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SYCOMORE WASPS FROM ANCIENT EGYPTIAN TOMBS

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Abstract

The interrelations between the Sycomore fig (Ficus sycomorus L.) and its sycophilei wasps are extremely specific. The wasps enter and oviposit only in young living figs at the appropriate phase of their development. In Sycomore figs removed from ancient Egyptian tombs (Schweinfurth Collection, Botanical Museum, Berlin) a female of Sycophaga sycomori and males of Sycophaga sycomori and Apocrypta longitarsus have been found. It is shown that the flower biology of the figs and the insect species in habiting them have not changed since ancient times.

INTRODUCTION

Scientists have encountered insect remains which date from early geological times, hundreds of millions of years ago. The later the period, the greater the number of insect remains discovered. Since very early times, from the dawn of history, records are known, both pictorial and written, bearing chiefly on insects connected in some way with man's welfare - his health, food and residence. Insects are featured in cuneiform inscriptions, sculptures and seals from Assyria and Babylon, in writings and drawings on papyrus from ancient Egypt, and on bas-reliefs from Egyptian tombs and palaces (Montgomery 1959). Insects are often mentioned also in the Bible, and in the writings of sages and authors of all ages (Bodenheimer 1928).

On the other hand, actual remains of insects dating from historical times are few. Insects from archeological sites have meagre prospects of preservation and when they are found in such a site, it is generally very difficult to determine their exact date of entry. A clear relation of some insects with a given site may be determined only in specific cases.

The highly developed death cult in ancient Egypt created especially suitable conditions for the preservation of insects in the tombs. Food offerings and, in fact, the mummies themselves were a good medium for the development of beetles of stored products (Alfieri 1931) and scavengers

(Allaud, 1908-9) respectively. Even a few embalmed insects, chiefly the dung beetles, sacred to the Ancient Egyptians, were found in tombs and palaces (Keller 1913). The paucity of rain and the dry climate of arid Egypt contributed considerably to the preservation of such insects. A thorough knowledge of the biology of the insects is, however, indispensable if one is to ascertain whether they really belong to the same period as the tombs in which they were found.

Among the various items deposited in Egyptian tombs which could harbor insects, the Sycomore fruit are of special interest. The Sycomore tree (Ficus sycomorus L.) and its insects in ancient Egypt are the subject of this paper.

THE SYCOMORE TREE

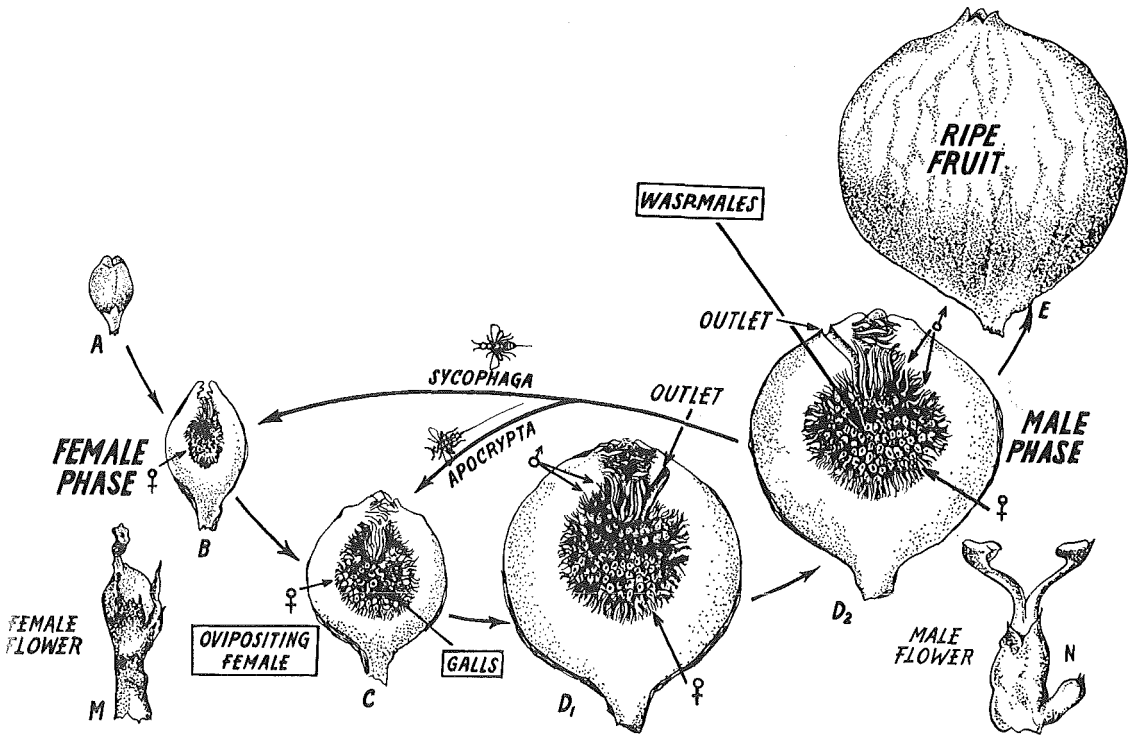
Throughout the entire course of Egyptian history Sycomore trees were grown in large numbers and were very popular (Woenig 1897). They were introduced from their native habitat in tropical Africa - probably by man - as early as the predynastic period (about 3500 B. C.) or even earlier (Lucas 1962) and were extensively cultivated for their shade, timber and fruit.

