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Posters

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RNA-Seq analysis differentially expressed genes in purple pakchoi (*Brassica campestris* ssp. *chinensis* Makino.) under low temperature

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Shanghai Academy of Agricultural Sciences, China

Low temperature is the main environmental factor that affect anthocyanin biosynthesis and accumulation in purple pakchoi, which is one of the most popular vegetables in China with high anthocyanin content. In the present study, the transcriptome profiles of the purple pakchoi cultivar "ziyi", which maintained at 5°C (low temperature, LT) and 20°C (normal temperature, NT) for 10 d, were analyzed using Illumina paired-endsequencing technology in order to reveal mechanisms associated with anthocyanin biosynthesis and accumulaiton at low temperatures. The anthocyanin content under 5°C treatment was gradually increased, and the purple color deepened as compared to that observed under 20°C. After *de novo* assembly and quantitative assessment of the obtained reads, 114,043 unigenes were obtained, and 76,369 sequences were annotated by aligning the sequences against five public databases. Of all the differentially expressed genes (DEGs), 4,172 and 3,918 up-regulated genes were identified in the 5°C and 20°C treatment groups, respectively. Twelve major anthocyanin accumulation- and biosynthesis-related genes, including transcription factors (TFs), were identified, and their expression levels were estimated. The structural genes *PAL*, *C4H*, *F3H*, *CHS*, and *CUT75G1* and TFs *HY5*, *MYB44*, and *MYB113* were induced by low temperature conditions. Overall, this is the first transcriptome sequencing analysis of this plant species under low temperature conditions. Studies of the DEGs involved in the anthocyanin accumulation and biosynthesis pathways provide insights into the regulatory mechanisms of anthocyanin synthesis and accumulation in purple vegetables at low temperature.

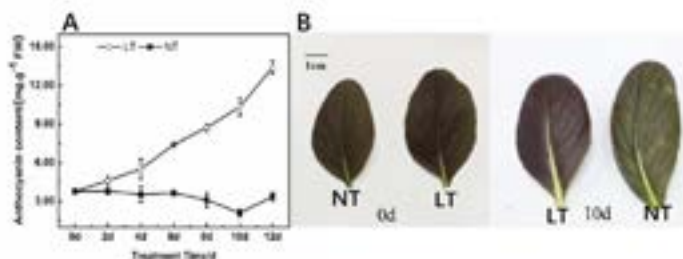


Fig. 1 Anthocyanin content and the color of purple pakchoi at 5°C and 20°C. Anthocyanin content changes in purple pakchoi treated with low temperatures from 0 d to 12 d (A); comparison of color in purple pakchoi under low temperature conditions at 0 d and 10 d.

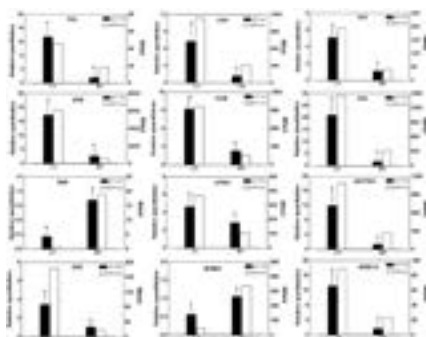


Fig. 2 Real-time PCR. Data represent the mean ± SE (n = 3 or 4). Single and double asterisks indicate statistical differences compared to the control (t-test, p < 0.05). The relative gene expression of 12 randomly selected genes examined using qRT-PCR (5 or 0.01, respectively)

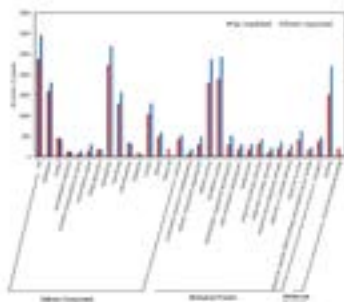


Fig. 3 Four major pathways likely implicated in the effects of low temperatures on purple pakchoi during IMC identified by a KEGG enrichment analysis. The red line represents a p-value of 0.05

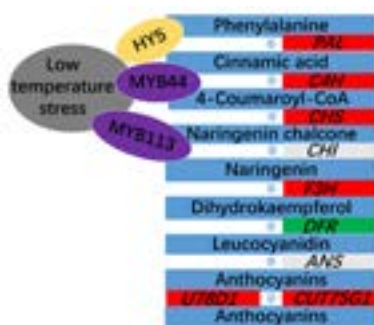


Fig. 4 Anthocyanin biosynthetic pathway in purple pakchoi under low temperature conditions. HY5, MYB44 and MYB113 are transcription factors. Genes involved in this pathway include PAL, C4H, CHS, F3H, DFR, ANS, U78D1 and CUT75G1. Red represents the up-regulation of the gene expression level, while green denotes down-regulation. Gray indicates a non-DEG.

Recent Publications

1. N.U. Ahmed, J.I. Park, H.J. Jung, et al., Anthocyanin biosynthesis for cold and freezing stress tolerance and desirable color in Brassica rapa, *Funct Integr Genomics*. 2015 Jul;15(4):383-94.
2. C. Kang, O. Darwish, A. Geretz, et al., Genome-scale transcriptomic insights into early-stage fruit development in woodland strawberry *Fragaria vesca*., *Plant Cell* 25 (2013)1960-78.
3. Y. Qu, A. Zhou, X. Zhang, et al., De Novo Transcriptome Sequencing of Low Temperature-Treated *Phlox subulata* and Analysis of the Genes Involved in Cold Stress, *Int J Mol Sci* 16 (2015)9732.
4. X. Gu, Y. Chen, Z. Gao, et al., Transcription factors and anthocyanin genes related to low-temperature tolerance in rd29A:RdreB1BI transgenic strawberry, *Plant Physiology & Biochemistry* Ppb 89 (2015)31-43.
5. C. Zhang, H. Jia, W. Wu, et al., Functional conservation analysis and expression modes of grape anthocyanin synthesis genes responsive to low temperature stress, *Gene* 574 (2015)168-77.

Biography

Yuying Zhu has working on Shanghai Academy of Agricultural Sciences since 1984. Now he has his expertise in pakchoi cultivation and breeding. He has chosen 15 pakchoi varieties that have large area.

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A non-chemical approach for controlling Panama disease occurrence in Taiwan with the essential oil of *Biden pilosa*

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Panama disease caused by *Fusarium oxysporum* f. sp. *ubense* (FOC) is the most destructive disease in banana production. In this study, we explore a potential non-chemical approach to reducing the incidence of Panama disease in fields in Taiwan. Fresh materials collected from 11 naturalized or invasive plants were subjected to steam-distillation, and the isolated essential oils or hydrosols were subsequently evaluated for in vitro antifungal activity against three FOC reference isolates: YJL-F040 race 1, ATCC-76243 race 2, and ATCC-38741 subtropical race 4. The essential oil of the *Biden pilosa* plant demonstrated potent antifungal activity against FOC isolates, showing 22% to 43% inhibition of mycelial growth in races 1, 2, 4, and 70% inhibition of spore germination in race 4. A preliminary field experiment was then conducted in an orchard in Taitung County, Taiwan, and the area was divided into four sections, and one testing area and three control areas were randomly assigned. A re-dissolved 0.01% (v./v.) solution prepared from the essential oils and hydrosol of *B. pilosa* plants were irrigated into the bulk soil areas of 84 banana plantlets during secondary hardening, once a week beginning March 13, 2017. The incidence of Panama disease was investigated from August 28 to November 15, 2017. Disease incidence was just 16% in the testing area, compared to 53%, 51%, and 12% in the three control areas. A second investigation was carried out on four different orchards from March 20, 2018 to December 21, 2018. Incidence rates of Panama disease were 22.2% to 27.3% in the testing areas and 45.2% to 62.2% in the control areas. In-depth analysis of the antifungal compounds in *B. pilosa* essential oils was carried out with gas chromatography–mass spectrometry. Our results suggest a promising non-chemical approach for controlling the occurrence of Panama disease using *B. pilosa* essential oils.

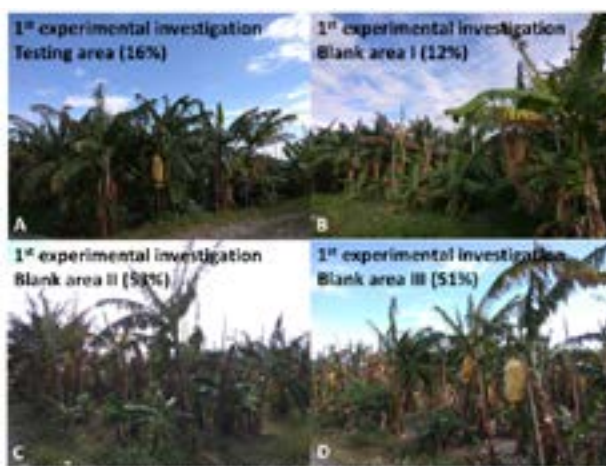


Figure 1: The 1st experimental investigation of non-chemical preventive approach for controlling the occurrence of Panama disease. Incidence of Panama disease was investigated during the period from August 28th to November 15th, 2017. The results showed 16% of disease incidence in the testing area (A) and 53%, 51% or 12% (B-D) in each blank area.

Recent Publications

1. Al-Reza SM, Rahman A, Ahmed Y, Kang SC (2010) Inhibition of plant pathogens in vitro and in vivo with essential oil and organic extracts of *Cestrum nocturnum* L. *Pesticide Biochemistry and Physiology* 96: 86-92.
2. Deba F, Xuan TD, Yasuda M, Tawata S (2008) Chemical composition and antioxidant, antibacterial and antifungal activities of the essential oils from *Bidens pilosa* Linn. var. *Radiata*. *Food Control* 19: 346-352.
3. MS, Ali S, Akhtar M, Singh KS (2012) Efficacy of plant extracts in plant disease management. *Agricultural Science* 3: 425-433.
4. Sefu G, Satheesh N, Berecha G (2015) Effect of essential oils treatment on anthracnose (*Colletotrichum gloeosporioides*) disease development, quality and shelf life of mango fruits (*Mangifera indica* L). *American-Eurasian Journal of Agricultural & Environmental Sciences* 15: 2160-2169.
5. Wu ZB, Chi FL, Tsay JS (2015) Development of non-pesticide cultivated technique using plant materials to control *Colletotrichum* spp. associate with anthracnose on coffee plants in Taiwan. *Phytopathology* 105: S4.151.

