Aegyptus et Pannonia VIII.

Acta Symposii anno 2021

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Editor: Hedvig Győry

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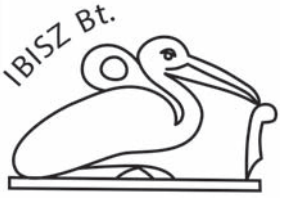

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Contents

“Plants for Health from Ancient Egypt to Present Day” Conference and the HEFS AEC

Dr. Hedvig Győry PhD
HEFT AEC president

After the realization of the 2019 mummy conference, the need arose to discuss the new trends, methodologies and achievements in ancient materia medica from a phytotherapeutic point of view and to disseminate the results achieved by our in-depth research. With this conference, we also wanted to explore how many different ways there are to approach ancient plants and medicine, also from historical, cultural, religious, ethnographic and pharmacological points of view, and to compare it with other related fields. We also wanted to draw attention to other areas of research into plants that maintain and improve health. In this way, contemporary and historical treatments were juxtaposed, Egyptian, Hittite, Greek, Roman and later European herbal medicine, to mention only the most important regions studied in these proceedings. The conference was held in two languages, English and Hungarian, but all the articles in the proceedings are English. We hope that this way we can bring these issues to the attention of as many people as possible.

This time we have chosen to discuss the plants used for health problems. A significant proportion of the substances in ancient Egyptian prescriptions are of plant origin. Reviewing and studying their effects and data can also provide new opportunities for the current pharmacopoeia. Our group of doctors thought that there was a lot of new knowledge to be gained in this area worldwide, and that the knowledge of plants is becoming increasingly important, if we only think of the research into pathogens, many of which have adapted to synthetic drugs. We need thus new materials to use to eliminate them, and earlier medical practices may lead to the discovery of new active substances that are important for people today. Knowledge of these active ingredients makes it possible to apply these drugs as new medicines in a consistent quantity and quality. On the other hand, there are also many places where conditions do not allow the use of drugs produced by modern technology, but nature can help patients with its often hidden treasures. In addition to pharmacological research, folk remedies studied by ethnomedicine

and historical medical research play an essential role in getting to know them.

The HEFS AEC partly organizes its activities in cooperation with other organizations – the above-mentioned international workshop of the Nephthys project in 2022 was co-organized by the Hungarian Natural History Museum, while this very conference took place in partnership with the HNM Semmelweis Museum of Medical History, whose members gave several lectures on historical medicine and modern ethnomedicine, and where a special chamber exhibition would have welcomed the participants in honour of the conference, if the COVID had not prevented the organization of a face-to-face meeting. Nevertheless, we were able to offer the possibility of discussions and consultations in special virtual chambers, allowing the exchange of professional experiences.

The HEFS AEC has published these new proceedings, this time in two volumes (Aegyptus et Pannonia VII-VIII), containing more than half of the papers presented at the conference: “Plants for Health from Ancient Egypt to Present Day”. As we focused on our main research topic in the Medical Research Group of the HEFC Ancient Egyptian Committee, we wondered what the scientific community thought about the ancient Egyptian use of plants in various fields of human and natural sciences, the continuity of related knowledge, and the implications and possibilities of these ancient practices for people today. We also wanted to present the ideas we had developed and the results we had achieved in the professional field, and to provide an opportunity for specialists to discuss different topics. In terms of the structure of the proceedings, we have returned to the previous method of the series, so that the articles are once again listed in alphabetical order of authors, rather than by subjects

The HEFS Ancient Egyptian Committee and the medical history

The HEFS, which has been operating since 1995, carries out several activities in the tradition of its earlier activities: the general programs focus on the last five thousand years, selecting interesting and important topics, while the work of the AEC is mainly directed in three directions. An important objective is (1) the cultural transmission and dissemination of knowledge about ancient Egyptian culture through lectures and public meetings for interested adults, also in the framework of the Hungexpo. We also organise (2) artistic and handicraft activities, workshops accompanied by discussions on various topics with children, launching every year a fine arts competition (drawing/painting), the results of which will be exhibited for the third time in January 2023 in the Deák 17 Children’s and Youth Art Gallery of the Budapest History Museum; and (3) following scientific and scholarly research into the use of ancient objects, human and animal remains – including an international event of the Nephthys Project in 2022 – and medical history, concentrated on phytotherapy and surgery.

As far as our material at the conference is concerned, we present here as a starting point our research focused primarily on the use of plants in surgery, if only because several members of the group are doctors from the Department of Surgical Research and Techniques at the Faculty of Medicine in Semmelweis University, Budapest. The first scientific results of this new direction are published of today's surgical tools and materials. Thus our conference papers focus on the ancient Egyptian surgery from the point of view of the application of plants in these volumes, but research is alsobeing carried out in other areas. Firstly we present research in the direction that is mainly focused on comparative analysis, directed towards the ancestors surgical kit, the plant materials used for wound care and the general knowledge of ancient Egyptian surgeons, with a view to the surgical culture of other peoples and periods or the use of pharmacognostic knowledge. We have also considered it essential to investigate into possible reasons for the use of plants, which may allow us to consider modern phytotherapeutic applications.