Arid Egypt was always poor in trees and the Egyptian civilization was constantly in search of timber. The Sycomore tree which grew luxuriantly along the Nile and the irrigation canals, especially in the well-watered Delta area, was favored by the Egyptians and became integrated in their cultural and economic life. It was sacred to several Egyptian gods, especially to Hathor, the goddess of love. Appreciation of the tree has survived to the present time, although its economic importance has decreased considerably (Laurent-Tackholm 1964).

The value attached to the Sycomore in ancient Egypt is evident already from the dawn of Egyptian history more than 3000 years B. C. Coffins and all manner of household and other utensils were made of Sycomore wood. Especially interesting from the biological standpoint, however, are the leafy branches (Schweinfurth 1884) and the fruit deposited in funeral chambers as offering to the dead. In Egyptological and Botanical museums in European capitals and Cairo, many such archeological remains are exhibited. Most of them are in a good state of preservation and may be easily examined and determined, just as if they were recent herbarium specimens, picked from the trees only a short while ago.

THE DEVELOPMENT CYCLE OF THE SYCOMORE FIG.

For a better understanding of the specificity of the interrelations between the Sycomore and its insects, the development cycle of the fig ought to be surveyed (Fig. 1). The Sycomore is monoecious. Its inflorescence, the so-called fig or syconium, is a hollow ellipsoid receptacle containing both female and male flowers on its inner surface. The mouth of the fig - the ostiole - is closed by imbricated scales. The numerous female flowers occupy most of the surface, while the scarcer male flowers are arranged in 2-3 rows at the upper pole of the fig, around the ostiolar scales. As in other Ficus species, the Sycomore fig is pronouncedly protogynic, male flowers maturing several weeks after the female ones (Fig. 1).



The females of Sycophaga sycomori L. (Agaonidae, Sycophaginae, Fig. 2), the most usual sycophile wasp of the Sycomore in the Near East, enter the young figs at the B phase (Fig. 1). They penetrate into the narrow slits of the ostiole leaving their wings and even parts of their antennae at the entrance. Upon entering they oviposit through the styles into the ovaries. As a result, these ovaries develop into galls. They grow in size, their outer cells sclerify and a special nutritive tissue is formed within, due to proliferation of the nucellar tissue of the ovules (Rosen 1965). The larvae of Sycophaga develop within these galls.

Somewhat later, when the fig reaches phase C (Fig. 1), the second sycophile wasp of the Sycomore tree appears, namely Apocrypta longitarsus Mayr. (Torymidae, Idarninae, Fig. 2). These do not enter the figs, which by now are tightly closed, but insert their very long ovipositors through the peel of the fig, directly into the young galls which are already occupied by the larvae of Sycophaga. Apocrypta is an inquiline (Grandi 1930, Joseph 1955) incapable of inducing the development of galls, and is dependent on Sycophaga in this respect. Apocrypta never oviposit into figs not previously occupied by Sycophaga. The larva of Sycophaga dies, while that of Apocrypta, the subtenant of the gall, continues its development.

As usual in fig waps (Grandi 1929), the males of both Sycophaga and Apocrypta mature first (phase D, Fig. 1). They emerge into the cavity of the fig and impregnate the females which are still within the galls. When mating is over, the males and after them the females, leave the galls and congregate in the cavity of the fig.

In contrast to the figs of most Ficus species, that of the Sycomore does not open spontaneously at phase D; the ostiolar scales remain adpressed and stuck together. Some of the Sycophaga males concentrate in the upper part of the fig and proceed to bore exit holes in its wall through which the impregnated females of Sycophaga and Apocrypta leave the fig. These exit holes are typical in Sycomore figs at the late D phase (Fig. 1). Only males remain inside the fig. Following exit of the wasps, the fig increases in size, softens and acquires a roseate color.