Biography

Zhong-Bin Wu is an assistant professor in Department of Horticulture and Landscape Architecture, National Taitung Jr. College, Taiwan. His current research programs focus on the (1) development of non-pesticide cultivation techniques by using plant materials to control plant disease in organic farming, (2) identification of newly crop diseases and (3) development of detection methods for disease diagnosis.

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Effect of temperature on life history characteristics of *Liposcelis bostrychophila*

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The psocid *Liposcelis bostrychophila* is a worldwide stored product pest of various processed and unprocessed dry foods in households, granaries and warehouses. Recently, post-harvest treatments are not recommended due to food safety awareness. Therefore, it is necessary to develop an alternative approach of chemical to manage *L. bostrychophila*. However, knowledges of the life history and ecological adaptability of *L. bostrychophila* are important for identifying the optimal timing to implement effective control measures. In this study, we investigated the developmental and reproductive traits of *L. bostrychophila* at 9 constant temperatures from 15 to 35°C at 2.5°C interval. The development period from egg to adult was decreased with the increasing of temperatures until 30°C, then increased at 35°C. At 35°C, most of the laid eggs did not hatched. The lower developmental threshold (T_0) and the thermal constant (K) estimated by using a linear model were 12.9°C and 346.2 degree-days, respectively. The average life span of *L. bostrychophila* was ca. 138 days at 25°C and ca. 90 days at 30°C. The intrinsic rate of natural increase (r_m) was 0.077 at 25°C and 0.138 at 30°C. Our results would be useful for assessing the overall effects of temperature on *L. bostrychophila* and the temperature effects should take into consideration when use the management program of this pest species.

Recent Publications

1. Waguri, S., S. Ogino, Y. Kitashima and T. Gotoh (2016) Effect of light trap size and location on capturing of cigarette beetle, *Lasioderma serricorne* (Coleoptera: Anobiidae).
2. Suzuki, T., Y. Yoshioka, O. Tsarsitalidou, V. Ntalia, S. Ohno, K. Ohyama, Y. Kitashima, T. Gotoh, M. Takeda and D. S. Koveos (2014) An LED-based UV-B irradiation system for tiny organisms: system description and demonstration experiment to determine the hatchability of eggs from four Tetranychus spider mite species from Okinawa. *J. Insect Physiol.* 62 (1): 1-10.
3. Gotoh, T., Y. Kitashima and T. Sato (2013) Effect of hot-water treatment on the two-spotted spider mite, *Tetranychus urticae*, and its predator, *Neoseiulus californicus* (Acari: Tetranychidae, Phytoseiidae). *Internat. J. Acarol.* 39 (7): 533-537.
4. Gotoh, T., S. Fujiwara and Y. Kitashima (2011) Susceptibility to acaricides in nine strains of the tomato red spider mite *Tetranychus evansi* (Acari: Tetranychidae). *Internat. J. Acarol.* 37 (2): 93-102.
5. Ohno, S., A. Miyagi, T. Ganaha-Kikumura, T. Gotoh, Y. Kitashima, T. Ooishi, T. Ando, K. Kijima, K. Futagami, T. Uesato and K. Yasuda (2009) Species composition of spider mites (Acari: Tetranychidae) on vegetables in Okinawa, southwestern Japan. *Appl. Entomol. Zool.* 44 (4): 627-633.

Biography

Yasuki Kitashima has working at Faculty of Agriculture Ibaraki University since 2006. My research subjects are ecology and control of spider mites and stored product pests.

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The impact of macroelements on the mineral and amino acid content of coloured flesh potato

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Statement of the Problem: One of the primary sources of potassium, phosphorus and magnesium as well as vitamin C and good quality protein in everyday diet is the potato. A rising interest is being observed in the potato cultivars with purple-blue peel and flesh, as these contain high levels of polyphenols. The purpose of this study has been to determine optimal doses of soil fertilisation with macronutrients in the cultivation of the potato cultivar Blue Congo, a variety with purple-blue peel and flesh, which have an effect on the qualitative composition of potato tubers.

Methodology & Theoretical Orientation: In the first part of the experiment (I) nitrogen was applied as urea fertiliser. The doses of nitrogen: 40 kg ha⁻¹ and 80 kg ha⁻¹ were sprayed before potato planting. The dose of 120 kg N ha⁻¹ was split in two: 100 kg N ha⁻¹ was applied before potato planting and then supplemented with 20 kg N ha⁻¹ before the final earthing-up. In the second part of the experiment (II) potassium was applied as potassium sulphate at doses of 120 kg K ha⁻¹, 150 kg K ha⁻¹ and 180 kg K ha⁻¹.

Conclusion & Significance: The study proves that the optimal doses of fertilisers applied to soil under the potato cultivar Blue Congo are: 80 kg N ha⁻¹ and 150 kg K ha⁻¹. Application of the dose of 120 kg N ha⁻¹ caused a decrease in the content of all macro- and micronutrients. The limiting amino acid in the cv. Blue Congo potato tubers was isoleucine, which reached the highest content at the fertilising dose of nitrogen equal 80 kg ha⁻¹. The nutritive value of protein measured by the EAAI was around 47.2% relative to the reference value. The CS calculated for the cv. Blue Congo potato exceeded traditional potato cultivars for such amino acids as methionine+ cystine and phenylalanine-tyrosine.

Recent Publications

1. Brown CR (2005). Antioxidants in Potato. American Journal of Potato Research 82:163-172.
2. Michalska A, Wojdyło A, Bogucka B (2016) The influence of nitrogen and potassium fertilisation on the content of polyphenolic compounds and antioxidant capacity of coloured potato. Journal of Food Composition and Analysis 47:69-75.
3. Lachman J, Hamouz K, Čepel J, Pivec V, Šulc M, Dvořák P (2006) The effect of selected factors on polyphenol content and antioxidant activity in potato tubers. Chemické Listy 100:522-527.
4. Westermann DT (2005) Nutritional requirements of potatoes. American Journal of Potato Research 82:301-307.
5. White PJ, Wheatley RE, Hammond JP, Zhang K (2007) Minerals, soils and roots. In: Vreugdenhil D (ed) Potato biology and biotechnology, advances and perspectives. Elsevier, Amsterdam:739-752.

Biography

Bożena Bogucka, since 2002, she has worked as a doctor of agricultural science at the University of Warmia and Mazury in Olsztyn (Poland, Europe). Her scientific activity has been concentrated on research related to the impact of macro- and microelements on quantitative and qualitative characteristics of potato for the food and processing industry for over 14 years. She has published over 30 works in this field. Her area of interest also includes root food plants storing starch and an additional polysaccharide - inulin.

Research work presented at conference: 4th International Conference and Exhibition on Food Processing and Technology, 2015 London, United Kingdom, "The impact of macroelements and microelements on the size of starch granules in potatoes".

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Stability and field evaluation of rhizobia in alfalfa seed treatment

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Autonomous University of Barcelona, Spain

Statement of the problem: Alfalfa cultivation in the world is necessary for forage uses in animal feeding. Nodulation by nitrogen-fixing bacteria is highly used in agriculture and it is well-known that the inoculation of leguminous plants increments nitrogen input in the plant increasing ultimately yield. However, the application of this kind of bacteria in the seed is relatively new. Seed Technology comprises a series of methods, techniques and protocols that allow the improvement of the seed after it is produced. Seed treatment, is a part of Seed Technology that it is defined by the use of different compounds adhered to the seed in order to improve its performance once cultivated. The aim of this study is to determine the dosage, stability through time and the effects on plant performance in the field of a seed treatment consisting of two rhizobia strains in alfalfa seeds.

Methodology & Theoretical Orientation: Formulation and coating of the seeds, plate-counting dilution protocol in rhizobia-specific medium, stability of the rhizobia inoculation in the seed through time, evaluation of germination and vigor protocols and field testing and evaluation of the seed treatment. Findings: The formulation protocol is effective and allows retention and survival of the bacterial strains through time, providing higher weight to the seeds and protecting them from external damage. Miniaturization of plate-counting traditional method allows quality control of the treated seeds in an easy and cost-effective manner. Rhizobia seed treatment showed increased germination (5-9%) and field testing showed increased plant stand (8.9%), percentage of nodulation (15.5%) and yield in dry weight per hectare (2%).

Conclusion and significance: In SEMILLAS FITO company we developed a seed coating for alfalfa inoculated with alfalfa-specialized rhizobium and free-living nitrogen-fixing bacteria that improved germination under chilling stress, prevents the seed from external damage, increases plant stand, percentage of nodulation and fresh weight of aerial parts.



Fig 1. Upper left: seeds with or without the treatment. Upper right: colonies of rhizobia. Lower left: agitating rhizobia for plate-dilution method. Lower right: nodule of rhizobia in alfalfa roots

Recent Publications

1. Somasegaran P, & Halliday J (1982) Dilution of Liquid Rhizobium cultures to increase production capacity of inoculant plants. Appl. Environ. Microbiol. 44 (2) 330-333.
2. Corral Lugo A, Morales García YE, Pazos-Rojas LA, Ramírez Valverde A, Martínez Contreras D, Muñoz Rojas J (2012) Quantification of cultivable bacteria by the “massive stamping drop plate” method. Rev. Colom. Biotecnol. 14(2):147-156
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5. Lang-Unnasch N & Ausubel FM (1985) Nodule-Specific polypeptides from effective alfalfa root nodules and from ineffective nodules lacking nitrogenase. 77:833-839.

Biography

Virginia Estévez Geffriaud, BSc. In Microbiology (2014, Autonomous University of Barcelona, UAB); MSc. In Environmental Agrobiology (2015, University of Barcelona); Master Thesis in FUTURECO BIOSCIENCE (2015). Industrial PhD student at University of Barcelona (2016-); Project assistant and Trial Coordination at Seed Technology Dpt. (R&D) at FITO SEEDS (SEMILLAS FITO) (2016-); Last oral presentation: MICROPe (Microbe-assisted crop production-opportunities and challenges, Vienna 2018).

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First research on pests of Japanese quince (*Chaenomeles japonica*) in Latvia

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Since 1980's, Japanese quince (*Chaenomeles japonica*) is cultivated as minor fruit crop in Latvia. So far, growers have not reported any significant problems caused by invertebrate pests, however lately, total area of quince plantations is noticeable increasing and there is possibility that some pests of rose family (Rosaceae) crop plants or some polyphagous generalist pests may become significant pests also of Japanese quince. Therefore, objective of this research is to study potential pests of Japanese quince in Latvia.

