TAXONOMIC STUDIES ON SOME SPECIES OF AMARANTHACEAE IN EGYPT

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THESIS

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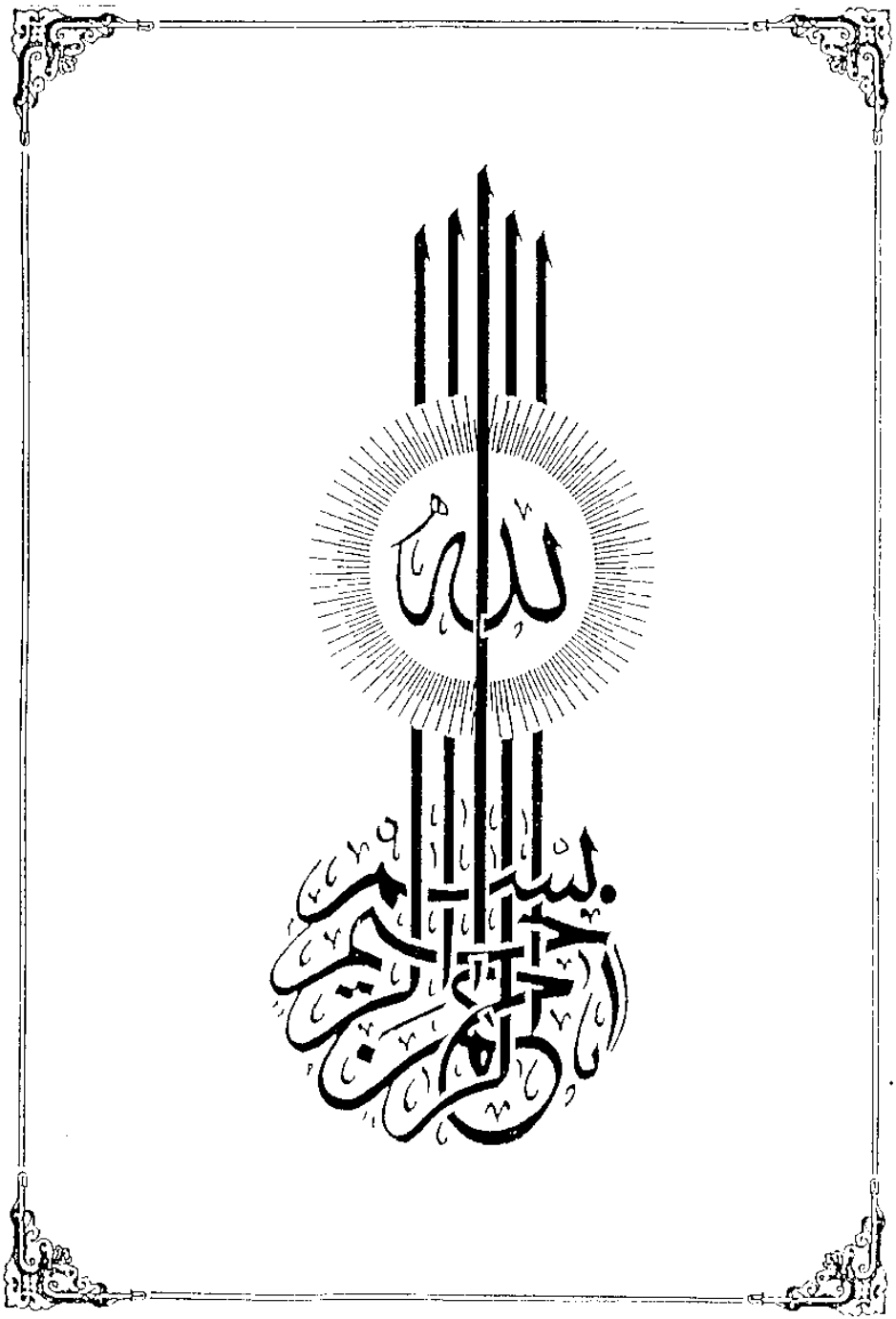


COURSES STUDIED

In addition to this thesis, the student has passed the examination in the following theoritical courses :

1 - PLANT ECOLOGY

a) - Climatic factors.

b) - Edaphic factors.

c) - Biotic factors.

d) - Synecology : Study of plant communities in Egypt with special reference to desert vegetation.

2 - TAXONOMY OF HIGHER PLANTS

a) - History of classification.

b) - Different systems of classification.

c) - Taxonomy dealing with all monocotyledonous and dicotyledonous families.

3 - F L O R A

Distribution of plant communities in Egypt.

4 - PLANT PHYSIOLOGY

Dealing with plant growth regulators.

LIST OF PLATES

C O N T E N T S

PREFACE

P R E F A C E

The Amaranthaceae is a family of about 80 genera and 800 species distributed throughout the warmer parts of the earth. It is represented in the Egyptian wild flora by 8 genera and 24 species. The largest of these genera is Amaranthus which includes 14 species. Five genera are monotypic and these are Digera, Saltia, Pupalia, Achyranthes and Psilotrichum. Aerva has two species and Alternanthera has three species.

Most of the plants are annuals and they represent about 79.17% of the total number of the species. The perennials are usually fruticose in the sense that they are woody.

