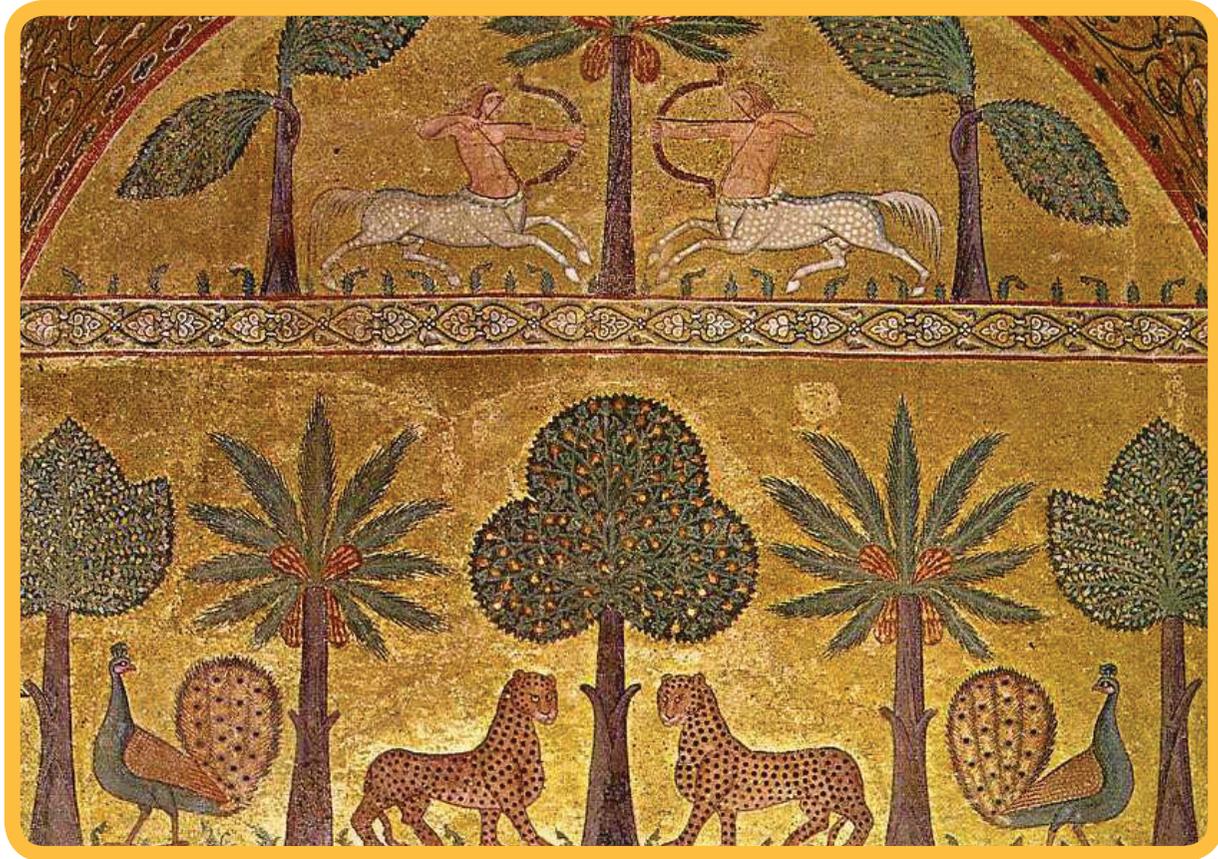


1st European Conference of Post graduate Horticulture Scientists

May 12-13, 2016 - Palermo - Italy

Conveners
Prof. Paolo Inglese & Dr. Giorgia Liguori



Book of Abstracts and Conference Program



Dear Colleagues and friends,

few year ago I went to Poland with my elder son who was attending an European meeting of young post graduate students of his research field. I was surprised to see so many young fellows sharing their knowledge in an informal environment, paying very low fees. I said myself, why not doing something similar? In fact, international meetings pay very little attention to our youngest fellows and this is quite a great mistake, since many, if not most of them, are attracted by on line communities that offer a worldwide network, with fast services, no limit download of papers, daily update of new articles in the most important journal of each specific research field and, more important for them, the opportunity to let the colleagues know their papers with the final goal to improve citations. We must do something to let them be aware of the importance of creating a 'real' community, based on the opportunity of sharing time and ideas together, to improve their networking ability. 'If you can't stand your peers get out of science' this is what J. Watson wrote in Science more than 20 year ago, and I really feel social activity in science is crucial. The Network of the European Societies of Horticultural Science and then ISHS accepted our proposal and so the First European Congress for Post Graduate Horticultural Scientists is now real, based on low fees, real participation to the organization of young scientists and, hopefully, a friendly environment for their presentations. The Scientific Committee made of two senior scientists together with young scientists coming from the horticultural societies of Germany, Greece, Italy, Netherlands, Portugal, Romania, Spain chaired by prof. George Manganaris choosed the 20 papers that will be presented ad oral presentation, together with the topic of the workshop that will be held during the congress. Moreover, they will select the best papers that will be prized. This book of 60 abstracts with authors coming from 20 countries. Excellent numbers for this first edition of this new format that we hope will gain his future.

We welcome our young colleagues together with our 'senior' guests, particularly proff. S. Nicola, M. Rieger, B. Basile, M. Tagliavini and J. Wuensche who will give plenary lectures and prof. S. De Pascale, president of the Italian Society of Horticultural Science, that together with ISHS and the NESHS supported our efforts.

Paolo Inglese and Giorgia Liguori - Conveners

Scientific Committee

George Manganaris	<i>President</i> Cyprus University of Technology, Cyprus
Massimo Tagliavini	Free University of Bozen-Bolzano, Italy
Chrystalla Antoniou	Cyprus University of Technology, Cyprus
Alexandra Badescu	Faculty of Horticulture, Bucharest, Romania
Pietro Gramazio	COMAV Valencia, Spain
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Organizing Committee

Paolo Inglese	<i>Convener</i> Network European Societies Horticultural Science
Giorgia Liguori	<i>Convener</i> Università degli Studi di Palermo - Italy
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Jaime Prohens	Sociedad Española de Ciencias Hortícolas (SECH)
Gheorghe Glaman	Romanian Horticultural Society – Romania (RHS)
Jens Wünsche	Gartenbauwissenschaftliche Gesellschaft (DGG)

08:30 - 09:00 Registration

09:00 - 09:15 Opening

09:15 - 09:45 - Plenary Lecture

Silvana Nicola, University of Turin, Vice-President ISHS

Horticultural Science, Scientists, People: loop or link?

Session I - Plant physiology & response to abiotic factors

chair: Dr- Bart Van der Wal

10:00 - 10:25

D'Asaro A., Reig Valor C., Farina V., Agustí Fonfria M.

Factors affecting fruit set and early flowers/fruit drop in avocado (*Persea americana* Mill.).

10:25 - 10:50

Di Stasio E., Roupheal Y., Raimondi G., Giordano M., De Pascale S.

Influence of seaweed-derived biostimulant on 'friariello' growth, photosynthesis and nutrition value under nutrient stress

10:50 - 11:40 **Coffee Break/Poster Session I**

11:40 - 12:05

Vermeiren J., Stoffels K., Van Delm T., Steppe K.

Effects of LED assimilation lighting on everbearing strawberry plants monitored with leaf clips

12:05 - 12:30

de Koning A.N., Tsafaras I.

Real-time comparison of measured and simulated crop transpiration in greenhouse process control

12:30 - 12:55

Vaštakaitė V., Viršilė A., Brazaitytė A., Samuolienė G., Jankauskienė J., Sirtautas R., Duchovskis P.

The effects of supplemental light-emitting diodes lighting on mineral element contents in microgreens

12:55 - 13:20

Lauriks Fran S., Van de Put Hans A.L., Steppe K.

Towards drought detection and irrigation scheduling in ornamentals with continuous plant-based measurements

13:30 – 15:00 Lunch

15:00 - 15:30 - Plenary Lecture

Mark Rieger – Dean University of Delaware, College of Agriculture and Natural Resources (CANR)

Study abroad from the perspective of US institutions

Session II - Plant Propagation

chair: Dr. Pietro Gramazio

15:30 - 15:55

Hameg R., Barreal M.E., Gallego P. P.

Improving quality of micropropagated Baby Kiwi (*Actinidia arguta* var *Issai*) plantlets using a neurofuzzy logic approach

15:55 - 16:20

Kulus D., Rewers M., Mikula A.

Encapsulation-dehydration technique exploration for chrysanthemum 'Richmond' cryopreservation

16:20 - 16:45

Opata J., Skala J., Hegele M., Hegele S., Dzomeku B. M., Wünsche J.

In vivo multiplication of banana for small scale farmers

16:45 - 17:10

Sabatino L.

Use of un-rooted grafted cuttings for eggplant plug-transplant production and shipping: effect of the grafting-healing duration on the finished transplants

17:20 - 18:20 - Workshop

Chair: B. Basile, University of Naples

The Impact of Innovations in Horticulture

20:00

Banquet

May 13, 2016

08:30 -09:00 Plenary Lecture

Jens Wuensche, University of Hohenheim, ISHS Board Member

ISHS and young minds - a future-oriented relationship

Session III - Phytochemical constituents & quality of horticultural produce

chair: Dr. Giuseppe Pignata

09:00 - 09:25

Barroso M., Barros L., Rodrigues M. Â, Sousa M. J., Santos-Buelga C., Ferreira I.

Antioxidant profile of Stevia rebaudiana Bertoni cultivated in Portugal and submitted to different conservation conditions

09:25 - 09:50

Georgoudaki T., Nanos G. D., Mitsopoulou N., Vemmos S.

Field variability in fruit quality and storability of Greek apple cultivar 'Pilafa Delicious'

09:50 - 10:15

Nagy Z., Jahnke G., Nyitrai Sardy D., Kallay M., Majer J.

Compared analysis by HPLC, AAS and TAC for woodland grape (*Vitis silvestris* Gmel.) genotypes and European grapevine (*Vitis vinifera* L.) cultivars

10:15 -10:40

Rafique M. Z., Palmieri L., Fraser P. D., Martens S.

Flavonoid's pathways block step and yellow pigmentation in raspberries (*Rubus idaeus* L.)

10:40 -11:05

Simões Grilo F., Di Stefano V., Lo Bianco R.

Effect of partial rootzone drying and maturation stage on quality and flavonoid composition of 'Valencia' orange fruit

11:05 - 11:55 **Coffee Break/Poster Session II**

Session IV - Plant pathology, plant protection & plant-microbe interaction

chair: Dr. Michael H. Hagemann

11:55 - 12:20

Lantos E.

Comparison of penetration and feeding behavior of Green peach aphid (*Myzus persicae*) on *Asparagus* spp. susceptible and resistant to *Asparagus virus 1* using electrical penetration graph

12:20 - 12:45

Michalko J., Medo J., Bibeň T., Barta M.

Diversity of endophytic microbial communities inside the leaves of evergreen plants

12:45 - 13:10

Ar Rashid H., Thomas B.

Genetic regulation of day length adaptation and bulb formation in onion (*Allium cepa* L.)

13:30 – 15:00

Lunch

Session IV - Plant pathology, plant protection & plant-microbe interaction

chair: Dr. Michael H. Hagemann

15:00 - 15:25

Rasiukevičiūtė N., Valiuškaitė A., Supronienė S.

Challenges of strawberry protection from grey mould

Session V - Genetic Resources & molecular aspects on horticultural products

chair: Dr. Michael H. Hagemann

15:25 - 15:50

Gramazio P., Borràs D., Vilanova S., Plazas M., Herraiz F. J., Prohens J.

Evaluation of genetic diversity and relationships in African eggplants using EST-SSR markers

15:50 - 16:15

Röper A. C., Christensen B.

Intergeneric hybridization between advanced *Spinacia oleracea* and *Beta vulgaris* to enhance product quality of *Spinacia oleracea*

16:30 - 17:00

Conference closing and prize giving



Soil and Water Management Strategies for Enhancing Cacao Productivity, Food Security and Adaptation and Resilience Building in the Frame of Variable Climate/Weather

Agele, S.O.* , Famuwagun, I.B., Aiyelari, O.P., Ogunleye, A.O. & Charles, E.F.

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Within the cocoa-growing belt of West Africa, sale of cocoa beans is a major foreign exchange earner making up for about high per cent of the total foreign exchange earnings. In the cocoa-growing belt, changing environmental conditions (marginal soils and extreme weather events) along the ecological transect of wet to moist forests, impose constraints on cacao growth and productivity. However, there is increasing need to expand the land area for cocoa cultivation and increases in productivity to meet global needs for cacao beans. It is imperative to develop climate-smart adaptive strategies for the fruit tree-based agroforestry systems of the humid tropics in the wake of changing climate/weather conditions. The effects of densities of plantain shade and irrigation regimes (5 and 10 days interval) for enhanced survival, field establishment and development of cacao seedlings on the field was investigated. Shade regimes (open sun, moderate and dense shades) affected the gradients of microclimate, canopy characteristics and light integrals of dry season field-grown cacao seedlings. The characteristics of cacao canopy development was measured by leaf area index (LAI), canopy extinction coefficients (k), intercepted photosynthetic active radiation (PAR), higher LAI and radiation use efficiency (RUE) improved for the irrigated unshaded (open sun) compared with moderate and dense shade treatments. For the non-irrigated moderately shaded cacao, about 30% of the transplanted seedlings survived and the achievable percent survival from the various shade-irrigation combinations ranged from 47 – 90 %. Open sun in combination with 5-day irrigation interval promoted growth and development of cacao in the dry season. Shade-irrigation combinations ameliorated microclimate and enhanced growth, seedling survival, flowering/ fruiting and bean yield. Drip irrigation strategy should be adopted to ameliorate dry season terminal drought (hydrothermal stresses) effects on cacao survival and establishment. Shade-irrigation combinations adopted are a veritable tool for scaling up for adoption by small holder cacao farmers of the humid tropics. Shade and irrigation strategy is a useful input to mainstream adaptation/resilience to changing climate and extreme weather conditions.