Research was carried out in seven biological and one integrated farmed quince plantations dispersed in whole area of Latvia. Potential pests were studied with different methods: yellow sticky traps, pest registration on quince plants, delta traps with sex pheromones of rose tortrix (*Archips rosana*), large fruit-tree tortrix (*Archips podana*), holly tortrix (*Rhopobota naevana*) and codling moth (*Cydia pomonella*). Also visual assessment and registration of damaged buds, flowers, leaves and fruit was done. All studies were done during vegetation seasons of 2017 (cool and rainy) and 2018 (hot and dry).

Pest infestation level was low in both years. Buds, flowers, leaves and fruit were almost intact. Eggs of European red mite (*Panonychus ulmi*) were not recorded on quince twigs, however infestation of the mite was observed during summertime in one plantation located near heavy infested orchard. Tortrix moths appeared in plantations located near apple orchards. In all plantations, aphids (Aphididae) were caught with yellow sticky traps, but colonies of these pests were not observed on quince plants. During 2018 when weather was particularly hot and dry, low but noticeable infestation of garden chafer (*Phyllopertha horticola*) and black-veined white (*Aporia crataegi*) was observed.

This research was a part of ERAF project "Environment-friendly cultivation of emerging commercial fruit crop Japanese quince – *Chaenomeles japonica* and waste-free methods of its processing" (No. 1.1.1.1/16/A/094).

Recent Publications

1. Grigaliunaite B, Zilinskaite S, Radaitiene D (2012) Phytosanitary condition of *Chaenomeles japonica* in Vilnius University Botanical Garden. Optimization of Ornamental and Garden Plant Assortment, Technologies and Environment: scientific articles 3(8): 25-29. (In Lithuanian, English summary).
2. Jaskiewicz B. (1995) The species composition of the aphids feeding on *Chaenomeles japonica* Lindl. in the Academy Park in Lublin. Annales Universitatis Mariae Curie-Sklodowska. Sectio EEE, Horticultura 3: 145-158. (In Polish, English summary).
3. Jaskiewicz B, Kmiec K, Gantner M (2004) Beet aphid and ornamental shrubs. Ochrona Roslin 49(6): 30-32. (In Polish, English summary).
4. Rumpunen K (2011) Pros and cons of Japanese quince (*Chaenomeles japonica*) - an underutilized pome fruit. Acta Horticulturae 918: 887-900.

Biography

Janis Gailis has a Master's degree in Biology and a PhD in Agriculture. He is working in Latvia University of Life Sciences and Technologies as docent and senior researcher since 2012. His scientific interests and activities are related with entomology (mainly Coleoptera). Main topics of Janis' studies are diversity and conservation of insects, integrated pest management, predatory insects as biological control agents of arthropod pests.

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Transcriptome to identify critical genes involved in flowering and floral organ development

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Statement of the Problem: Tree peony (*Paeonia suffruticosa* Andrews) is a globally famous ornamental flower, with large and colorful flowers and abundant flower types. However, a relatively short and uniform flowering period hinders the applications and production of ornamental tree peony. Unfortunately, the molecular mechanism of regulating flowering time and floral organ development in tree peony has yet to be elucidated.

Methodology & Theoretical Orientation: Because of the absence of genomic information, 454-based transcriptome sequence technology for de novo transcriptomics was used to identify the critical flowering genes using re-blooming, non-re-blooming, and wild species of tree peonies.

Findings: A total of 29,275 unigenes were obtained from the bud transcriptome, with an N50 of 776 bp. The average length of unigenes was 677.18 bp, and the longest sequence was 5,815 bp. Functional annotation showed that 22,823, 17,321, 13,312, 20,041, and 9,940 unigenes were annotated by NCBI-NR, Swiss-Prot, COG, GO, and KEGG, respectively. Within the differentially expressed genes (DEGs) 64 flowering-related genes were identified and some important flowering genes were also characterized by bioinformatics methods, reverse transcript polymerase chain reaction (RT-PCR), and rapid-amplification of cDNA ends (RACE). Then, the putative genetic network of flowering induction pathways and a floral organ development model were put forward, according to the comparisons of DEGs in any two samples and expression levels of the important flowering genes in differentiated buds, buds from different developmental stages, and treated buds. In tree peony, five pathways (long day, vernalization, autonomous, age, and gibberellin) regulated flowering, and the floral organ development followed an ABCE model. Moreover, it was also found that the genes *PsAPI*, *PsCOL1*, *PsCRY1*, *PsCRY2*, *PsFT*, *PsLFY*, *PsLHY*, *PsGI*, *PsSOC1*, and *PsVIN3* probably regulated re-blooming of tree peony.

Conclusion & Significance: This study provides a comprehensive report on the flowering-related genes in tree peony for the first time and investigated the expression levels of the critical flowering related genes in buds of different cultivars, developmental stages, differentiated primordium, and flower parts. These results could provide valuable insights into the molecular mechanisms of flowering time regulation and floral organ development.



Figure 4 The putative schematic network of flowering induction pathways and floral organ development in tree peony. Arrows indicate positive regulation and bars indicate negative regulation.

Recent Publications

1. Wang SL, Xue J Q, Ahmadi N, Holloway P, Zhu F Y, Ren X X, Zhang X X (2014) Molecular characterization and expression patterns of PsSVP genes reveal distinct roles in flower bud abortion and flowering in tree peony (*Paeonia Suffruticosa*). Canadian Journal of Plant Science 94: 1181–1193.
2. Wang SL, Beruto M, Xue JQ, Zhu FY, Liu CJ, Yan YM, Zhang XX (2015) Molecular cloning and potential function prediction of homologous SOC1 genes in tree peony. Plant Cell Reports 34: 1459–1471.
3. Zhou H, Cheng FY, Wang R, Zhong Y, He CY (2013) Transcriptome comparison reveals key candidate genes responsible for the unusual reblooming trait in tree peonies. PLOS ONE 8(11): e79996.
4. Li WQ, Liu XH, Lu YM (2016) Transcriptome comparison reveals key candidate genes in response to vernalization of oriental lily. BMC Genomics 17: 664.
5. Becker A, Theißen G (2013) The major clades of MADS-box genes and their role in the development and evolution of flowering plants. Molecular Phylogenetics and Evolution 29: 464-89.

Biography

Xiuxin Zhang, Phd, Prof of Institute of Vegetables and Flowers, Chinese Academy of Agricultural Science. Research Area: tree peony and peony germplasm resources evaluation and new varieties creation. She has published about more than 50 papers and Awarded CAAS science and technology in tree peony new technology research of forcing culture and development. June 2014. (The second prize, Ranked first). She will do a poster at the conferences

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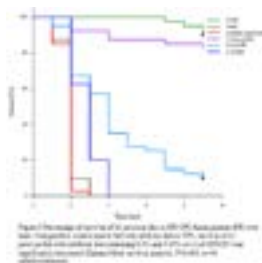
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August 15-16, 2019 | Rome, Italy

Oral toxicity of fusion protein containing insecticidal spider venom toxin against aphid (*Mizus persicae*)

Supavadee Chanapan, Martin G. Edwards and Angharad M.R. Gatehouse
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Synthetic insecticides have been widely applied to reduce agricultural crop loss. However, they can result in adverse effects on non-target organisms, the environment and human health. More recently, insecticides derived from biological molecules have been developed as an alternative strategy. Arachnid venom peptides are highly specific antagonists of receptors found in the central nervous system (CNS). They act by blocking the action potential and inhibit muscular activity. They are highly toxic to insects yet display no mammalian toxicity, but toxicity relies on delivery to the insect haemocoel. Therefore, if used as a biopesticide they must be fused to a carrier peptide capable of crossing the insect gut. This study demonstrates the oral toxicity of a novel fusion protein towards *Mizus persicae*. The fused spider venom neurotoxin (SFI) and carrier molecule (CP2) was expressed in *Pichia pastoris*. The efficacy of the purified protein was tested against *M. persicae* using an artificial diet bioassay. The SFI/CP2 fusion protein was toxic and significantly reduced survival in a dose dependent manner. Survival of aphids fed artificial diet containing 0.05% (w/v) fusion protein was reduced to 35% after four days and 10% after nine days; the higher concentration (0.1%) reduced aphid survival to 20% after three days with no survival after four days. The fusion protein induced mortality in *M. persicae* with LC50 of 0.043 % (0.43 mg/ml) after four days. These results indicate that the CP2 molecule is able to transit the insect gut and deliver the neurotoxic venom peptide to the CNS of *M. persicae*. This proteinaceous biopesticide could be developed either as a sprayable compound or expressed *in planta*.



Recent Publications

1. Kanokratana P., Chanapan S., Pootanakit K., and Eurwilaichitr. (2004) Diversity and abundance of Bacteria and Archaea in the Bor Khlueng Hot Spring in Thailand. J. Basic Microbiol. 44, 430-444.
2. Chanapan, S., Tontiworachai, B., Deewatthanawong, R. and Suwanagul, A. (2017). Cloning and sequence analysis of chalcone synthase gene in *Curcuma alismatifolia*. Acta Hort. 1167, 299-304.
3. Deewatthanawong, R., Chanapan, S. and Suwanagul, A. (2017). Evaluation of methyl bromide alternatives to control thrips in orchid cut-flowers. Acta Hort. 1167, 393-398.

Biography

Supavadee Chanapan graduated from the Universities for a bachelor degree of B.Sc. in biology (Khon Kaen University, Thailand) in 2001 and a master degree of M.Sc. in Molecular Genetics and Genetic Engineering (Mahidol University, Thailand) in 2004. Then, she has been working as a researcher in Thailand Institute of Scientific and Technological research (TISTR) from 2004 to present. She is a PhD candidate at Newcastle University. Her research work presented in this conference is in 'Crop Protection and Entomology' that is based on application fusion protein technology as alternative approach to control insect pest.

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14th International Conference on

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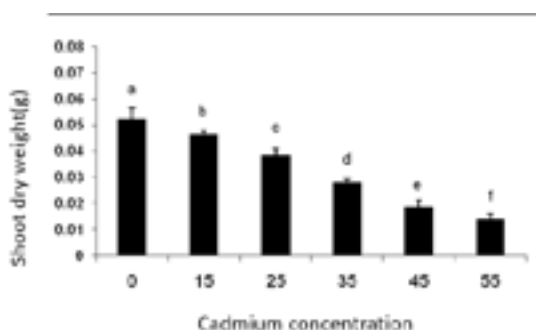
August 15-16, 2019 | Rome, Italy

Cadmium stress in rice plants: The effect of cadmium on seed germination and seedling growth of rice plant (*Oryza sativa* L.)