Of the six or seven sycophile wasp species inhabiting Sycomore figs in East Africa, only the above-mentioned two species are represented in Egypt and in Israel (Saunders 1878). Ceratosolen arabicus Mayr. - the ligitimate pollinator - is not found in the Mediterranean countries. Perhaps this is the reason for the absence of seeds in the fruit of the Sycomore in Egypt as well as in Israel (Galil and Eisikowitch, manuscript). It is of interest to note that the Greek botanist Theophrastus

(387-273 B. C. E.) was already aware of the fact that the Sycomore did not seed in Egypt.

NOTES ON THE BIOLOGY OF THE SYCOMORE FIG IN ANCIENT TIMES

Sycomore figs of various phases have been found in ancient tombs. Several young figs were preserved in the Flinders Petrie Collection at the Museum of Natural History in London. In the Schweinfurth Collection at the Botanical Museum in Berlin, there are many figs at various stages of development. We were able to examine and photograph some of these figs. Most of them were in a good state of perservation, so that it was very easy to study their biology and even to observe the insects within. The following are a few examples of the figs in that Collection. The dates given are those marked on the labels of the various display cases. In two instances, there was uncertainty as to the dating of the figs, but in any event all of them were quite ancient.

1. Carbonized figs, found in the grave of King Ti, of the 1st or 2nd Dynasty, at Om El Gaab, near Abydos. Discovered by Ameliae in 1896/97 (Fig. 4). As these figs were carbonized, their examination yielded little information.

2. Strings of beads made of young fruits perforated at both ends, which were found at Thebes by Dr. G. Moeller in a grave from the Middle Kingdom (about 1600 B. C.). These were small figs, at phase B (Fig. 5). In one of them, which was cut across, the female flowers were clearly seen, both short- and long-styled, with their ovaries, styles and stigmata. No wasps were found within.

3. A cut fig - an offering from a grave at Dra Abuen'Negga, Thebes, dating either from the XXth - XXVI Dynasty, or from the greco-Roman epoch (Fig. 6). Discovered by Prof. Schiaparelli in 1885 (Schweinfurth 1887a). This fig was at phase C. One wingless Sycophaga female was detected in its cavity, evidently one of the female wasps which had entered the fig at phase B and oviposited there. The galls were young and no wasps could be seen within them. Still closed male flowers were found near the ostiole.

4. Large figs in a small grass basket, found at Gebelen as offerings in the tomb of Ani from the XXth Dynasty (about 1200-1085 B. C.). Discovered in 1886 by Prof. M. Maspero. The date given on the label of the display case is that of the XIth Dynasty, but according to Schweinfurth (1887b), they belong to the XXth Dynasty. These figs are at the late D phase. Several exit holes are clearly seen around their ostioles (Fig. 7).

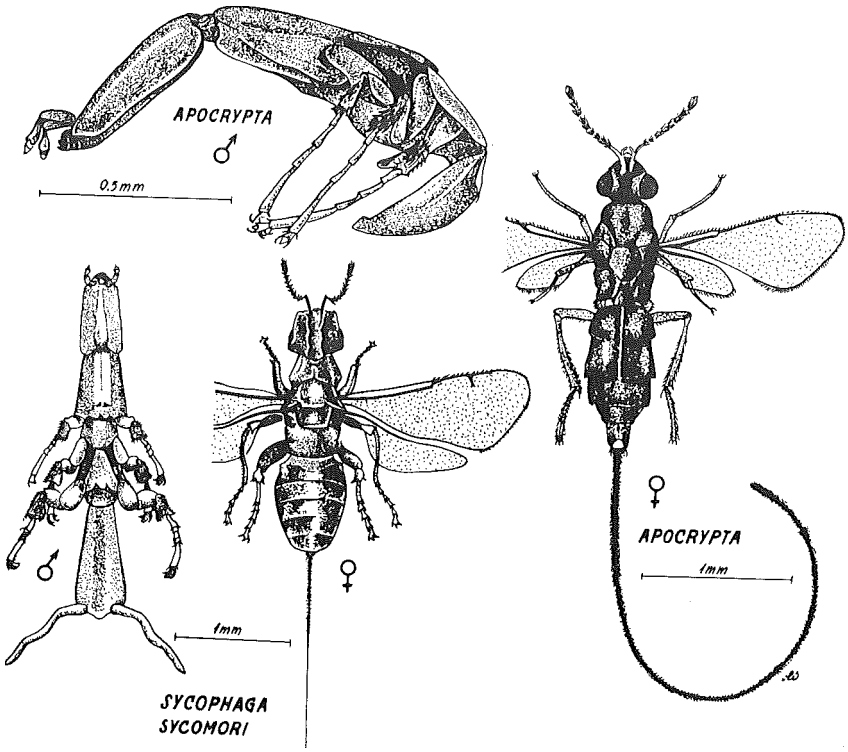


Fig. 2. Fig insects of the Sycomore fig in Egypt.

