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# Evaluation of the weed flora of Egypt from Predynastic to Graeco-Roman times

**Ahmed Gamal El-Din Fahmy**

Botany Department, Faculty of Science, University of Cairo at Beni-Suef, Beni Suef City, Egypt

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**Abstract**. Macrofossils of weeds retrieved from archaeological sediments in Egypt are discussed in terms of their presence, preservation and representation significance. The study reveals 112 field weeds from 61 archaeological sites dating from Predynastic times (4500 B.C.) up to the Graeco-Roman period (A.D. 395). Most of the remains were preserved by desiccation. The 112 listed species include 24 taxa from Predynastic Hierakonpolis (3800-3500 B.C.) identified for the first time. This study is based on a selection of 97 species from the entire list. Interpretation of field weed finds from the archaeological contexts is discussed. The highest number of species, 63, is recorded from the Pharaonic period. The Predynastic era is represented by 46 species and the Graeco-Roman period by 34. The intensive archaeological excavation of Pharaonic settlements may explain the rich flora of that period compared with the two others. Floristic analysis shows that 57 species were introduced in association with crops from the Middle East and 40 may belong to the native vegetation of the Nile valley.

**Key words** : Egypt – Archaeobotany – Field weeds – Plant macro-remains

## Introduction

The present work discusses the Egyptian field weed macro-remains which were retrieved from the archaeological sediments in terms of their presence, preservation and representation significance (Fahmy 1995).

Analysis of the plant-macro remains (grains, seeds, fruits, leaves and flowers) of field weeds retrieved from archaeological contexts gives clear insights into past agricultural practices. It also contributes to our knowledge of other aspects of past ecology, such as soil conditions and the growth of a specific assemblage of field weeds restricted to a particular crop (Willerding 1986, 1991).

Previous work on the history of field weeds in Egypt shows the need for further investigations. El-Hadidi (1992, 145) considered 170 species to "constitute adaptation to agriculture during the Neolithic / Predynastic period (4500-3100 B.C.)". His figure was increased to 225-255 species during the Pharaonic period (3100-332 B.C.) due to the cultivation of other crop plants. The present weed flora of Egypt is estimated at 470 species or 20% of the flora. The present study reviews the records of 97 field weed species which were retrieved from the sediments of 61 archaeological sites, of which 10 were Predynastic, 40 Pharaonic and 11 Graeco-Roman. Most of the specimens are in the form of seeds and fruits; flowers and leaves of field weeds were also present in ornamental garlands and bouquets. Morphological features of the studied macro-remains are well preserved by desiccation, an effect of the dry climate in most parts of the country.

## Material and Methods

Records of Egyptian field weed finds were found in the available archaeobotanical and palaeo-ethnobotanical literature. The valuable collection of plant remains of G. Schweinfurth, deposited in the botanical garden and botanical museum at Berlin-Dahlem, Germany, was examined by the writer. Seeds and fruits are the most common remains of field weeds in ancient grain stores, or among layers of cereal chaff from threshing waste which was found in particular archaeological pits. Desiccated flowers and leaves of field weeds mixed with the archaeological artefacts were recovered from many archaeological sites across the country. The macro-remains were identified by their gross morphological features, and were compared with modern reference specimens in the collections of the Systematical-Geobotanical Institute of Göttingen University, Germany, and of the Royal Botanic Gardens, Kew, England and of Cairo University Herbarium, Egypt. Floristic studies and reference works, drawings and photographs from archaeobotanical reports from Egypt and the Middle East were used.

