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Strigolactones (SLs) are a group of terpenoid lactones, and function as a plant hormone that inhibits shoot branching as well as communication signals for symbiosis and parasitism in the rhizosphere. SLs consist of tricyclic-lactone (ABC-ring) and methyl butenolide (D-ring), connected with an enol ether bridge. Studies using chemical inhibitors and mutants have suggested that the ABC-ring is derived from a carotenoid cleaved product. However, the isoprenoid origin of the SL carbon skeleton has not been proved directly in a metabolism study. Especially, little is known about the biosynthetic origin of D-ring. To address this question, a 13C-labeled precursor specific to the mevalonate or methylerythritol phosphate (MEP) pathway was fed to *Lotus japonicus* cultured roots in the presence of a chemical inhibitor that blocks each endogenous pathway. LC-MS/MS and 13C-NMR analysis of 5-deoxystrigol, a previously identified SL in this species, indicated that the MEP pathway contributes to the biosynthesis of the entire SL carbon skeleton, including the D-ring. Possible pathways for SL biosynthesis will be discussed.

P0575 – ePoster

Immunohistochemical analysis of the localization of an auxin efflux facilitator, CsPIN1, during gravimorphogenesis of cucumber seedlings

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When cucumber seeds are placed in a horizontal position for germination, resulting seedlings develops a specialized protuberance, termed the peg, on the lower side of the transition zone between the hypocotyl and the root, due to gravistimulation. The peg anchors the seed coat so that the elongation of hypocotyl pulls the cotyledons out of the seed coat. On the other hand, when cucumber seeds germinate in a vertical position with the radicle pointing down or under microgravity conditions in space, the seedlings develop a peg on each side of the transition zone. Thus, cucumber seedlings have a potential ability to develop a peg on each side, and peg formation on the upper side of the transition zone is suppressed in response to gravity when seedlings are grown in a horizontal position on the ground. We previously showed that application of either auxin or auxin efflux inhibitors induced peg formation on both sides of the transition zone even when the seedlings were placed horizontally. Thus, we hypothesized that gravistimulation induces auxin efflux to decrease auxin content on the upper side so as to suppress peg formation. However, the molecular mechanism underlying this process is less understood. To reveal the mechanism of how gravistimulation induced this asymmetric auxin redistribution in the transition zone, we analyzed the localization of CsPIN1, an auxin efflux facilitator that was expressed in the endodermal cells, which were thought to sense gravistimulation. The transition zone has four vascular strands, and endodermis situates just outside of each vascular strand. In the seedlings grown in a vertical position, a peg developed on each side of the transition zone, and CsPIN1 signals in endodermal cells among the four endodermal layers were equally detected on the vascular bundle side. In the seedlings grown in a horizontal position, CsPIN1 signals in the two endodermal layers in the upper side of the transition zone were much stronger than those in the lower side. In addition, when the vertically grown seedlings were reoriented and placed horizontally, this differential accumulation of CsPIN1 protein commenced within 30 min after gravistimulation. Furthermore, our measurement of endogenous auxin content revealed that asymmetric auxin distribution was induced within 30 min after gravistimulation. Our results suggest that the gravity-induced changes of CsPIN1 localization in endodermal layers participate in regulating auxin distribution that leads to unilateral positioning of a peg in cucumber seedlings.

P0577 – ePoster

Phylogenetic relationships of the Korean *Salix* species

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We have analyzed chloroplast and nuclear DNA marker sequences of Korean *Salix* species to reveal the phylogenetic relationships among them. Plastid *trn*L intron, *trn*L-F IGS, *trn*H-*psb*A IGS, *atp*F-*atp*H IGS, *psb*K-*psb*I IGS, *rpo*B gene, *rpo*C gene, and *mat*K sequences are tested and analyzed, in addition to nuclear xdh gene sequences. Plastid *mat*K and nuclear xdh produced best resolution and most usable. Using both the sequences, we have reconstructed the phylogenetic relationships among the Korean *Salix* species, including other relevant species.The resulting phylogeny matches with previous phylogenetic studies and indicates a evolutionary pathway of an Korean edemic species.

P0578 – ePoster

Water supply and photosynthesis in terrestrial, climbing and semi-epiphytic *Freycinetia excelsa* F. Muell (Pandanaceae)