Elham Abedi¹ and Ramazan Ali Khavari-Nejad²¹Islamic Azad University, Iran^{1,2}Kharazmi University, Iran

Cadmium (Cd) non-essential, but toxic, element for animals and plants is frequently present in paddy fields. *Oryza sativa* L., a staple food for at least the half of world population, also aquatic plants are known to accumulate heavy metals, easily absorbs Cd by the root, and in this organ the pollutants evoke consistent damages and reducing the root system. In this study the effects of different cadmium chloride concentrations (0, 15, 25, 35, 45 and 55 μM) on some physiological and biochemical processes including seed germination, root and shoot fresh and dry weight in rice were investigated. The results showed that after treated, seed germination rate was less affected, but root growth was restrained evidently. It affected the subsequent growth rate in these plants. Higher cadmium concentrations specially at 45 and 55 μM reduced plant growth significantly. Leaf chlorosis, wilting and leaf abscission were observed in plants treated with cadmium. Also Cd treatment reduced the germination percentage 6.9%, root and shoots length 68.9% and 85.6%, respectively. The decrease of 42.3% in fresh weight was noticed following the treatment with 45, and 55 μM cadmium doses compared with control treatment, respectively.

Based on the results we concluded that, these traits of rice plant are seriously affected by Cd treatment and also these are symptoms of toxicity of Cd element. Our results demonstrate that Cd affect rice root system, by interfering with the formation of the roots and their development. This results into an important change in the root system architecture, which may negatively affect plant survival in highly polluted paddy soils. Therefore, less amount of reduction in a special genotype is referred to the index of tolerance to Cd. Finally, in the metal contaminated areas, further research is needed to determine different levels of metals in the environment and various parts of the plants. Having in mind the value of this crop as a food all over the world, the consequences of the reactivity of its root system to these pollutants is very important for evaluating possible economic losses, and for executing repair strategies.



Effect of different concentrations of Cd on rice seedling biomass. Different letters on bar indicate significant differences at $P = 0.05$



Cadmium concentration in sterile rice growth medium (μM)

Recent Publications

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2. Ge, L.; Cang, L.; Yang, J.; Zhou, D. Effects of root morphology and leaf transpiration on Cd uptake and translocation in rice under different growth temperature. *Environ. Sci. Pollut. Res.* 2016, 23, 24205–24214
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5. Room R, Lei, M.; Tie, B.; Williams, P.N.; Zheng, Y.; Huang, Y. Arsenic, cadmium, and lead pollution and uptake by rice (*Oryza sativa* L.) grown in greenhouse. *J. Soils Sediments* 2011, 11, 115–123.

Biography

Elham Abedi has studied in plant physiology. She received her B.S. and M.S. degrees in plant physiology from the Department of basic science, Isfahan University, and Science and Research Branch, Islamic Azad University, Tehran, Iran, respectively. In 2015, she started her Ph.D. in the same department where her thesis is about the Effect of different concentrations of Nanoparticles on germination and some physiological and biochemical parameters of *Dorema ammoniacum* D. Don.

She has worked in evaluation of some physiological parameters in several poaceae family plants under in vitro stresses, such as heavy metal and salt. Now she has focused on selenium supplement on endemic species plants.

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Notes:

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August 15-16, 2019 | Rome, Italy

Juvenility in micropropagated plantlets versus rooted cuttings of maqui (*Aristotelia chilensis*)

Hermine Vogel, Benita González, Valeria Muñoz, Mariana Moya and Ursula Doll
Universidad de Talca, Chile

The antioxidant “superfruit” maqui (*Aristotelia chilensis*) is coming from a woody plant native to Chile and West-Patagonian areas of Argentina. It is a sacred medicinal plant of the indigenous Mapuche people. Up to now the rising international demand for maqui-berries is coming from wild collection. To provide in the future high quality and sustainable raw material for processing industry our research group has selected high-yielding genotypes that are propagated vegetatively, exploring also micropropagation techniques. As in some other woody plants micropropagation promotes juvenility expressed by a delay in fruit production. The objective of the present study was to compare young plantlets of the same age coming from in vitro propagation and rooted cuttings. In half of the plants the apical sprout was removed. Six clones were established in April 2017 (autumn) in field trials in an experimental design with four treatments and five replicates. During the following spring (December 2017) one of the genotypes ('Luna Nueva') produced fruit in all treatments, in three others ('Perla Negra', '304', and '319') only the rooted cuttings bloomed, and two of the genotypes ('218' and '622') produced flowers just in the following year (October 2018), when all studied genotypes and all plants had overpassed juvenility.

Initiation of flowering and fruit production of six selected genotypes of *Aristotelia chilensis* coming from micropropagation or rooted cuttings

Propagation method	Initiation of fruit production by genotypes (season)					
	Luna Nueva	Perla Negra	304	319	218	622
Rooted cuttings	1 st	1 st	1 st	1 st	2 nd	2 nd
Micropropagation	1 st	2 nd	2 nd	2 nd	2 nd	2 nd

Recent Publications

- Vogel H, González B, Catenacci G, Doll U (2016) Domestication and sustainable production of wild crafted plants with special reference to the Chilean Maqui Berry (*Aristotelia chilensis*). *Julius-Kühn-Archiv* 453:50-52.
- Doll U, Mosqueira D, Mosqueira J, González B, Vogel H (2016) Pruning maqui (*Aristotelia chilensis*) to optimize fruit production. *JARMAP* 6:10-14.
- Salgado P, Prinz K, Finkeldey R, Ramírez C, Vogel H (2017) Genetic variability of *Aristotelia chilensis* (“maqui”) based on AFLP and chloroplast microsatellite markers. *Genetic Resources and Crop Evolution* 64:2083–2091.
- Brauch JE, Reuter L, Conrad J, Vogel H, Schweiggert RM, Carle R (2017) Characterization of diglycosylated anthocyanins in two Chilean maqui berry clones by HPLC–DAD–ESI/MSn and 2D–NMR-spectroscopy. *J Food Composition and Analysis* 58:16-22.
- Moya M, González B, Doll U, Yuri JA, Vogel H (2019) Different covers affect growth and development of three maqui clones (*Aristotelia chilensis* [Molina] Stuntz). *Journal of Berry Research* DOI: 10.3233/JBR-180377.

Biography

Hermine Vogel is an Agronomist (Dipl. Ing. agr., 1987; Dr. agr. 1991) from TU München-Weihenstephan (1991). Since 1992 she is a professor at Universidad de Talca, Chile, and dean of the Faculty of Agronomic Sciences (2017). Her research is focused on plant breeding, domestication, medicinal and aromatic plants. In 2006 she obtained the Innovation Award for Women in Agronomy of the Fundación para la Innovación Agraria, Ministerio de Agricultura of the Chilean Government. In the last decade she initiated the domestication process of the Chilean Maqui-Berry, developing three female and three male varieties of *Aristotelia chilensis* as a genetic material for commercial cultivation of the species. Other research projects involved the Chilean species Boldo (*Peumus boldus*), Matico (*Buddleja globosa*), Bailahuén (*Haplopappus* sp.), and epiphytic orchids (*Chloraea* sp.) native to central Chile. She is the main author of two books and more than 25 indexed publications.

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Notes:



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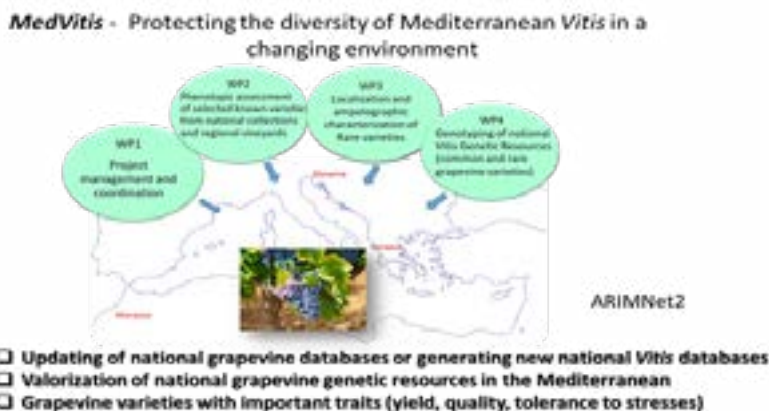
Agriculture & Horticulture

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MedVitis - Protecting the diversity of Mediterranean Vitis in a changing environment

Aliko Kapazoglou¹, Georgios Merkouropoulos¹, Theodora Pitsoli¹, Demetrios Taskos¹, Barbara Pipan², Victor Meglič², Lovro Sincovic², Younes Hmimsa³, Salama El Fatehi³, Mohammed Ater³ and Aicha El Oualkadi⁴¹Institute of Olive Tree, Greece²Agricultural Institute of Slovenia, Slovenia³University Abdelmalek Essaâdi, Morocco⁴National Institute of Agricultural Research, Morocco

Viticulture and wine production are important agricultural activities in Mediterranean countries, such as Greece, Slovenia and Morocco. In all three countries diverse geographical terrains and microclimates have favoured wide Vitis diversity and led to local varieties that are well adapted to the specific agro-climatic conditions supporting sustainable agricultural systems of low inputs. However, introduction of foreign commercial varieties have resulted in genetic erosion and loss of genetic diversity, calling for collaborative actions to preserve the diversity of Vitis genetic resources. Moreover, environmental changes across the Mediterranean region, linked to the ongoing global climate change, and the threat of diseases may have a negative impact for Mediterranean viticulture. The project, 'MedVitis', within the framework of the ARIMNET2 programme, is an integrated effort by Greek, Slovenian and Moroccan partners, aiming to protect Mediterranean grapevine biodiversity and enrich national grapevine resources. It involves phenotypic and molecular characterization of commonly used as well as rare grapevine varieties leading to proper variety identification, resolving problems of ambiguous varietal identity, and updating national grapevine databases. Furthermore, exploration and characterization of rare grapevine germplasm will provide knowledge about varieties with tolerance to the changing climatic conditions observed in these Mediterranean regions, such as drought, elevated temperature, increased rainfalls, or with resistance to common pathogens, and could promote sustainable viticulture as less water and/or fungicide usage will be needed. The project 'MedVitis' aims to protect the diversity of grapevine germplasm across the three countries, in order to address more efficiently issues of grapevine identification, genetic erosion, climate change and Vitis pathogenicity across the Mediterranean basin. Hence, the research proposed by the project 'MedVitis' is expected to contribute to the conservation of Mediterranean grapevine genetic resources, promote sustainable viticulture in the region, and enhance rural development affecting the economy and growth of local communities.



