STUDIES ON THE EFFECT OF HIGH DAM ON SOME PROPERTIES OF THE SUSPENDED MATTERS AND SOIL

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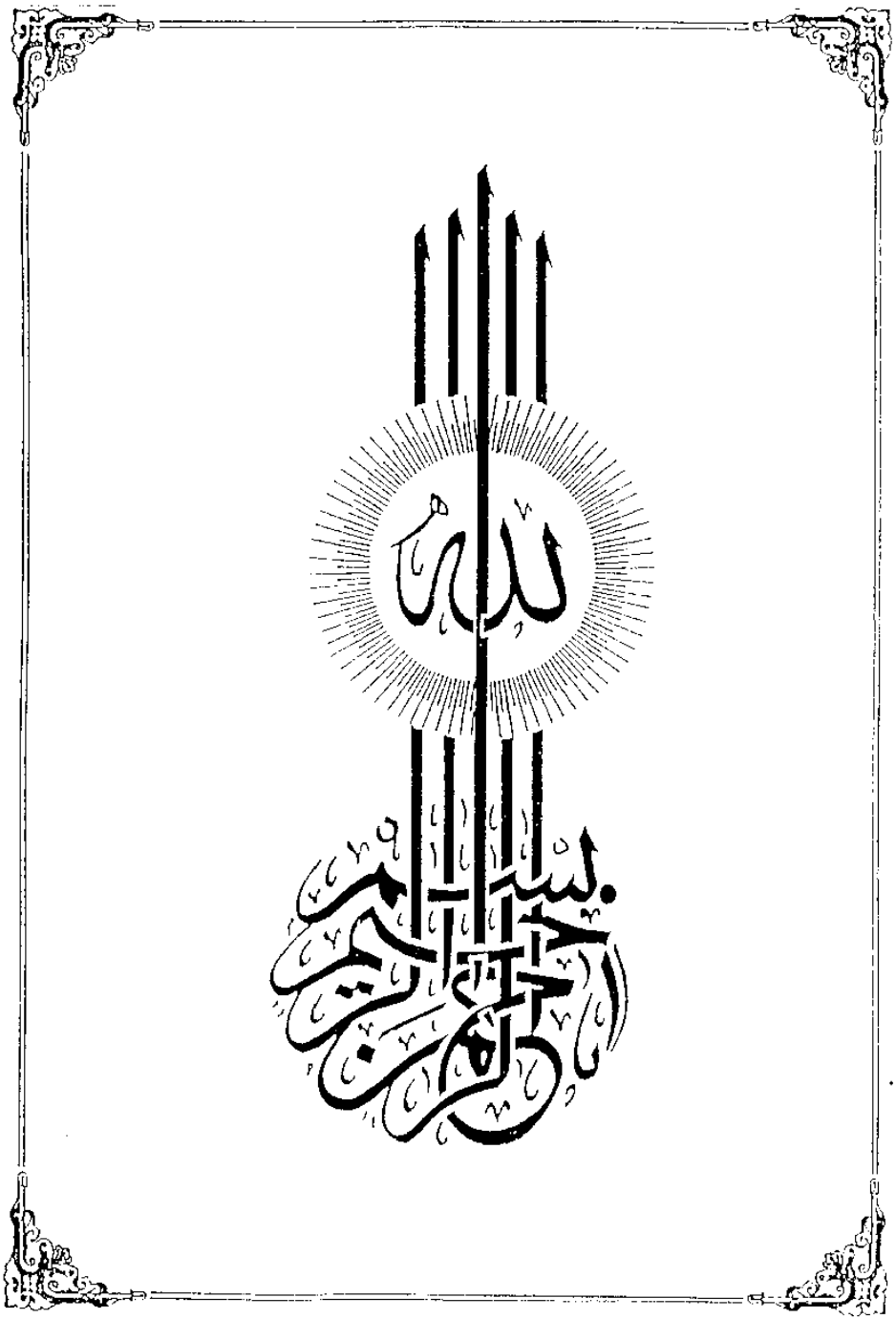

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C O N T E N T S

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1- INTRODUCTION

In 1964 the High Aswan Dam, has been constructed through comprehensive plan for the utilization of water resources of the Nile, for horizontal agricultural expansion, the productions of relatively cheap hydro-electric power, the protection against high floods, the improvement of navigation and draingge conditions as well as for the development of fish culture and recreational facilities. Obviously, the basin-irrigated lands of the valley have been converted to the perennial irrigation system. Within very few years, the common problems of irrigated agriculture will come into existence and are now claimed to be serious problems of very high priority for the state.