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Production of Lisianthus (*Eustoma grandiflorum*) Cultivars Under Different Shades

Akhtar M.*, Akbar Anjum M.

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Lisianthus (*Eustoma grandiflorum*) is perennial plant but also grown as annual. The effects of shading on flower yield, quality and plant growth were assessed in four Lisianthus cultivars. The experiment was laid on RCBD with three treatments and three replications along with one as control. Shading with green nets of 30%, 50% and 70% reduction in light intensity were fixed on experimental units for period of 90 days with one as without shade (control). The results showed variable affects the 70% Shade level delayed flowering maturity as compared to control. The 50% shade reduction caused reduction in stem length and diameter. The yield was also reduced significantly in 70 % and 50% shade levels maximum 30% reduction was recorded in 70 levels. Shading also prolonged flowering time up to 30 and 22 days to 50% 30 levels respectively.

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Role of Green Spaces in Women Psychological Wellbeing and Health

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²Institute of Horticultural Sciences, University of Agriculture, Faisalabad 38000, Pakistan

Green spaces play a vital role in the development of the urban environment by providing opportunities to urban dwellers to be closer and cohesive to nature. This project was initiated to sort out the potential contribution of parks and green spaces in women health and psychological wellbeing. The research sort out the certain psychological and health issues faced by women of Faisalabad city (Pakistan). Two areas of Faisalabad city: Jinnah Garden and University of Agriculture Faisalabad were selected for this study, women of both areas were interviewed on structured format regarding study objectives. Specifically focused on certain curative impacts of green spaces such as recovery level and reduction in medicinal requirement in certain ailments like hypertension, diabetes, cardiac and muscular issues. The highest recovery effect was observed in diabetes and hypertension 29 and 27%, respectively. Similarly psychologically stressed and anxiety patients recorded 58% healing and soothing effect. So far as the recovery level was assessed by reduction in medication use by 44% respondents. To seek out the conclusive curative effect of green spaces/ parks, 67.61% respondents showed an optimum level to cure their acute ailments. The research also emphasized on women perception about the problems associated with planning and development of such places and possible remedial measures.

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Effect of Different Type of Polythene on Quality and Shelf Life of Tomato (*Lycopersicon esculentum* L.) at Ambient Condition (25°)

Ali M. K.*, Moniruzzaman M., Baree M. A., Borkatulla M. A. B., Ferdous S., Abdul Hye M.

Rajshahi University

An experiment was conducted at Natore district during from March to April 2013 to study the effect of polythene bag on shelf life of tomato. Significant variation was found due to the combined effects of different color and types of polythene bags at room temperature (25°C) in respect of time required for ripening of tomato and weight loss percent of tomatoes. Control treatment showed the sign of full ripening after 9.67 days where as black sealed treatment took 12.00 days. Control treatment showed the highest weight loss (19.41%) where as it was the lowest (8.9%) in black sealed polythene. There were non-significant variations among all the treatments in case of total soluble solids (TSS), acidity and pH. Significant variation among the treatments resulted from the combination of color and types of polythene in respect of moisture content, percent of dry matter and shelf life. The highest moisture content (94.13%) was recorded in black sealed polythene and the minimum moisture content (82.87%) in white and transparent with perforated polythene. White and non transparent polythene with sealed condition showed the highest dry matter content (17.13%) whereas the lowest dry matter was in black sealed (5.87%). The highest shelf life (28.89 days) was recorded in black perforated polythene and the lowest shelf life (14.33 days) in control.

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A Novel Instrumented Sphere for Acceleration Measurements During the Mechanical Harvest of Grapes

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The use of the harvesting machine for grapes harvest has the limit of the production of must coming out from the detachment of the berries that could reflect negatively on the quality of the final product. It depends on many factors including grapes variety, ripeness and frequency of the shakers of the harvesting machine. The shaking frequency generally adopted (number of strokes / min) is the one that achieves the maximum harvest efficiency, that means high work capacity and low grape juice production. The breaking of the harvested berries causes the trigger of some biochemical processes that can negatively affect the characteristics of the wine. In this paper, the authors present a new system to measure the accelerations received by the grapevine during mechanical harvest with the aim of evaluating the influence of the shaking frequency on the quality of wine. The device is an instrumented sphere designed and implemented by the Agricultural Mechanics Section of the Department of Agricultural and Forest Sciences, University of Palermo, Italy. It contains a triaxial Micro Electro-Mechanical Systems (MEMS) sensor capable of acquiring acceleration from a few mg to 400 g (where g is the gravitational acceleration). The field tests were carried out in September 2015 on Viognier and Grillo grapes. They allowed to measure the accelerations on the plants during mechanical harvesting with three different frequencies of shaking and then to evaluate their influence on the main quality characteristics of the musts obtained.

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Micropropagation of *Eryngium viviparum* J. Gay: a New Way to Recover this Endangered Plant with Potential in Pharmacology

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Eryngium genus is well-known worldwide due to its properties as medicinal plant being used for hypertension, asthma, fevers, gastrointestinal problems, malaria and so on. These plants are very rich in several organic compounds such as flavonoids, tannins, saponins, triterpenoids and alkaloids, all of them with great potential in pharmacology. However, several species of *Eryngium* are endangered, and their extinction would mean the loss of important drugs for human disease. *Eryngium viviparum* (Apiaceae) is a small biennial plant that grows in areas subject to seasonal flooding in the NW of Spain and France. *E. viviparum* is classified as endangered. Then, previously to any study about their medicinal properties, it's necessary to increase the population of this plant. For this purpose, *in vitro* plant tissue culture represented a new way to get a massive amount of new plants. Even more, using this technology it could be obtained enough plant material to reintroduce micropropagated plants in their habitat to increase their natural population and at the same time, to extract phytochemicals with pharmacology interest at due amount. Due to the lack of information about the *in vitro* culture for this species, we designed a micropropagation protocol, and firstly evaluated the effect of two phytohormones (6-benzyladenine (BAP) and kinetin) at different concentrations (1, 1.5 and 2 mg l⁻¹) on shoot proliferation during the multiplication stage of *in vitro* culture. The highest rate of multiplication (number of new shoots per shoot; 2.47±0.77), were achieved with the MS medium supplemented with 2 mg l⁻¹ BAP.

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Antioxidant Profile of *Stevia rebaudiana* Bertoni Cultivated in Portugal and Submitted to Different Conservation Conditions

Barroso M.*^{1,2}, Barros L.^{1,3}, Rodrigues M.A.¹, Sousa M.J.¹, Santos-Buelga C.², Isabel. Ferreira I. C.F.R.¹

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²*GIP-USAL, Facultad de Farmacia, Universidad de Salamanca, Spain*

³*Laboratory of Separation and Reaction Engineering (LSRE), Associate Laboratory LSRE/LCM, Polytechnic Institute of Bragança, Portugal*

The demand for natural sweeteners has been gaining more and more importance due to the great controversy associated with the use of some synthetic sweeteners as cyclamates, aspartame and acesulfame-K. The steviol glycosides (E 960) are a group of natural sweeteners of generalized use; these compounds are obtained from *Stevia rebaudiana* Bertoni, a sweet plant native from South America (Carocho et al., 2015). However, *Stevia rebaudiana* Bertoni may have other uses to be exploited, in particular due to its antioxidant capacity. This plant is already produced in Portugal but it is important to evaluate if the plant chemical composition is maintained regardless of culture conditions. Therefore, in this study, stevia samples were cultivated in Bragança (north-eastern of Portugal) in a field trial with defined culture conditions. After harvesting, the plants were submitted to two different treatments: kept fresh by freezing (-20°C) and oven-dried (30°C). The antioxidant profile of the samples was studied through evaluation of free radicals scavenging activity, reducing power, phenolic compounds (HPLC-DAD-ESI/MS), tocopherols (HPLC-fluorescence) and free sugars (HPLC-RI). Significant differences were observed: while oven-dried samples showed the highest antioxidant activity and phenolic compounds concentration (mainly 5-*O*-caffeoylquinic acid and 3,5-*O*-dicaffeoylquinic acid), the frozen fresh samples had the highest values of total tocopherols and total sugars. These results confirm that the plants grown in Bragança have excellent bioactive secondary metabolites responsible for the observed antioxidant capacity.

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***Stevia rebaudiana*: a Study in the Volatiles Profile from Plants Grown in the Field in the Greenhouse and Micropropagated *in vitro*.**

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²*Center for Environment and Marine Studies (CESAM), Faculty of Science, University of Lisbon, Center for Plant Biotechnology, Lisbon, Portugal*

Stevia rebaudiana Bertoni leaves are natural sources of steviol glycosides, which are used commercially for sweetening and flavouring foods and beverages. Steviol glycosides are natural sweeteners constituting an alternative to synthetic compounds like cyclamates or aspartame. *S. rebaudiana* has been produced mainly for its stevioside compounds but it contains other metabolites with potential therapeutic benefits such as alkaloids, hydroxycinnamic acids, oligosaccharides or essential oils. The chemical profile of samples development by micropropagation or in green house or in field conditions, should be characterized to ensure the quality of the samples supplied by *Stevia* producers. Multiplication rate and fresh weight were determined for plants micropropagated in two different culture media (medium A - Murashige and Skoog (MS) without hormones and sucrose), (medium B - MS with 0.5 mg.L⁻¹ of kinetin and 20 g.L⁻¹ of sucrose). Apart from spontaneous rooting rate determination, induction of plant rooting by auxin shock, using indole-3-butyric acid (IBA) (2 mg.mL⁻¹), was also evaluated. Acclimatization in greenhouse was performed with hydro atomization nozzles working every 10 minutes. Plants on the field were fertilized by a nutrient solution with N, P₂O₅, K₂O and B. The essential oil yield was determined for plants in all conditions (*in vitro*, greenhouse, field) using a Clevenger-type apparatus. Volatiles were isolated using a Likens-Nickerson apparatus and analyzed by GC-MS. The *in vitro* multiplication rate was 300% per month and the fresh weight after a 4 week subculture was 0.9 g. Spontaneous rooting rate was less than 4% after 4 months but induced rooting achieved 30% of plants with developed root system after 1 week and 70% after 2 weeks. Acclimatization rate was 100% after 2 weeks. The essential oil yield was <0.06% for all samples. Volatiles identification revealed identical composition in all samples, with α -pinene (11-31%), bicyclogermacrene (5-19%), *trans*- β -farnesene (7-15%), β -elemene (6-10%) and β -caryophyllene (3-10%) as major compounds. Quantitative differences were noteworthy.

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The Competitive Advantage of the Tunisian Palm Date Sector in the Mediterranean Region

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In Tunisia, date-palm cultivation and production are of clear strategic importance in terms of economic, social and environmental development. However, the globalization of markets has had a huge impact on the traditional concept of the comparative advantage enjoyed by Tunisia in date exports, highlighting the necessary determinants for competitiveness in the international scenario. In fact, an analysis of the competitive advantage of the Tunisian date industry in the Mediterranean area and Iran over the last 20 years shows that Tunisia is still the main supplier of dates to the EU. The Deglet-Nour variety, in particular, puts Tunisia ahead of traditional competitors such as Algeria and Iran, with average of competitiveness indices as BIS 6405.98 ID 17.38 CMS 41.03 and TBI 99.50 are more stable than those countries during the studied period. But it is currently facing new competitors like Israel and re-exporting countries like France. New business strategies (conditioning, new non-chemical treatments, packing, opening new markets, new distribution channels) would be positive responses to tackle current market limitations, the emergence of new producers and restrictive EU policies.

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Factors Affecting Fruit Set and Early Flowers/fruit Drop in Avocado (*Persea americana* Mill.)

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One of the main limitations for the world production of avocados is the massive abscission of flowers and early fruit drop in the first two months after flowering. An avocado tree can produce up to a thousand of panicles and each of them, can be constituted by about 100 flowers with a production of more than a million flowers but only 0.015% will arrive at fruit set. The aim of this work was to study how the nutritional competition during vegetative and reproductive development determines the survival of flowers/fruits and the role of gibberellins in this process. The experiment was carried out in Llaurí (Valencia, Spain) using eight 6 years old avocado (*Persea americana* Mill.) trees, cultivar Hass. In particular, it was studied the flowers/fruits drop evolution in relation to the vegetative development and the evolution of the nutritional content (gluc-6-phos, sucrose, glucose, galactose, fructose, perseitol) and hormonal content (GA_9 , GA_{51} , GA_{19} , GA_{20} , GA_{29} , GA_8) during this period. The results showed that the abscission of reproductive structures (flowers/fruits) is not caused by nutritional competition between shoots and flowers/fruits or between flowers and fruits but by environmental conditions and no-fertilization due to dichogamy. Moreover, a crucial role is played by the action of gibberellins on the survival of reproductive structures in the early stages of development. The exogenous application of gibberellic acid (GA_3) ($50 \text{ mg} \cdot \text{L}^{-1}$) at the time of fruit set increased approximately 30% of the harvested fruits.