Recent Publications

1. Kapazoglou A, Ganopoulos I, Tani E, Tsaftaris AS (2018) Epigenetics, Epigenomics, and Crop Improvement. *Advances in Botanical Research* 86:287-324.
2. Merkouropoulos G, Michailidou S, Alifragkis A, Argiriou A, Zioziou E, Koundouras S, Nikolaou N (2015) A combined approach involving ampelographic description, berry oenological traits and molecular analysis to study native grapevine varieties of Greece. *Vitis* 54:99–103
3. Taskos, D., Stamatiadis, S., Yvin, J. C., & Jamois, F. (2019). Effects of an *Ascophyllum nodosum* (L.) Le Jol. extract on grapevine yield and berry composition of a Merlot vineyard. *Scientia Horticulturae*, 250:27-32.
4. Pitsoli T, Kapazoglou A, Doulis AG (2019) Morphological characterization and phenotypic variability of autochthonous Greek grapevine varieties. 21St GiESCO International Meeting (Group of international Experts for Cooperation on Vitivinicultural Systems) June 23-28, 2019, Thessaloniki, Greece.
5. Rusjn D, Pipan B, Pellengic R, Meglic V (2012) Genotypic and phenotypic discrimination of grapevine (*Vitis vinifera* L.) varieties of the 'Vitovska' and 'Garganja' Denominations. *European Journal of Horticultural Science*, 77:84-94.
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Biography

Aliki Kapazoglou is a Researcher at the Hellenic Agricultural Organization-Demeter, Institute of Olive Tree, Subtropical Crops and Viticulture, Department of Vitis, Lykovryssi, Athens, Greece. She received a PhD degree in Biochemistry from the Biochemistry/Molecular Biology Department of the University of Georgia, Athens Georgia, USA. She held Post-Doctoral and Research Fellow posts on plant molecular biology at the University of Cambridge, Cambridge UK, at the Imperial College of Science, Technology and Medicine, London, UK, the Wolfson Institute for Biomedical Research, University College London, UK, and at the Institute of Applied Biosciences (INAB), Centre of Research and Technology (CERTH), in Thessaloniki, Greece. Her research interests include genetic and epigenetic mechanisms governing plant development and abiotic and biotic stress responses, preservation of local genetic resources, molecular traceability of plants species and their products. She has publications in international scientific journals (SCI) and book chapters (i-index 13, >600 citations), a multitude of conference presentations and is a reviewer in scientific journals.

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Notes:

14th International Conference on

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August 15-16, 2019 | Rome, Italy

PyrrouAmpelos Phenotypic characterization, molecular fingerprinting and oenological evaluation of indigenous Vitis cultivars from the Epirus region of Greece

Theodora Pitsoli^{1*}, Eleni Sintou², Alike Kapazoglou¹, Ioannis Lambropoulos³, Andreas Doulis¹, Haralampos Stamatidis⁴, Dimitra Papaefthimiou⁴ and Eleni Tani⁵

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The project “PyrrouAmpelos” constitutes a synergy among two companies in the region of Epirus and three research originations: Zoinos Winery, IPER, the Hellenic Agricultural Organization-Demeter, the University of Ioannina and the Agricultural University of Athens.

It aims at preserving and promoting the uniqueness of indigenous grapevine genetic resources of the Epirus region of Greece, through their proper identification and valorization.

The goal of the project is to strengthen the capacity of the regional viti-vinicultural sector to place a variety of branded products in the market.

The project focuses on:

- localization of autochthonous grapevine varieties (either registered or not registered in the National Catalogue), ampelographic description and phenotypic evaluation
- genotyping and epigenetic analyses towards developing diagnostic molecular tools for identification, traceability and stability of genetic resources
- evaluation of the phytosanitary status of the grapevine germplasm
- evaluation of the oenological potential of different grapevine varieties through vinification, chemical analysis, metabolomic analyses and organoleptic assessments
- generation of a grapevine database with the phenotypic, genetic and epigenetic information complemented by geo-referenced data.



Recent Publications

1. Pitsoli T, Kapazoglou A, Aikaterini B (2019). Phenotypic variation of autochthonous Greek Vitis varieties. 1st annual meeting of COST Action 17111-INTEGRAPE, March 25-28, Chania, Greece
2. Pitsoli A, Kapazoglou A, Doulis AG, (2019) Morphological characterization and phenotypic variability of autochthonous Greek grapevine varieties. 21st GiESCO International Meeting (Group of international Experts for Cooperation on Vitivinicultural Systems), June 23-28, Thessaloniki, Greece.
3. Theodora Pitsoli et al. (2018) Differentiation of white wine-producing Vitis vinifera L. biotypes, autochthonous to Crete, Greece, employing ampelographic and SSR markers. International Conference “Vine, wine, food and health” May 22 – 26, Heraklion, Greece
4. Kapazoglou A, Ganopoulos I, Tani E, Tsaftaris AS (2018) Epigenetics, Epigenomics, and Crop Improvement. *Advances in Botanical Research* 86:287-324
5. Božić, D., Papaefthimiou, D., Brückner, K., De Vos, R. C., Tsoleridis, C. A., Katsarou, D., ... & Kanellis A (2015) Towards elucidating carnolic acid biosynthesis in Lamiaceae: functional characterization of the three first steps of the pathway in *Salvia fruticosa* and *Rosmarinus officinalis*. *PLoS One*, 10(5), e0124106.
6. Tani E, Chronopoulou EG, Labrou NE, Sarri E, Goufa M, Vaharidi X, ... & Abraham EM (2019) Growth, Physiological, Biochemical, and Transcriptional Responses to Drought Stress in Seedlings of *Medicago sativa* L., *Medicago arborea* L. and Their Hybrid (Alborea). *Agronomy*, 9:38.
7. Xanthakis E, Theodosiou E, Magkouta S, Stamatis H, Loutrari H, Roussos C, & Kolisis F (2010) Enzymatic transformation of flavonoids and terpenoids: structural and functional diversity of the novel derivatives. *Pure and Applied Chemistry*, 82:1-16.

Biography

Pitsoli Theodora holds a position of scientific personnel at the Hellenic Agricultural Organization-Demeter, Institute of Olive Tree, Subtropical Crops and Viticulture, Department of Vitis, Lykovryssi, Athens, Greece specializing in Ampelography and phenotypic evaluation of grapevine germplasm. She received her M.Sc. degree in Viticulture and Oenology from the Agricultural University of Athens. She was employed as a scientific officer and participated as research team member in various research programs. Her main research interests include the identification, classification and evaluation of grapevine varieties by ampelographic methods and grapevine micropropagation. She participated as a member of the Ministry of Agriculture Working Group, in the ECPGR On-Farm Conservation and Management Working Group and Wild Species Conservation in Genetic Reserves Working Group and as a member of the group of reviewer for the rational use of pesticides. She has undertaken a series of projects on the comparative assessment of native grapevine varieties in cooperation with local authorities in various regions of Greece. She has publications in international scientific journals and in conference presentations.

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Accepted Abstracts

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Field evaluation and distribution uniformity of subsurface drip irrigation systems for half-high blueberry under different mulching practices

Lordwin Jeyakumar and David McKenzie

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Emitter clogging is one of the major drawbacks of subsurface drip irrigation systems which can seriously affect crop yields significantly. The uniformity of water application in a subsurface drip irrigation system is an important aspect of the system performance. The objectives of this study were to better understand the drivers of the clogging phenomena and evaluate the uniformity coefficients of subsurface drip irrigation systems. This study was undertaken at St. John's Research and Development Centre, St. John's, Newfoundland and Labrador. The subsurface drip irrigation was designed and installed on a blueberry field (Figure. 1). Subsurface drip irrigation lines were installed with a 30" emitter spacing and a flow rate of 0.42 gal per hour. The blueberry field soil was slightly towards the clay side of the water depletion curve for the loam soil. Wood chip (10cm), sawdust (10 cm) and black plastic were used to maintain moisture and improve soil conditions. The distribution uniformity, emitter clogging and the performance of subsurface drip irrigation system were assessed using the randomly collected field data. Study results indicates that the coefficient of uniformity was found only 59.85% (wood chips), 34.25% (saw dust) and 33.65% (black plastic). It was found that the piping system was clogged in the mainline, submain line and the lateral pipes which eventually affected the flow rate through the emitters. An attempt to flush the main pipe lines reduced the emitter clogging significantly. This suggests that the lateral flushing and proper filtration system can control emitter clogging problems in subsurface drip irrigation systems.

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August 15-16, 2019 | Rome, Italy

Maize aphid and their associated natural enemies in maize based cropping pattern

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The present investigation on Abundance of natural enemies associated with *Rhopalosiphum maidis* (Fitch) in maize based planting system was carried out at Instructional farm and Department of Entomology, Rajasthan College of Agriculture, MPUAT, Udaipur. Maize variety Pratap maize-5 was sown with different intercrops viz., green gram, black gram, cowpea and soyabean in kharif, 2017. The coccinellids appeared in first week of August and thereafter gradually increased with aphid population reaching to its peak in second week of September, 2017. The maximum seasonal mean population of coccinellids was recorded in maize + cowpea (5.09 aphids/ plant). The mean population of coccinellids had a significant positive correlation with mean atmospheric temperature in all the intercrop treatments. The predation of aphids by the larval population of syrphid fly maggots was observed from the first week of August, in the maize + greengram, maize + blackgram and maize + cowpea; while, in sole maize and maize + soybean the predation began in second week of August. The maximum seasonal mean population of syrphid fly maggots was recorded in maize + cowpea (2.00 maggots/ plant).

