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Scripta Classica 9, 41-48

2012

Artykuł został opracowany do udostępnienia w internecie przez Muzeum Historii Polski w ramach prac podejmowanych na rzecz zapewnienia otwartego, powszechnego i trwałego dostępu do polskiego dorobku naukowego i kulturalnego. Artykuł jest umieszczony w kolekcji cyfrowej bazhum.muzhp.pl, gromadzącej zawartość polskich czasopism humanistycznych i społecznych.

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Physiology and Morphology of σίλφιον in Botanical Works of Theophrastus

Abstract: The main aim of this paper is to shed some light on possible identification of *silphium*, one of the most mysterious plants of Antiquity. Even though many investigations both on the field of botany and classical studies were made, scientists still have problems to give a satisfying answer. The basis for the analysis are fragments from the botanical treaties of Theophrastus where *silphium* was fully described, correlated with achievements of modern taxonomists. Putting all the pieces of information together may help solve this interesting problem.

Key words: Theophrastus, history of botany, *silphium*

Nowadays, no one doubts how big was the impact that Theophrastus of Eresos had on science, mostly botany. Doing the researches himself, and what is more, sending out his own students into the varied regions of the known world to collect specimens and making some observations – for botany itself – either *in situ* or in his own garden,¹ is what differs him from the other ancient authors interested in botanical issues. Arthur Hort, the editor and translator of *Enquiry into Plants*, in his introduction wrote that the garden near the Lyceum was the real place, where “the first systematic botanist made many of the observations, which he recorded in his botanical works.”² But on the other hand, many modern scholars

¹ See: Diog. Laert. V 39, 10: λέγεται δ' αὐτὸν καὶ ἴδιον κήπον σχεῖν μετὰ τὴν Ἀριστοτέλους τελευτὴν, Δημητρίου τοῦ Φαληρέως, ὃς ἦν καὶ γνώριμος αὐτῷ, τοῦτο συμπράξαντος [...].

² See: Theophrastus: *Enquiry into Plants*. Ed. and transl. A. Hort. Vol. 1–2. London 1916, p. XVIII.

are of the opinion that most of descriptions in Theophrastus' writings were simply a second-hand reporting, however, as John E. Raven suggests, it is highly possible that the Father of Botany made some journeys throughout the world observing different species of plants himself:

[...] though he probably never went to Crete and certainly never to mainland Asia, Theophrastus had actually, at some stage before he wrote the *Historia*, visited both Cyprus and Egypt, including the less arid parts of Libya.³

Those inventive for his times methods of collecting and describing different plants later became the basis for modern botanical systematics, taxonomy and other botanical sciences. That is the reason why modern scholars, both philologists and biologists, can use the knowledge preserved in Theophrastus's texts to talk about environment of ancient times.

In his botanical treatises *De Historia Plantarum* and *De Causis Plantarum* nearly 500 taxa, as a modern biologist would call them, are described, among them both cultivated and wild species. It may seem to be a very insignificant number when compared to the whole number of species in the Greek flora, which is estimated to 3,460 species, but when the Balkan Peninsula is counted in this number increases up to 6,500 species. But one thing should be noted: even though Theophrastus's investigations were made without those instruments basic in biological sciences, such as microscopes, still the diversity of plants is enormous. What he had, was his own senses and ability to depict and name things – for us it might seem obvious, for him it was something unusual. That is the reason why his achievements in the field of botany should not be neglected.

Many of those 500 species mentioned in his botanical works present some trouble with identification or taxonomical classification. It is hard not only because of the time gap between us and Theophrastus, but even worse – some plants could be simply extinct without any notice. The biggest problem is that all plant names used by the Father of Botany were quite familiar for his students and listeners, but for modern scientists most of them are a great mystery. What is more, he often used one name to denote different species from one family e.g. all taxa from family *Pinaceae* are described either as *πεύκη* or as *πίτυς*, with a geographical epithet added to determine the origin. The accurate number of species defies any further biological or philological analysis, which sometimes makes the identification almost impossible.

The best known example that still brings many difficulties with its taxonomical or systematical classification is the plant mostly known by its Greek name *σίλφιον*, in Latin either as *silphium* or *laserpitium/laserpicium*. Up until now scientists have not found a satisfying solution for this mysterious plant of ancient times and are

³ See: J.E. Raven: *Plants and Plant Lore in Ancient Greece*. Oxford 2000, p. 19.

still quite unsure to which genus and family this plant should be assigned. The problem arises at the very beginning: the plant became extinct in the 1st century of the Modern Era and not even a tiny part was preserved to our times, so no one can examine it and correct all prior assessments. What modern scholars have is mostly simplified images on coins and descriptions preserved throughout the Greek and Latin literature. In case of this article, the base for any further investigation will be literature, mostly Greek. With all pros and cons Theophrastus seems to be the most reliable botanist of Antiquity and his descriptions of σίλφιον may put some light on its taxonomical classification.