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The Comparison of the Growth of Mycelium of Several Strains of *Pleurotus pulmonarius* (Fr.) Quél. on Various Substrate with Straw

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Pleurotus pulmonarius is cultivated on commercial scale almost all over the world. The aim of the study was selection the substrate on which the mycelium growth will be the fastest and the mycelium hyphae will have the best quality. In the experiment, five strains of *P. pulmonarius* (B18, B42, B47, B51 and B76) were used. The experiment compared the growth of mycelium on substrate with wheat straw (control sample) and substrate with wheat straw and the addition of hemp shives in growing amount: 10, 20 and 30%. The measure of mycelium growth was the length of the substrate in biological tube overgrown by hyphae after 7 and 14 days of incubation. The results of the conducted experiment showed the growth of mycelium of tested strains on different substrate varied. The best growth of mycelium in all strains after 7 days of incubation occurred on substrate with wheat straw and the addition of hemp shives in an amount 10%. The weakest growth of mycelium in all cultivars after 7 days of incubation occurred on substrate with wheat straw and the addition of hemp shives in an amount 30%. The best growth of mycelium in all strains after 14 days of incubation occurred on substrate with wheat straw and the addition of hemp shives in an amount 20%. The development of low-cost and simple method for the production of *Pleurotus pulmonarius* can contribute to the introduction of this species into intensive cultivation in Poland. Use of waste materials in mushroom production will significantly increase the profitability of the crops and reduce its costs.

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The First Fruit Germplasm in Afghanistan

Dehqan G.R.*

Horticulture Research Farm

The project is in line with the objectives of the Ministry of Agriculture, Irrigation and Livestock to contribute to poverty alleviation for the rural population as expressed in the Agriculture Master Plan. This is establishing for identifying fruit Germplasm and fruits evaluation. Since I starting with the PHDP Afghanistan, I registered 1546 nurseries in all Afghanistan with total 15,000,000 saplings. We successfully registered and collected 850 fruits varieties and add in collections. According protocol for Distinctness, Uniformity and Stability Test description I am evaluating more than 300 fruits characteristics with my staff continue working with this project as horticulturist. And also I Manage the fruits germplasm according to procedures and continue description and observations as per given standards. The specific objective of the project is to develop a demand oriented and export led perennial horticulture industry. The project will create a core of knowledge for the perennial horticulture industry in Afghanistan, centered on knowledge of the best varieties and the best growing techniques to help in the development of a high quality export horticulture industry that responds to the requirements of customers in those countries that are requirements of customers in those countries that are willing to pay high prices for Afghan fruits and nuts. The project has completed the collection of all the fruit and nut varieties in the country. This collection is intended as a permanent resource for the benefit of everyone working in horticulture in Afghanistan. Once the varieties are collected and catalogued, the value of the varieties will be assessed, and the project will be able to make recommendations to orchard growers on which varieties will best suit their different markets and different climates and growing conditions. The project aims to be one of the key players in the development of the horticulture industry in Afghanistan.

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Influence of Seaweed-derived Biostimulant on ‘friariello’ Growth, Photosynthesis and Nutrition Value Under Nutrient Stress

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Fertilizer use in modern horticulture is highly inefficient, because much of the applied mineral nutrients is released into the environment. A sustainable tool in which fertilizer use can be reduced without detrimental effect on plant nutrition is to improve crop nutrient uptake using plant biostimulants (PBs). (PBs) correspond to ‘any substance or microorganism applied to plants with the aim to enhance nutrition efficiency, abiotic stress tolerance and/or crop quality traits, regardless of its nutrients content’. Among these substances seaweed extracts have now gained importance as PBs in horticulture. The aim of the current research was to assess plant growth parameters, leaf gas exchange, SPAD index, hunter colour, leaf mineral composition and nutrition value such as antioxidant activities, vitamin C and phenols of greenhouse “friariello” (*Brassica rapa* L. subsp. *sylvestris* L. Janch. var. *esculenta* Hort.) either untreated or treated with a biostimulant produced from a brown seaweed, *Ecklonia maxima* (Kelpak). Root application was adopted by supplying 100 mL of solution at a concentration of 3 ml L⁻¹ into the growing medium at weekly intervals. “Friariello” plants were grown under three nutrient solution concentrations 2, 1 or 0.5 dS m⁻¹. The plant growth parameters, photosynthesis and mineral composition decreased under quarter-strength solution (0.5 dS m⁻¹), with no significant differences between the full and half strength solutions. The root application of seaweed extracts increased some quality traits, the fresh yield, dry biomass, SPAD index in comparison the control. This was associated with an improvement in nutritional status and an increase in the photosynthetic activity. Overall, the application of biostimulants may be considered as a sustainable tool to obtain higher yield and product quality with less impact on the environment.

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Study on Biometrical Indicators of Fresh Fruits of Bulgarian and Introduced Plum Cultivars of *Prunus domestica* L.

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The study was conducted in the period of 2014 - 2015 in the collection plantation in the Experimental Station of Dryanovo, Bulgaria. The object of study was fresh fruits of Bulgarian cultivars - 'Gabrovska', 'Gulyaeva', 'Strinava', 'Balvanska slava' and the introduced cultivars - 'Opal', 'Ontario', 'Hramova renkloda', 'Althan's Gage', 'Čačanska lepotica'. 'Stanley' was used as a control cultivar. The following indicators were observed: fruit mass (g), stone mass (g), stone percentage in relation to fruit weight; fruit size – fruit height, fruit width and fruit thickness (mm); dry matter content (%). 'Balvanska slava' had the highest fruit weight - 37.24 g. and 'Opal' had the lowest - 20.54 g. 'Opal' had the lowest percentage of fruit stone in relation to fruit weight- 2.82%, and the highest value was for 'Stanley' cultivar - 4.91%. Fruit height was from 33.26 mm for 'Opal' to 47.80 mm for 'Balvanska slava'. The largest width was found in Althan's Gage fruits - 41.02 mm, and the smallest width for 'Opal' - 30.40 mm. The fruit thickness was the largest again for Althan's Gage - 40.80 mm and the smallest thickness was for 'Opal' - 30.46 mm. It was found that dry matter content was the highest for 'Gulyaeva' cultivar - 21.94%, followed by 'Strinava' cultivar - 21.40%. The results show that the Bulgarian cultivars have very good physiological indicators, which are close to the popular introduced plum cultivars.

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Tropic Fruit Consumption in Turkey

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The interest in having a healthy and balanced diet has been increasing over the past few decades and due to this phenomenon the consumption of fruits and vegetables that are low in calories and rich in nutrients has changed. The emergence of some disease prevention and aftercare properties of fruits and vegetables also has an effect on these changes. Because the consumption of fruits and vegetables that are low in fat, sugar and sodium can help reduce the risk of some types of diseases, daily consumption of 400 g of these fruits and vegetables is recommended by the WHO. These developments helped consumers to change their habits and new products to take their places in shelves and tables. While kiwi, avocado, pineapple, coconut, pepino, cashew nuts and mango are among the products that we became familiar with; papaya, pomelo and guava has entered the market in Turkey recently. In this study, in order to determine the consumption of these tropical fruits, an advanced data analysis was performed with the data obtained from 387 households. The factors that affect the recognition, consumption and purchase frequency of tropical fruits were determined by surveying the perception and attitude of the consumers. High recognition rate of tropical fruits (83.7%) was found. Except bananas and kiwi fruit, pineapple (42.4%), coconut (17.3%) and avocado (14.7%) were the most consumed fruits. The high price of tropical fruits is the biggest reason for not consuming these products. In this study, household health, nutrition and eating habits were established as well.

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Molecular Evidence of the Presence of Quarantine Citrus Pathogens in the Main Algerian Citrus Growing Areas Predicts a Risk on the Citrus Patrimony

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Citrus represent one of the most important fruit crop in Algeria, covering a total of ca. 70.000 ha and a production of ca. 900.000 tons of fruits. In addition, the country established a rich citrus varietal collection including 178 varieties, thus, representing inestimable genetic resources for the Mediterranean area. This collection is located in the Mitidja area that represents one of the main citrus growing regions in the northern part of the country where several quarantine pathogens, such as *Citrus tristeza virus*, and *Spiroplasma citri*, the causal agents of citrus tristeza and stubborn disease have been identified. Monitoring in this area has been conducted by using new developed serological techniques (DTBIA) and molecular assays (PCR) for the detection of both pathogens. In this context, around 3000 citrus trees were inspected for the presence and distribution of these pathogens in the region. These surveys evidenced a high incidence of CTV infection (25%), whereas lower was the incidence of the *S. citri* infected trees (2%) in this area. The detected strains of CTV shared a high nucleotide identity with the Spanish CTV mild isolate T385, whereas the detected *S. citri* revealed high nucleotide identity with the Iranian Fasal strain and the Moroccan strain (GII3), both of them were responsible of severe epidemics in some Mediterranean countries. In order to avoid the dispersal of these diseases and preserve the citrus patrimony in the country, several preventive measures such as the use of healthy propagating material, sanitation procedures, vectors and disease monitoring were taken by the governmental and scientific institutions.

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Ozone Application to Control black Aspergilli and Ochratoxin A Contamination of Turkish Raisins

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Raisins are an important product in Turkey, but they are target for numerous fungal contaminants, some of which proliferate during the drying phase. Among the possible contaminants, fungi play a key role, in particular the black Aspergilli group, which produce a toxic secondary metabolite; Ochratoxin A (OTA). Several methods have been used to control these fungi, but none of which has been significantly effective. In this work we isolated black Aspergilli from Turkish raisins samples, and we found that 15.2 % are *Aspergillus carbonarius*. The 33% of the *A. carbonarius* isolates are able to produce OTA. We investigated the effect of ozone (O₃) treatment in controlling the growth of black Aspergilli and OTA production by using three doses: 50, 100, and 150 ppm for two hours. The evaluation of the O₃ effect was conducted by analysing the number of colony forming units (CFU) and OTA production. The results obtained showed a significant difference between treated and non-treated samples, and the O₃ treatment at 50, 100, and 150 ppm reduced the fungal growth by 28,62%, 34,42% and 36,23% and the production of OTA by 66,35%, 67,60% and 69,38% respectively. However, no significant difference among O₃ treatment doses was found. Ozone treatment appears to have good potential to be for a good means of controlling fungal growth and OTA production in raisins.

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Field Variability in Fruit Quality and Storability of Greek Apple Cultivar ‘Pilafa Delicious’

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We studied the quality and storability of ‘Pilafa Delicious’ apples from four commercial orchards with different characteristics at Tripoli area (southern Greece): organic orchard with mature trees (D); conventional orchard with mature trees (S) (both cup-shaped); 8-year-old intensive orchard on MM106 rootstock (K); and 8-year-old intensive orchard with rootstock EM9 (M) (both palmette formed). Fruit were treated or not with SmartFresh (625 nL L⁻¹ 1-MCP) after harvest. Fruit quality was evaluated as external appearance, skin color, organoleptic and nutritional quality at commercial harvest and after storage at 0 °C and 90-95% RH for up to five months plus four days shelf-life. Fruit quality changed similarly to other apple cvs during storage and shelf-life with partial change of their skin color (better parameters a* and Hue), reduction of flesh firmness and juice acidity and partial increase of soluble solids (SSC), total phenolics and DPPH antioxidant capacity (DPPH). Apples treated with 1-MCP had similar skin color, SSC and DPPH, but higher flesh firmness, acidity and total phenolics than control apples. The four apple orchards studied showed significant differences in fruit quality and storability. It is concluded that fruit quality of ‘Pilafa Delicious’ apples was significantly affected by one or some of the factors: cv clone, rootstock, production method and yield, while 1-MCP maintained the fruit quality in this variety for at least five months in air cold storage.

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Evaluation of Genetic Diversity and Relationships in African Eggplants Using EST-SSR Markers

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Although common eggplant (*Solanum melongena*) is globally the most important cultivated eggplant, in many parts of Africa scarlet (*S. aethiopicum*) and gboma (*S. macrocarpon*) eggplants are widely used. Little information is available on the genetic diversity of these eggplant crops. In order to assess the genetic diversity relationships in African eggplants we have used 12 EST-SSRs markers in 47 accessions belonging to *S. aethiopicum* (n=37), *S. macrocarpon* (n=6) and its respective wild ancestors *S. anguivi* (n=2) and *S. dasyphyllum* (n=2). In addition, one *S. melongena* and its close wild relative *S. incanum* accessions were included in the analysis. Eleven out of 12 EST-SSRs amplified successfully and generated 51 alleles, with a range of two to 7 alleles per locus. Polymorphic information content (PIC) presented an average value of 0.36, ranging from 0.07 to 0.64. The mean observed heterozygosity (H_o) presented a very low value ($H_o=0.03$), while the mean expected heterozygosity (H_e) had a value of $H_e=0.39$, which suggests a high degree of fixation, probably resulting from autogamous reproduction. The principal coordinates analysis (PCoA) separates the accessions in three main groups corresponding to the three cultivated species together with their wild relatives. We can also observe that the *S. aethiopicum* cultivar groups (Aculeatum, Gilo, Kumba and Shum) were not clearly separated. The results reveal that a great variation exists in the African scarlet and gboma eggplants, which is of interest for the conservation and genetic improvement of these neglected crops.

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Air Stimuli Induce Compact Plant Growth

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The Section of Crop Physiology of Specialty Crops at the University of Hohenheim in cooperation with the State Horticultural College and Research Station in Heidelberg is trialling a forced air device, constructed by the company Knecht, Metzingen, Germany, for inducing compact plant growth. With this system, greenhouse crops are treated by moving a nozzle guided flow of pressurized air (1-1,5 bar) for 3-4 hours and 60-80 passages per day over the plant stand, starting at 7 am. The main goal of this project is to avoid or at least reduce the use of synthetic plant growth regulators (PGRs) in greenhouse cultivation of ornamentals and to completely replace these compounds in the production of herbs, where the use of PGRs is prohibited in Germany. Throughout an experimental period of two years we could clearly demonstrate that plants (e.g. tomato, creeping bellflower) treated with this mechanical device had shorter but thicker main shoots, a greater number of side shoots and lateral buds as well as an enhanced root system when compared to control plants. We attempt to elucidate the underlying physiological mechanisms that are associated with the observed morphological changes. A physiological explanation mainly involving plant hormones, specifically ethylene, auxins and cytokinins, will be presented at the Symposium.