## Results

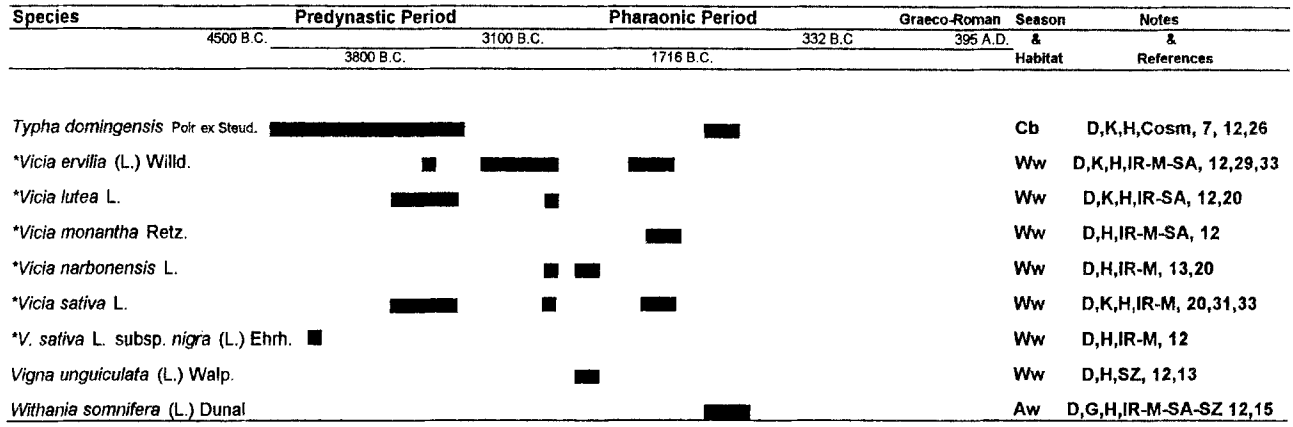
The results are set out in Table 1. For each taxon the following data are provided :

1) the accepted names according to Greuter et al. (1984, 1989) and Boulos (1995)

**Table 1.** Records of field weed macro-remains from Predynastic, Pharaonic and Graeco-Roman sites in Egypt, their seasonality and habitat

