FID Biodiversitätsforschung

Mitteilungen der Floristisch-Soziologischen Arbeitsgemeinschaft

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1963

urn:nbn:de:hebis:30:4-92931

The Desert Scrub in Egypt

by

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Phytogeographical Situation of Egypt

Egypt is a desert country located in the north-eastern corner of Africa. It forms part of the desert belt named "Great Sahara" that stretches along the whole of North Africa and becomes continuous on the east with the deserts of Arabia and Iraq. According to GOOD's system of classification of the earth's surface into phytogeographical regions, Egypt is mainly located within two floral regions: the Mediterranean (No. 5) and the African-Indian desert (No. 7). However, relies of the floras of two other regions are also represented in the Egyptian flora. Thus in Southern Sinai, in certain mountains of the Isthmic desert and in the Galala mountains of the Arabian desert can be distinguished relies of the flora of West and Central Asia (Region 4 in GOOD's map). Similarly, in Gebel Elba, at the south-east corner of the country, are found relics of the flora of the Sudanese Parke Stappe (No. 10).

Within Egypt itself the main phytogeographical regions are:

1. The Desert region: comprising the Libyan desert to the west of the Nile valley, the Arabian desert to the east and the Isthmic desert north of the latitude of Wadi Tumilat, which extends eastward from the edge of the Nile valley along the latitude of Cairo—Suez Road west and east of the Suez Canal.
2. The Mediterranean region: representing the northern coastal strip, having a breadth of 15—25 km. from the sea southward.
3. The Red Sea coast.
4. Sinai region: the mountainous southern part of the Peninsula.
5. Gebel Elba and surrounding mountains in the south-east corner.
6. The Oases of the Libyan desert.
7. The Nile region: which is the cultivated part of the country, with fertile alluvial soil, depending on irrigation from the Nile. This region comprises (a) the delta or Lower Egypt, (b) the Nile valley or Upper Egypt and (c) the Faiyum province.

Topography

The total area of Egypt is about a million square kilometres, of which 680,000 represent the Libyan desert and 223,000 represent the Arabian and Isthmic deserts.

The Libyan desert plateau is almost flat, without any well-defined drainage lines or catchment areas. A considerable proportion of the surface is covered by accumulations of drifted sand overlying rocky or clayey substrate. In the

northern and central parts the drifted sand takes the form of long lines of dunes (Barchans) while in the southern part it has a flat or slightly undulating surface. The Libyan desert has several closed-in depression representing the oases.

The Eastern desert rises rapidly from the Nile valley often as steep cliffs which are broken by numerous large openings representing the mouths of large Wadis. The main wadis are 50 or more kilometres in length. Joining them on either side are tributaries the numerous feeders of which cut up the plateau that intervene between the mountain ranges of the Red Sea and the Nile region. The wadis are filled only partially and for short periods under exceptionally heavy rainfalls. The wadi systems are lines of surface drainage.

The northern part of Sinai peninsula also belongs to the Eastern desert. It is a great plateau sloping from heights of more than 1000 m. downwards to the Mediterranean. The drainage channels are shallow and open.

The Sinai region is bounded on the north by El Tih desert, which belongs to the Isthmic desert subregion. It is formed of high granite mountains dissected by a complicated system of deep wadis. The peaks of many of the Sinai mountains rise to considerable heights, and are often covered by snow in winter. Rain is relatively heavy in this region. Part of it penetrates the ground. Springs and rock pools are abundant.

Climate

Egypt lies mainly in the north temperate zone and partly in the tropical zone. It is characterised by a warm and almost rainless climate. The air temperature frequently rises to over 40°C in the daytime during the summer, and seldom falls as low as 0°C, even during the coldest winter nights, and the average rainfall over the whole country is only about 10 mm. a year. Even along the Mediterranean littoral where the rainfall is heaviest the average yearly precipitation is less than 200 mm., and the amount decreases very rapidly as one proceeds inland from the coast. Thus while Alexandria, on the Mediterranean coast, has an average annual rainfall of 190 mm., Cairo, some 170 km. inland has only 30 mm., Asyut 370 km. south of Cairo, has but 5 mm., and Aswan, about 400 km. further south, has nearly no rain at all. An important feature of the rainfall of Egypt is its great variability both in time and space.

The Egyptian desert has a Saharan Mediterranean climate except in the Mediterranean coastal strip where the climate is semi-arid. The pulviothermic quotient for Cairo district is 1.6; and is even less than that for the more southerly deserts. In the climadiagrams the precipitation curve underlies the temperature curve and no humid period prevails at all except a very short one in the Mediterranean region. According to WALTER's map of the climadiagrams of Africa the climate of Egypt is of the extremely arid type (Type 3). It is only in the Mediterranean coastal strip that the climate is slightly less arid, and so belongs to type 2 "Übergangsgebiet".

The Desert Vegetation

A. Inland Deserts

According to HASSIB (1951) the number of species of flowering plants in the inland deserts is 755, which constitute 41 % of the total number of species representing the Egyptian flora. They are distributed among the various deserts as follows:

Libyan desert	105 spp.	= 13.8 %
Isthmic desert	336 ,,	= 44.0 %
Northern Arabian desert	220 ,,	= 29.1 %
Southern Arabian desert	104 ,,	= 13.7 %

These species are distributed among the various life-forms of RAUNKIAER as follows: Phanerophytes 7.2 %, Chamaephytes 17.1 %, Hemicryptophytes 19.0 %, Geophytes 6.8 % and Therophytes 46.5 %. It is thus clear that the flora of the desert is mainly therophytic, Hemicryptophytes and Chamaephytes are strongly represented. The Phanerophytes are represented by such trees and shrubs like date palm, tamarisks, reatam, *Ficus pseudosycamorus*, *Caletropis procera*, *Leptadenia pyrotechnica*, *Moringa aptera* and *Acaciaspp.*

B. Mediterranean Coastal Strip

The rainfall of this region varies from 40 to 200 mm. in different years, with great variability both at the same place and in different places from year to year. The Mediterranean region contrasts sharply with the inland desert which is almost rainless. The fertility of the Mediterranean region depends largely on winter rains. These do not persist for more than a few hours at a time.