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Effect of Pruning severity on Yield and Fruit Quality of two Mandarin Cultivars

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The present study was carried out during two consecutive seasons (2014 and 2015) at a private orchard located in Wadi Almollak, Ismailia Governorate, Egypt on 5 years old Murcott and Fremont (*Citrus reticulata* Blanco) mandarin cultivars to elucidate the effect of pruning severity on yield and fruit quality. The results indicated that pruning treatments induced a significant increase in yield in both cultivars in comparison to those of control. In this regard, pruning 50% gave the highest values of yield in compared with those of other treatments and control. The physical fruit characteristics of Murcott and Fremont trees significantly increased in response to pruning in comparison to control. Murcott mandarin was superior to Fremont variety regarding fruit weight and volume. Pruning improved the fruit chemical characteristics of Murcott and Fremont in comparison to control. Maximum TSS (%) and TSS/acid ratio in fruit juice of Fremont was gained with moderate pruning. The highest V.C content was produced with the heavy pruning treatment.

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Improving Quality of Micropropagated Baby Kiwi (*Actinidia arguta* var Issai) Plantlets Using a Neurofuzzy Logic Approach.

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Mineral nutrition is a key factor in *in vitro* plant tissue culture. In fact, almost each cultivar needs a specific medium for an adequate micropropagation. The selection of an optimal medium takes too much time because of the mineral composition complexity. Usually, traditional statistics to analyze and understand the factors affecting this complex processes have been used, but the outputs obtained are very difficult to understand and not clear conclusions can be drawn. Recently, artificial intelligence tools, such as fuzzy logic, have been proposed as alternative to those classical statistics tools. Our group has been pioneer on using the neurofuzzy logic approach to model complex plant processes. In this study, a large database including all the mediums used in the *Actinidia* genus has been built to investigate the effect of the mineral ions on kiwi plants quality (health) and callus formation, and to use the information obtained to design a new media optimized for *Actinidia arguta* var Issai. The resulting model obtained by neurofuzzy logic have pinpointed the importance of some ions alone, such as PO_4^{-2} , and the interaction of some others, such as $\text{NO}_3^- \times \text{Ca}_2^+$ and $\text{Cl}^- \times \text{NH}_4^+$ in the formation of high quality shoots and in the reduction of callus induction. In conclusion neurofuzzy logic can be considered as an efficient tool to analyze and extract information of the very large and complicated databases, and to assess and understand more easily the effect of ions on plant micropropagation.

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Elicitors Can Increase Tomato Tolerance to High Temperature

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Nowadays, agriculture is facing major challenges that make it necessary to consider some factors more systematically, especially those that contribute to an increase the resilience in crops, particularly related to abiotic stress and traits associated with improved plant performance under adverse conditions. High temperature is one of the factors related to global climate change that may largely affect productivity and the quality of tomato as these suffer flower abortion and limits fruit set under high temperature. Elicitors are molecules that rapidly activate a range of plant chemical defences when translocated to plant tissue. The plant response induced by the application of an elicitor, can affect tolerance to other non-related abiotic or biotic stresses. In this study, the effect of different elicitors: Salicylic acid (SA), methyl jasmonate (MeJA), chitosan (CH), 2,4-epibrassinolide (BR) on productivity and the nutritional quality of tomato cultivated under high temperature. Treatments with SA and BR increased fruit total yield, as a result of increasing fruit number but no significant effect was observed in fruit weight, regardless of the treatment. In addition to this increased yield, BR treatment did not affect the concentration of the main carotenoids, vitamin C or phenolic compounds, and SA increased the concentration of lycopene, compound related to the red colour of tomato fruits which has recognized health-promoting properties. The results show that the application of elicitors could be considered a potential tool to increase the resilience of tomato under increasing temperatures by improving fruit yield and nutritional quality.

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Promising Nectarine Cultivars from Crimea

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The nectarine is one of the most important fruit species grown in many regions all over the world. This article reports the main agronomic (as disease susceptibility, productivity, ripening time) and qualitative characteristics (as sugar content, acidity, firmness, color) of three yellow nectarines selected in Crimea. The study was conducted in 26 consecutive years (1980-2015). Control cultivar for comparison was ‘Super Crimson Gold’. We used the ‘Le Grand’ cultivar as mother plant and the cultivar ‘Nectaheart’ as pollen donor plant in our breeding programme, and obtained the ‘Rubinovy-7’ cultivar. Cultivar ‘Nikitskiy-85’, was developed from cross between the cultivars ‘Nikitskiy Zheltyiy’ and ‘NIC-19’. ‘Kryimtsuht’ was selected from seedlings of self-pollination nectarine cultivar ‘Krymchanin’. Cultivars were obtained by intraspecific crossing using classical breeding techniques. These cultivars had high quality fruits to be used for fresh consumption and processing, and their fruit weight was higher than 200 g. The taste is sweet. Aroma is very pleasant. The flesh of ripe fruits is tender and juicy. Tested cultivars were productive and precocious. Flowering is late and abundant. The trees were grafted on GF 305 and GF 667 rootstock, *Amygdalus communis* L., *Prunus cerasifera* Ehrh. and planted at the distance 4,0x3,0 m. The trial was established in five replications (1 tree per replication). Overall, cultivars ‘Nikitskiy-85’, ‘Rubinovy-7’ and ‘Kryimtsuht’ were found as promising in terms of examined characteristics.

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The Low-Susceptible to Powdery Mildew Peach Cultivar Bred by Nikita Botanical Gardens

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Nikita Botanical Gardens (Crimea, Yalta), as a participant of the state programme for the developing of new crop varieties, use for this purpose its comprehensive peach gene pool collections. Developing the low-susceptible to powdery mildew peach cultivars is one of the most important directions of these activities. The powdery mildew (*Sphaerotheca pannosa* Lev. var. *persicae* Woronich.) is one of the most common fungus peach diseases. It affects the leaves as well as the shoots and fruits. In the Crimea its first sign (flour-like white deposit) emerges in June, in dry and hot weather after rainy days. Strong powdery mildew affect may result in the fruit deformation, premature leaves fall and reduction of yields. Developing peach cultivars with higher resistance to this disease allows to reduce the expenses for fungicide sprays, to maintain the fruits with high market quality and to get the ecologically clean production. Researches of peach resistance to powdery mildew has been carried out between 2007 and 2015 in collections of Nikita Botanical Gardens. As research object served cultivars bred by Nikita Botanical Gardens. The cultivar Redhaven was used as the standard. Thanks to long lasting monitoring the cultivars with a low susceptibility to powdery mildew (from 10 up to 25 per cent leaves affection tree crown) has been selected. They are Krymskaya Osen, Lakomy, Karnavalny, Yubileyny Ranny, Yuzhnaya Garmoniya and Demerdzhinsky. These cultivars have got such features as stable yields, as well as large fruits, and their good taste- and commercial properties.

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Impact of Composted Waste Paper Casing in *Coprinus comatus* Cultivation

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Casing material is crucial element of obtaining high quality yield in cultivation of *Coprinus comatus*. In commercial cultivation, carpophores appear on the surface of casing material covering compost after germination phase. Peat, as the most common casing material is “slow-renewable” factor and its geographic availability is limited. Recently use of alternative cheap and easily available casing material is investigated. The objective of investigation was to evaluate applicability of casing material from composted waste office paper supplemented with AD liquid fraction as an addition to peat and its impact on yield and carpophores dry matter content. Two cultivation composts were used, conventional wheat straw-chicken manure compost and compost of Straw-Paper-Digestate. Casing material on conventional compost was peat, three investigated casing material contained different amount of composted paper mixed with peat 15, 25 and 35% respectively. The waste office paper was shredded and soaked with liquid fraction of digestate from AD food waste biogas production and composted for 30 days. Yield, dry matter content and chemical composition of fruiting bodies depended on the investigated casing material. The yields within three casing combinations were similar (from 250-370 g/3kg of cultivated substrate) and were much higher than the control (97 g/3kg). The carpophores dry matter content was from 6-16%. Casing was investigated in terms of dry matter, organic matter, micro and macro elements as well as heavy metals. Results of experiment shows the composted waste paper could be used as alternative casing material in cultivation of *Coprinus comatus*.

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Innovative Ways of Feeding Honey Bees in Poland

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Honeybees are an important part of our environment. The work that does not produce bee products but above all leads to pollinate plants. This process is the foundation for human life, because without pollination would not be so well developed agricultural economy and apiary. Given the role of bees, they play in the ecosystems they began to be interested in the intensification of the economy apiary feeding through more effective social insects. The problems of this issue affects all breeds of bees reared in the world. It is the nature of the products included in the feed, syrups and cakes make the whole series of factors determining the efficiency of the economy apiary. The most important is the health of families, which in a further step gives us the expected results of work, or products, development of colonies, longevity, resistance to poisoning and disease. The paper presents an innovative method of feeding honeybees in Polish, which indirectly affects the development of the economy apiary and agriculture but also plays an important role in gardening and seed. We analyzed the possibility of using the products used in the feeding of the bees in the feeding of other animals and also in the formation of compost. One such component is even *Yarrowia lypolitica* out there that are very well-known ingredient in animal feed. Their widespread use caused an innovative composition that has been given the job. It also presents the results of research using yeast in horticulture, vegetable growing and animal nutrition.

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The Physiological, Metabolic and Molecular Basis for Biennial Bearing in Apple (*Malus domestica*)

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The biennial bearing behavior in apple (*Malus domestica*) is characterized by high production of small sized fruit in the ON-season followed by low or no yields in the subsequent OFF-season. This cropping irregularity is usually managed by chemical, mechanical or manual thinning methods. One of the major factors causing biennial bearing in apple is believed to be the overlap of flower bud formation for the subsequent season and fruit development during the current season which suppresses floral development by hormonal control and carbohydrate limitations. However, the specific signals, which trigger flower bud formation, is still largely unknown. This study is part of an interdisciplinary research project aimed at increasing our knowledge on the genetic, physiological and metabolic underlying mechanisms of biennial bearing in apple. Therefore, buds on 2-year-old spurs were collected from the apple cultivars Fuji, Gala and Golden Delicious with different degrees of biennial bearing behavior. Half of the trees were set to 'OFF' bearing status by removing all flowers by hand at balloon stage, whereas the other half consists of trees which were naturally in 'ON' bearing status. Buds were sampled weekly from four weeks until 19 weeks after full bloom. At each sampling date, five buds for RNA extraction, two buds for histology and 55 buds for metabolite and protein analysis were sampled from each of four trees per cultivar and treatment. Methods used and preliminary data from histological analysis as well as from protein screening will be presented at the conference.

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Changes in The Quality of Apricot Varieties and Forms of Fruit Depending on the Year of Growth.

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A comparative analysis of apricot varieties has been carried out, taking into consideration favorable period (2005, 2006, 2008-2010) and anomalous (2007, 2011 -2015) period (heavy drought, lack of water supply, low temperature during flowering and defeat by malicious pathogens). A significant decreasing of yield, fruit size and taste of the most studied varieties were revealed over unfavorable year. Among the introduced varieties and forms in unfavorable years revealed 44.8% of genotypes with the harvest. Among them a good taste of fruits (tasting score 4.1 points on a 5-point scale) had 15.4% of plants of varieties and forms. Almost all genotypes revealed reduction in the size of fruits (for 2-30 g) compared with favorable years. Only the varieties Kiena Dryanovska, Nagycorosy Orias and form 7 (3) 3-70b, observed a slight increase in weight of fruits, in these years, which is likely associated with a reduction in their number on the tree. 80% of varieties of the Nikita Botanical Garden selection fruited in unfavorable years. It revealed 56.3% of varieties with good taste (tasting score 4.1-4.5 points) and a decrease in the size of fruits to five grams. Other varieties were observed a decrease in the size of fruits on 6-20 g. In the variety Konservnyj Pozdnij their size has not changed, and the varieties Dionis, Shalard 4, Gornyj, Saharnyj increased slightly. According to characteristic complex (large-fruited – 45g or more, high fruit quality – 4,1-4,5 points by 5point scale) 8 varieties and forms have been marked out: Roxana 7(3)-3-70b (introduction of NBG), Krymskij Amur, Dionis, Kostyor, Kostinskij, Magystr, Olimp (NBG selection). They are mostly adapted and gain a significant importance for further selection.

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An Update of EFSA's Database on Host Plants of *Xylella fastidiosa* up to 20 November 2015

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Xylella fastidiosa (XF), a vector-transmitted bacterial plant pathogen, is associated with important diseases in a wide range of plant species and it is regulated as harmful organism in the EU. In Europe the disease was reported in 2013 in Apulia, southern Italy and in 2015 in Corsica and southern France. Initially, the pathogen was detected and characterized in North America, but is now recorded also from Central and South America, Iran, Taiwan and restricted areas of Southern Europe. The high potentiality of the disease to spread in the EU has concerned the scientific community, national authorities and the European Commission (EC). EFSA was requested by the EC to create and periodically update a database of XF host plants. The first publication of the database was in April 2015. An extensive literature search approach was used for updating the database in order to catch all new scientific developments published on the topic. Furthermore, investigation outputs on host plants affected by XF in the Italian and French outbreaks were included. Literature screening and data extraction were performed using the Distiller platform. The updated version of the database includes reports of XF host plants published until 20 November 2015. The updated list consists of 359 plant species (including hybrids) from 204 genera and 75 different botanical families. Compared to the previous database, 44 new species and 2 new hybrids, 15 new genera and 5 new families were found. The majority of the additional species (70%) were reported in Apulia, Corsica and southern France.