Two other areas of our phytotherapy research are also represented in these volumes. The origin and treatment of various diseases throughout the world, and especially in ancient Egypt, is also an interesting topic. In this direction, we have chosen to focus one disease in particular. Diabetes is one of the most widespread diseases of our time, and we have chosen to study its ancient treatment methods. In this case, as in the case of surgery, we have compared several cultures to find out the ancient knowledge and problem-solving methods, and have pointed out herbs that are officially used in the world, or in Hungary.

Another problem of our time, seemingly far removed from the history of medicine, is the conservation and preservation of biodiversity, which is affected not only by climate change and other natural factors, but also by human activity. This phenomenon can be traced back even to ancient Egypt, although the process has accelerated in the last hundred years. One of our topics in this respect is presented here, showing how an ancient curiosity herb has become a plant of large-scale production in the 21st century, and saving this way the species from extinction.

A new direction of the group is the study of the history of Hungarian phytotherapy in partnership with the Semmelweis Museum for Medical History. We have just taken the first steps in this direction, but we can already say that the classical Roman authors, and the ancient Egyptian knowledge they transmitted also played an important role in official medical practice and influenced folk medicine in our country. It seems that the herbaria published in Hungarian language played a key role in this process.

The interweaving of contemporary and historical issues characterizes many of the articles in the volumes. At the same time, mutual influences, shifts of emphasis and reinterpretations within the ancient world, or elements of later historical periods that reach into the past or present, play a prominent role. In this field, it is essential to collect and examine the sources from a new perspective in order to obtain a clearer picture of certain details of the past. Historical, artistic, literary, religious, economic, museological, pharmaceutical, phytotherapeutic, ethnobotanical or even chemical points of view appear in individual articles. It has been proven that the ingredients listed in many of the ancient Egyptian recipes studied so far can still be used as effective medicines today.

This volume contains 16 contributions on the role of drug use in different periods. There are chapters on the reconstruction of some ancient Egyptian remedies, on the ancient method prescribed for the preparation of antjw ointment, or on the preparation and action of kyphi, and pelargonium, traced through biochemical and experimental research; Others are devoted to the materia medica used in Hungary over the centuries, or to the comparison of contemporary Egyptian folk medicine and pharaonic materia medica in the field of gynaecology; another is devoted to studies on the possible identification of magical Egyptian plant names with a dominant connection to the moon, or to the ritual and non-ritual use of some plant substances with religious names in Egypt. Others relate to the popular treatment of diseases such as tuberculosis and cholera in Hungary, or which edible plants have been identified in Coptic medical therapies. Sedative plants are also featured in the current volume, and a plant closely associated with a butterfly is discussed. Another article focuses on the pomegranate, with its many meanings as a symbol of fertility and female power. Yet another focuses on the worldwide surgical use of plants, while others discuss the balance between practical and religious beliefs in the use of medicinal plants. The pop-up exhibition for the conference is briefly introduced, hinting at the museological aspect of medical history.

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The editors of these volumes would like to thank again all the organizations and individuals who made the conference and the publication of these volumes possible, as well as the speakers, the members of the Organizing and Scientific Committees, the secretary of the conference, and the technical assistance, i.e. all those who contributed to the realization of the conference and who have contributed with their knowledge to the these volumes. Special thanks are also due to the authors of the papers for their work and cooperation.

We would also like to express our gratitude to all those colleagues and volunteers who have shared their expertise and offered their generosity by providing scientific or linguistic proofreading for these volumes.

Thanks are also due to the active participation of Aquila Design, who coordinated and realized the editing and printing and to our financial supporters, the Hungarian Natural History Museum, the Ibisz Bt. and the Kiss Ferenc a Növényi Biodiverzitásért Alapitvány [Kiss Ferenc Plant Biodiversity Foundation], whose aim is to raise awareness of the natural treasures we have and to try to teach people to use them, rather than abuse them.

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Myth and Facts on Calotropis Procera: an Overview

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Abstract

The article is focused on *Calotropis procera* (Aiton) Dryand. (Sodom apple), plant used as source of medicines and curative preparations since remote times. Currently it has different uses depending on the region where it is grown and range from medicinal, artisanal to even ritual use.

Main components of the plants are cardiotonic glycosides, which have constituted, apart from their therapeutic effects, a defense mechanism of the plants themselves against herbivores and a mean of protection against insects that feed from them. One of the latter ones is a lepidopteran, the *Danaus chrysippus* butterfly (African monarch or plain tiger), which accumulates these glycosides in the chitinous structures of the thorax and abdomen, causing immediate vomiting in birds that try to devour them.

This butterfly is the most often represented in the funerary repertoire of the tombs of Ancient Egypt, which has led to a strong debate on the interpretation among specialists. In our study, we have analyzed a significant number of tombs illustrating this lepidopteran, and representative from various periods of the ancient Egyptian history, from the Old Kingdom to the 18th Dynasty, concluding that the symbolic aspect is outstanding. We based our interpretation on the constant presence of this species compared to others that also inhabit the marsh areas, its depictions on the papyrus thickets where also *Calotropis* plants grow, or the plant's association with the goddess Hathor.