The difference between the Mediterranean region and the inland deserts is not confined to the amount of rain alone but extends to the frequency of rainfall. While at the latitude of Cairo the number of rainy days (days with rainfall of more than 1 mm.) is 5—6 every year, in the coastal region there are 20 rainy days per annum. This difference in rainfall has its effect on the soil water content and the vegetation. Thus although the area of the Mediterranean region is but a very small fraction of the area of the inland desert, yet it is richer in number of species and in density and vigour of the vegetation. If we compare the soil water content at a depth of 50—100 cm. along the coast at Ras El Hikma with that at the latitudes of Cairo and Asyut we notice that along the coast the water content is above 30 % of the total water capacity for most of the year, rising to a maximum of 50 % in the wet season and falling to a minimum of 18 % in the dry season. The plant cover in the low lands rises to 70 % or more in winter. In the deserts near Cairo the water content is of the order of 15 % of the total water capacity for most of the year, and rises to a maximum of 30 % in winter. The plant cover in the drainage channels in winter may be as much as 30 %. In the desert wadies near Assiut the water content below half a metre depth rarely rises above 5 % of the total water capacity and the plant cover does not exceed 2—3 %. Vegetation is open and very sparse.

The Mediterranean vegetation is represented by 925 species, equivalent to 51 % of the flora. The percentage distribution of these species among the life forms is as follows: Phanerophytes 3.2 %, Chamaephytes 9.2 %, Hemicryptophytes 11.7 %, Geophytes 11.9 % and Therophytes 58.8 %. The proportion of therophytes (ephemerals) is even higher than in the inland deserts

while the proportion of trees and shrubs (phanerophytes) is much lower. The decreased proportion of high plants is referred to the strong action of maritime winds, setting a limit to the increase in height of the plants.

Main Life Forms of Egyptian Desert and Semi-Desert Plants

1. Ephemerals

Desert ephemerals are drought-escaping plants. They depend completely on rain and appear only in rainy years. They are short-lived and shallow-rooted, and can exist on shallow soils. They grow very rapidly and complete their life cycle in a few months, sometimes even in a few weeks. They succumb when the dry season ensues and the surface soil in which the roots extend dries out. Ephemerals, unlike perennials, transpire at a high rate and do not show special devices for economising water. Examples of desert ephemerals are *Mesembryanthemum forskalei*, *Trigonella stellata*, *Schismus barbatus*, *Monsonia nivea*, *Ifloga spicata*, *Filago spathulata*, *Plantago ovata*, *Aizoon canariense* and *Senecio coronopifolius*.

2. Succulents

This group of plants are characterised by a high proportion of water to dry substance and water to surface. They transpire at a low rate. Some of them are physiologically active all the year round while others lose their green parts partially or completely during the drought season, and so become physiologically inactive. Examples of common succulents of Egyptian deserts are *Zygophyllum coccineum*, *Z. simplex*, *Haloxylon salicornicum*, *Mesembryanthemum forskalei* and *Hyoscyamus muticus*. It is possible that suppression of transpiration rate in these succulents is due partly to certain xerophytic characters (sunken stomata, e. g. in *Haloxylon*; thick cuticle in most of them and high osmotic pressure in *Zygophyllum*) partly to decreased stomatal frequency and partly perhaps to a high content of hydrophyllic colloids.

3. Evergreen Perennials

This group is best exemplified by *Retama raetam*. The plant is xeromorphic and deep-rooted. It obtains its water supply from the permanently wet layer of the soil at a depth exceeding 50 cm. The cuticle is thick and the stomata are sunk in depressions with narrow openings occluded with hairs. The transpiration rate is low and fluctuates in the different seasons within narrow limits.

4. Winter-Deciduous perennials

These are exemplified by *Colocynthis vulgaris*. The plant is mesomorphic with broad green leaves. It is both heat and drought resistant, but cannot tolerate the cold weather in winter. For this reason it sheds its green parts and becomes dormant during the winter months but restores its physiological activity in spring and summer. The epidermis of *Colocynthis* is thin-walled and the cuticle is thin. Stomata are exposed and the osmotic pressure is not high.

Colocynthis is characterised by a very high transpiration rate under favourable soil moisture conditions, but is capable of restricting water loss to a minimal rate under conditions of severe edaphic drought. Regulation of transpiration is achieved by means of stomatal control.

5. Summer-Deciduous Perennials

A large proportion of perennial desert plants shed their foliage, partly or completely, during the late summer and early autumn and lose their physiological activity in order to save water. Examples of this group in the desert near Cairo are *Euphorbia cornuta*, *Centaurea aegyptiaca* and *Pancratium sickenbergeri*. They show but slight xeromorphism, e. g., slight sinking of the stomata and a coating of wax. The roots are relatively shallow. Limitation of transpiration is considerable in this group. The transpiration rate fluctuates within a wide range, and is greatly suppressed by decrease in soil water content with the progress of the dry season. The plants can withstand a big water saturation deficit without damage.

Manuskript eingeg. am 10. 3. 1963.

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