| Species | Predynastic Period | | Pharaonic Period | | | Graeco-Roman | Season & Habitat | Notes & References |
|---|---|---|---|---|---|---|---|---|
| | 4500 B.C. | 3800 B.C. | 3100 B.C. | 1716 B.C. | 332 B.C | 395 A.D. | | |
| **Anthemis pseudocotula* Boiss. | | | | | | | Ww | D,G,H,K,M-IR-SA,15,20 |
| *Anthemis retusa* Delile | | | | | | | Ww | D,E,G,20 |
| **Arisarum vulgare* Targ. Tozz. | | | | | | | Ww | D,H,M-IR-SA,12, 27 |
| *Asphodelus tenuifolius* Cav. | | | | | | | Aw | D,H,M-IR-SA-SZ,12,28 |
| **Beta vulgaris* L. subsp. *maritima* (L.)Arcang. | | | | | | | Ww | D,H,M-IR-SA,12,20,36 |
| **Calendula arvensis* L. | | | | | | | Ww | D,H,M-IR-SA, 11 |
| *Ceruana pratensis* Forssk. | | | | | | | Cb | D,H,SA-SZ, 11 |
| **Chenopodium album* L. | | | | | | | Aw | D,H,Cosm, 29 |
| **Chenopodium murale* L. | | | | | | | Aw | D,K,H,Cosm,12,21,29,30 |
| **Chrysanthemum coronarium* L. | | | | | | | Ww | D,G,H,M-IR,3,11,13,36 |
| **Convolvulus arvensis* L. | | | | | | | Aw | D,H,Cosm, 12,13 |
| **Corchorus olitorius* L. | | | | | | | Sw | D,H,Pan, 12 |
| *Coronopus niloticus* Spreng. | | | | | | | Cb | D,H, SA-SZ, 11 |
| *Cotula anthemoides* L. | | | | | | | Cb | D,H,F38SZ, 11 |
| **Crypsis alopecuroides* Schrad. | | | | | | | Ww | D,M-IR, 11 |
| **Crypsis schoenoides* (L.) Lam. | | | | | | | Ww | D,M-IR, 11 |
| **Cuscuta pedicellata* Ledeb. | | | | | | | Ps | D, H, IR-M-SA, 12 |
| **Cynodon dactylon* (L.) Pers. | | | | | | | Aw | D,H, Cosm, 12 |
| *Cyperus alopecuroides* Rottb. | | | | | | | Cb | D,G,H,SA-SZ,12, 27 |
| *Cyperus articulatus* L. | | | | | | | Cb | D,H,SA-SZ,12, 27 |
| *Cyperus longus* L. | | | | | | | Aw | D,H,M-IR-SA-SZ,12, 27 |
| *Cyperus rotundus* L. | | | | | | | Aw | D,H,K,M-IR-SA-SZ,11,12, 27 |
| *Desmostachya bipinnata* Stapf | | | | | | | Cb | D,K,H,IR-SA-SZ, 2, 26 |
| **Didesmus aegyptius* (L.) Desv. | | | | | | | Ww | D,H, M, 12 |
| *Digitaria sanguinalis* (L.) Scop. | | | | | | | Sw | D,H,Cosm, 11 |
| *Echinochloa colona* (L.) Link | | | | | | | Sw | D,H,TR, 11,12,26 |
| **Echium rauwolfii* Delile | | | | | | | Sw | D,H,IR-SA-SZ, 2 |
| *Eleocharis palustris (L.) Roem. & Schult.* | | | | | | | Cb | D,K,G,H,IR-M-SA-SZ 12, 27 |
| **Emex spinosa* (L.) compd. | | | | | | | Ww | K,M-IR-SA, 2 |
| **Enarthocarpus lyratus* (Forssk.) DC. | | | | | | | Ww | D,H,M-SA, 12 |
| *Epilobium hirsutum* L. | | | | | | | Cb | D,G,H,M-IR-SA-SZ,12,13 |
| *Eragrostis barrelieri* Dareau | | | | | | | Sw | D,E, 11, 26 |
| *Euphorbia forsskaolii* J. Gay | | | | | | | Aw | D,G,SA-SZ, 3,16 |
| **Euphorbia helioscopia L.* | | | | | | | Ww | D,H,M-IR-SZ, 12 |
| *Fimbristylis bisumbellata* Bubani | | | | | | | Cb | D,H,K,M,IR-SA-SZ, 11 |
| **Galium tricornutum* Dandy | | | | | | | Ww | D,H,M-IR-SA, 12 |
| *Gnaphalium luteo-album* L. | | | | | | | Cb | D,G,H,BT, 12 |
| **Hibiscus trionum* L. | | | | | | | Sw | D,G,H,Cosm, 12 |
| *Imperata cylindrica* (L.) Raeusch | | | | | | | Aw | D,H,M-IR-SA-SZ 12, 15,21,26 |
| *Juncus rigidus* Desf. | | | | | | | Cb | D,H,M-IR-SA-SZ,12,15,27 |
| **Lathyrus aphaca* L. | | | | | | | Ww | D,H,IR-M,2,20 |
| **Lathyrus hirsutus* L. | | | | | | | Ww | D,K,H,M-IR-SA,2,11,12, 20, 31 |
| **Lathyrus marmoratus* Boiss. & Blanche | | | | | | | Ww | D,H,M, 12,20 |
| *Lathyrus sativus* L. | | | | | | | Ww | D,K,H,M-IR-SA-SZ,4, 8, 2,23 |