Keywords: *Calotropis procera*, medicine, butterfly, *Danaus chrysippus,* ritual, funeral cult, fertility.

Introduction

Since immemorial time, plants have been used as a source of medicines and curative preparations, presenting a most remarkable therapeutic diversity. One such plant was the *Calotropis procera* with vernacular names of milkweed or Sodom apple, which was used in traditional medicine in different regions and cultures to treat varied diseases. It belongs to the *Apocynaceae* family. The

former family name, *Asclepiadaceae* that is now considered a subfamily of the *Apocynaceae* family, was a name given to them by the Swedish naturalist Carl N. Linnaeus (or Carl von Linné once ennobled) referring to the god of medicine Asclepius, son of Apollo, based on its prolonged use as a medicinal plant. Since the 4th millennium BC, there has been an increase in the distribution range of *Calotropis*, perhaps due to a desertification of the wide strip on the banks of the Nile and the impact of human activity on this process. Therefore, it can be assumed that the increase in human activity leads to an increase in its distribution range.[1]

The plants *Calotropis procera* (family *Apocynaceae*) have been widely

Calotropis procera plant with fruits. Photo by ©H.Gy. 2016.

used in traditional medicine in North Africa, the Middle East and India and this has led to extensive studies on the properties of these species.[2] Research on their chemical components has led to the evaluation of the therapeutic properties, from cardiotonic activities used in the treatment of congestive heart failure diseases,[3] to broad indications as antibacterial and antiparasitic, and

1 Newton 2007, 17, 1109-1118

2 Al Sulaibi 2020,1.

3 Agraval et alii 2012,2.

even against cancer.[4]

The dried plant has been used as a tonic, anthelmintic, and expectorant. The roots also have similar activities and even as a laxative. In traditional medicine it has been used to treat bronchitis, asthma, leprosy, eczema, elephantiasis, and the latex that is extracted from it, vertigo, baldness, hair loss, toothache, fevers, intermittent rheumatoid disease, swelling and paralysis. The leaves are also used for joint pain and swelling, and along with the flowers they are processed and marketed as an eye tonic. The dried leaves have been used in sexual dysfunction and as an aphrodisiac, and the dried latex and the dried root as an antidote against snake venom and even as an abortifacient.[5] The plant is also used in Indian Ayurvedic medicine as a means of longevity and rejuvenation.[6]

The adverse effects of *Calotropis procera* consist of blisters and skin lesions, but they can become much more dangerous when they alter liver or heart cells, leading to death.[7]

They are also responsible for poisoning livestock when feeding on these plants. In turn, they have been used as arrow poison in warfare producing cardiac alterations by their components due to the cardiac glycosides they have among their components. It could be that they were used in ancient Egypt as a complement to hunting and fishing in the Nile marshes. In fact, some authors think that the ancient Egyptians were also aware of the properties of toxic and narcotic plants and those toxic plants were used in hunting and fishing, while narcotic plants were used for medicinal or pleasant purposes.[8]

In this sense, in a 2010 study on the effects of *Calotropis procera* conducted by A.M.Y. Moustafa from the Department of Biochemistry of the University of Suez in Egypt on indigenous plants, it is described how the plant extracts have multiple effects: antipyretic, anticoagulant, anthelmintic and with effects on the myocardium, bradycardia, increased contraction force.[9] This leads one to believe that ancient Egyptian doctors should know about them and also about their use as a therapeutic measure. Currently, in the areas of Egypt where *Calotropis procera* grows, it has different traditional uses and ways of applying it

4 Meena et alii 2011, 47-51; Upadhyay 2014, 6.

5 Meena et alii 2014, 6.

6 Puri 2003, 16-19.

7 Mahmoud et alii 1979, 241-250; Maia De Lima et alii 2011, 184-186.

8 Jonckheere 1947 and El Shahhat Saad 2015, 28.

9 Moustafa et alii 2010, 1080-1190.

Flowering *Calotropis procera*. Photo by ©H.Gy. 2016.

a) in medicine[10]

- To treat asthma, cigarettes made from the dried leaves are smoked.
- The crushed fresh leaves are applied as a poultice to promote the healing of abscesses, snakebites and skin inflammations. Likewise, the fresh leaves are placed directly on the skin in case of sunstroke.
- The decoction of the dried or fresh leaves is applied in compresses, to treat scabies of camels and goats.

b) in arts and crafts

- Fruit fibers and seed hairs are used to fill cushions and to make ropes.[11]

c) in ritual:

- The rural population of Matruh, where a study was conducted, believes that burning the plants drives away evil spirits.[12] Keimer talks about the plants being cut down by the natives and hung on the doors of the house even for a whole year.[13]

10 Nagla 2013. The study area in this Doctoral Thesis work is located 63 km west of Alexandria and 275 km northwest of Cairo; and it corresponds to the Mediterranean coast between El-Hamman and El-Salum, which has important terrestrial and marine ecosystems, beaches with transparent waters, mined areas since World War II, industrialized areas and sprawling cities. This coastal area corresponds to the Matruh province which occupies a very large area of land in the western desert, almost 16,656 km^2.