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The Influence of Various Tillage Systems and Soil Amendments on Crop Performance, Yield and Gross Margin of an Organic Potato Production System in the Netherlands

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Moldboard plowing is a common tillage practice in potato production systems yet it can negatively affect soil fauna and structure. The objective of this study was to investigate the interactive effects of two tillage systems (Reduced Tillage - RT vs Standard Tillage - ST) and three organic amendments (Solid Cattle Manure - SCM; Lucerne Pellets - LP; Grass/Clover Silage - GCS) applied at a target rate of 170 kg N ha⁻¹ on crop performance, yield and gross margin of organic potatoes in The Netherlands. Use of RT did not affect plant emergence but promoted early growth and increased plant height. Leaf area index (LAI) values were similar for ST and RT while canopy volume (CV) values were 48-55% greater at 6 and 10 WAP for RT. However, the leaf chlorophyll index was slightly lower for RT compared to ST. It was found that RT increased tuber yield by 18% compared to ST while it resulted in similar tuber quality. In terms of soil amendments, use of GCS, delayed plant emergence by a day but it did result in taller plants, a greater canopy volume, and higher LAI and SPAD values. Generally, SCM performed worse among the soil amendments. Soil amendments had no significant effect on yield. Conforming to the economic analysis, RT and SCM had higher gross margin compared to ST and other organic soil amendments respectively. Since RT promotes early growth it may provide significant yield benefits when incidence of phytophthora requires premature harvesting.

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Encapsulation-Dehydration Technique Exploration for Chrysanthemum ‘Richmond’ Cryopreservation

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The aim of this study was to determine the effect of sucrose concentration during preculture and the time of osmotic-dehydration on the efficiency of purple-flowering chrysanthemum ‘Richmond’ shoot tips cryopreservation by encapsulation-dehydration. In addition, the recovered plants were comprehensively verified at the phenotypic, biochemical, cytogenetic and molecular levels. Shoot tips were precultured on MS medium supplemented with different sucrose concentrations of 0.09, 0.25 or 0.5 M for 14 days, encapsulated in sodium alginate and then osmotically dehydrated in sucrose gradient for 4 or 7 days. The best explant survival after cryopreservation reaching about 70% was obtained with the lowest sucrose concentration, and 4-day-long osmotic dehydration. It was found that higher sucrose concentrations slow down shoot growth, stimulate their vitrification, increase formation of multiple shoots and conduce to the regeneration via callus, while encapsulation inhibits rooting. The analysis of the phenotype (inflorescences colour, diameter and weight, and flowering time/length) and biochemical activity (pigment content in ligulate flowers), as well as, cytogenetic analysis (DNA content, ploidy and the number of chromosomes) and genetic markers (RAPD-PCR and ISSR-PCR) confirmed the stability of the plants obtained after liquid nitrogen treatment. However, it was noted, that the bottom and central leaves of shoot tips cryopreserved-derived plants were shorter and thinner, and had a reduced amount of chlorophyll, while their internodes were shorter when compared to the control. Finally, these phenotypic changes are positive from the horticultural production point of view. This confirms the validity of utilizing cryopreservation in the protection of valuable plant material.

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Comparison of Penetration and Feeding Behavior of Green Peach Aphid (*Myzus Ppersicae*) On *Asparagus* Spp. Susceptible and Resistant to *Asparagus Virus 1* Using Electrical Penetration Graph

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Asparagus virus 1 (AV-1) is one of the most important viruses of asparagus (*Asparagus officinalis* L.) crops. The virus is transmitted in a non-persistent manner by the Green peach aphid (*Myzus persicae* S.). The virus transmission is related to aphid behavior during brief intracellular punctures. The cell penetration activities are very important for host plant recognition and feeding of the aphids but also for the acquisition and inoculation of viruses. In resistance screenings the four asparagus wild relatives *A. acutifolius*, *A. ramosissimus*, *A. stipularis* and an unidentified *Asparagus* species from Asia were found with resistance to AV-1. To explore the difference in the feeding behavior of *M. persicae* between the control plants of *A. officinalis* and the wild relatives, the electrical penetration graph method (EPG) was used. In this method the feeding behavior was gathered through electrical recording of the stylet penetration. In detail the following parameters were investigated: sum of probing and non-probing time, time to first probe, duration of first probe and number of cell penetrations (potential drops) during the first probe. The comparison of *A. officinalis* (control) and the wild relatives showed significant differences in the penetrating behavior of *M. persicae*. The sum of probing on *A. officinalis* was significantly longer than on wild relatives. Most of the cell punctures were executed on *A. officinalis* (control). This shows a better acceptance of *A. officinalis* as host plant. The results suggested that vector resistance can be excluded for the hitherto tested wild relatives. We hypothesize that the resistance based on a virus-plant interaction.

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Towards Drought Detection and Irrigation Scheduling in Ornamentals with Continuous Plant-Based Measurements

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The timing of production as well as the high quality of the produce are two price-determining factors in ornamental horticulture. Greenhouse climate control and irrigation scheduling are essential settings, which allow steering the plant's growth pattern. The use of plant-based measurements in ornamental horticulture can therefore be of great added value to determine optimal growth conditions for the crop. In this experiment, continuous plant-based measurements on the non-flowering *Ficus benjamina* and flowering pot roses (*Rosa chinensis* cv.) were performed. Sap flow, leaf thickness, diurnal variations in stem diameter and long-term stem growth were continuously monitored during five weeks. In addition, leaf temperature and changes in total plant weight were measured. Measurements were conducted under both standard and well-irrigated conditions, and during a period of imposed drought. Analysis of these continuous plant measurements gave better insight in the plant's response to drought stress, and allowed determination of the most useful signaling parameters. These can play an essential role in the development of a fast drought detection and irrigation scheduling system.

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Phenolic Amount and Antioxidant Activity of Extracts Obtained from *Cistus albidus*

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In the present research, acetonitrile and aqueous extracts from *Cistus albidus* were evaluated for their phenolic and flavonoid amounts as well as their antioxidant potential. The total phenolic and flavonoid contents were quantified using Folin-Ciocalteu and aluminum trichloride colorimetric methods respectively, where the antioxidant activity was screened by two universal and complementary tests 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay and β -carotene/linoleic acid bleaching system. Acetonitrile extract showed superiority in phenolic content ($1.23 \pm 0.11 \mu\text{g EGA/mg}$) and flavonoids ($0.53 \pm 0.04 \mu\text{g EQ/mg}$) compared to aqueous extract revealing $0.28 \pm 0.08 \mu\text{g EGA/mg}$ and $0.18 \pm 0.02 \mu\text{g EQ/mg}$ of phenolic and flavonoid contents respectively. The antioxidant potential unveiled a proportionality with phenolic amounts, where acetonitrile extract exhibited the highest activity ($\text{IC}_{50} = 0.82 \pm 0.08 \text{ mg/ml}$ and β -carotene bleaching = $80.32 \pm 1.20\%$) against $1.82 \pm 0.10 \text{ mg/ml}$ as IC_{50} and $67.32 \pm 1.43\%$ of β -carotene bleaching for aqueous extract.

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Diversity of Endophytic Microbial Communities inside the Leaves of Evergreen Plants

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Plants are colonized by hundreds of endophytic microorganisms that grow asymptotically within their tissues. It is believed that some of them are functionally important for plants by stimulating their growth or providing tolerance against negative biotic and abiotic factors. The aim of this work was to screen the diversity of endophytic microbial communities within surface-sterilized leaves of evergreen horticultural plants belonging to 10 families. By the PCR method we amplified microbial -specific sequences from the complex genomic DNA extracted from homogenized leaf tissues. The communities of endophytes were visualized using the Denaturing Gradient Gel Electrophoresis (DGGE). We observed that all analyzed evergreen plants harbor rich spectra of microbial communities consisting of one or a few dominant species and tens or hundreds of minor species. The composition of microbial spectra seems to be species/family specific. Plants belonging to the same family harbor very similar bacterial communities whereas plants from different families differ markedly in their microbial composition even when they are growing next to each other. Our results indicate that plants can specifically control the diversity of microbial communities within their tissues which could have implications for the integrated plant management.

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Organic Farming for Sustainable Strawberry Farming in Georgia

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The benefits of organic farming for producing eco fruit in Georgia are widespread and important to multiple sectors of society. Organic and eco fruits can help protect what's most valuable to people--their health. Eating a healthy diet rich in antioxidants, vitamins and minerals is a solid investment in preventative care. Preventing disease is much more cost efficient than treating disease. Organic foods can play an important role in keeping people healthy. In addition to the health benefits, the organic industry is important in many other ways. For investors, the organic agricultural sector is one of the few sectors with consistent growth over the last decade. During the current economic downturn, the growth of the organic industry has outpaced the food industry as a whole. Organic products are increasingly important to consumers who are committed to reducing their carbon footprints and their impacts on the environment. More and more people are making their purchasing decisions based, at least partially, on environmental considerations. For families, organic products are important in protecting and enhancing the health of their children. Young bodies in particular are more susceptible to the impacts of pesticides, fungicides and other synthetic chemicals used in non-organically grown fruits and vegetables. As the leading national non-profit organization, firstly entering in Membership of IFOAM in 2000 the Association for Farmers Rights Defense, AFRD is building the guidelines and toolkits for the success of organic farmers. Organic farmers or Agricultural Cooperatives bring economic benefits to their communities by providing increased employment opportunities, as well as health benefits to farmers and their families, consumers of organic foods, and the environment.

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Compared Analysis by HPLC, AAS and TAC for Woodland Grape (*Vitis sylvestris* GMEL.) Genotypes and European Grapevine (*Vitis vinifera* L.) Cultivars

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The evolution of cultivated plants played important role in the ascent of humanity. Based on theoretical and practical researches, it is supposed, that this species itself, or crossing with other species could be the progenitor of the European grapevine (*Vitis vinifera*). In this study, a total of 6 *Vitis sylvestris* genotypes compared to cultivated grapes of *Vitis vinifera* L. were studied by HPLC (High Performance Liquid Chromatography) and AAS (Atomic Absorption Spectroscopy) in two different years (2014 and 2015). In 2015 TAC (Total Antioxidant Capacity) was measured for *Vitis sylvestris* and Cabernet sauvignon wine. The preliminary results of this study pointed out interesting differences in the constitution of organic acids, sugars, elements of *Vitis sylvestris* genotypes and *Vitis vinifera* cultivars. The TAC value of *Vitis sylvestris* wine was 3 times higher compared to Cabernet sauvignon wine. Because of the high content of compounds of positive physiology effect, so woodland grapes, it can be used in our future breeding program as the donor of this feature.

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***In vivo* Multiplication of Banana for Small Scale Farmers**

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Banana and plantain (*Musa AAB*) are very important food crops in Ghana and are grown widely in almost all the agro-ecological zones, except the Savanna regions. Despite the significance of these crops, there are major challenges getting healthy and clean planting material to establish productive and sustainable plantations. Traditionally, farmers in Sub Saharan Africa use suckers and corms which in most cases are infested with pests and diseases. It is upon these reasons that an *in vivo* propagation trial was carried out at the University of Hohenheim, Germany. Corms, the swollen underground plant stem of plantain, were manipulated by mechanically removing all leaf sheaths and thereby exposing latent buds. The corms were then treated by (1) destroying the apical meristem with a crosswise incision and (2) immersion or vacuum infiltration with Benzylaminopurine (BAP) solutions at 10^{-3} or 10^{-5} M, respectively. Treated and untreated corms were planted in a germination bed inside a greenhouse in a randomized complete block design. The results demonstrated that vacuum infiltration enhanced solution uptake and increased the number of plantlets produced when compared to the immersion method. Corms that were vacuum infiltrated with either BAP concentrations produced plants with bigger stems and more roots than BAP immersed or non-treated corms. The results proved that farmers should vacuum infiltrate corms with BAP for producing robust shoots.

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Agro-Morphological Characterization Of Chili Pepper Varieties Cultivated In Northern Benin

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Variability study of agro-morphological characteristics is important for varietal improvement and plant breeding program. For this, 148 chili pepper landraces (*Capsicum annum* L.) collected from northern Benin were characterized using 39 (21 qualitative and 18 quantitative) morphological characters. The trial was conducted in a Fisher block design with 3 replicates at the experimental station of the Faculty of Science and Technology (FAST) of Dassa based in Central Benin. The results revealed considerable morphological variability between landraces. Twenty nine (16 quantitative and 13 qualitative) variables among the 39 examined were discriminatory and group the landraces into 4 classes when considering the qualitative variables. With quantitative variables, 9 groups were obtained. The correlations between the studied quantitative variables are shown that the yield parameters are correlated with the variables related to the vegetative part of the plant. This study will help breeders to better select their parents for crossing in order to produce desirable and high yielding varieties.