| Species | Predynastic Period | | Pharaonic Period | | Graeco-Roman | Season & Habitat | Notes & References |
|---|---|---|---|---|---|---|---|
| | 4500 B.C. | 3100 B.C. | 332 B.C | 395 A.D. | | | |
| | 3800 B.C. | | 1716 B.C. | | | | |
| *Lepidium sativum* L. | | | | | | Ww | D,H,Cosm, 11,12 |
| *Lolium perenne* L. | | | | | | Aw | D,H,M,IR-SZ, 7,12,25, 26,30 |
| *Lolium temulentum* L. | | | | | | Ww | D,K,H,M-IR-SA-SZ 2,11 12,13,22,26,29,30,31,33 |
| *Lotus glaber* Mill. | | | | | | Aw | D,H,M-IR-SA-SZ, 12 |
| *Lupinus digitatus* Forssk. | | | | | | Ww | D,H,K,M-SA-SZ, 12,13,16 |
| *Malva parviflora* L. | | | | | | Ww | D,K,H,IR-M-SA,3,22,29 |
| *Medicago minima* (L.) L. | | | | | | Ww | D,K,H,IR-M-SA-SZ, 30 |
| *Medicago polymorpha* L. | | | | | | Aw | D,K,H,IR-M-SA-SZ,20,36 |
| *Melilotus indicus* (L.) All. | | | | | | Ww | D,G,H,M-SA-SZ, 12 |
| *Papaver rhoeas* L. | | | | | | Ww | D,G,H,M-IR-SA, 5,12,13, 15, 21 |
| *Paspalidium geminatum* (Forssk.) Stapf | | | | | | Aw | K,H, IR-SA-SZ, 2,12,26 |
| *Persicaria salicifolia* Willd. | | | | | | Cb | D,K,H,Cosm, 5,12,23 |
| *Phalaris minor* Retz. | | | | | | Ww | D,G,H,M-IR-SA-SZ,3,11, 26 |
| *Phalaris paradoxa* L. | | | | | | Ww | D,H,IR-M, 12,20,22, 26 |
| *Phragmites australis* Trin. ex Steud. | | | | | | Cb | D,K,H,Cos, 2,7,12,15, 26, |
| *Picris asplenoides* L. | | | | | | Ww | D,G,H,SA, 12,15 |
| *Pluchea dioscorides* (L.) DC. | | | | | | Cb | D,G,H,SA-SZ, 12,13 |
| *Polygonum aviculare* L. | | | | | | Ww | D,H,Cosm, 12 |
| *Polygonum lapathifolia* (L.) Gray | | | | | | Cb | K,H,Cosm, 23,29 |
| *Polygonum plebeium* R. Br. | | | | | | Aw | D, Cosm, 30 |
| *Persicaria senegalensis* (Meisn.) Soják | | | | | | Cb | D,H,M-SA-SZ, 12,13 |
| *Portulaca oleracea* L. subsp *oleracea* | | | | | | Sw | D,Cosm, 11 |
| *P. oleracea* L. subsp *stellata* Danin & Baker | | | | | | Sw | D,Cosm, 11 |
| *Potentilla supina* L. | | | | | | Cb | D,K,H,IR-M, 11, 33 |
| *Raphanus raphanistrum* L. | | | | | | Ww | D,H,IR-M-SZ, 12, 24 |
| *Rostraria cristata* (L.) Tzvelev | | | | | | Ww | D,H,M,SA-SZ, 12,26 |
| *Rumex dentatus* L. | | | | | | Aw | K,H,IR-M-SA,11,13,20, 23,29,30,31 |
| *Rumex pulcher* L. | | | | | | Ww | D,H,IR-M-SA, 2,11 |
| *Rumex simpliciflorus* Murb. | | | | | | Ww | K,H,M-SA, 29 |
| *Schoenoplectus senegalensis* | | | | | | Aw | D,K,H,SA-SZ, 29,30 |
| *Scirpus maritimus* L. | | | | | | Aw | D,H,M-IR-SA-SZ, 12 |
| *Scorpiurus muricatus* L. | | | | | | Ww | D,H,IR-M-SZ, 13,20 |
| *Senecio aegyptius* L. | | | | | | Cb | D,H,E, 11 |
| *Senecio glaucus* L. | | | | | | Ww | D,G,H,IR-M-SA,4, 13 |
| *Setaria verticillata* (L.) P. Beauv. | | | | | | Ww | D,G,H,M-SA-SZ,11,12 26 |
| *Sinapis arvensis* L. var. *allionii* (Jacq.) Baillarg. | | | | | | Ww | D,H,E, 12,13,21,36 |
| *Solanum nigrum* L. | | | | | | Aw | D,H,Cosm, 11,33 |
| *Sonchus oleraceus* L. | | | | | | Aw | D,H,Cosm, 11,29 |
| *Sphaeranthus suaveolens* (Forssk.) DC. | | | | | | Cb | D,G,H,SA-SZ, 12,13 |
| *Sphenopus divaricatus* Rchb. | | | | | | Ww | D,H,IR-M-SA, 7 |
| *Thesium humile* Vahl | | | | | | Ww | K,H, IR-M,2 |
| *Trifolium alexandrinum* L. | | | | | | Ww | D,G,H,IR-M, 12 |
| *Trifolium resupinatum* L. | | | | | | Ww | D,H, IR-M-SA, 12 |
| *Trigonella glabra* Thunb. | | | | | | Ww | D,H, M-SA-SZ, 12,20 |