11 Nagla 2013, p.74.

12 Nagla 2013, p.74.

13 Keimer 1924.

Environmental effects and the *Danaus chrysippus* butterfly

Cardiac glycosides evolved as a defense of the plants themselves against herbivores, thus they develop a chemical protection system that is very strong in case of Sodom apple. These compounds were used by traditional medicines, becoming precious elements of therapeutics of the moment, and even currently sought by the pharmacological industry.

But they were also used by insects that fed on them by sequestering these compounds in their own organisms. Ones of these insects are the well-known monarch butterflies, both the American *Danaus plexippus* and the African *Danaus chrysippus* (African monarch or tiger butterfly). These lepidoptera accumulate in their chitinous structures of the thorax and abdomen, above all, the glycosides that will cause immediate vomiting in the birds that try to devour them, constituting an effective defensive mechanism against their predators.[14]

Monarch butterfly larvae often eat these plants rich in cardenolides, which are steroidal substances that insects have little ability to synthesize and were suspected of originating from asclepids. The experiments carried out in birds (blue jays, a corvid) demonstrated the above mentioned process: blue jays could eat butterflies that in larval stage had fed on non-toxic plants such as *Gonolobus rostratus*, but were induced to vomit immediately, if they ate milkweed-fed monarchs (*Calotropis* or also *Gomphocarpus*), due to the emetic properties of cardenolides.[15] Caterpillars (1st-5th instars) use some of the latex proteins in their diet. It is suggested that the proteolytic digestive system of caterpillars destroys the toxic proteins of *Calotropis* latex, including peptidases, and thus makes them immune to the toxic principles of the plant. There also appears to be a delicate balance in the feeding behavior of *Danaus chrysippus* caterpillars, particularly the younger ones, where the need to feed is offset by exposure to *de facto* poisonous cardenolides in the latex. When the caterpillars cut the leaves, they wait for the exudate latex to dry and continue feeding the leaves avoiding latex.[16]

Danaus chrysippus is the African relative of the famous North American monarch butterfly (*Danaus plexippus)*, which is, however, also present in Europe and North Africa, though rarely.[17] Based on our investigation, usually

14 Brower et alii 1967, 898; Anaya Lang 2013, 158.

15 Brower et alii 1967, 893-898.

16 Al Sulabi 2020, 6.

17 Chinery 1977 and Kenawy – Abdel-Hamid 2015, Referring to David Kendall (2009a/ http://www. kendall-bioresearch.co.uk/sacredinsect.htm): The *Danaus plexippus* butterfly is much less frequent in the Palaearctic zone than *D. chrysippus*, although its presence has been described in North Africa, the Iberian Peninsula and the Canary Islands. However, due to its migratory capacity, it is possible that it appeares in Egypt today and even more frequently in the past, which would support the identification of a specimen of *D. plexippus* in the tomb of Ptahshepses, vizier of the

the African monarch (*Danaus chrysippus)* appears in the funerary paintings of Ancient Egypt.[18]

Danaus chrysippus butterfly in ancient Egypt

This butterfly was frequently represented in Egyptian tombs, especially in hunting and fishing scenes on the banks of the Nile, scenes of leisure and recreation of kings and nobles that showed the pleasures that the deceased would enjoy in the Hereafter. However, it seems that these scenes acquired a more symbolic content, since they were still represented in the Theban tombs of the New Kingdom, where there was probably not as much hunting area and there were not as many marshes as in the delta of the Nile.

The repetitive appearance of this butterfly species in ancient Egyptian art has caused great controversy among specialists, some inclining to attribute a mere decorative component[19] or a clear symbolic meaning.[20] Dawn Haynes in her work "The Symbolism and Significance of Butterfly in Ancient Egypt", attempts to examine the symbolism and significance of the butterfly in ancient Egypt. In her study, artworks with butterflies in the different dynasties are analyzed and she observes certain patterns that indicate that the butterfly really played an important role as a symbol in ancient Egypt and highlights the large quantity of the pictures of butterflies compared to the other animals in the scenes. This would abound in the principle of hierarchical proportion according to which the most important person or element within a scene is highlighted and represented in a bigger scale. It is suggested that this may indicate that there is some importance attached to butterflies; they are not included just for their beauty, but may be important as a symbol. Haynes tries to establish a concordance between the life cycle of the butterfly and the cycle of life and thus assign them an important role in Egyptian symbolism, a bit similar to that, the beetle *Scarabeus sacer* could have. Studying nine aspects in graphic representations (shape, size, location, materials, color, number, hieroglyphs, actions and gestures), she tries to conclude the importance of the symbolism of butterflies and its relationship with different Egyptian deities. [21]

Diego Espinel also attributes a certain symbolism to the presence of monarch butterflies in the hunting and fishing scenes of the Egyptian funerary murals. He considers it as a metaphor for resurrection or renewal through successive metamorphoses, because it only appears in the funerary context

reign of Niuserre, in Abusir.