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Freycinetia excelsa is a secondary hemi-epiphytic vine with a three phase life-cycle: terrestrial, terrestrial but climbing a host, and semi-epiphytic. Beginning life as ground-dwelling plant with normal roots, *F. excelsa* climbs a host and the basal portion of the stem dies back, in most cases remaining connected to the soil via aerial feeder roots. We ask whether water supply and photosynthesis differs between the three morphological forms of *F. excelsa*. For all growth forms of *F. excelsa*, pre-dawn leaf water potentials correlated with volumetric soil moisture, and leaf water potential and CO_2 assimilation rates were generally lower in the dry season than in the wet season. Within each season, water

potentials of leaves from all growth forms were similar but the patterns of daily CO_2 exchange differed, with CO_2 uptake by terrestrial plants most affected by dry season conditions. Terrestrial plants exhibited the lowest CO_2 exchange in the dry season, but the CO_2 exchange rates were similar for the three forms during the wet season. Stem hydraulic conductivity and xylem anatomy differed between the growth forms. Terrestrial plants, with conventional roots and a main stem, have narrow xylem and lower hydraulic conductivity. In comparison, climbing and semi-epiphytic plants are attached to the soil by narrow aerial roots and hydraulic conductivity of the stem is greater. Down-regulation of CO_2 exchange in the dry season was greatest in the terrestrial plants, but all forms operated at similar pre-dawn water potentials of -1.5 MPa and afternoon water potentials of not less than -2 MPa. The lower hydraulic conductivity of the stems of terrestrial plants may restrict water supply such that down-regulation of CO_2 uptake and stomatal opening are necessary to diminish water loss and maintain water potential. Water supplied to climbing and semi-epiphytic plants by aerial roots variously inserted at a number of sites along a stem is evidently sufficient to sustain higher rates of CO_2 exchange and water loss.

P0579 – ePoster

How nitrogen and phosphate deficiency affect strigolactone production and plant growth

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Strigolactones (SLs) function as a germination stimulant of root parasitic weeds and a hyphal branching factor of AM fungi in the rhizosphere, and also as a plant hormone inhibiting shoot branching in planta. In this study, effects of nitrogen (N) and phosphate (P) deficiency on SL production and plant growth were examined in Fabaceae (alfalfa and Chinese milk vetch), Asteraceae (marigold and lettuce), Solanaceae (tomato), and Poaceae (wheat) plants. In alfalfa and tomato, only P deficiency promoted SL exudation, by contrast, in Chinese milk vetch, lettuce, marigold and wheat, N as well as P deficiency enhanced it. N and P deficiency negatively affected shoot fresh weight and positively affected root length in all plants examined. Root fresh weight responses to N and P deficiency varied with plant species. Loss of these nutrients did not affect root fresh weight in alfalfa and wheat, increased in Chinese milk vetch, and suppressed in lettuce, marigold and tomato. Interaction of nutrient deficiency and SL production will be discussed.

P0584 – ePoster

Effects of drought stress produced by PEG-6000 on antioxidant enzymes activity of two sensitive and tolerant cultivars of Safflower (*Carthamus tinctorious* L.)

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In order to study the adaptability of Safflower (*Carthamus tinctorius* L.) plants to water deficit, we analyzed the activity of antioxidant enzymes, including guaiacol peroxidase (GPX ,EC 1.11.1.7) and Catalase (CAT ,EC 1.11.1.6), in Safflower shoots and roots subjected to drought stress during seedling growth stage. The germination rate and shoot dry weight of five safflower cultivars were studied under different osmotic potentials (0, -0.05, -0.1, -0.5, -1.0 MPa) prepared by polyethylene glycol 6000 (PEG-6000). Safflower cultivars, IL111 and Mahali Esfahan were selected as stress–tolerant and stress–sensitive, respectively, and were used for further characterization. After PEG-6000 treatment, IL111 showed higher enzymatic activity of GPX and CAT in its shoots and roots than Mahali Esfahan. Guaiacol peroxidase activity remained relatively constant up to -0.5 MPa and increased significantly at -1.0 MPa. Catalase activity increased in both cultivars, but was significantly higher in IL111 cultivar at all osmotic potential tested. Since biotic and abiotic stresses cause increase in reactive oxygen species (ROS) which reduce plant growth and development, increased activities of antioxidant enzymes are part of mechanisms which confer tolerance to some varieties of safflower plants such as IL111.

P0585 – ePoster

Micromorphology of secretory trichomes and chemical composition of volatile oils in *Perovskia atriplicifolia* Benth. from north-eastern Romania

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Perovskia atriplicifolia Benth. is a plant growing in the rocky regions of Afghanistan and Pakistan, known for its febrifuge properties, for culinary use or its decorative qualities. This species is cultivated in Europe, being also experimentally introduced in Romania as a cultivated plant in order to use its medicinal, aromatic and air purifying (aerosol) properties. In this context, the objective of the present paper is to get thoroughly into the knowledge of the morphological traits and of the distribution rate of the volatile oil–producing secretory trichomes, situated on the surface of the aerial vegetative organs (stems and leaves) and reproductive organs (flowers) and also to analyze the composition of the volatile oils produced by these organs in anthesis stage, an ontogenetic moment in which the secreted products have real phytoterapeutic and aromatic properties. The micromorphological investigations have been carried out using a surface electron microscopy, at a TESCAN VEGA II SBH microscope. The volatile oils extraction was conducted using a Clevenger hydrodistillation system. The component separation was performed by gas chromatography, with a 6890 Agilent GC/MS. The volatile compound identification was made using the NIST spectral bank and Kovats indexes. In the investigated biological material, grown in the