Therefore the current work is, in the first place, a trial to determine the nature of soil problems that accompanied the application of the perennial system in the Nile valley. In dealing with this task, the investigation has been restricted to the changes occurred in the chemical, physico-chemical and mineralogical properties of the soil profile. In addition, special attention has been

paid to the recent Nile deposits at the bottom of Lake Nasser in front of High Dam. Although mineralogical variations if any, are obviously of a long-term nature, yet the clay mineralogy of the investigated specimens was also considered.

REVIEW OF LITRATURE

2- REVIEW OF LITERATURE

2.1. General Outline:

The area under study lies between latitudes 26.5° and 29.0° N and between longitudes 30.5° and 31.5° E. From the data in table (1) which indicate the temperature, relative humidity and rainfall of such area, it appears that the climate of the Nile Valley is typically continental with hot summers and warm and almost rainless winters.

Considering the geological origin of the area under consideration, Attia (1954) stated that the Nile Valley began by the river action on a large scale during the Miocene period and completed by the early part of Pliocene. The lower part of the valley to about the latitude of El-Fashn was subsequently invaded by the sea and enlarged before middle Pliocene times. At the bottom of the channel, there are deposits of boulders, gravels, sands and clays, in lenticular form of Plio-Pleistocene age, while on the top the fine sands prevail and are covered by Nile alluvial of recent age.

According to Ball (1938), suspended matter that covers the flat of the Nile Valley and most of the Delta

Table (1): Some meteorological data of the studied area.

a- Assuit meteorological station
(means of the period 1946-1960)

data of / months	Jan	Feb.	Mars.	Apr.	May	Jun.	Jul.	Aug?	Sep.	Oct.	Nov.	Dec.
Max. Temp.	20.8	22.8	26.4	31.9	36.7	37.4	36.9	37.1	35.1	30.9	26.6	22.4
Min. Temp.	6.6	7.5	10.5	14.8	19.3	21.0	22.3	22.4	20.1	18.0	12.4	8.9
Daily mean	13.9	14.9	18.4	23.3	28.1	29.5	29.9	29.7	27.7	24.3	19.3	15.3
Rainfall mm	—	0.4	—	—	—	—	—	—	—	—	—	—
R.H. %	47	42	33	26	24	28	33	35	39	48	49	51

b- Menia meteorological station
(means of the period 1941 - 1960)

Max. Temp.	20.6	22.5	26.6	30.6	35.2	36.2	36.9	36.6	33.4	32.2	26.8	22.0
Min. Temp.	4	5.4	7.8	10.8	16.6	18.8	20.2	20.4	18.6	16.0	11.6	7.1
Daily mean	11.8	13.8	16.6	21.1	25.9	27.5	28.6	28.4	25.8	22.2	18.7	14.0
Rainfall mm	0.5	1.4	0.4	0.5	0.7	—	—	—	0.1	0.7	0.2	0.8
R.H. %	57	53	48	47	37	41	44	49	56	56	60	62

c- Bani Suef meteorological station
(means of the period 1931 - 1955)

Max. Temp.	20.9	22.6	25.0	29.3	34.0	36.0	36.9	36.8	34.5	31.6	26.9	21.8
Min. Temp.	4.7	6.0	8.1	11.8	16.0	18.6	20.6	20.2	18.4	15.5	11.2	7.1
Daily mean	11.8	13.6	16.6	20.7	25.6	27.6	28.6	28.3	26.6	23.4	18.4	13.2
Rainfall mm	0.5	2.7	1.8	1.3	—	—	—	—	—	0.1	0.2	4.7
R.H. %	64	57	52	47	41	44	50	55	50	60	66	70

and forms the arable land of A.R.E. has all been deposited by the flood waters of the river in the course of Recent geological period.

The uppermost part of the deposited material, which averages 9,m in thickness is composed of very finely divided minerals with comparatively little admixture of sand and silt fractions. Beneath this accumulation of almost pure Nile mud, there is a considerable thickness of mixed sand and mud, deposited from the river during the transition period between Paleolithic and Neolithic times. Owing to the rising sea-level, the Nile was aggrading its bed and rapidly raising the level of its flood plain in its northern part.