*** Species seem to be introduced**

**Aw : All year weed**
**BT: Borealo-Tropical**
**Cb: Weeds on canal banks**
**Cosm: Cosmopolitan**
**D: Desiccated**
**E:Endemic taxon**
**G: Recorded from Garlands**
**H: Higher than 40 cm**
**IR: Irano-Turanain**
**K: Carbonized**
**M: Mediterranean**
**Pan: Pantropical**
**PS: Parasite**
**SA: Saharo-Sindian**
**Sw: Summer weed**
**SZ: Sudano-Zambezian**
**TR: Tropical parts of the world**
**Ww: Winter weed**

**Arabic number: References of the records**
These numbers are mentioned in practice at the end of each citation in the section of References

2) archaeological finds are given in form of black columns, according to dates of the sites. The geographical location of major sites along the Nile valley related to different cultural periods in Egyptian history is shown in the map (Fig. 1)
3) seasonality and habitat
4) references to the field weed finds

The plant macro-remains which were only identified to genus level, such as *Brassica, Chenopodium, Medicago, Polygonum, Rumex, Vicia* and *Xanthium* are excluded. Another 7 species seem to be recent contaminants, hence they are also excluded, namely *Artemisia absinthium* L., *Avena strigosa* Schreb., *Chenopodium foliosum* Asch., *Chenopodium hybridum* L., *Chrysanthemum segetum* L., *Lathyrus nissolia* L. and *Vicia cracca* L.

Out of the list of 112 Egyptian field weed taxa listed in Table 1, 97 species have been identified from Egyptian archaeological sites dating from the Predynastic period (4500 B.C.) to the Graeco-Romans (A.D. 395). The highest numbers of species (63) is recorded from the Pharaonic period species, probably due to the high number (40) of excavated sites (Fig 2).

Seeds, fruits, flowers and leaves from Pharaonic and Graeco-Roman sites include the following taxa: *Ambrosia maritima* L., *Chrysanthemum coronarium* L., *Convolvulus arvensis* L., *Epilobium hirsutum* L., *Euphorbia hirsutum* L., *Euphorbia forsskaoli* J. Gay, *Melilotus indicus* (L.) All., *Papaver rhoeas* L., *Pluchea dioscorides* (L.) DC., *Sphaeranthus suaveolens* (Forssk.) DC., *Trifolium alexandrinum* L., *Withania somnifera* (L.) Dunal.

## Discussion and conclusions

In Egypt, plant remains are almost entirely recovered preserved by either desiccation or charring. The present study shows that preserved flowers and leaves were mostly desiccated while seeds and fruits were found either desiccated or charred. Among the studied field weed remains, high percentages (92.7%) are preserved by desiccation rather than by carbonization. This could be the result of the arid climate in most parts of the country.

The deposition of field weed remains in archaeological sites may be a result of the comparatively large size of some of the seeds or fruits, which may be in the same size range to that of the crop grains. Desiccated field weed remains are frequently found in archaeological granary pits. In other cases, they were charred in a fire or as a result of cooking together with cereal grains.

On the other hand, the remains of cereal chaff are relatively small in size and consist mostly of seeds, nutlets and achenes. Spikelet remains were either preserved by desiccation or found carbonized. This could be because cereal crop waste was used to start fires in kilns and furnaces in villages and nomadic sites.

### *Field weed remains in garlands and bouquets*

Desiccated flowers and leaves of weeds found among garlands recovered from many Pharaonic and Graeco-Roman sites across the country prove the ornamental value of these plants during these periods. The plants probably grew in the cultivated plots near the sites of temples, houses and tombs of ancient Egypt. These remains were not subjected to considerable mechanical movement since they were found beside other archaeological artefacts.