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Horticultural Practices and Varietal Diversity of Chili Pepper (*Capsicum annum* L.) in Central and Northern Benin

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Chili peppers play a significant role in the world diet and can contribute to the improvement of horticultural producers' incomes. In Benin, chili pepper production is hampered by many challenges that need to be characterized, prioritized and addressed. Moreover, the existing diversity, as well as the agronomic potential, of the varieties being cultivated in Benin is still not well understood. In order to define the scientific basis for the improvement of chili pepper production and the preservation of its diversity, 100 villages were randomly selected and surveyed in Northern and Central Benin by using participatory research appraisal tools and techniques. Twelve production constraints were identified, of which low productivity, soil infertility, drought, pests and disease susceptibility, early fall of plant organs appear as the most important. In terms of diversity, 77 chili pepper varieties were found. The number of varieties varies from three to seven (four on average) per village and from one to five by household. The proportion of loss of diversity per village varies from 0% to 75% with an average of 26.61%. Susceptibility to pests and diseases, early fall of plant organs and susceptibility to drought, were the most important reasons given in attempts to explain the loss of diversity. Farmers' varietal preference criteria are essentially agronomic. The participative agronomic evaluation revealed that the varieties of *frutescens* group are significantly higher with respect to the evaluated variables, but they are less appreciated by the consumers.

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Electrical Conductivity Relates Seed Germination in Leek

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Electrical conductivity (EC) is a seed test used to predict seed vigour in different crops. Recently, it is for estimating seed germination in cabbage and *Brassica* family. This work is conducted to test whether it can be used as a indicator of seed germination potential of leek seeds (*Allium ampelosprasum var. porrum*). Seeds were aged artifically at 45°C with 20% seed moisture contents during 96 hours, and seed radicle germination varied between 96 and 7%. EC measurements were done on 50 seeds of 4 replicates. Each replicate was soaked in 40 ml in distilled water over 24 hours at 20 °C. In germination test ISTA rules were followed in germination test conditions. EC values were changed beetwen 235,1 and 378,3 $\mu\text{S}/\text{cm}^{-1}/\text{g}^{-1}$. Regression analysis showed that radicle germination percentages significantly related to ($R^2=0,98$, $P<0,001$) EC values. In the second stages of the study the relationship beetwen EC and seed germination of commercially available leek seed lots will be tested.

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The Effect of Postharvest 1-Methylcyclopropane Treatments on Sugar Content of ‘Gloster’ and ‘Cooper 900’ Apples During Cold Storage

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Sugars are one of the most important components of apple quality and taste. It has been proved that postharvest 1-MCP technology is very effective for keeping quality for long term storage in many apple cultivars. There is no available data on how this technology effects sugar content of fruit in ‘Cooper 900’ and ‘Gloster’ apple cultivar. For this reason fruit harvested at the commercial harvest time of these cultivars and treated with 1-methylcyclopropane (1-MCP) at two different concentrations (625 and 1250 ppb) at room temperature ($20\pm 1^{\circ}\text{C}$) for 24 hours and then stored at $0\pm 1^{\circ}\text{C}$ and 85-90% relative humidity conditions for 5 months. Controls were stored without any treatment. Whole experiment was carried out completely randomized design with three replications. In each replication ten fruits were used for the assessments. As a result, in both cultivars sucrose, glucose and fructose were the dominant sugars. 1-MCP treatments had significant effect on sucrose content but not on other carbohydrates such as fructose and glucose. However significant differences were observed between the cultivars. It seems that sucrose may be a ripenig related carbohydrate in these cultivars

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Distribution and Health Condition of Old European Chestnut (*Castanea sativa* Mill.) Orchards in Slovakia

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European chestnut (*Castanea sativa* Mill.) is one of the oldest non-native woody plant species in Slovakia. At present, it is widespread at more than 220 localities. It occurs in the southern part of country, on steep slopes with altitudes ranging from about 200 to 400 m a.s.l. Chestnut grows here outside the recorded natural distribution range and therefore doesn't have optimal climatic conditions. In Slovakia, chestnut occurs mostly in extensive old orchards or forest stands. Currently, the health condition as well as chestnut production has rapidly declined as a result of enormous dying out of chestnut individuals infected by fungus *Cryphonectria parasitica* (Murr.) Barr. During last decades the fungus gradually spreaded at all chestnut localities. We have predicted that disease – chestnut blight interrelated with abiotic factors and absence of regular management. We didn't find a correlation between the first chestnut blight presence in a particular site and its topographic characteristics. We found that the death of trees, as a result of chestnut blight attack, occurred predominantly in dry years with precipitations below the long-term average, or with air temperature above the long-term average.

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Cytogenetic and Molecular Characterization of an Interspecific Hybrid *Asparagus officinalis* x *A. Amarus*

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Interspecific hybridization is an excellent method for transferring genetic information. The genetic variability of *Asparagus officinalis* is extremely limited which leads to a high susceptibility to pests and diseases. The most common one is the *Asparagus virus 1* (AV-1). The virus is distributed worldwide and is transmitted in a non-persistent manner by aphids and by mechanically transmission. Infected asparagus cultivars show no symptoms but this viral infection leads to detrimental effects on vigor, yield and quality. AV-1 cannot be controlled by pesticides, therefore breeding for resistance is the best solution for a sustainable asparagus production. In *A. officinalis* no AV-1 resistance is known up to now but in contrast the wild relative *A. amarus* has been identified as resistant to AV-1. In the current project this resistance from the hexaploid ($2n = 6x = 60$) species *A. amarus* will be transmitted through introgression-backcrossing to the diploid ($2n = 2x = 20$) *A. officinalis*. We used tetraploid ($2n = 4x = 40$) *A. officinalis* plants and embryo rescue to overcome the crossing border. The cytological examination of the hybrid plants (F1) showed the expected number of 50 chromosomes and the plants of the first back crossing generation (BC1) contain approximate 40 chromosomes. Presently we are testing different repetitive probes including LTR retrotransposons to characterize the hybrid plants by fluorescence in-situ hybridisation (FISH) and to identify specific karyotypes. In the next crossing step the BC1 plants will be back crossed with diploid *A. officinalis* genotypes. The BC1 plants segregate for AV-1 resistance therefore we are performing a bulked segregant analysis (BSA) using microsatellites to identify molecular markers linked to AV-1 resistance genes.

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Flavonoid's Pathways Block Step and Yellow Pigmentation in Raspberries (*Rubus idaeus* L.).

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Raspberries (*Rubus idaeus* L.) are rich sources of variety of poly(phenols) especially ellagitannins and anthocyanins those account for broad range of biological functions in plants (1,2,3). The reports show that these compounds have potential health beneficial effects in humans against coronary heart diseases, blindness, cancer, aging, inflammation, cardiovascular and neuro-degenerative diseases (4,5,6). Anthocyanins and carotenoids are known to be the two main pigments, while colour of red fruits is mainly considered due to the varying contents of anthocyanins (4). Despite the interest in raspberry anthocyanins, there is no study about the genetic control and their regulation process during fruit development. Here, we describe a detailed study conducted to identify the reason behind pigmentation of yellow raspberry fruits. To uncover the facts of yellow pigmented raspberries, targeted metabolomics approaches focusing on carotenoid and (poly)phenolic pattern were performed in selected yellow and red varieties (3,7). The carotenoids profile in ripening raspberries changes drastically, with a dramatic decrease of β -carotene and chlorophyll derivatives, the xanthophyll lutein has also decreased however lutein esters increased during ripening. The polyphenolic profile revealed some differences, however there were no major metabolite distinctions between red and yellow genotypes besides the presence or absence of anthocyanins (3) but it indicate the possible deviation of secondary metabolism into other directions (3,7). Among the flavonoid pathway genes decrease in transcripts at the anthocyanidin synthase (*ANS*) level was observed during ripening and further molecular cloning of *ANS* gene revealed a 5 bp mutation/insertion leading to a truncated protein, which lacks conserved region for substrate, cosubstrate and iron binding sites in "Anne". The complementation of *ANS* gene via *Arabidopsis* line (*tds4-2*) mutant for *ANS* and functional characterization of *ANS* gene through recombinant protein expression elaborates the role of this gene in the flavonoid biosynthesis pathway in raspberry. Functional characterization of putative carotenoid pathway genes from *Rubus* was carried out in microbial host to identify their role in yellow pigmented raspberries. The activity of carotenoid cleavage enzymes was also evident playing its important role in colour determination with production of some apocarotenoids. Based on these results and further proceedings a pathway map for pigmentation in raspberry will be predicted that can be utilized for biotechnological production of specific aroma compounds of interest having beneficial effects on health.

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FvTFL1 Integrates Light and Temperature Signals to Control Flowering in Woodland Strawberry *Fragaria vesca*

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Wild strawberry, *Fragaria vesca*, is a facultative short day plant. Flower induction occurs independently of photoperiod at cool temperatures whereas high temperature represses flowering. Photoperiodic flowering is controlled by homolog of *TERMINAL FLOWER1* (*FvTFL1*) that is non-functional in perpetual flowering accessions. In contrast to *Arabidopsis*, *F.vesca* homolog of *SUPPRESSOR OF OVEREXPRESSION OF CONSTANS1* (*FvSOC1*) is *FvTFL1* dependent floral repressor. We studied how light and temperature regulate flower induction. The expression of *FvTFL1* was observed to correlate with flowering at temperatures between 10-23°C independently of photoperiod. The functional role of *FvTFL1* in the temperature response was confirmed using transgenic plants. However, *FvSOC1*, the up-stream regulator of *FvTFL1*, was activated under non-inductive long day showing no temperature dependence. Furthermore, silencing of *FvSOC1* resulted in flowering at 16°C, but not at 23°C. The homolog of *Arabidopsis* floral activator *FLOWERING LOCUS T* (*FvFTI*) showed no temperature response. *FvFTI* was highly up-regulated under long day, but flowering occurred only in the perpetual flowering accession lacking *FvTFL1*. Our results indicate that *FvFTI* and *FvSOC1* regulate *FvTFL1* at intermediate temperatures to control flowering. Cool temperature down-regulates *FvTFL1* independently of this pathway. At high temperatures unidentified factor up-regulates *FvTFL1* to suppress flowering. *FvFTI* mediates photoperiodic signals but its functional role in the seasonal flowering *F.vesca* needs to be further studied. We suggest that *FvTFL1* integrates photoperiodic and temperature signals to repress flower induction in *F.vesca*.

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Genetic Regulation of Day Length Adaptation and Bulb Formation in Onion (*Allium cepa* L.)

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Genetic studies aimed at onion improvement have been limited because of outcrossing, high heterozygosity, a very large genome size with a high level of repetitive DNA. Onion bulb initiation is photoperiod-dependent, which places a significant barrier to adapting new varieties for growth at different latitudes. In comparison to photoperiodic regulation of flowering, relatively little is known about genetic regulation of the bulbing process. This project aims to test the hypothesis that the genetic regulation of bulb formation in response to day length is analogous to the day length regulation of flowering and to identify genes involved in day length adaptation in onion. A comprehensive set of developmental, diurnal and spatial mRNA expression experiments were carried out to investigate the bulbing response. Bulbing ratios were used to measure the bulbing response of onion plants under long day (LD) and short day (SD) conditions, and the reversibility of the bulbing process. Differentially expressed transcripts in response to photoperiod and two new Constans-like (*COL*) genes were identified in onion by RNA-Seq analysis. *AcFT1*, *AcFT5* and *AcFT6* were expressed more highly in LD, which induces bulb formation. *AcFT4* was expressed more highly in SD, which inhibits bulb formation. *FKF1*, *GI* and *COL2* showed good diurnal expression patterns consistent with photoperiod sensing, and all *FT* genes exhibited different diurnal expression patterns peaking at different times of the day. *FKF1*, *COL2*, *FT1*, *FT4* and *LEAFY* genes show tissue specific expression in onion, being leaf or bulb specific.

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Challenges of Strawberry Protection from Grey Mould

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The major strawberry yield losses are caused by grey mould (*Botrytis cinerea* Pers.: Fr.). Generally, the pathogen remains quiescent in unripe tissue and develops disease symptoms at harvest time in ripe fruits. Significant amounts of pesticides are used against grey mould during the growing season of strawberries. Inadequate usage of pesticides may lead to pesticide resistance. To prevent this, new plant protection solutions are needed. With this end in view, two field experiments were carried out at the Institute of Horticulture, LRCAF in May-June of 2013 and 2014. In the first experiment we investigated the efficiency of iMETOS®sm forecasting model for *B. cinerea* control in strawberry. In the second experiment we investigated the efficacy of the environment-friendly chlorophyllin derivative (Chl) against strawberry grey mould. The experimental data revealed that iMETOS®sm forecasting model is an innovative plant protection tool which allows reduction of application frequency and more precise application timing. Using the forecasting model in 2013 and 2014 the yield increase was 4.28 t ha⁻¹ and 3.21 t ha⁻¹ respectively, compared with the untreated control. Moreover, the spray applications forecasted by the model extended the postharvest storage of strawberries. The Chl is an alternative and environment-friendly plant protection product. In 2013 it gave a yield increase of 3.94 t ha⁻¹; however, there was no effect in 2014. The alternative plant protection product Chl tended to reduce grey mould and improve the growth and productivity of strawberry.

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Intergeneric Hybridization between Advanced *Spinacia oleracea* and *Beta vulgaris* to Enhance Product Quality of *Spinacia oleracea*.

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Spinacia oleracea is one of the favorite vegetables for both the fresh market and the frozen products industry. The early flower induction by *Spinacia oleracea* is a problem for breeding companies. The aim of the study was to create hybrids between one cultivar of *Spinacia oleracea* and two cultivars of *Beta vulgaris* to introduce two years of live cycle for flower induction. To ensure a successful pollination two different methods were applied. In the first method pollen was placed on the stigma and in the second method the stigma was removed and the pollen was directly placed on the ovary entrance. To increase the likelihood of obtaining hybrids ovary culture was applied as embryo rescue technique. Due to the unknown embryo development rate ovaries were collected at two different periods, two and three weeks after pollination. To identify the best medium for in vitro germination of the embryos four different media with BA, NAA and GA₃ combinations were tested. Results showed that only one *Beta vulgaris* cultivar resulted in hybrids plants. The two methods of pollination did not show big differences. Most embryos germinated on the MS med. van der Salm including 1 mg/l BA + 0,1 mg/l NAA + 1 mg/l GA₃. Potential hybrid plants were acclimated in the greenhouse and cultivated for further phenotyping.