18 Panagiotakopulu – Buckland 2010, 347-361; Fleuren 2010; Nazari – Evans 2015, 241.

19 Kritsky 1991, 85-89.

20 Lopez-Mincet – Aufrère 1999, 265-277; Haynes 2013; Nazari – Evans 2015, 241.

21 Haynes 2013, 39-96.

and in reliefs and paintings of activities in swampy areas and marshes.[22] He even highlights the link pointed out by André Lopez-Moncet with the *Calotropis* plant and the goddess Hathor "*lady of the transformations and the behavior of the deceased in the world of the dead*." André B. Wiese also arrived at the same identification based on Old Kingdom / First Intermediate Period button seals, decorated with butterfly motifs replacing the Hathor / Bat emblem.[23]

Figure 1. Limestone from the funerary temple of Userkaf. Cairo, Egyptian Museum, Upper Floor, Gallery 54. JE56001. Public domain.

All this leads us to think that the representations in the Egyptian wall paintings of the tiger butterfly (*Danaus chrysippus)*, could be related to the regeneration and rebirth of the bodies on their journey to the Hereafter (the sarcophagus would be like a large chrysalis where regeneration is produced) and the reason for its appearance would be the wish that the deceased could resurrect, once the journey was completed, through the conviction they had in their beliefs and the different possibilities that their priests and their science conferred on them. This conviction would be based on the therapeutic properties of the *Calotropis procera* plant on which the butterflies fed and that its appearance in the paintings would indicate that with these plants the deceased could achieve the regeneration or resuscitation so longed for. And this procedure would be due to Egyptian doctors, who knew that its (cardiac glycosides') properties were effective in heart failure and have resuscitating effects.

22 Diego Espinel 2015, 125-127.
23 Wiese 1996.

Methodology

In the present study, a large number of tombs with representations of butterflies have been analyzed[24] and now we can affirm that the high frequency of these elements in hunting and fishing scenes is of great relevance. They are associated with papyrus thickets and with birds being harassed by the tomb owner. In the agitation of these birds for hunting with a stick, butterflies appear fluttering without control in all directions, so we can see them in different states and poses and represented in a very realistic way. From these precise images, the Egyptian artists made, it is possible to identify the species; and the most frequently attested butterfly is indeed the *Danaus chrysippus*, with the vernacular names of the tiger butterfly or African monarch. It is a constant species in all paintings, while we are practically not able to confirm the presence of other species that are also common in the Nilotic fauna. This overwhelming presence is what makes us suspect that their representation was something more than decorative and that it was due to some aspect not previously analyzed by the scholarly society. [25]

In the current research, the presence of these butterflies has been attested in more than 60 tombs and mastabas of ancient Egypt, helping to define the identification and symbology aspects to study.[26] However, other authors propose greater numbers of representations with butterflies, around 500, considering all the possible images present in museums, of unknown origin or even falling into overlaps.[27]

Figure 2. Scene with butterfly below the left arm in the mastaba of Mehu, 6th Dynasty. Photo by ©Francisco Munguía.

24 see Appendix

25 Fleuren 2010; Nazari – Evans 2105; Diego Espinel 2015.

26 Munguía 2021.

27 Porter – Moss 1960; 1964; 1972; 1978; 1981; Harpur 1987, 2006b; Van Valsen, 2008.

Although there are an important number, it must be said that they are not excessively frequent, especially when having in mind the much larger number of funerary elements that exist in Egypt (a fact to corroborate it: from the 466 tombs in Thebes, they only appear in about 20 ones). Most of the representations are found in elite tombs, but they are occasionally featured in some royal buildings. The first known representations were among the decorative

Figure 3. *Danaus chrysippus (L.)*

Figure 4. *Danaus chrysippus alcippus (Cramer)*

Figure 5. *Hypolimnas misippus (L.)* female

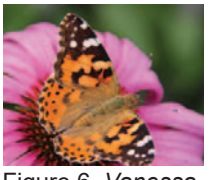

Figure 6. *Vanessa cardui (L.)*

Figure 7. *Merefnebef (6th Dynasty)*

Figure 8. *Khnumhotep II (12th Dynasty)*

Figure 9. *Nebamun (18th Dynasty)*

elements of the 4th Dynasty and in architectural complexes of the pharaohs of the 5th Dynasty. Later, they appeared in the elite mastabas; and in the end, they are attested in other private tombs. Worth mentioning are, among the first, the butterflies of Hetepheres, mother of Kheops, whose bracelet incorporated them as inlays, as well as the representations on the limestone reliefs of the Pharaohs Userkaf and Niuserre of the 5th Dynasty. These butterflies were very frequent in Saqqara and Giza, in the

Figure 10. Sodom apple on the banks of the Nile ©Francisco Munguía, 2021.

mastabas associated with the royal funerary complexes of Djoser, Teti, Userkaf and Unas. They later had a prominent appearance in the Middle Kingdom, in Meir and Beni Hassan. Finally, its presence culminated in the apotheosis of the New Kingdom and in its splendid Theban representations, especially in Abd el-Qurnah.