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August 15-16, 2019 | Rome, Italy

Cultivating Food Sovereignty and Political Agroecology in Philadelphia and Beyond: The Power of Policy Analysis

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University of Pennsylvania, USA

Since the dawn of capitalism, small-scale agriculture has been consumed by industrialization and the persistent pursuit of economic growth. Farmers' wages are dwindling, and more of them are joining the record-high pool of hungry, malnourished, food insecure, and diet-related disease afflicted people worldwide. Food and agriculture policy in the United States has merely advocated for band-aid solutions to address these disparities, if any. These policies are still structured to perpetuate the status quo of corporate farm subsidies and global trade for growing cash crops, often not even used for food, at the grave expense of our local economies, communities, farmers, and environment. Policy analysts and decisionmakers must liberate agriculture from a deregulated market if we wish to preserve these invaluable resources, and redistribute power and wealth into the hands of those who can feed the world sustainably. La Via Campesina, an international movement advocating for small sustainable farmers' rights, coined a solution called "food sovereignty," defined as the right of food producers, distributors, and consumers should have control over food and agriculture policy, rather than corporate agribusinesses. It also emphasizes the right to agroecologically produced and culturally appropriate food. The literature on the subject is beginning to uncover a deep necessity for institutionalizing food sovereignty and political agroecology. This paper aims to build upon this cause by asking: what can policy analysis do to empower the voices of smallholders and food insecure people at varying levels of government? This policy analysis focuses on answering this question in the context of the Philadelphia area's food system. The study encompasses a thorough definition of the problems that have led to the food sovereignty and political agroecology movements, a survey of the evidence and alternatives, an evaluation of the policy options, an outcome projection, and a set of policy recommendations.

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August 15-16, 2019 | Rome, Italy

Taxonomic study of bacterial pathogens associated with ornamental plants in Assam

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Assam Agricultural University, India

Cultivation and export of floriculture products have received considerable interest in recent years due to the sector's immense potential to generate employment, income and export services. Assam due to its agro – climatic diversity, is a potential hub for cultivation of different ornamental plants. But the floriculture industry is being challenged mostly by different biotic stresses. For effective management of the biotic stress, the causal agents needs be identified, characterized and studied thoroughly. The taxonomic studies on the bacterial pathogen is least reported from Assam and other states of the North-Eastern region of India. The present investigation was made to isolate and determine the taxonomic position of the pathogenic bacterial isolates associated with flowering and foliage ornamental plants of Assam. 32 samples of 20 ornamental plants were collected from three major districts of Assam, viz., Tinsukia, Jorhat and Kamrup. Bacterial growth was confirmed in 18 diseased samples, which were then subjected to pathogenicity test in their respective host crops to satisfy the Koch postulates. Six bacterial isolates, viz., could reproduce the symptoms in their respective hosts, viz.; Gerbera (*Gerbera jamesonii*), Chrysanthemum (*Dendranthema grandiflora*), Anthurium (*Anthurium andreaeanum*), Marigold (*Tagetes erecta*), Dendrobium (*Dendrobium* sp) and Tuberose (*Polyanthus tuberosa*) hence were proven pathogenic to their respective hosts. The morphological, cultural, biochemical and molecular characterization of the bacterial isolates were done. The phylogenetic tree of the bacterial isolates was constructed to determine the similarity with related strains of respective genera. The isolate GE (J) isolated from Gerbera (*Gerbera jamesonii*) was confirmed to be *Pseudomonas cichorii*, isolate CH(K) isolated from Chrysanthemum (*Dendranthema grandiflora*) was confirmed to be *Pseudomonas cichorii* as well, isolate AN(K) isolated from Anthurium (*Anthurium andreaeanum*) was confirmed to be *Xanthomonas axonopodis* pv. *differenbachiae*, isolate MA(J) isolated from Marigold (*Tagetes erecta*) was confirmed to be *Pseudomonas syringae* pv. *tagetis*, isolate DE(J) isolated from Dendrobium (*Dendrobium* sp) was confirmed to be *Burkholderia gladioli* and isolate TU (J) isolated from Tuberose (*Polyanthustuberosa*) was confirmed to be *Xanthomonas campestris*.

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Population dynamics of insect pests of RABI Sorghum and their management through eco-friendly approaches

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Sorghum (*Sorghum bicolor* (L.) Moench) is one of the most important cereal crops in the semi-arid tropics. India contributes about 16% of the world's sorghum production. In Karnataka major area under cultivation is in the Northern dry zone of Karnataka. The production in these zone is affected by a wide array of biotic constraints, of which insect pests are major once. As many as 150 species of insects have been recorded as pests of sorghum from emergence to late grain filling stage. Among them sorghum shoot fly, (*Atherigona varia soccata* Rondani), stem borer (*Chilo partellus*), sugarcane aphid [*Melanaphis sachari* (Zehntner)], Shoot bug or plant hopper (*Peregrinus maidis* Ashmead and head bug (*Calocoris angustatus*) are major once and is reflected in low grain yields with avoidable losses ranging from 12 to 83%. In the present investigation the efforts were made from 2008-09 to 2016-17 to know the pest dynamics on the crops over the years, Data clearly indicated that shoot fly incidence was ranged from 2 to 51% with maximum during 2013-14. Stem borer incidence is increasing trend, which was 2-6% in 2008-09 compared to 2016-17 season (1.76 - 10.34%). Aphid (1- 9 grade) and shoot bug (15-80 bugs/pl) incidence was highly variable depending upon the temperature and amount of rainfall received during the cropping season. Further different integrated pest management module were framed and evaluated against the major pests of rabi sorghum. Pooled data of two years revealed that shoot fly and stem borer dead heart as well as shoot bug incidence was did not differ significantly among the modules. The cost economics data indicated that module comprising of Seed treatment with Biofertilizers (Trichoderma+ PSB + Azospirillum)+ Btk @ 2g/l at 25 DAE -Spray of Lecanicillium lecani @ 2ml/l at 45DAE recorded highest net profit (Rs. 29584/ha) with highest Benefit cost ratio of 2.46

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Chemical spraying using unmanned aerial vehicle technology in wetland rice cultivation in Malaysia

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Mechanisation Index (or MI) of 0.59 for Wetland Rice Cultivation in Malaysia can be considered very low as compared to other major cereal crops in most developed countries. Chemical spraying (MI of 0.19) with fertilizing and seeding (MI of 0.17 and 0.25, respectively) have been prioritized as the three critical field operations that need to be mechanized. Currently, knapsack power blower or knapsack mist blower were used by the service providers to the farmers in doing the seeding, fertilizing and chemical spraying operations. Being, manually operated, these modes of operation give low effective field capacities (0.72 to 1.25 ha/hr) and low work qualities in accordance to Good Agriculture Practices (GAP). Unmanned Aerial Vehicle (UAV) technology for chemical spraying is now getting much interest among farmers in the Rice Scheme Areas. Until December 2018, UAV has been used for 4 rice planting seasons in the Muda Agricultural Development Authority (MADA) Rice Scheme area to cover the spraying processes of herbicide, pesticide and foliar. Although the utilization is still in the earlier stage, it is optimistic that the UAV technology will be the best option for chemical spraying operation for rice. This paper describes on the pioneer R&D work by the research team of Universiti Putra Malaysia (UPM) in building an indoor test facility and formulating the test standard for testing UAV for agricultural field operations. Also, works by the team in formulating the spray chemical for optimum spray pattern and minimum spray drift that is specifically for UAV is presented in this paper.

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Assessment of variability in morphological traits of apricot germplasm issued from various genetic and environmental resources in Morocco

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Agro-morphological traits were evaluated for 92 Moroccan apricot accessions issued from different geographical sites, using 34 morphological qualitative and quantitative characters. Strong correlations between studied traits were observed, especially between fruit weight, stone weight, fruit dimensions, flesh firmness and color traits. Significant variations ($p \leq 0.001$) were observed among studied parameters which can help differentiate between different apricot accessions. The analysis of structure was able to show that the dimensions of the leaf and the fruit as well as the skin color of fruit represent the discriminating parameters of studied apricots. No clear morphological structure was displayed according to the geographical origin of accessions. However, the apricot genotype had a marked effect on the observed variability (More than 48 % of the total variance revealed in PCA analysis) and morphological structure of studied apricots. This study would provide a solid and genuine basis for effective management and sustainable use of apricot genetic material in future breeding programs in the Mediterranean region.

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Histopathological and biochemical response of selected maize cultivars to post flowering stalk rot in maize

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Macrophomina phaseolina and Fusarium verticilloides are one of the most devastating pathogens causing post flowering stalk rot (PFSR) disease in maize. Post flowering stalk rots of maize is globally important and among the most destructive diseases of maize. In India it poses moderate to severe threat to maize production in areas where it occurs endemically. Yield losses as high as 70% and economic losses up to 51% are recorded in susceptible varieties. Investigation was undertaken to study the host pathogen interaction and response of contrast cultivars against this disease. Various studies were done at histopathological, biochemical and genotypic level. This revealed that the asymptomatic behavior of inoculated contrast genotypes up-to knee-high level. However, histopathological studies exhibited the invasion of fungi in the roots and stem of young plants from where the pathogen enters in vascular bundle and adjacent tissues including the protoxylem lacuna, xylem vessels and metaxylem, this was observed in histopathological studies. To determine content of total phenolic compounds (TPC) of resistant lines developed from different genetic background, biochemical analysis was done. Hence, the biochemical analysis of inoculated and uninoculated genotypes was done which confirmed 3 to 4 fold increase in total phenolic compounds in diseased tested plants. This itself confirms the elicitation of biochemical defence by the host. The findings were validated by amplification of PR protein, β -1-3 glucanase in the test plant by casting gel of inoculated and uninoculated plants. Observations were compared with control plants.

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Influence of beneficial microorganisms on the development of maize

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Agriculture is becoming more and more intense and farmers forget to take care of the soil, restore its fertility. One of the options is to use biological products, because different microorganisms are vital components of the soil. They mobilise nutrients, produce plant growth regulators, protect plants from phytopathogens, improve soil structure and degrade xenobiotic compounds. The use of biological products results in the higher biomass and seedling height of maize. It also improves organic matter content and total nitrogen in soil.

The aim of the experiment – to find out the effectiveness of beneficial microorganisms for maize growth in different types of soil: sandy loam, clay loam and black soil/natural peat substrate. Maize seeds were treated in three different ways: 1 – control (not treated), 2 – treated with biological product, 3 – treated with biological product, fulvic, humic acids, 4 – treated with biological product, amino acids and seaweed extract. The research results have revealed differences in maize green mass, root mass, height, chlorophyll index, area of the leaves and dry matter. Maize green mass was higher when seeds were treated with biological product, fulvic and humic acids, therefore, root mass was higher when seeds were treated with biological product, amino acids and seaweed extract. It is noticed, that the use of biological compounds have a positive influence on maize chlorophyll index.