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Use of Un-rooted Grafted Cuttings for Eggplant Plug-transplant Production and Shipping: Effect of the Grafting-healing Duration on the Finished Transplants

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Vegetable grafting is one of the most effective eco-friendly technique to overcome pests and soilborne diseases in modern cropping systems of fruiting vegetables. Due to the increased farmers' preference for grafted seedlings of high-quality and better performance, the use of vegetable grafted plants is rapidly spreading and expanding over the world and intensive research on new commercial production systems are underway. However, in many areas of the world, due to the high cost of skilled manpower, the use of grafted plug plants is still limited causing a relatively slow development of the grafting nursery industry. The aim of this work was to evaluate a possible use of un-rooted grafted cuttings as means of propagation and distribution of eggplant transplants. In this experiment, un-rooted eggplant cuttings ('Birgah' eggplant scion with *Solanum torvum* rootstock) harvested after diverse healing time [0 (DIH 0), 1 (DIH 1), 3 (DIH 3), 5 (DIH 5), or 7 (DIH 7) days after grafting] were exposed to 20°C 'simulated transportation temperature' and dark condition in a growth chamber for 72 hours. After 72 hours of the simulated transportation treatment, all un-rooted grafted cuttings were transferred into the greenhouse for rooting. The results showed that *S. torvum* is a suitable rootstock for applying the un-rooted grafted cutting propagation technique. The treatment DIH 0 gave the better results in terms of rooting, growth and development rates of the finished plug transplants. This innovative production/shipping method might be successfully used in areas where local nurseries do not have high grafting ability.

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Sensitivity of ZIM-probes and Fruit Gauges for the Determination of Plant Water Status in Two Olive Genotypes

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Recently, as a consequence of climate change, water became one of the most limiting factors for plant growth. This led to the necessity of using more sensitive and precise tools in order to improve irrigation management. In this work two continuous monitoring systems were tested on ‘Nocellara del Belice’ (NB) and SAF10 olive genotypes. ZIM-probes were installed on leaves for the measurement of leaf patch pressure (P_p , the inverse of leaf turgor pressure), whereas fruit gauges were installed on olive drupes for the assessment of fruit absolute growth rate (AGR) fluctuations ($\mu\text{m min}^{-1}$). Midday stem water potential (Ψ_{stem}) was determined at regular intervals during the season and used as reference monitoring system. Both the reference and the innovative systems suggested that, on seasonal scale, NB trees coped with a higher water stress with respect to SAF10. The two continuous monitoring systems highlighted a different response to water stress of the two genotypes. Under drought conditions SAF10 showed a higher variation of AGR between day and night compared to NB; such difference disappeared when irrigation reestablished optimal plant water status. This behavior may be responsible for the higher capability to resist drought of SAF10 with respect to NB. The inversion of the P_p daily curve and the increase of the AGR daily range was observed as the Ψ_{stem} went down to an average value between -2 and -2,5 MPa for both the genotypes studied. In conclusion, both ZIM-probes and fruit gauges were considered good indicators to detect water stress in olive.

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Effect of Partial Rootzone Drying and Maturation Stage on Quality and Flavonoid Composition of ‘Valencia’ Orange Fruit

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Effects of continuous deficit irrigation (DI) and partial rootzone drying (PRD) treatments (50% ETc) in comparison with full irrigation (CI, 100% ETc) were investigated during ‘Valencia’ orange fruit maturation. Ultra-high-performance liquid chromatography, high-resolution mass spectrometry was used to identify and quantify individual flavonoids in fruit juice and peel. Yield, juice soluble solids and acidity were not affected by irrigation. Peel color increased during maturation and was reduced by DI irrigation. Juice acidity reached a peak in May, while soluble solids increased linearly throughout maturation. Hesperidin was the major flavanone detected during maturation, with concentrations 200-fold higher in the fruit peel than in the juice. In peel, narirutin, didymin, and neoeriocitrin decreased with maturation, while hesperidin, nobiletin, and tangeritin increased. Narirutin synthesis in the orange fruit showed to be insensitive to irrigation. In fruit peel, PRD and DI irrigation induced a decrease of hesperidin (-35%), nobiletin (-55%), and tangeritin (-69%) only in June. In the juice, PRD and DI induced an increase of hesperidin (+12%) and didymin (+21%). The results suggest that deficit irrigation, and specifically the conditions imposed with PRD, may cause a significant shift in flavonoid accumulation from the peel into the juice, with a positive impact on the quality of the edible fruit portion. Fruit compositional changes during maturation also suggest that good eating and health quality levels can be reached in May under the cultural and environmental conditions of this study.

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Antennal Olfactory Response to Companion Plant Volatiles in *Trissolcus basalis* Females Using Single Sensillum Recording

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In food resources location and selection, parasitoid females spend considerable time examining the substrate with their antennae, where chemosensory, mechanosensory and thermo-hygroreceptive sensilla exist. Olfaction and perception of plant volatiles play a basic role in recognition of nutritional resources. For *Trissolcus basalis*, an egg parasitoid of the green stink bug *Nezara viridula*, previous electroantennography and behavioural experiments tested the parasitoid's response to extracted headspace volatiles and a synthetic blend of buckwheat volatiles indicated that *T. basalis* females have sensitive and selective olfactory responses some major buckwheat, *Fagopyrum esculentum*, flower volatiles, such as 3-methylbutanoic and 2-methylbutanoic acids. This suggests that antennal olfactory sensilla play an important role in buckwheat volatile compounds perception. Based on these finding results we examined the sensitivity of antennal olfactory sensilla to seven individuals compounds of buckwheat plant volatiles to determine the major active component using single sensillum recording technique (SSR). All seven buckwheat volatiles elicited responses from some ORNs but 3-Methylbutanoic acid and p-benzoquinone were the most active compound which were showing consistent responses. These results represent a first step toward the identification of specialized ORN's for *T. basalis* which could help in enhancing its activity in the field as a biological control agent using 'attract and reward' strategies where synthetic companion plant volatiles are provided from dispensers to attract the egg parasitoid to the crop.

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Effect of Fermentation on the Antioxidant Activity of Kalecik Karası (*Vitis vinifera* L.) Winery Pomace

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Besides the effects on the quality of wine, phenolic compounds have an important role in viticulture and oenology with their antioxidative effects. Phenolics compounds in winery pomace change with vinification. The studies confirmed that phenolic compounds in grapes and wines have antioxidant, anti inflammatory and anti carcinogenic effects. In this research Kalecik Karası (*Vitis vinifera* L.) grape variety harvested on technological maturity and processed into the wine. Samples was taken in two different times; at harvest day and after pressing. The purpose of the study is to identify the differences antioxidant activity in grape pomace between before and after fermentation. Antioxidant capacity of the pomace was measured spectrophotometrically with TEAC and DPPH methods. As a result of the study the highest antioxidant activity of Kalecik Karası grape pomace was measured in the after fermentation samples.

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Real-time Comparison of Measured and Simulated Crop Transpiration in Greenhouse Process Control

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Applying more intelligent algorithms in process computers that control the greenhouse climate and irrigation may help growers to optimize crop growth and yields as well as save energy. A greenhouse process computer has been developed with an architecture that allows for easy implementation of custom algorithms without risk to control continuity. The system in question was demonstrated by implementing a transpiration model that predicts actual crop transpiration from greenhouse climate measurements. In addition, the process computer was connected to a system that calculates the transpiration rate from the rooting substrate weight, irrigation supply, drainage water and crop weight. The transpiration model was calibrated and validated with historical data from the weighing system collected at a Dutch commercial greenhouse in 2014. Then, the model was implemented in the process control computer at commercial nurseries. Model predictions were compared with actual transpiration data from the weighing system in real time. Generally, the predicted and measured data were in close agreement ($r^2 > 0.90$) for all sites. It can be assumed that the model predicts the transpiration rate of a healthy and productive crop. Therefore, suboptimal crop-performance is indicated when the measured transpiration rate is different than predicted. On those occasions, the process computer generated an alarm in order to warn the grower that a problem had occurred. This study demonstrates that additional intelligence, such as simulation models, when implemented in a greenhouse process computer and combined with the appropriate measurements, can automatically alert the grower of potentially damaging conditions. The developed architecture will facilitate the design of new generation computer controls that take advantage of increasing knowledge of crop-functioning and other greenhouse processes.

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Monitoring Plant Growth in a Flowering (*Rosa chinensis*) and Non-flowering (*Ficus benjamina*) Ornamental

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In horticultural science, research on monitoring plant growth is mainly focused on vegetables (e.g., tomatoes). Although ornamental horticulture represents a large portion of the horticultural revenue in Belgium (35% of the total revenue in 2013) and other European countries, like the Netherlands, continuous plant monitoring of these crops is scarce. Use of plant sensors in ornamental horticulture may however greatly assist growers to further optimize growing conditions and improve crop quality. In this study, pot roses (*Rosa chinensis*) and *Ficus benjamina* were selected as model crops for flowering and non-flowering ornamentals, respectively. These ornamentals were continuously measured for sap flow, stem diameter variations and leaf thickness variations. In this way, aberrant plant growth, for example caused by drought stress, could be detected and remedied. This allowed action to be taken even before visual signs of stress were observed. The small size of ornamental plants and leaves, with pot roses in particular, introduced new challenges to plant monitoring. These challenges are mostly related to difficulties of sensor installation, but sometimes also to poor measurement quality. Additionally, practical use of the sensors in commercial settings must be taken into account. Therefore, different sensors were tested, compared and an optimal set of sensors for monitoring ornamentals was selected.

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The Effects of Supplemental Light-Emitting Diodes Lighting on Mineral Element Contents in Microgreens

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The supplemental light-emitting diodes (LEDs) lighting effects on mineral element contents in microgreens were investigated. Experiments were performed at the Institute of Horticulture, Lithuanian Research Centre for Agriculture and Forestry. Mustard (*Brassica juncea* L. ‘Red Lion’) and basil (*Ocimum basilicum* L. ‘Sweet Genovese’) microgreens were grown in controlled environment growth chamber (21/17±2 °C day/ night temperature; 55±5 % relative air humidity) for 7 and 14 days (respectively) after sowing under artificial light provided by high pressure sodium (HPS) lamps (SON-T Agro, Philips) (16 h day⁻¹). For lighting treatments, HPS lamps were supplemented by ~20 μmol m⁻² s⁻¹ sole blue 445- or 447 nm, green 505-, orange 590- and red 627 nm LEDs; and total photosynthetic photon flux density (PPFD) was ~200 μmol m⁻² s⁻¹. The contents of micro and macro elements in dry mass of microgreens were determined quantitatively by microwave digestion technique combined with inductively coupled plasma optical emission spectrometry (ICP-OES) (Spectro Genesis, Germany). The obtained data showed that accumulation of mineral elements in microgreens depended on specific supplemental LED wavelength in comparison with reference plants grown under HPS lamps, and varied among species. Mustard microgreens grown under supplemental 470-, 505-, 590-, 627 nm LEDs accumulated significantly (P<0.05) higher contents of Mn, Mg, Fe, Zn, Ba. All supplemented LED wavelengths had influence on enhanced contents of Ca, Mg, Cu, P, S, Ba, Sr in basil microgreens. In conclusion, a target management of supplemental LED lighting may lead to maximized nutritional quality of microgreens grown in controlled environment.

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Effects of LED Assimilation Lighting on Everbearing Strawberry Plants Monitored with Leaf Clips

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The strawberry season in Belgium is developed to an almost year-round production from mid-March until early January. This is possible by combination of cultivation systems and cold storage of plants. With assimilation lighting, production of strawberries is also possible in January and February. The direct effects of using assimilation light on strawberry plants, and plants in general, are however not well understood. A lack of knowledge exists on how much and how long plants have to be exposed to assimilation light. In this study, everbearing strawberry plants (*Fragaria x ananassa* Murano cv.) were used. These plants are able to initiate flowers under long days, so they continue yielding strawberries over a long season. Plants were grown under two different light intensities: 100 and 140 $\mu\text{mol m}^{-2} \text{s}^{-1}$, on top of the natural light inside the glasshouse. Assimilation lighting was provided with LED lamps (Philips GreenPower LED Toplighting DR/W LB), because they produce less heat and use less energy compared to conventional high-pressure sodium (HPS) lamps. Notwithstanding the use of LEDs in this study, the gathered information is also useful for cultivation under HPS lamps. In order to continuously monitor the plant responses under the two treatments, plant sensors were used. Because of the small dimensions of the strawberry plants, leaf clips were used. These sensors were capable of measuring variations in leaf thickness, and allowed continuous and real-time registration of the plant-specific responses under the different light intensities.

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Morphometric and Physicochemical Analysis of Watermelon Cultivars Grown in Malta

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The aim of this study was to determine the quality parameters of mini and medium-sized watermelons and the relation between agronomic quality parameters with health promoting compounds, hence the adaptability of grafted watermelon cultivars to the climatic and agronomic practices on the island. The studied cultivars, Triploid watermelon Pixie and Constitution, and diploid watermelon variety Watermelon 5500, were transplanted on the 15 April and 15 May, respectively. These were grafted on Macis rootstock. On harvesting, the watermelons were analyzed for various parameters as outlined below. Results show that Constitution (5450g) had superior weights to Pixie (3262g) watermelons ($p < 0.001$). The conductivity (2498-2928 μ S/cm), pH (5.19-5.78), titratable acidity (0.555-0.9325g/l), Brix (9.613-10.55%) and lycopene (0.525-0.0975%w/w) did not show any significant differences for the three cultivars at the two transplanting dates. However, there was a significant difference between the Constitution and the other two cultivars ($p < 0.01$) for their total polyphenolic (TPC) (0.741-1.762%w/w) content. Correlation statistics revealed that lycopene and TPC were positively correlated with each other ($r = 0.498$), but both correlated negatively with % dry matter and Brix content ($r < -0.300$). Principal component analysis showed a distinctive discrimination between the Constitution cultivar vis-à-vis the other cultivars. Weight and lycopene content are parameters that characterize the particular cultivar. However, the TPC was superior for the second transplanting batch (1.349%) compared to the first batch (0.795%).