The only representations in real contexts occur in the temples of Niuserre and Userkaf and in the palaces of Amenhotep III at Malqata and of Akhenaten at Amarna.

The fact that butterfly decorations appear more often in private tombs than in royal buildings is due to the fact that in the former the scenes concern daily life, which are places of public offerings, visited by relatives, while in the latter the funerary program focused on the underworld, as in the Valley of the Kings, where the so-called daily life scenes do not appear and, therefore, those of butterflies, are irrelevant, thus absent.

Figure 11. Mastaba of Hesi. Buorgarzone 2006. ©Francisco Munguía, 2021.

The butterflies appear mainly in the scenes of the marshes or of the riverbank, associated with hunting and fishing activities and this, obviously, because it is the place of feeding and reproduction of the insect. It is in these scenes where the decoration of butterflies becomes more frequent, being attested in nearly 20% of these scenes,[28] thus, their presence indicates important aspects; and of all the insects that can populate the wetlands, only three are represented, and it is the butterfly that is depicted in a pre-eminent place and much larger than a real one. They also appear in boating and hippo hunting scenes, albeit rarely. Where they appear frequently is in the bird hunting scenes with hexagonal netting (clapnet) associating them with the papyrus thickets where the Egyptians seem to want to mark the zone of maximum influx of birds.

Analyzing the represented species, it can thus be concluded that most of the time they are limited to *Danaus chrysippus*, although some authors confuse their pictures with other species such as the female *Hypolimnas misippus* or with *Vanessa cardui*. The confirmation that it is *Danaus chrysippus* comes from the presence of white dots on a black background on the head and torax, which *Vanessa* does not have. And because of the existence of black spots on the posterior wings, which *Hypolimnas misippus* does not present

28 Fleuren 2010, 38-39.

and because of the lack of abdominal pencils typical of males that appear in some representations such as in the tomb of Khnumhotep II.

Thus, the constant presence of this species leads us to wonder about the cause of this fact. As mentioned above, the butterfly larvae feeds on the *Calotropis procera* plant, which is associated with wetlands and papyrus bushes, so it is understood that the butterfly is flitting through the marsh areas. However, since other butterfly species also live here, and they do not appear in the decorations, there must be a significant reason for the depiction of this insect.

On the other hand, the milkweed plant has been associated with the goddess Hathor, because this goddess is seen often emerging from a scrub of papyrus and Isis raised her son Horus in a papyrus thicket. And indeed, this plant itself grows among the papyri, merging with the surrounding weeds. It is in this environment where butterflies grow and multiply and, in turn, signal the presence of the plant that feeds them. Also in these places, marked by butterflies, Egyptian doctors collected the various parts of plants for their therapeutic preparations, just as these butterflies marked the places where birds with the hexagonal net could be best hunted. An iconographical peculiarity is in the latter cases that Egyptian artisans decorated the posts or papyrus screens with the figures of butterflies.[29.]

Figure 12. Mastaba of Mehu. Photo taken by ©Francisco Munguía, 2021

Therefore, the representation of butterflies has an outstanding significance there, and it has a great importance as a marker of places where *Calotropis* plants live and grow. As the plant has cardiac effects, it could be used by Egyptian doctors to treat congestive heart diseases and thus they could

29 Wreszinski 1936, 77, 149; Harpur 1987

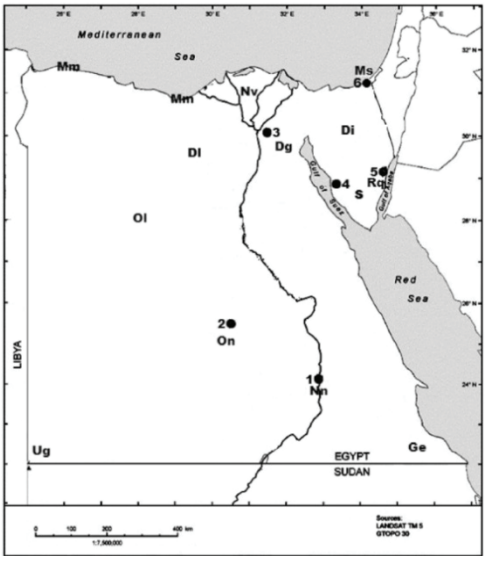

Figure 13. Map of Egypt indicating the localities where *Calotropis procera* grows

give them resuscitation properties in cases when the patient was at risk of death. If it was an actual knowledge, it would be a clear case of joint symbolism of the *Calotropis* plants and the host *Danaus* butterflies.

Delving into this hypothesis, some authors also bet on a symbolic and religious meaning of the representations of the butterfly. Thus, Ludwig Keimer sees them as a symbol of transformation and regeneration helping the deceased to the Hereafter.[30] Frédéric Servajean also considers them to be a symbol of transformation by relying on the metamorphic sense of their biology in which they undergo successive transformations in their lives, just like grasshoppers or frogs, which also appear in the scenes of marshes.[31] André Lopez-Moncet and Sydney Aufrère, agree on the interaction between the butterfly and the *Calotropis* plant, considering that it confers toxic substances to the larvae that avoid predators and ensure that the plant frequently appear in a magical, religious and funerary context. They also confirm that they are used as an aphrodisiac and are associated with the female force and a deity called Matjeret. Based on all these, they link the plant to Hathor, because it was used in the perfumes that were offered, for instance in Dendera. In addition, Hathor is the lady of transformation and guide of the deceased to the dead's world.[32] They even believe that the presence

Figure 14. Fruit of *Calotropis procera*. Gebelein, Old Kingdom. Egyptian Museum Cairo. Photo taken by ©Francisco Munguía.