Σίλφιον occurs many times in both botanical treatises but the most significant to this study seem the fragments giving detailed pieces of information about the plant itself i.e., concerning its range, morphological and physiological analysis: *HP*, IV, 3; VI, 5, IX, 1,1–4, 7. The most interesting fact about *silphium* is that probably it was an endemic species typical of North Africa and its range was restricted to the region of Cyrenaica in Libya. Theophrastus mentioned that *silphium* was the most characteristic kind for this region:

ἐν δὲ τῇ Κυρηναίᾳ κυπάρισσος καὶ ἐλάαι τε κάλλισται καὶ ἔλαιον πλείστον.
ιδιώτατον δὲ πάντων τὸ σίλφιον [...].⁴

In the Cyrenaica cypress grows and the olives are fairest and the oil most abundant. Most special of all to this district is silphium [...].⁵

Usage of the superlative form of ἴδιος, which can mean private, personal but also distinct, proper, specific is a very strong confirmation of *silphium's* endemism. Despite its endemic character, according to Theophrastus it grew on vast territories in Northern Libya and its biggest habitats were in the Gulf of Sidra (gr. σύρτις) and Euesperides (modern Benghazi) in Western Cyrenaica:

Τόπον δὲ πολὺν ἐπέχει τῆς Λιβύης· πλείω γάρ φασιν ἢ τετρακισχίλια στάδια· πλείστα δὲ γίνεσθαι περὶ τὴν σύρτιν ἀπὸ τῶν Εὐεσπερίδων.⁶

The plant is found over a wide tract of Libya, for a distance, they say, of more than four thousand furlongs, but it's most abundant near the Syrtis, starting from the Euesperides islands.

As reported by the Father of Botany, the main habitat of this plant was 740 km long (1 στάδιον = ca. 185 m), based on the coastal waters between modern towns of Benghazi and Shahhat. As this is the only habitat described, the real number of *silphium* remains unknown but certainly it must have been impressive.

⁴ See: Thphr. *HP*, IV 3, 1.

⁵ All translations of *Historia Plantarum* followed by quoted A. Hort's edition.

⁶ See: Thphr. *HP*, VI 3, 3.

Very interesting evidence of *silphium*'s limited range can be found in Roman poetry. Poet Catullus answering to his lover Lesbia how many her kisses would be enough for him said:

quam magnus numerus Libyssae harenae
lasarpiciferis iacet Cyrenis⁷

[...] as many as are grains of sand [...] in Libya where the silphium grows [...]⁸

The city of Cyrene (modern Shahhat in Jabal al Akhadr district), which in the Peter Whigham's translation is represented by Libya (maybe a kind of *totum pro parte*), was specified by the poet with the adjective *lasarpicifer* "silphium bearing" (from the word *laser* as *silphium* and its resin was often called). This strict distribution made Cyrenaica famous for its unusual plant, which was supposed to have some medicinal properties. On the other hand, endemism created further restrictions in trade of all products containing *silphium* as vending and output was fully controlled by the state, till the Roman times, which of course made the price of *silphium* products very high.

It should be added that endemism is nothing exceptional in the Mediterranean flora. Endemic types and species are estimated up to 50% of all species (ca. 9,000!) in the region and more over northern part of Libya is one of many centres of endemism, where even now can be found many species limited to this region only.

The most important fragment for this study is the description of the plant, very brief and not so detailed as one may expect. Instead of the word "description", which in taxonomy has a very specific meaning of long and very close depiction of new taxon, we should rather use the term "diagnosis", which is very short and contains only basic facts. Nevertheless it is still the oldest one ever made about *silphium*.

Τὸ δὲ σίλφιον ἔχει ρίζαν μὲν πολλήν καὶ παχεῖαν, τὸν δὲ καυλὸν ἡλίκον νάρθηξ, σχεδὸν δὲ καὶ τῷ πάχει παραπλήσιον, τὸ δὲ φύλλον, ὃ καλοῦσι μάσπετον, ὁμοιον τῷ σελίνῳ· σπέρμα δ' ἔχει πλατύ, οἷον φυλλῶδες, τὸ λεγόμενον φύλλον. ἐπετειόκαυλον δ' ἐστίν, ὥσπερ ὁ νάρθηξ.⁹

The silphium has a great deal of thick root; its stalk is like ferula in size, and is nearly as thick; the leaf, which they call maspeton is like celery: it has a board fruit, which is leaf-like as it were and it's called phyllon. The stalk lasts only a year, like that of ferula.