Among the recorded field weeds, five species were frequently found at Predynastic, Pharaonic and Graeco-Roman sites. These are *Lathyrus hirsutus* L., *Lolium temulentum* L., *Phalaris minor* Retz, *Rumex dentatus* L. and *Setaria verticillata* (L.) P. Beauv. The presence of these remains in almost all periods may be attributed to their hard and durable fruits, compared with those of other weeds, for example those of *Crypsis alopecuroides*

Schrad, *Crypsis schoenoides* (L.) Lam., *Cuscuta pedicellata* Ledeb. and *Lepidium sativum* L. which were rarely found, due to their tiny and fragile remains.

The present study confirms that not all of the field weeds were known from the beginning of the Predynastic period (4500-3100 B.C.). The number of species which are found increased due to the development of agriculture throughout the different periods (El Hadidi 1993).

Some species were reported only once from a particular period but not from the others. However, these unique records are of present-day field weed taxa, which may have remained rare during ancient times. The relatively smaller numbers of field weeds known from the Predynastic and Graeco-Roman periods are not expressions of a decline in agriculture during these periods, but reflect the smaller number of investigations from these periods compared with the thorough and numerous studies of Pharaonic period sites. The total number of field weeds recorded from Pharaonic sites is 87 species, compared with 46 species from Predynastic sites. On the other hand, the Graeco-Roman period is represented by a very slight increase to 97 species (Fig. 2). We must keep in mind that this slight increase in records is attributed to the number of excavated sites (10 archaeological sites dated to the Graeco-Roman period) when compared with those of the Pharaonic period (40 sites). It seems likely

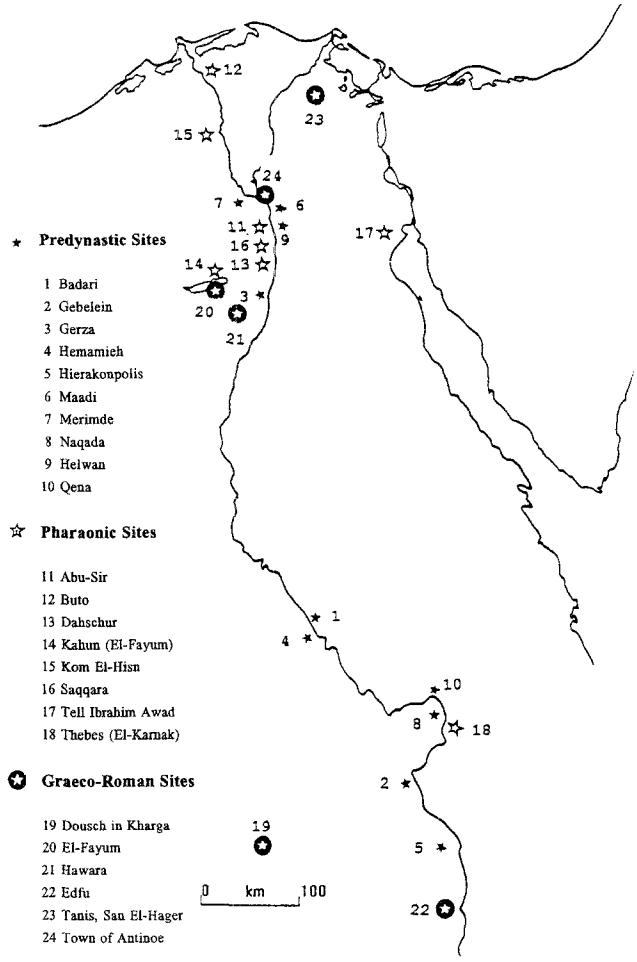



**Fig. 1.** Location of archaeological sites of archaeobotanical significance in Egypt, from the Predynastic period up to the Graeco-Roman period