30 Keimer 1924.

31 Servajean 1999.

32 Lopez-Mincet – Aufrère 1999, 265-277.

of butterfly jewelry in funerary contexts is another signification of a Hathoric meaning.

The distribution of the current locations of the Sodom apple in Egypt is limited to the Delta area, the Sinai Peninsula, the Middle Egypt area and the Theban area. These locations coincide with the presence of representations of the tiger butterfly in Egyptian funerary paintings.

One of the strongest arguments to support the link between the butterfly paintings, the *Calotropis* plant and the symbolism for the regeneration of the deceased would be to discover which components of the plant were used by Egyptian doctors.

There are not many references to the sodome apple plant in ancient texts and there is confusion when it comes to identify it. Ebbell mistakenly translated *irtjw* as sodome apple in the Ebers papyrus.[33] Warren Dawson believed that *m3ḏ(r)t* was the mandrake,[34] which Lefebvre denied, and François Daumas identified with *Calotropis.*[35] This word is ending in various plant signs in the Pyramid Texts:  (1440d, e), and is personified, as the guardian goddess of heaven, who gives her arms to Pharaoh (Pepi I, Pepi II, Merenra) for his ascent to heaven.[36] Unfortunately, the *m3ḏrt* tree or shrub is not mentioned in ancient Egyptian recipes. It seems, the medical term for sodome apple is yet to be determined among unidentified drug names. On the contrary, in magic spells, we can find the *m3ḏrt* tree relatively frequently.[37] There may also be some references to *Calotropis procera* in the 26th Dynasty Brooklyn medical papyrus still under study, though hidden under another previously unknown name.[38]

It is also clear that this plant was known since the Old Kingdom as evidenced also by the presence of specimens in the Egyptian Museum in Cairo, dating from the Old Kingdom, found in the Gebelein area (see figure 14), while others are dated to the Nagada period, or to the Roman occupation.[39]

Conclusion

To sum up, several conclusions can be emended:

- We can identify butterflies, which appear in funeral representations, belonging to the *Danaus chrysippus* species, since the beginning of pharaonic era, and their representation can clearly not be confused with other species. They are always shown in larger size then natural, and in a prominent location.

33 Ebbell 1937.

34 Dawson 1933, 134-135, 137, it was later rejected by Lefebvre.

35 Daumas 1957.

36 Daumas 1957..

37 Charpentier 1991, §501bis.

38 Unger 2020 and her article in this volume.

39 Vartavan et alii 2010, 63-64.

- The diet of the *Danaus* is mainly based on milkweeds, specifically *Calotropis procera*, which has pharmacological components that are used in traditional and current medicine in various parts of the world.
- One of the pharmacological properties of *Calotropis* is the myocardial activation, being used today in congestive heart diseases. This cardiac property might have been known by ancient Egyptian doctors and used in ancient times as a resuscitator of patients with heart failure.
- This property would be transfered to the *Danaus chrysippus,* represented with relatively great frequency, in a larger size and in prominent places and would support the symbolic element of its appearance in the funerary paintings of ancient Egypt.