⁷ See: Cat. 7, 3–4.

⁸ See: *The poems of Catullus. A bilingual edition*. Transl. P. Whigham. Berkley 1966, p. 57.

⁹ See: Thphr. *HP*, VI 1, 6–11.

Later he added that the root has black peel and the leaf is of golden colour. To sum up, all morphological pieces of information: the plant had thick, dark-black main root with many fibrous roots, one cubit (πῆχυς ca. 46 cm) long with head in the middle. The head described as “milk” was the tallest of all organs, sticking out of land and in later stage of life produced stalk. The stalk was probably 1–4 meters tall, with tripinnate leaflets of green to golden-yellow colour (quite similar to *Ferula assa-foetida* L.). Unfortunately, Theophrastus mentioned nothing about the flowers, but they might have been dense umbels. Asuka Hishiki, a botanical artist as she was called by Jeff Cox, created a marvellous rendering of *silphium* based both on Theophrastus’s diagnosis and images from coins found in Cyrene, which due to copyright cannot be presented here. Unfortunately, it depicts only the stalk with yellow, umbellate blossoms, but nevertheless presents the hypothetical look of this plant.¹⁰

Although the morphology of *silphium* is short and looks like second-hand report rather than the result of his botanical observation and investigation (both of which are possible) the diagnosis also contains a peculiar information about the seed, which can help to assign this taxon to an order or family of plants. Theophrastus noted that it is flat or wide (πλατύ) and resembling the leaf (φυλλῶδες). The leaflets are supposed to be similar to celery, but it is hard to define whether a wild or cultivated species should be considered. Celery leaflets are pinnate or bipinnate with rhombic leaflets. On the reconstructed picture the *silphium* leaflets are quite similar, but they are less rhombic, more pointy and slightly dentate, still resembling a celeriac leaf. The images of seeds preserved on coins depict a heart-shaped fruits. This will be very important in final classification of *silphium*, which will be given later.

More space was left for physiological analysis. Theophrastus stated that in the beginning of spring the root bore “maspeton”, which given to herds of sheep was causing a purge and making them fat. Also the meat was supposed to get a peculiar taste. But the most known and valuable thing that *silphium* was famous for was the resin. In agreement with *Historia Plantarum* there were two types of resin: one from stalk, and the other from root. Incisions were made and the drops of juice were collected and dried. The final product was the resin, called in Latin *laser*. The root *laser* was clear, much thicker, transparent and of course more expensive than the one made from stalk. It was used as purgative, contraceptive and digestive, but mostly as a spice to give the dish a specific taste. It is hard to tell something more about the chemistry of resin, but it might resemble the asafoetida, an oleoresin made from rhizome of *Ferula* plants. Even in Antiquity those two were often mistaken as *Ferula* resins were much cheaper than original *laser*. As reported by the author of *Historia Plantarum* the root resin was obtained by cutting the root only

¹⁰ See: J. Cox: “The Ghost of Silphium Past”. *Horticulture* 2010, vol. 107, pp. 40–42. This work also presents short history of *silphium* and gives some hints on identification.

in needed amount, then it was kept in vases. Sometimes flour was added to prolong its permanence.

The breeding also seemed to interest Theophrastus. The root, as already has been mentioned, had a head in the middle. In line with the Botanist, the head was sticking out of the ground, later bearing “magydaris”, kind of stalk that was supposed to give the seeds after the set of Sirius. From those the typical plant arose. Still we have no information about the flowers and as modern biology knows this is the main generative organ.

The fact that *silphium* could not be cultivated and all attempts to domesticate it ended without any satisfying result was the main reason of declining number and later extinction of this plant. But even Theophrastus himself was not quite sure in that matter as once he stated that the plant cannot be cultivated. Few lines later he says that to keep it in better shape it should be hilled up each year. Nevertheless, the number of *laserpitium* was dropping down, automatically the price went up. It is known that during the reign of Nero a drastic decline in *laser* availability occurred and probably this should be taken as the time of final extinction. What is more, Pliny the Elder noted that in his times the plant had not been seen in its habitats for many years.¹¹ Many factors were possible to cause the disappearance of *laserpitium* but the main causes seem to be:

1. Overharvesting – too much *silphium* was collected mostly in Roman times, without any control so the plant could not keep up with its reproduction. Furthermore, Romans did not allow the soil to rejuvenate and planted other crops like garlic, cereals, cumin, saffron, etc. The natural habitat was broken which contributed to the plant's diminution.
2. Overgrazing – to many flocks of sheep were let to eat the “maspeton” and mature plant cannot grow. It was believed that young leafs will make the sheep fatter and the meat itself will get a specific taste, so more and more flock were grazed, even at night as it was illegal.
3. Soil erosion – Theophrastus noted in *De Causis Plantarum* that the *silphium* occurred in Cyrene after heavy and tarry rains¹² as well as a forest, because it was not there before. The main tree of that forest was ὄβον now identified with *Tetraclinis articulata* Vahl. (= *Callitris quadrivalvis* Vent.), family *Cupressaceae*, sandarac gum tree. This is a big coniferous, evergreen tree to (6–8 (6–15) meters tall, with reddish-brown, scented trunk. It grows in Southern Spain, Morocco, Northern Algeria, Tunisia and Malta. It also has been reported, but not yet collected, from Jabal al Akhdar (the same district were *silphium* grew). According to what Theophrastus wrote, it grew around the temple of god Amun and in Cyrenaica. The range of *T. articulata* and *silphium* cloud over,

¹¹ Cf. Plin. *NH*, XIX 39, 1–5: [...] multis iam annis in ea terra non invenitur, quoniam publicani, qui pascua conducunt, maius ita lucrum sentientes depopulantur pecorum pabulo. unus omnino caulis nostra memoria repertus Neroni principi missus est.

¹² See: Thphr. *CP*, I 5, 1.

which could mean that those two plants were engaged in a kind of symbiosis. The sandarac tree was always admired for its wood, called a citron-wood, oil and resin. Very often that wood was used for furniture, roof coverings and artistic production. Ken Parejko presented a very interesting theory that decline of *silphium* can be connected with destruction of the forest and ongoing soil erosion.¹³ It is also possible that sandarac forest created specific microclimate for *silphium*. When the number of *T. articulata* got low and the *silphium*'s habitat was destroyed, its population also decayed.

All the three factors are responsible for changing living conditions and *silphium* could not cope in new environment. But, it seems that the biggest impact was made by Romans. Their overexploitation was gradually transforming the Cyrenian land into unfriendly place for *laserpitium*. Roman landlords preferred short-term profits rather than more sustainable practices and they did not manage the land well. All this caused the degradation of *silphium*'s habitat and in consequence led to extinction.

The identity of *silphium* or, as it should be said, its taxonomical classification, is unknown. What was left is simplified images of the plant, the seed and stalk on coins from Cyrenaica and descriptions found in literature. Connecting them together one can at least try to assign this plant to any *genus* or *familia*, unfortunately no definite answer can be given. What seems to be quite sure is that *silphium* belonged to family *Apiaceae* (= *Umbelliferae*) from order *Apiales* (= *Umbelliflorae*). This family consists of perennial plants with complexed leafs and tiny blossoms organized in umbels. The fruit is usually a dry schizocarp which divides into two parts. Looking at the images preserved on coins it can easily be seen that *silphium* flower is a typical umbel and the seed represents a *schizocarpium*. The celeriac leaf also suggests that a member of this family should be considered. Over 3,000 species belong to *Apiaceae*, but comparing all the information it can be noticed that the genus *Ferula* (νάρθηξ) at the first sight agrees with both Theophrastus's description and images on coins. Even in the Antiquity *Ferula* plants were often taken for *silphium* as e.g. *F. assa-foetida*, which was considered as less expensive ersatz, also *F. tingitana* and *F. communis* were said to be *laserpitium*. Unfortunately, none of this is correct and *silphium* should not be identified with *Ferulas*. Firstly, because those species came from Far East and were not endemic to Cyrenaica; secondly, those are very common in Mediterranean and it is hard to imagine that Greeks and Romans paid in gold for a plant that grew under their windows. Moreover, *Ferulas* bear an elliptic seed, not the shape suggested on coins.

Amongst *Apiaceae* there is one genus that seems to be a perfect match – it is genus *Laserpitium*. A Polish botanist Krzysztof Spalik, who is interested in the sys-

¹³ See: K. Parejko: "Pliny the Elder's Silphium: first recorded species extinction". *Conservation Biology* 2003, No. 3, vol. 17, p. 926.

tematics and ecology of *Apiaceae*, has a very convincing argument that the ancient plant might have been a member of genus *Laserpitium*: the fruit has heart-shaped wings, the same as on the image presented on several coins from Cyrenaica.¹⁴

It is hard not to agree with Spalik and it looks that finally more can be said about the taxonomical classification of *silphium*, although no one can guarantee accuracy as long as any physical trace will be found (for example the seed itself). If this ever happen and the DNA is tested, the case will be resolved, but till that time a hypothesis that ancient *silphium* can be a lost member of genus *Laserpitium* must be sufficient.

¹⁴ See: K. Spalik: "Smutna i pouczająca opowieść o silphium". *Wiedza i Życie* 2007, nr 3, pp. 34–36.