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Essential oil percentage of celery and parsley and their components as affected by method extraction

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Celery essential oil percentage gave insignificant effect according to the two used methods, meanwhile parsley essential oil percentage appeared significant values, the main components of the two plants were decreased with extracted by evaporator, (limonene of celery and Myristicin of parsley). Limonene was decreased from 71.32% with hydro distillation to 42.04% with evaporator hydro distillation, myristicin was lower from 77.58% to 53.69% according to the previously methods. Monoterpene hydrocarbons were decreased in two plants with evaporator hydro distillation, but oxygenated compounds were increased and the decrease was very low in both two plants, meanwhile sesquiterpene hydrocarbons cleared decrease in celery and increase in parsley.

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Enhance growth and biochemical composition of *Nannochloropsis oceanica*, cultured under nutrient limitation, using commercial agricultural fertilizers

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Microalgae culture media should be economic, allow for high growth, satisfy the needs of microalgal cells and easy to prepare. In this study, we evaluate the effect of different media formula prepared from commercial agricultural fertilizers (CAGF), comparing to F/2 Guillard standard medium as a control medium, on growth (cell density, CD; dry weight, DW and specific growth rate, μ) and biochemical composition (lipid, protein, and carbohydrate) of *Nannochloropsis oceanica*. Comparing to N/P ratio (9.6) and actually quantity (12.36 g/l and 1.29 g/l, respectively) of F/2 standard medium, six N/P ratios (19.2, 9.6, 9.6, 4.8, 3.2 and 1.6) were prepared from Nitric Acid (N-Nt) or Ammonium Sulphate (N-Am), as a nitrogen source, with phosphoric acid (P), as a phosphorus source, for culturing media of *N. oceanica*. The results investigated that some CAGF media achieved significant ($P \leq 0.05$) growth and biochemical composition higher than F/2. Comparing to lipid percentage (30.70 %) of F/2, the lipid percentage of *N. oceanica* cultured on different CAGF media were ranging from 18.40% to 46.12%, depending on nutrient limitation, nitrogen source, N/P ratios and actually atom concentrations. Finally, the use of CAGF constitutes a viable alternative of F/2 medium to reduce the production costs *N. oceanica*, the commonly used in marine hatcheries and also other biotechnological applications.

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Black cumin (*Nigella sativa* L.) response to PSB and date and plant density in dry farming systems in semiarid condition

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Objective: change the seeding time, use of phosphorus solubilizing bacteria and chose different plant densities are the most typical factors that influence the plant characteristics, morphological indicators and grain yield in Black cumin.

Methods: threes seeding dates (28 October, 11 and 25 November), three phosphorus resource (control, 50% recommended Ammonium Phosphate + biological Phosphorus, and biological Phosphorus alone) and three plant densities (20, 30 and 40 plants/m²) were applied as split-split plot arrangement in RCBD at three replications in farm condition in Qazvin, Iran in 2015 and 2016.

Results: change the number of carpels per capsule from to 6.09, number of grain per plant? from to 2679), grain weight per plant from to 6.04g), grain yield from? to 1590 kg/ha are some of results that were obtained by change the seeding time from? to November 11. number of grain per capsule and number of grain per carpels increased by biological phosphorus application significantly. Also maximum number of grain per plant and grain weight were obtained in 20 plants/m² density.

Conclusions: Results of this study have showed that application of A. absinthium extract can improve heal–ing process of damaged Achilles tendon.

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Relationship between population dynamics of oriental fruit flies and biotic factors in different year 2012 and 2017 in Yezin, Myanmar

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The aim of this study is to monitor the population fluctuation of oriental fruit flies in different year 2012 and 2017 and to study the effect of abiotic factors (temperature, rainfall, duration of sunshine hour and relative humidity) on the population fluctuation of male oriental fruit fly using methyl eugenol traps in mango orchard farms of Department of Agricultural Research in Yezin, Myanmar. In 2012, the highest mean number of male oriental fruit flies/trap/day (108.24 ± 3.65) was observed in the month of June and the lowest (2.95 ± 0.20) in December, 2012. The highest mean number of male oriental fruit flies/trap/day (458 ± 15.5) was observed in the month of July and the lowest (0.90 ± 0.30) in January, 2017. Population data were analyzed with meteorological data including temperature, rainfall, duration of sunshine and relative humidity. Population fluctuation of male oriental fruit flies were clearly observed to be positively correlated with temperature, rainfall and relative humidity, and negatively correlated with the duration of sunshine.

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New approach for production of volatile and acephenanthrylene constituents (anti-breast cancer) using biotic and abiotic elicitors in cell cultures of *Pimpinella anisum* L.

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Pimpinella anisum L. (anise) is a worthy aromatic medicinal plant involving medical and pharmacological potentials. Our study aimed to apply the biotechnological techniques using biotic (yeast) and abiotic (L.phenylalanine) elicitors for enhancement callus productivity of anise and enrichment their content of biological efficient phytochemical constituents to be applicable in medical and pharmacological purposes. Total 15 of volatile constituents and acephenanthrylene skeleton were detected comparatively in callus cultures of *Pimpinella anisum* L. and were identified by GC-MS. Cytotoxicity of the extracts for suppression breast cancer cell lines (MCF7) proliferation was evaluated. Leaf, stem and shoot tip *explants* of in vitro seedlings were examined for callus initiation, shoot tip was the best on medium containing 1mg/l IAA+1mg/l 2.4-D+2mg/l kin. Fresh weight, growth rate and increase value of shoot tip calli were maximum values (18.356 ± 0.269 , 2.407 ± 0.038 , and 11.237 ± 0.179 , respectively) after 4 weeks as the optimal period for sub-culture. Shoot tip calli were improved by culturing on medium containing either yeast at 0.5, 1.0, 1.5 g/l concentrations or L.phenylalanine at 2, 4, 6 mM/l concentrations. Treatments of yeast (0.5, 1.0, 1.5 g/l) and 2mM/l L.phenylalanine increased callus fresh weight (17.556 ± 0.195 , 21.864 ± 0.428 , 26.92 ± 0.440 and 13.734 ± 0.199 , respectively) compared to calli grown on medium free elicitors (control) which recorded 12.996 ± 0.284 . Total volatile constituents content were boosted to be 32.38%, 40.96%, 43.51% in treatments of 2, 4, 6 mM/l L.phenylalanine, respectively and 45.45%, 31.09%, 26.01% in treatments of 0.5, 1.0, 1.5 g/l yeast, respectively, in comparison to the control (16.83%). 1,2-Diphenyl-5-(t-butyl) acephenanthrylene was detected in all treatments at different proportions. Anise callus extracts possessed high positive efficiency against breast cancer prevalence. Cytotoxic activity of callus extracts was between IC₅₀ of 1.33 µg/ml to IC₅₀ of 2.39 µg/ml. From the phytocomponents point of view, the percents of acephenanthrylene and volatile constituents in anise callus contributed to their anticancer influence.

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Validation of agronomic UAV and field measurements for tomato varieties

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Unmanned aerial vehicles (UAV) have been recognized as excellent tools to provide real time feedback of temporal and spatial conditions found in agricultural fields throughout the growing season. UAVs have also allowed accelerating breeding programs by screening varieties or by selecting agronomic traits that confer biotic and abiotic stresses and selecting the best management practices that optimize the management of soil and water resources. The main objectives of this study were to assess the potential use of UAVs to determine crop height, canopy cover, and NDVI during the tomato growing season for eight tomato varieties; to validate tomato height obtained with a UAV; and evaluate the correlation between leaf area index and canopy cover determined with the UAV. This study was conducted at the Texas A&M AgriLife Research and Extension Center located in Weslaco, TX. The UAV was flown over a tomato trial planted with 90 plots that contained eight different tomato varieties; 3 roma (DRP8551, SV8579TE, and Tycoon) and 5 round (Mykonos, TAM-Hot, Shourouq, TAMH FIA F1, Everglade) replicated three times per row and planted in three rows. The plots of the tomato varieties Mykonos and DRP-8551 were duplicated so plants could be removed and destroyed to collect biomass data. Commitment field measurements of plant height, leaf area index, and NDVI were collected weekly (from April 27 to June 22, 2017). All the tomato varieties were healthy without diseases and the NDVI values estimated with the UAV peaked between 90 and 110 days after planting. A coefficient of determination of 0.72 was observed between canopy cover estimated with the UAV and leaf area index measured with the ceptometer. The UAV data of crop height was fitted to sigmoid curve and the coefficient of correlation was 0.9966. In addition, the calculated Fisher's paired t test statistic showed no significant difference ($P \leq 0.05$) between the estimated, the UAV and manually measured crop heights. In the future, UAV crop growth and NDVI monitoring could be improved through temporally dense data acquisition, increasing the number of ground samples and their geometric coincidence with the grids in UAV images, removal of weather effects, and other systematic errors caused from image quality and grid size.

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Algerian fermented butter "*Smen/Dhan*": lipolytic flora composition and comparative study of their lipase production

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In Algeria, traditional dairy products are prepared according to know-how inherited by rural women. These products are part of the Algerian heritage and have a great cultural and economic importance. Among these foods, fermented butter "*Smen/Dhan*" prepared from fresh butter according to different processes. During the maturation, the product develops organoleptic and nutritional qualities whose lipolysis is the main mechanism of this transformation and this activity could arise from the microbial cells. The aim of this work is the search and isolation of lipase-producing microbial strains from the "*Smen/Dhan*" and evaluates their potential. Isolation of lipolytic strains was realized from five samples of fermented butter obtained with different preparation methods and the storage times (years): 1 (E1), 3 (E2), 23 (E3), 5 (E4) and, 10 (E5). Samples were collected from different areas of Algeria (El-Oued, Sétif, Jijel and Béjaïa). To obtain a diversity of lipolytic flora, we have used several culture media (Ordinary Nutrient Agar, Man Rogosa Sharp agar, Terzaghi agar, Sabouraud Dextrose agar). These entire mediums are added with olive oil and / or Tween 80 to make them selective. The incubation was carried out at 37 °C for 5 days. The strains obtained are classified with their potential activity. Titration is the method used to estimate of the free fatty acids or lipase activity. 95 strains were selected for their lipolytic activity and classified as bacteria. 29 strains producing lipases: were preselected for their ability to develop a high lysis height on the agar medium. They are Gram+, catalase +, immobile and unpopulated and cocci (04), rods (04) and filamentous (21). This shows that different preparation methods and storage times of these five products have effects on their microbial counts. After a hierarchical ascending classification, six strains (SG5, BG14, SG9, SG26, SG25, and SS46) were screened for their ability to produce high levels of extracellular lipases independently on the nature of the lipid substrate in the medium.

