


[Read April 6, 1865.]

I have written the following notes on the flora of the Desert, more especially the Sinaitic part of it, from memoranda made, and specimens collected, during a tour in the East in the months of February, March, and April 1864, in the hope that, slight as is the information contained in them, it may be of use to those who (as I did), before leaving England, search almost in vain for information on this subject.

I reached Alexandria on the 11th of February, too early to see its flora to advantage; but what I saw did not give promise of much variety. The only trees outside the enclosed gardens of the merchants are Phanix dactylifera, of which there are extensive groves within the fortifications, and which grow luxuriantly in the saline soil, Tamarix orientalis, and Aloysia lebbeki, both planted in avenues along the roads by Mehemet Ali,—the former dusty and stunted in growth, the latter with large yellow pods hanging from its almost leafless branches.

The waste ground, now being gradually built upon as the modern city expands over the deserted site of its ancient predecessor, is thinly covered with vegetation, the most noticeable plants being a small yellow-flowered Eruca (E. sativa), a white-flowered Eruca (E. aleppica), and the bright-orange Calendula officinalis all very dwarf: great quantities of a Mesembryanthemum (apparently M. crystallinum) were springing from seed. On the banks of the Mahmoudieh canal I remarked a kind of Cyperus...