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ECPHS2016 - INDEX

Soil and Water Management Strategies for Enhancing Cacao Productivity, Food Security and Adaptation and Resilience Building in the Frame of Variable Climate/Weather *pag. 9*

Agele S.O.*, Famuwagun I.B., Aiyelari O.P., Ogunleye A.O., Charles E.F.

Production of Lisianthus (*Eustoma grandiflorum*) Cultivars under different Shades *pag. 10*

Akhtar M.*, Akbar Anjum M.

Role of Green Spaces in Women Psychological Wellbeing and Health *pag. 11*

Akhtar M.*¹, Qasim M.²

Effect of Different Type of Polythene on Quality and Shelf Life of Tomato (*Lycopersicon esculentum* L.) at Ambient Condition (25°) *pag. 12*

Ali M. K.*, Moniruzzaman M., Baree M. A., Borkatulla M. A. B., Ferdous S., Abdul Hye M.

A Novel Instrumented Sphere for Acceleration Measurements During the Mechanical Harvest of Grapes *pag. 13*

Alleri M.*, Vallone M., Catania P.

Micropropagation of *Eryngium viviparum* J. Gay: a New Way to Recover this Endangered Plant with Potential in Pharmacology *pag. 14*

Ayuso M*¹, Pernia B¹, Ramil P², Gallego PP¹, Barreal ME¹.

Antioxidant Profile of *Stevia rebaudiana* Bertoni Cultivated in Portugal and Submitted to Different Conservation Conditions *pag. 15*

Barroso M.*^{1,2}, Barros L.^{1,3}, Rodrigues M.A.¹, Sousa M.J.¹, Santos-Buelga C.², Isabel. Ferreira I. C.F.R.¹

***Stevia rebaudiana*: a Study in the Volatiles Profile from Plants Grown in the Field in the Greenhouse and Micropropagated *in vitro*.** *pag. 16*

Barroso M.*^{1,2}, Goes H.¹, Rodrigues M.A.¹, Arrobas M.¹, Pedro L.M.G.², Sousa M.J.¹.

- The Competitive Advantage of the Tunisian Palm Date Sector in the Mediterranean Region** *pag. 17*
Ben Amor R.*^{1,2}, De Miguel M. D.², Aguayo E.¹
- Factors Affecting Fruit Set and Early Flowers/fruit Drop in Avocado (*Persea americana* Mill.)** *pag. 18*
D'Asaro A.*¹, Reig C.², Farina V.¹, Agustí M.²
- The Comparison of the Growth of Mycelium of Several Strains of *Pleurotus pulmonarius* (Fr.) QuéL. on Various Substrate with Straw** *pag. 19*
Dawidowicz L.*
- The First Fruit Germplasm in Afghanistan** *pag. 20*
Dehqan G.R.*
- Influence of Seaweed-derived Biostimulant on 'friariello' Growth, Photosynthesis and Nutrition Value Under Nutrient Stress** *pag. 21*
Di Stasio E.*, Rouphael Y., Raimondi G., Giordano M., De Pascale S.
- Study on Biometrical Indicators of Fresh Fruits of Bulgarian and Introduced Plum Cultivars of *Prunus domestica* L.** *pag. 22*
Dimkova S., Ivanova D., Todorova S.*, Marinova N.
- Tropic Fruit Consumption in Turkey** *pag. 23*
Dölekoğlu Ö. C., Uğur T., Budak D.B., Hayran S.*
- Molecular Evidence of the Presence of Quarantine Citrus Pathogens in the Main Algerian Citrus Growing Areas Predicts a Risk on the Citrus Patrimony** *pag. 24*
Drais M.I.*^{1,4}, Larbi D.², Ghezli C.³, Varvaro L.¹, Djelouah K.⁴

Ozone Application to Control black Aspergilli and Ochratoxin A Contamination of Turkish Raisins *pag. 25*

Fodil S.^{1*}, Yaseen T.¹, Ricelli A.², Akin M.A.¹, Varvaro L.³.

Field Variability in Fruit Quality and Storability of Greek Apple Cultivar ‘Pilafa Delicious’ *pag. 26*

Georgoudaki T.^{*1}, Nanos G.D.¹, Mitsopoulou N.¹, Vemmos S.²

Evaluation of Genetic Diversity and Relationships in African Eggplants Using EST-SSR Markers *pag. 27*

Gramazio P.^{*}, Borràs D., Vilanova S., Plazas M., Herraiz F.J., Prohens J.

Air Stimuli Induce Compact Plant Growth *pag. 28*

Wegscheider A.^{1,2}, Ruttensperger U.², Hegele M.¹, Hagemann M.H.^{*1}, Wünsche J.¹

Effect of Pruning severity on Yield and Fruit Quality of two Mandarin Cultivars *pag. 29*

Ezzat Hamdy A.^{*}

Improving Quality of Micropropagated Baby Kiwi (*Actinidia arguta* var Issai) Plantlets Using a Neurofuzzy Logic Approach. *pag. 30*

Hameg R.^{*}, Barreal M.E., Gallego P.P.

Elicitors Can Increase Tomato Tolerance to High Temperature *pag. 31*

Hernández V.^{*}, Hellín P., Fenoll J., Molina M.V., Cava J., Garrido I., Flores P.

Promising Nectarine Cultivars from Crimea *pag. 32*

Tsiupka S.^{*}, Shoferistov E., Ivashchenko I.

- The Low-Susceptible to Powdery Mildew Peach Cultivar Bred by Nikita Botanical Gardens** *pag. 33*
Smykov A., Fedorova O., Ivashchenko I.*, Shishova T., Mesyats N.
- Impact of Composted Waste Paper Casing in *Coprinus comatus* Cultivation** *pag. 34*
Jasińska A.*¹, Wojciechowska E.¹, Stoknes K.², Mleczek M.
- Innovative Ways of Feeding Honey Bees in Poland** *pag. 35*
Kęsy M.*
- The Physiological, Metabolic and Molecular Basis for Biennial Bearing in Apple (*Malus domestica*)** *pag. 36*
Kofler J.*¹, Milyaev A.¹, Flachowsky H.², Hanke M.V.², Wünsche J.¹
- Changes in The Quality of Apricot Varieties and Forms of Fruit Depending on the Year of Growth.** *pag. 37*
Korzin V.*, Gorina V.
- An Update of EFSA's Database on Host Plants of *Xylella fastidiosa* up to 20 November 2015** *pag. 38*
Koufakis I.*, Gardi C., Tramontini S., Andueza M., Pautasso M., Stancanelli G.
- The Influence of Various Tillage Systems and Soil Amendments on Crop Performance, Yield and Gross Margin of an Organic Potato Production System in the Netherlands** *pag. 39*
Koufakis I.*, Scholberg J., Lantinga E.
- Encapsulation-Dehydration Technique Exploration for Chrysanthemum 'Richmond' Cryopreservation** *pag. 40*
Kulus D.*¹, Rewers M., Mikula A.³

- Comparison of Penetration and Feeding Behavior of Green Peach Aphid (*Myzus Ppersicae*) On *Asparagus* Spp. Susceptible and Resistant to *Asparagus Virus 1* Using Electrical Penetration Graph** pag. 41
Lantos E.*, Schliephake E., Nothnagel T., Krämer R.
- Towards Drought Detection and Irrigation Scheduling in Ornamentals with Continuous Plant-Based Measurements** pag. 42
Lauriks F.S.*, Hans A.L. Van de Put H.A.L., Steppe K.
- Phenolic Amount and Antioxidant Activity of Extracts Obtained from *Cistus albidus*** pag. 43
Merouane A.*¹, Noui A.¹, Khelifa Z.M.²
- Diversity of Endophytic Microbial Communities inside the Leaves of Evergreen Plants** pag. 44
Michalko J.*¹, Medo J.², Bibeň T.¹, Barta M.¹
- Organic Farming for Sustainable Strawberry farming in Georgia** pag. 45
Nadiradze K.*¹, Phirosmanashvili N.¹, Goginashvili M.²
- Compared Analysis by HPLC, AAS and TAC for Woodland grape (*Vitis sylvestrys* GMEL.) Genotypes and European Grapevine (*Vitis vinifera* L.) Cultivars** pag. 46
Nagy Z.*¹, Jahnke G.¹, Nyitraine Sardy D.², Kallay M.², Majer J.¹
- In vivo* Multiplication of Banana for Small Scale Farmers** pag. 47
Opata J.¹, Skala J.*¹, Hegele M.¹, Hegele S.¹, Dzomeku B.M.², Jens Wünsche¹
- Agro-Morphological Characterization Of Chili Pepper Varieties Cultivated In Northern Benin** pag. 48
Orobiyi A.*¹, Loko L. Y.¹, Agré P.¹, Sanoussi F.¹, Gbaguidi A.¹ Dansi A.¹, Agbangla C.²

- Horticultural Practices and Varietal Diversity of Chili Pepper (*Capsicum annuum* L.) in Central and Northern Benin** pag. 49
Orobiyi A.*¹, Loko Y. L.¹, Sanoussi F.¹, Adjatin A.¹, Gbaguidi A.¹, Dansi A.¹, Sanni A.²
- Electrical Conductivity Relates Seed Germination in Leek** pag. 50
Özden E.*, Demir I.
- The Effect of Postharvest 1-Methylcyclopropane Treatments on Sugar Content of ‘Gloster’ and ‘Cooper 900’ Apples During Cold Storage** pag. 51
Özüpek Ö.*, Köksal A.İ.
- Distribution and Health Condition of Old European Chestnut (*Castanea sativa* Mill.) Orchards in Slovakia** pag. 52
Pástor M.*¹, Pažitný J.²
- Cytogenetic and Molecular Characterization of an Interspecific Hybrid *Asparagus officinalis* X *A. Amarus*** pag. 53
Plath S.*, Nothnagel T., Krämer R.
- Flavonoid’s Pathways Block Step and Yellow Pigmentation in Raspberries (*Rubus idaeus* L.).** pag. 54
Rafique M.Z.*¹, Palmieri L.¹, Fraser P.D.², Martens S.¹
- FvTFL1 Integrates Light and Temperature Signals to Control Flowering in Woodland Strawberry *Fragaria vesca*** pag. 55
Rantanen M.*^{1,2}, Mouhu K.², Jiang P.³, Kurokura T.⁴, Koskela E.², Hytönen T.²
- Genetic Regulation of Day Length Adaptation and Bulb Formation in Onion (*allium cepa* l.)** pag. 56
Rashid H.A.*, Thomas B.

- Challenges of Strawberry Protection from Grey Mould** pag. 57
Rasiukevičiūtė N.*¹, Valiuškaitė A.¹, Supronienė S.²
- Intergeneric Hybridization between Advanced *Spinacia oleracea* and *Beta vulgaris* to Enhance Product Quality of *Spinacia oleracea*.** pag. 58
Röper A.C.*¹, Christensen B.
- Use of Un-rooted Grafted Cuttings for Eggplant Plug-transplant Production and Shipping: Effect of the Grafting-healing Duration on the Finished Transplants.** pag. 59
Sabatino L.*
- Sensitivity of ZIM-probes and Fruit Gauges for the Determination of Plant Water Status in Two Olive Genotypes** pag. 60
Scalisi A.*¹, Marino G., Marra F.P., Lo Bianco R.
- Effect of Partial Rootzone Drying and Maturation Stage on Quality and Flavonoid Composition of ‘Valencia’ Orange Fruit** pag. 61
Simões Grilo F.*¹, Di Stefano V.², Lo Bianco R.¹
- Antennal Olfactory Response to Companion Plant Volatiles in *Trissolcus basalis* Females Using Single Sensillum Recording** pag. 62
Slimani T.*¹, Park Kye C.², Foti M.C.¹, Rostás M.³, Peri E.¹, Colazza S.¹
- Effect of Fermentation on the Antioxidant Activity of Kalecik Karası (*Vitis vinifera* L.) Winery Pomace** pag. 63
Tahmaz H.*¹, G. Söylemezoğlu G.
- Real-time Comparison of Measured and Simulated Crop Transpiration in Greenhouse Process Control** pag. 64
De Koning A.N.M., Tsafaras I.*

Monitoring Plant Growth in a Flowering (*Rosa chinensis*) and Non-flowering (*Ficus benjamina*) Ornamental

pag. 65

Van de Put H.A.L.*, Lauriks F.S., Steppe K.

The Effects of Supplemental Light-Emitting Diodes Lighting on Mineral Element Contents in Microgreens

pag. 66

Vaštakaitė V.*, Viršilė A., Brazaitytė A., Samuolienė G., Jankauskienė J., Sirtautas R., Duchovskis P.

Effects of LED Assimilation Lighting on Everbearing Strawberry Plants Monitored with Leaf Clips

pag. 67

Vermeiren J.*¹, Stoffels K.², Van Delm T.², Steppe K.¹

Morphometric and Physicochemical Analysis of Watermelon Cultivars Grown in Malta

pag. 68

Charles Zahra*¹, Cherubino Leonardi², Everaldo Attard¹



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