APPENDIX: list of tombs and mastabas with butterflies

Adu	Reino Antiguo, Din. 6 c. – 1º Periodo Intermedio	Dendera
Akhethotep I	Reino Antiguo, Din. 5: Djedkare tardío a Unis tempr.	Saqqara
Akhethotep II	Reino Antiguo, Din. 5: Unis a Din. VI: Teti a Pepi I	Saqqara
Ankhmaher	Reino Antiguo, Din. 6: Teti tardío a Pepi I temprano	Saqqara
Hesi	Reino Antiguo, Din. 6: Teti tardío a Pepi I temprano	Saqqara
Hetepet	Reino Antiguo, Din. 6: Teti a Pepi II Años 1-34	Gizeh
Hetepherakhti	Reino Antiguo, Din. 5: Niuserre a Djedkare temprano	Saqqara
Iasen	Reino Antiguo, Din. 6: Teti medio a Pepi I medio	Gizeh
Idut	Reino Antiguo, Din. 5: Unas (re) Din. VI: Teti a Pepi	Saqqara
Irenkaptah	Reino Antiguo, Din. 5: Niuserre a Unas	Saqqara
Itisen	Reino Antiguo, Din. 5: Niuserre a Djedkare	Gizeh
Iynefert	Reino Antiguo, Din. 5: Unas tardío	Saqqara
Kagemni	Reino Antiguo, Din. 6: Teti temprano	Saqqara
Kaimankh	Reino Antiguo, Din. 6: Teti	Gizeh
Kaimneferet	Reino Antiguo, Din. 5: Menkauhor a Unis temprano	Saqqara
Mehu	Reino Antiguo, Din. 6: Pepi I medio a Merenre	Saqqara
Merefnebef	Reino Antiguo, Din. 6: Pepi I tardío	Saqqara
Nebet	Reino Antiguo, Din. 5: Unas	Saqqara
Nefer & Kahai	Reino Antiguo, Din. 5: Niuserre	Saqqara
Neferherenptah	Reino Antiguo, Din. 5: Djedkare a Unas	Saqqara
Neferseshemptah & Sekhentiu	Reino Antiguo, Din. 5: Unas	Saqqara
Nekhbu	Reino Antiguo, Din. 6: Pepi I	Gizeh
Niuserre	Reino Antiguo, Din. 5: Niuserre	Abusir
Niankhnesut	Reino Antiguo, Din. 6: Teti tardío a medio	Saqqara
Niankhnum & Khnumhotep	Reino Antiguo, Din. 5: Niuserre tardío a Menkauhor	Saqqara
Niankhpepi	Reino Antiguo, Din. 6: tardío (Meryre Pepy)	Meir
Nikauisesi	Reino Antiguo, Din. 6: Teti medio	Saqqara
Nimaatre	Reino Antiguo, Din. 5: Unas a Dinastía VI: Teti	Gizeh
Ptahhotep II	Reino Antiguo, Din. 5: Unas medio a tardío	Saqqara
Ptahshepses	Reino Antiguo, Din. 5: Niuserre	Abusir
Seankhuiptah	Reino Antiguo, Din. 6: Teti	Saqqara

Sekhemankhptah	Reino Antiguo, Din. 5: Djedkare a Unas	Saqqara
Sekhemkare	Reino Antiguo, Din. 5: Sahure	Gizeh
Senedjemibinti	Reino Antiguo, Din. 5: Djedkare tardío	Gizeh
Ti	Reino Antiguo, Din. 5: Menkauhor a Djedkare	Saqqara
Unas	Reino Antiguo, Din. 5: Unas	Saqqara: calzada
Userkaf	Reino Antiguo, Din. 5: Userkaf	Saqqara
Wernu	Reino Antiguo, Din. 6: Merenre a Pepi II, años 1-34	Saqqara
Initif TT 386	Reino Medio, Din. 11	el Asasif
Khnumhotep II	Reino Medio, Din. 12	Beni Hassan
Senbi B.1	Reino Medio, Din. 12: Amenemhat I	Meir
Ukh-hotep, B.4	Reino Medio, Din. 12: Amenemhat II	Meir
Ukh-hotep, C.1	Reino Medio, Din. 12: Sesostris II	Meir
Akhenaton	Reino Nuevo, Din. 18: Akhenaton	Amarna
Amenemhet, TT 82	Reino Nuevo, Din. 18: Hatshepsut & Thutmosis III	Sheikh Abd el Qurnah
Amenhetep (?): TT 73	Reino Nuevo, Din. 18: Hatshepsut	Sheikh Abd el Qurnah
Amenhetep III	Reino Nuevo, Din. 18: Amenhetep III	Malqata
Horemheb, TT 78	Reino Nuevo, Din. 18: Thutmoses III - - Amenhetep III,	Sheikh Abd el Qurnah
Ineni, TT 81	Reino Nuevo, Din. 18: Amenhetep I - - Thutmoses III,	Sheikh Abd el-Qurnah
Menkheperra-seneb TT 79	Reino Nuevo, Din. 18: Thutmoses III - - Amenhetep II,	Sheikh Abd el Qurnah
Menna, TT 69	Reino Nuevo, Din. 18: Thutmoses IV	Sheikh Abd el Qurnah
Nakht, TT 52	Reino Nuevo, Din. 18: Thutmoses IV - - Amenhetep III?	Sheikh Abd el Qurnah
Nebamun	Reino Nuevo, Din. 18: Amenhetep III - - Akhnaten	Tebas
Nebwenenef, TT 157	Reino Nuevo, Din. 19: Ramses II	Dra‘ Abu el-Naga
Neferhotep, TT 49	Reino Nuevo, Din. 18: Tutankhamom/ Ay/ Horemheb	Khokha
Neferhotep, TT. A. 5	Reino Nuevo, Din. 18: Thutmoses II - Amenhetep II	Dra‘ Abu el-Naga
Neferhotep, TT6	Reino Nuevo, Din. 19: Horemheb - - Ramses II	Deir el-Medinah
Puiemre, TT 39	Reino Nuevo, Din. 18: Thutmoses III	Khokha
Rekhmire, TT100	Reino Nuevo, Din. 18: Thutmoses III - - Amenhetep II	Sheikh Abd el Qurnah
Simut, A.24	Reino Nuevo, Din. 18	Dra‘ Abu el-Naga
Thutmoses, TT 32	Reino Nuevo, Din. 19: Ramses II	Khokha
Montuemhat	Periodo Saita, Din. 25-26: Taharqa - - Psametico I	el Asasif

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