Ball (1938) added that gravels and sands of Pleistocene to Recent ages are to be seen bordering the edge of the cultivated lands in many parts of the Nile Valley, where they form a series of terraces at various heights above the valley floor. His study on these terraces indicates that with the end of Pliocene period, the sea level continued to to fall relatively to the land, and the Nile continued to erode its channel downwards in the Pliocene dediments, until near the end of Pleistocene period.

Although the matter brought down in suspension by the river, some thousands years ago, may differ in composition from that deposited up to the time of High Dam erection, yet some degrees of alteration must undoubtedly have taken place in the soil mineral composition, mainly due to the action of plant-life and percolation of irrigation water. However, several soil forming processes and agencies are also involved in profiles development. The integrated effect of these factors is therefore reflected in soil formation and development.

2.2 The Alluvial Soils of Egypt.

The rich agricultural lands of the Nile Valley and Delta regions have been entirely formed by the deposition of suspended matter carried by the Nile in the past. Although the Nile is no longer allowed to overflow its banks in Egypt, the soil received annually a minute addition to its thickness by deposition of sediments from the irrigation water that is led over it by canals branched from the river, the thickness is estimated to be about 1 mm /year and this amount is apparently diminished after the High Dam constraction.

The parent material from which the suspended matter has originated is the eruptive igneous rocks of the Ethiopian plateau. These rocks which are dominated by the basic igneous rock, basalt, produced the suspended matter through disintigration and weathering sequences.

The hypothesis that all the cultivated land enclosed in the Nile Valley and most of the Delta belongs to the alluvial origin, has for a long time been believed in and taken as the only one. However, investigations concerning the origin of the cultivated lands prove that other agents of soil formation do exist. Along the Eastern and Western fringes some alluvial materials are brought in from the adjoining hills by flash floods, in addition to admixtures of wind blown sands from the desert. Therefore, the processes of soil formation are dominated by the parent material, climate and, to a lesser extent, by man activity, Wahab et al.(1972). It is worthmentioning that the term "climate" here is related mainly to soil climate rather than to the atmposphere, due to the fact that the amounts of irrigation and ground water are taken into consideration.

Most of the northern part of the Delta must have been deposited under the sea or in salt lakes cut off from

the sea by sand bars. In these areas, heavy deposits with shells are frequent, and there has been a sorting of soil material by wave and current action, Schoonover et al. (1957)

As to the role of depositional course in controlling the nature of deposited materials, Hurst (1966) stated that about 110 million tons of Nile sediments were carried annually into Egypt by river water. Apart from this amount, about 97 % was carried during the flood period alone while only 3 % passed during the remainder of the year. Aledjam (1930) and Ball (1938) showed that the average amount of suspended matter passing Cairo was at its maximum, 1448 ppm, in August and at its minimum, 68 ppm, in May. After the construction of Aswan Reservoir, these amounts were reduced to 1404 ppm and 21 ppm in September and June respectively, Burns (1907). Recent estimations showed that the amount of suspended matter passing Cairo ranges between 16 and 3034 ppm, Hafez (1962). Obviously, the discrepancy between estimates are due to the differences associated with the nature and intensity of the floods. Depsoition of suspended matter varies accordingly, being 10.3, 3.1 and 0.6 cm. per century on basin lands, and on perennially irrigated lands in the Nile Valley and Delta respectively, Ball (1938) and

Hurst (1966). In this connection, Schoonover et al.(1957) reported that the depth of soil deposits indicates that the age of the cultivated lands of the valley is about 10,000 years, and those of the Delta is less, depending on location.

After the erection of High Dam, the proportions of suspended matter in the Nile water are diminished considerably. In this respect, Mitkees et al. (1972) demonstrated that these proportions are in the range of 15 to 68 ppm versus 21 to 1404 ppm after and before the erection of the Dam respectively. They further added that the variability in such proportions along the year is slight. However, to the writer opinion, this is not true, but only relatively slight if compared with the proportions determined prior to the erection of High Dam.

As deposition of the Nile mud had been taken place under varying conditions of topography and rate of flow, the soils are not uniform in texture. However, as a general statement, soil texture is finer towards the north and also with increasing distances from the river until approaching the interference zones with the Eastern and Western Desert, where coarser fractions increase again, Ball (1938),Abdalla