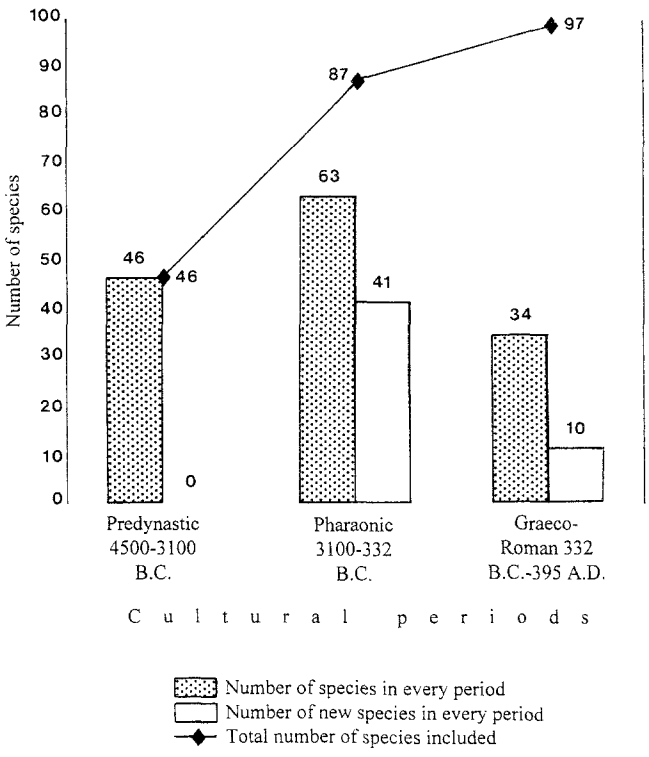



**Fig. 2.** Numbers of field weed species recorded from Predynastic, Pharaonic and Graeco-Roman archaeological sites in Egypt

that a control of field weeds by uprooting from the cultivated plots might had been practised during the Graeco-Roman period.

Finds of field weeds from archaeological sites give information about former agricultural practices. Some species can be used as indicators of soil conditions such as soil moisture, dryness of the cultivated land, its drainage status and soil structure, and could indicate specific field weed assemblages which were associated with a particular crop. These phytosociological inferences are derived from modern investigations of the weed flora of Egypt (El-Hadidi and Kosinová 1971; Kosinová 1974a,b; Kosinová 1975).

Among the field weeds that were found at Predynastic, Pharaonic and Graeco-Roman sites, 78 species grow higher than 40 cm. This could suggest the traditional method of cereal harvesting in ancient Egypt, by cutting the culms at about 40 cm above the soil, leaving the rest as stubble to fertilise the soil. This practice is seen in a drawing from Chum el Achmar (Hierakonpolis) (Wönig 1886, Fig. 77).

The large number of recorded winter field weeds is attributed to the classic basin irrigation system which was applied in ancient Egypt. In summer, the cultivated plots were completely inundated, and hence the crop rotation was very elementary and confined to a sole winter season.

During the last century, a perennial irrigation system has been established by constructing dams along the river Nile. These remarkable changes in river hydrology

are responsible for changes in the distribution patterns of some field weeds. Remains of *Ceruana pratensis* and *Potentilla supina* were found among the sediments of the archaeological sites, and these species were common on the silty banks of the Nile valley and Nile delta until the 1960's. However, efforts to collect both species during the last decade have not met with success.

It is interesting to note that the following species were recorded from different archaeological sites dated to the three cultural periods, namely *Lathyrus hirsutus* L., *Lathyrus sativus* L., *Lolium temulentum* L., *Phalaris minor* Retz. and *Rumex dentatus* L. These are constituents of cornfield weed assemblages in the land beside the Nile (Amry 1981, El-Bakry 1982).

Floristic analysis of archaeological field weed finds could be used as evidence of former contact between different cultures, which might be geographically separated. El-Hadidi (1992, Table 1) pointed out that the Saharo-Sindian, Sudano-Zambezian and Palaeotropical field weeds belonged to the natural vegetation of Egypt before the introduction of agriculture. On the other hand, he noted that Mediterranean, Irano-Turanian and cosmopolitan taxa were introduced to Egypt with cultivated plants.

The present study shows that there are archaeological records of 40 species of Saharo-Sindian, Sudano-Zambezian and Palaeotropical elements, which are thought to be natives of the ancient weed flora of Egypt, and 57 species which belong to Mediterranean, Irano-Turanian and cosmopolitan elements and are introduced field weeds.

It is not possible to ascertain precisely when the Mediterranean and Irano-Turanian weeds were introduced from southern Levant, due to the lack of archaeological evidence from Egypt's first farming communities. Generally, according to the available information one can assume that farming was established in Egypt sometime before 5000 B.C. (Wetterstrom 1993).

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