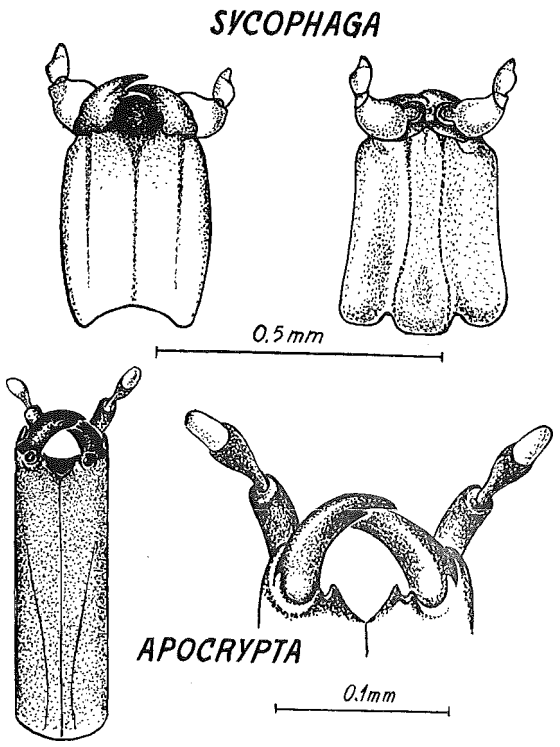


Fig. 3. Heads of recent males of Sycophaga and Apocrypta (from above and from below).

Fig. 4. Carbonized figs.

(Schweinfurth's collection).

Fig. 6.

A cut fig at phase C.

(Schweinfurth's collection).

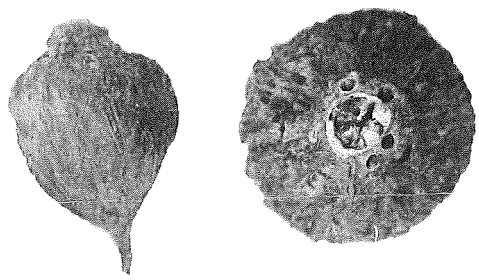
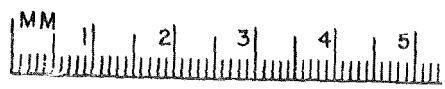


Fig. 7.

Figs at phase D, from the side and from above. Exit holes are evident.

(Schweinfurth's collection).



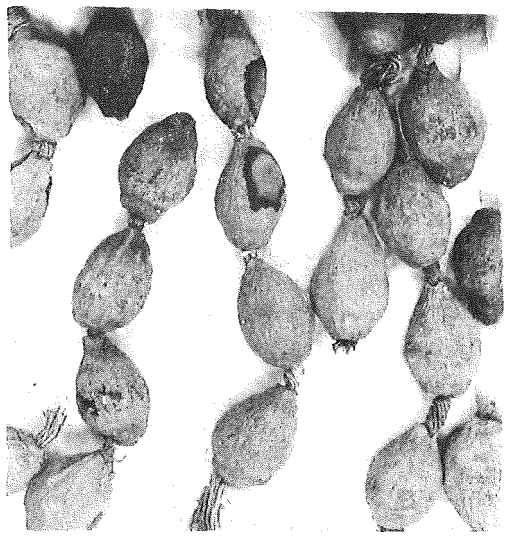


Fig 5.

String of beads, made from young figs at phase B.

(Schweinfurth's collection).

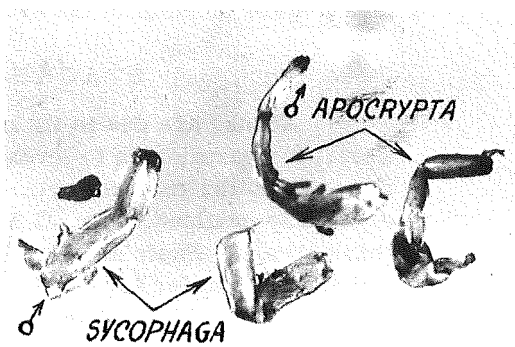


Fig. 8. Males of Sycophaga and Apocrypta removed from the fig in figure 7.

