and total sulfur by 68% and 63% respectively in comparison with control plants, whilst the corresponding percentage of the sulfate was 14% more than control plants. Furthermore, the S-deprived lamina presented more dry mass and water amount by 10% and 19% respectively. The specific surface area was as that of control plants and the transpiration rate of the S-deprived plants was decreased by 16% compared to control plants. It is concluded that somehow an alleviation process took place between the first and the second experimental day under the S-deprivation, a fact which to our knowledge has not been reported so far, too.

21) Metabolic state of Arabidopsis overexpressing SDI1

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O-acetyl-L-serine (OAS) provides the carbon backbone for cysteine synthesis and is assumed to positively regulate sulfur deficiency-responsive genes as its amount increases upon sulfur limitation. Therefore, mRNA accumulation of a number of sulfur responsive genes might be controlled by OAS. Recently this hypothesis was strengthened by global co-expression analysis under conditions of variable OAS levels with constant sulfur status. The function and the signaling cascade regulating the identified OAS cluster genes (*SDI-1*, *SDI-2*, *LSU1*, *LSU2*, *ChaC* and *SHM7*) are mostly unknown and need further elucidation. Functional characterization of SDI (sulfur-deficiency-induced 1 and 2) is the focus of this study as these candidate genes are prominently expressed upon sulfate deprivation, which is always coupled to OAS accumulation, and upon sulfate deprivation independent OAS accumulation. To promote our understanding of signaling processes and of the actual function of these genes, knock-out and double knock-out as well as overexpresser lines were produced. These lines are under investigation mainly employing transcriptomic and metabolomic approaches. GC/TOF measurements revealed significant increases of most amino acids in lines over-expressing SDI, most prominently alanine, asparagine and serine, as well as the polyamines putresine and spermidine. The levels of most sugars, sugar alcohols and organic acids (especially citrate, succinate, fumarate and malate) were significantly reduced in the same lines. While SDI double knock-out lines have reduced Cys levels, SDI1 overexpressers were found to have significantly elevated Cys levels and also accumulate more sulphate than WT plants under non sulphur limiting conditions. Besides the metabolic changes, SDI overexpresser lines display severe morphological phenotypes. Six-week-old plants grown under either shortday or longday conditions are much smaller in size than WT and they show delayed bolting and flowering and reduced seed production.

22) Making wealth out of sulfides and its consequences in Lavrion peninsula, Greece

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The history and the environmental issues of Lavrion are closely connected to sulfur and this connection was the subject of an excursion during the 4th Sulphyton Workshop. Lavrion is a town inhabited by more than 10,000 people, situated fifty five kilometers from Athens in the eastern part of Lavreotiki peninsula. Lavreotiki is located in the southeastern tip of Attica, it covers a surface of approximately 200 square kilometers where the places of Thorikos, Kamariza, Plaka, Botsaris Valley, Cavity Soureza Valley, Megala Pefka, Dimoliaki etc. are situated. Most of these places are remarkable centers of cultural and scientific tourism with ancient mines and ore washing plants, the Ancient Theatre of Thorikos, the natural National Park of Sounion, and the temples of Neptune and of Athena at Sounion. Lavreotiki was the center of considerable mining and smelting activities from ancient to recent times, due to its rich mineral wealth, which consists of argentiferous mineral deposits as polymetallic sulphides and iron ore. For this reasons, the history of Lavrion mines is directly connected with the history of Greece.

Many important metal ores are sulfides: argentite (silver sulfide), cinnabar (mercury sulfide), galena (lead sulfide), molybdenite (molybdenum sulfide), pentlandite (nickel sulfide), realgar (arsenic sulfide), stibnite (antimony sulfide), sphalerite (zinc sulfide), pyrite (iron disulfide), and chalcopyrite (iron-copper sulfide). There are mainly two types of mineralization in the substratum of Lavreotiki: a primary mineralization of mixed sulfide ores of basic metals, such as lead, zinc, iron and copper, which has been intensely exploited and a limited metallifery of Fe-Mn ores. A number of other sulfide minerals (e.g. Cu, As) and a variety of sulfur salts also take part in the ore mineral suite of the area. The accessory minerals that prevail are fluorite, calcite, barite, quartz and dolomite. Sulfide mineralization is mainly hosted within the carbonate formations.

The ancient Greeks extracted mainly silver and lead from the minerals of Lavrion, and especially from galena ore, with remarkable techniques. The galena ore was enriched in washing units by using water under pressure in order to remove the light and poor in metal parts of the ore. The enriched galena was converted to the oxide form (PbO + Ag) by the process called reduction roasting that produced lots of sulfur dioxide emissions in the atmosphere. The PbO + Ag chemical compound called "litharge" was directed into a furnace, where it melted with carbon (a process called reduction melting) and produced a PbAg alloy. The Pb-Ag alloy was next placed into a fireproof ceramic cup and heated in a specially constructed furnace were air was blowing under pressure. At 900 °C the alloy melted and lead was oxidizing whilst silver was not oxidizing. Then the alloy formed two separate layers, a heavy one containing silver in the bottom of the cup and a lighter containing litharge in the top. Litharge was removing and the process was continuing until the silver in the bottom was pure (over 99%). The precious metal was then ready for coins construction.

The mining history of Lavrion began at Thorikos, a settlement to the north of Lavrion and one of the most ancient industrial areas in Europe. The peak of mining and smelting activities was between the 6th and 4th centuries BC, and especially during the 5th century BC, the Golden Age of Athens. After the 4th century BC the exploitation declined. Mining and smelting activities continued intermittently until the 1st century AD. During the Roman and Early Byzantine period (2nd century BC – 6th century AD) it was sporadic and of small scale. Lavrion area between the 6th and 19th century was abandoned, losing all of its old glory. During the period 1864–1989 mining and metallurgical activities exploited the remaining deposits and the huge piles of mineral and metallurgical wastes, rich in Pb, Zn, Cu, Fe and other mineral elements. Enormous quantities of wastes from these activities, were deposited in heaps around Lavrion area,