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Performance evaluation of improvised organic fertilizers in the yield of cash crops: Its economic contribution to farmers in Tawi-Tawi province southern Philippines

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Today's farming activities relies on fertilizers. Fertilizers are becoming more important and common resource in today's farming society as many farmers and individuals use it frequently in their farms be it small-large scale farming. But, it is well known that fertilizers can greatly damage the environment as a result of the contamination and toxic waste pollution in soils it creates more particularly the commercialized inorganic fertilisers.

One of the most damaging yet poorly managed types of pollution caused by inorganic fertilizers is soil pollution and contamination which can be caused by a wide variety of factors such as improper use and over use of chemical fertilizers over the period of time in a particular place. Fertilizer pollution and contamination in soil can go on to severely impact plants, animals and eventually humans which totally destroys ecological diversity.

Bioremediation is an effective, efficient and increasingly popular method of removing contaminants from polluted soil. This is one of the identified methods that degrade pollutants with naturally occurring organisms. This can permanently remove the pollution at a very least expenses unlike the commonly used methods.

This contains naturally occurring organisms that can degrade pollutants in soils which can be enticed by a wide variety of collected materials capable of introducing more nutrients to the soils and therefore stimulate more pollutant degrading organisms, as demonstrated and confirmed in several studies the positive effects of bioremediation. This study contemplates improvised organic fertilizers as one bioremediation process to help regain soil fertility and ecological stability of the farming environment.

However, the possibility of using improvised organic fertilisers which are known to bring together essential nutrients to the soil has not been heavily researched though this solution holds a lot of potentials as it could solve two significant global issues (pollution and food waste).

Sea Urchins Spines, Banana Peels, Papaya Peels Extract and Fish remains are common food wastes that commonly serve no further purpose once the food is consumed. A bioremediation solution that utilises these materials could significantly help withstand economic and ecological stability of the farming environment. This study gives feedback on the importance of the improvised organic fertilizers as it enhances economic and ecological contribution to both farmers and farming. These were measured on the growth and yield two common crops (corn and peanuts) and incomes of the farmers.

Four kinds of cash crop used in this experimental study to include peanut, bellpepper and string beans distributed to four different concentrations of improvised organic fertilizers such as "Concentrated Mixture of Ripe Banana Peels and Papaya Extract for peanut, Concentrated Mixture of Triturated Sea Urchin Spines and Basil Extract for Bellpepper, Concentrated mixture of Algae and Wild Basil Extract for Corn, and Concentrated mixture of FFAA and Seaweed Extract for String beans".

An RCBD (Randomised Complete Block Design) was used to analyse the data where it resulted good responses of crops in terms of yield and thus increased the income of the local farmers. As the yield of each crop increases, the income tends to increase as well.

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Impact of some biofertilizers and olive pomace as soil amendments on *Meloidogyne incognita* , growth and chemical analysis of jasmine in Egypt

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Seven organic treatments manufactured of various substances viz., Nile compost (NC) , Town refuses compost (TRC) , Market residues compost (MRC) , Agro - compost 1% N (AC 1% N) , Agro - compost 3% N (AC 3% N) , Nile fertile (NF) and Olive pomace compost (OPC) as soil amendments were evaluated under field conditions as soil treatment for managing the root-knot nematode, *Meloidogyne incognita* populations either in the soil or in roots as compared to untreated plants throughout two successive seasons. Significant differences in the nematode populations were found within and between treatments. The percentage efficacy of such treatments in reducing the nematode populations in both soil and roots, the high rate of NC product & the recommended rate of MRC product in two months , one month at using each of the low rate and the recommended rate of NC , TRC, AC 3% N as well as one month at using each of the high rate of MRC and AC 3% N the lower rate (4 kg / tree) of AC 1% N has surpassed the others . As for plant growth, all the tested treatments caused increases in plant height , stem diameter , flower yield , weight of 100 flowers , concrete recovery of flowers % , some oil characters i.e. refractive index at 20°C , specific gravity at 15°C , acid and ester numbers as well as chemical composition of jasmine leaves and flowers i.e. their contents of N , P , K , total chlorophylls , total carbohydrates and crude protein % as compared with control plants. Generally, there were positive relationship between doses of all treatments and reduction in the nematode populations and increases in all the previous mentioned of jasmine growth parameters.

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Effect of *Symphytum Officinale*, *Cymbopogon Citratus* and *Allium sativum* extracts on *Botrytis Cinerea* causal agent of grey mold of tomato

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Botrytis cinerea Pers. is a necrotrophic plant pathogenic fungus, the causal agent of gray mold. The fungus has a wide host range and can infect over 230 plant species. In Algeria, it is almost present on all greenhouse crops, especially tomatoes; which the pathogen can cause major economic damages. This disease is controlled mainly by the application of fungicides. However, this can lead to the development of pathogen resistance. For this reason, some alternative methods of control have been adopted and our research is focused on them by using plant extracts against *B. cinerea*. In this study, we evaluated the effect of comfrey manure (*Symphytum officinale*), decoction of citronella (*Cymbopogon citratus*) and garlic decoction (*Allium sativum*) on one strain of *Botrytis cinerea* isolated from tomato and selected among 40 isolates for its high aggressivity and resistance to fenhexamid. Tests were conducted in vitro, on PDA medium for mycelial growth and on detached leaves by measuring the diameter of lesion. Different concentrations of plant extracts (5-10 and 20%) were tested on PDA medium. The results revealed that the highest antimicrobial activity (50% inhibition of mycelial growth) was obtained using *Symphytum officinale* at 10%. On detached leaves, the concentration of 5% was tested for all extracts, before and after inoculations. Results showed that *Symphytum officinale* reduce the severity of the disease by 52% in preventive and 44% in curative treatment. Whereas, *Allium sativum* revealed the highest efficacy on reducing the severity of the disease by 76% in preventive and 64% in curative treatment.

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Symbiont diversity of *Myzus persicae* complex

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Aphids are herbivorous insects widely distributed around the world, many species of aphids are agricultural pests causing significant economical losses due to direct damages by feeding and indirect damages by transmitting phytoviruses and contributing to fungus proliferation. Aphids live in association with endosymbiont bacteria classified as obligate or primary endosymbionts (without them the aphid does not survive) and facultative or secondary endosymbionts (the aphid can survive without them, but owning them can modify their ecological and physiological features). Among the most relevant aphid pests the peach-potato aphid, *Myzus persicae* (Sulzer), is a polyphagous insect able to utilize a wide range of weeds and crops, and possess a subspecies particularly well adapted to tobacco (*Nicotiana tabacum*) named *Myzus persicae nicotianae*. Knowing the endosymbionts of this aphid is fundamental to understand aspects related to the evolution, ecology and control of this pest; however, the technology required for this was, until recently, insufficient. Here, a metagenomic approach was used to identify all the bacterial species present in this aphids, for which samples were collected from different hosts, in a north-south transect of 1800 km in Chile. After the massive sequencing and bioinformatic analysis, different bacteria were identified, that include some belonging to different families, as the Oxalobacteraceae (related to host plants use); Comamonadaceae and Pseudomonadaceae that are plant and human pathogens; Enterobacteriaceae including the obligatory endosymbiont (*Buchnera aphidicola*) and facultative endosymbionts involved in the defense against natural enemies and other bacteria species that are human pathogens. These results open a new research line aimed at understanding the role of bacteria on evolutionary, ecological and physiological traits of this pest.

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Sustainable control of oil palm insect pests in Malaysia

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The oil palm environment in Malaysia is rich in many ecosystem services which can be benefited to control pests and diseases. Some examples are the soil microbes which consist of entomopathogenic fungi and bacteria which can be exploited for insect control, especially bagworms, rhinoceros beetle and termites. The bagworms (Lepidoptera: Psychidae) are currently severely infesting oil palm plantations in Malaysia. The Integrated Pest Management (IPM) of bagworms includes aerial spraying of *Bacillus thuringiensis* (Bt), cultivation of beneficial plants and fixing of natural pheromone traps. The rhinoceros beetle (Coleoptera: Scarabaeidae), can be managed with the soil fungus *Metarhizium* and the *Oryctes nuditarsis* (OrNV). The subterranean termite (Isoptera: Rhinotermitidae) can be controlled with two entomopathogenic fungi, *Beauveria bassiana* and *Metarhizium anisopliae* with perform similarly as an insecticide. Birds are also examples of ecosystem services which can be further exploited for the control of rodents and also insect pests. There are several endemic nocturnal and diurnal bird species inhabiting the oil palm plantation which have the potential to control pests, especially bagworms. This paper deliberates on some of the endemic ecosystem services in Malaysia which have been exploited towards the management of major insect pests in oil palm. The enhancement of existing and introduced ecosystem services would ensure better management of insect pests for the sustainable cultivation of oil palm.

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Influences of different storage conditions on postharvest quality of mango (*Mangifera indica* L. cv. Sein Ta Lone)

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Mango (*Mangifera indica* L) is one of the important exportable fruits in Myanmar. It is a climacteric fruit and the highest postharvest losses due to the most perishable fruit. The objectives of this study are to investigate respiration and ethylene production rates of Sein Ta Lone mango and to assess the postharvest quality and storage life as affected by different storage conditions. The wrapping materials were foam net sac, paper and untreated fruits used as control. The fruits were stored at room temperature and the optimum cold storage temperature of mango fruit at 13°C. Treatments were laid out by factorial arrangement in randomized complete block design (RCBD) with four replications. The collected data on weight loss (%), color index, respiration rate, ethylene production and shelf life (days) were analyzed. The fruits stored at 13°C significantly showed the longer shelf life than those stored at room temperature. There were no significant differences in color development and shelf life of fruits among the wrapping treatments at room temperature. Thus, Sein Ta Lone mango can be stored the shelf life of 7 days at ambient condition (36°C, 50% RH) and 14 days at 13°C. The ethylene production and respiration rates of Sein Ta Lone mango under 13°C were considerably lower than that of room temperature storage. The ethylene production and respiration rates were not significantly different among the wrapping treatments at respective temperatures. The minimum rate of respiration and ethylene production of untreated fruits were 10.37 mg kg⁻¹hr and 0.05 nl kg⁻¹hr, respectively.

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