(Schweinfurth's collection)

On one of these figs, which had been cut across, many males of Sycophaga, and Apocrypta were found (Fig. 8). As usual in figs inhabited by Sycophaga both the short-and long-styled flowers produced galls, and these were already perforated and empty. Around the ostiole, there were male flowers with their anthers almost intact. No seeds were found.

Sycomore fruits discovered in Egyptian tombs have been known for many years, but the insects hidden within the figs have not been seen until recently. The biology of the Sycomore flowers and fruit was little known, and the presence of the tiny wasps within has not been suspected.

The study of the developmental cycle clearly shows the specificity of the association between Sycomore wasps and certain phases of fig development. Since the wasps neither populate figs which are not at the appropriate phase (phase B for Sycophaga and early C for Apocrypta) nor inhabit dry figs after their removal from the tree, they could not have entered or oviposited in the figs after these have been deposited in the tombs. It is therefore quite clear that the wasps in such cases belong to the same period as the figs.

The data on the biology of the flowers and fruit of figs from ancient times are identical with those on recent figs. In both instances, the wasps found belong to the same species and it is quite clear that their behaviour was the same then as now. Consequently, it is evident that even in remote times, the legitimate pollinators were absent from Egypt and no seeds were produced. The figs did not open at phase D, and female wasps exited through tunnels bored by the males of Sycophaga. Even the beetles of stored products and scavengers found in ancient Egyptian tombs (Alfieri 1931, Alluaud 1908-9) belong to still existent species, which is only to be expected. Indeed 3000 years may be a very long period for the historian, but nevertheless a mere moment in the evolution of plants and animals.

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References.

Alfieri, A. 1931. Les insectes de la tombe de Toutankhamon. Bull. Soc. R. Entom. d'Egypte 15: 188-189.

Alluaud, Ch. 1908-1909. Note sur les Coléoptères trouves dans les momies d'Egypte. Bull. Soc. Ent. d'Egypte 1: 29-36.

Bodenheimer, F,S . 1928. Geschichte der Entomologie. W. Junk. Berlin.

Carmin, J. and D. Scheinkin. 1931. The fauna of Palestinian plants. Ficus sycomorus L. Bull. Soc. Ent. d'Egypte 15: 164-187.

Galil, J. and D. Eisikovitch. On the pollination ecology of Ficus sycomorus in East Africa (manuscript).

Galil, G. 1966. The Sycomore tree in the civilization of the Middle East. Teva Wearetz (Nature and Country) 8: 306-318; 338-355 (Hebrew).

Grandi, G. 1929. Studio morphologico e biologico della Blastophaga psenes L. Societa Tipografica gia Compositori, Bologna.

Grandi, G. 1930. Monografia del Gen. Philotrypesis Forst. Societa Tipografica gia Compositori. Bologna.

Joseph, K.J. 1955. Observations sur la biologie de Philotrypesis caricae L. C.R. Acad. Scienc. Paris 241: 1624-1625.

Keller, O. 1913. Die Antike Tierwelt. W. Engelmann, Leipzig.

Laurent-Tackholm, V. 1964. Faraos Blomster, Natur och Kultur. Stockholm.

Lucas, A. 1962. Ancient Egyptian materials and industries. Edward-Arnold, London.

Montgomery, B.E. 1959. Arthropods and ancient man. Bull. Ent. Soc. America 5: 68-70.

Rosen, D. 1965. The influence of Sycophaga sycomori L. on the development of the flowers in the syconia of Ficus sycomorus L. M.Sc. Thesis, Tel-Aviv University (in Hebrew).

Saunders, S.S. 1878. On the habits and affinities of Apocrypta and Sycophaga from the figs of Ficus sycomorus of Egypt. Trans. Ent. Soc. London: 313-320.

Schweinfurth, G. 1884. Ueber Pflanzenreste aus altaegyptischen Graebern. Ber. d. Deutsch. Bot. Ges. 2: 451-371.

Schweinfurth, G. 1887a. Die letzten botanischen Entdeckungen in den Graebern Aegyptens. Englers Bot. Jahrb. 8: 1-15.

Schweinfurth G. 1887b. Zusaetze nach brieflichen Notizen ueber neuere Graeberfund. Englers Bot. Jahrb. 8: 15-16.

Woenig, F. 1897. Die Pflanzen in Alt-Aegypten. A. Heitz, Leipzig.