Most of the Amaranthus species are weeds of the Nile and the Mediterranean Regions. A. angustifolius is, perhaps, of the widest distribution since it inhabits the different habitats. It occurs in all except in the Red Sea Region.

The general morphological characteristics are the herbaceous or shrubby habit with opposite or alternate simple

generally entire exstipulate leaves. The leaves are often more or less densely covered with hairs. The flowers are usually arranged in simple or branched spikes or racemes. The inflorescences are usually showy.

The flower structure corresponds with that of the Chenopodiaceae. The general floral formula can be written as

$$⚥ \; , \; \oplus \; , \; P_{4-5} \; , \; \text{or} \; (4-5) \; , \; A_{1-5} \; , \; G\,(\underline{2-3}).$$

Perianth leaves are usually membranous, white or more often coloured. The stamens are anteposed and more or less united below into a membranous tube which may carry certain appendages between the anthers. The ovary is unilocular with one-few ovules. The ovule is campylotropous on basal placenta. Styles united or free. Fruit a nutlet with a hard wall or a utricle with a thin wall. The flower is subtended by a welldeveloped bract and two bracteoles; all usually scarious and coloured.

Anatomically, the Amaranthaceae has long been known to have anomalous secondary thickening in the stem and root.

PART I

MACRO-AND MICROMORPHOLOGY

HISTORICAL INTRODUCTION

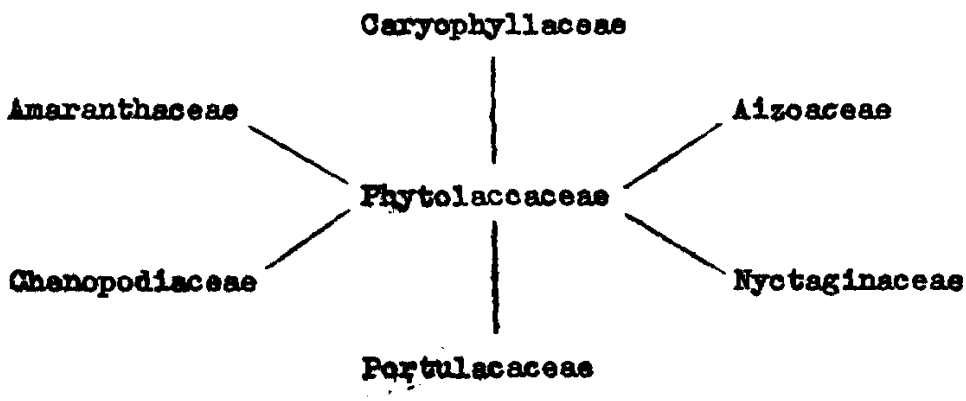
(1) S Y S T E M A T Y

The Amaranthaceae as well as its allied families have been variously categorised in different taxonomic works. Engler (1936) applied the term Centrospermae as an order including these families, and he classified Amaranthaceae together with the Chenopodiaceae under the Chenopodiineae. Bessey (1915) designated this order the Caryophyllales derived from Ranalian stocks. Bentham and Hooker (1862 - 1883) grouped Amaranthaceae with Nyctaginaceae, Illecebraceae, Chenopodiaceae and Phytolaccaceae with some other families under series Curvembryae of the Monochlamydeae or Incompletae. Hallier (1905) accepted Engler's name but greatly expanded its circumscription and derived it largely from Ranalian Podophylleae. Wettstein (1923) followed Engler. Hutchinson (1924 - 1926) recognized these families as representing two orders. Chenopodiales including Amaranthaceae, Chenopodiaceae and Phytolaccaceae, and Caryophyllales including Caryophyllaceae, Aizoaceae and Portulacaceae. In Hutchinson's view Caryophyllales are the more primitive arising from Ranales through Saxifragaceae while Chenopodiales are derived from

them i.e. Caryophyllales. Pax and Hoffmann (1934) suggested that the families of Centrospermae may have originated from Phytolaccaceae by development along different lines, since this small family shows great variety in the plan of the floral structure. It includes genera in which the ground plan is identical with that of Amaranthaceae and Chenopodiaceae, but also forms in which multiplication of stamens and carpels has taken place. Such diversity has led to the above suggestion. On this view Chenopodiaceae and Amaranthaceae represent a variation on the simple type of flower. From the type with two staminal whorls and two whorls of carpels the families with more highly developed flowers have been derived. Disappearance of the inner whorl of stamens and a whorl of carpels accompanied by reduction in the pistil gives the ground plan of Nyctaginaceae in which the perianth has become petaloid and a similar origin may be claimed for the simpler floral types of Aizoaceae. The floral type of Portulacaceae may be derived from the same source by disappearance of the inner whorl of carpels and the approximation of a pair of bracteoles to the flower to form the dimerous calyx.

The typically five whorled flower of Caryophyllaceae represents a further elaboration and the alternative positions

of the carpels, noted in the description of the family, may be explained by the disappearance of one of the two whorls which existed in the Phytolacca - like ancestor. Rendle (1952) gave the following diagram to illustrate this view of the origin of various families.



Pax and Hoffmann (1934) suggested a somewhat different arrangement. The main difference is that Amaranthaceae with the closely associated Chenopodiaceae should be considered as representing the origin of the group. The following diagram illustrates this view.