OTHERS (incl. Cultivation, Distribution, New species, Postharvest Technologies, Packaging Technology, New technologies/Know How Developed, Book reviews, Forthcoming events)

CULTIVATION

NPARR, 7(3), 2016-312 Using depth cameras to extract structural parameters to assess the growth state and yield of cauliflower crops

The use of robotic systems for horticultural crops is widely known. However, the use of these systems in cruciferous vegetables remains a challenge. The case of cauliflower crops is of special relevance because it is a hand-harvested crop for which the cutting time is visually chosen. This methodology leads to a yield reduction, as some inflorescences are cut before ripening because the leaves hide their real state of maturity. This work proposes the use of depth cameras instead of visual estimation. Using Kinect Fusion algorithms, depth cameras create a 3D point cloud from the depth video stream and consequently generate solid 3D models, which have been compared to the actual structural parameters of cauliflower plants. The results show good consistency among depth image models and ground truth from the actual structural parameters. In addition, the best time for individual fruit cutting could be detected using these models, which enabled the optimization of harvesting and increased yields. The accuracy of the models deviated from the ground truth by less than 2 cm in diameter/height, whereas the fruit volume estimation showed an error below 0.6% overestimation. Analysis of the structural parameters revealed a significant correlation between estimated and actual values of the volume of plants and fruit weight. These results show the potential of depth cameras to be used as a precise tool in estimating the degree of ripeness during the harvesting of cauliflower and thereby optimizing the crop profitability [D. Andújar*, A. Ribeiro, C. F. Quintanilla, J. Dorado (Center for Automation and Robotics, CSIC-UPM, Arganda del Rey, Spain) Computers and Electronics in Agriculture, 2016, 122, 67-73].

NPARR, 7(3), 2016-313 Phytochemical composition and allelopathic potential of three Tunisian Acacia species

This study was conducted to evaluate the phytochemical content and allelopathic potential of various organic extracts from seeds and pods of three Tunisian species of Acacia (Acacia cyclops, Acacia mollissima and Acacia cyanophylla) which was evaluated on lettuce germination and seedling growth. The total flavonoid contents in the organic extracts were closely ranged (3.1-24 mg RE/100 g DW), n-butanol extracts of Acacia pods were the richest ones in phenol and condensed tannin contents. For allelopathic activity, the EtOAc extract of seeds from A. cyanophylla inhibited the germination of the target seeds. The seedling growth was inhibited by all organic extracts with disproportion. The chromatographic separation methods led to isolation of a triterpenoid saponin named mollisside B from A. cyclops pods n-butanol extract. The allelopathic effect of this compound was evaluated on Lactuca sativa L. At a concentration of 200 µg/mL, the isolate has influenced on seedling growth with percentages of inhibition of 63.68% and 88.21% for shoot and root length, respectively [A. Jelassi, A. E. A. Zakhama, A. B. Nejma, A. Chaari, F. H. Skhiri, H. B. Jannet* (Laboratory of Heterocyclic Chemistry, Natural Products and Reactivity, Team: Medicinal Chemistry and Natural Products, Faculty of Science of Monastir, University of Monastir, Avenue of Environment, Tunisia) Industrial Crops and Products, 2016, 83, 339-345].

NPARR, 7(3), 2016-314 Effects of water on recovery of weed seedlings following burial

Recovery of common agricultural weeds after burial by soil was studied in four greenhouse and three field experiments. Species studied included velvetleaf, Powell amaranth,
common lambsquarters, barnyardgrass, and giant foxtail. Seedlings were bent over before burial to simulate the effect of the impact of soil thrown by a cultivator. Altogether, more than 35,000 seedlings were marked and observed for recovery. No seedlings recovered from 4 cm of burial. Recovery from complete burial under 2 cm of soil ranged from 0 to 24% depending on the experiment, species, and watering treatment, but recovery greater than 5% was rare. Large-seeded species tended to recover from complete burial under 2 cm of soil better than small-seeded species. The study did not reveal a difference in recovery of grasses relative to broadleaf weeds. Overall, seedlings tended to recover best when water was applied daily after burial, worst when water was applied once on the day of burial, and to an intermediate extent when no water was applied. However, difference in recovery between the no-water and watering-once treatments were usually small. Also, many experiment by species combinations showed no significant differences among watering treatments. When even a small portion of the seedling was left exposed, recovery generally exceeded 50%. Organic weed management systems commonly use burial of weed seedlings with tine weeders and soil thrown by sweeps and hilling disks to control weeds in crop rows. Recovery from burial can be minimized by withholding irrigation for several days after hilling-up operations. Nomenclature: Barnyardgrass, Echinochloa crus-galli (L.) Beauv. ECHCG; common lambsquarters, Chenopodium album L. CHEAL; giant foxtail, Setaria faberii Herrm. SETFA; Powell amaranth, Amaranthus powellii S. Wats. AMAPO; velvetleaf, Abutilon theophrasti Medik. ABUTH. [C. L. Mohler*, J. Iqbal, J. Shen, A. Ditommaso (Section of Soil and Crop Sciences, School of Integrative Plant Science, Cornell University, United States) Weed Science, 2016, 64(2), 285-293].

NPARR, 7(3), 2016-315 New knowledge about the ecology and control of important pests in apple cultivation

A large-scale three-year study on apple orchards in Havelland uncovered key knowledge about the ecology and control of significant pests for 3 different varieties. Experiments included a range of different blocks and varieties and focussed on the apple blossom weevil (Anthonomus pomorum), the rose tortrix moth (Archips rosana), the reticulated tortrix moth (Adoxophyes reticulana) and the European red mite (Panonychus ulmi). The experiments were divided according to season, from budding through flowering and finally at harvest. Infestation by the apple blossom weevil depended on the timing of flowering for the variety. The "Breuhahn" variety was the most heavily infested. Later and more delayed flowering resulted in higher infestation rates. The attack by pests had a thinning effect with corresponding flower infestation rates. There was no effect on yield when flowering tendency was normal. The flower clusters and leaves of the early-harvest variety "James Grieve" was most heavily infested by the rose tortrix moth (Archips rosana). The extent of the damage from pests that attack leaves could be determined exactly using the drying method. The rose tortrix showed significant differences only in the number of leaves in infected and healthy plants. There were significant differences in leaf mass between untreated controls and fruit clusters infested by the reticulated tortrix (Adoxophyes reticulana) for all 3 varieties. The "James Grieve" variety was most heavily infested. The results of the experiments involving the European red mite (Panonychus ulmi) in healthy and infested leaves and leaf number revealed preferential infestation of the "Golden Delicious" and "James Grieve" varieties. Overall, the study provided key information for the prognosis and control of key pests in apple cultivation [R. Gottwald (Monchort 6, D-19348 Perleberg, Germany) Gesunde Pflanzen, 2016, 68(1), 27-32].
NPARR, 7(3), 2016-316 Investigating energy balance and carbon footprint in saffron cultivation - a case study in Iran

Saffron is one of the most expensive agricultural crops in the world which needs to be clearly monitored in the view of energy balance and carbon footprint in the production stage. Iran is the leading countries in saffron production and now accounts for approximately 60% of the world total production. As the biggest producer of saffron, analyzing the energy and carbon balance would help to produce this crop more economically and environmentally friendly. In the present study, the saffron cultivation in Southern Khorasan, a province in the east of Iran was taken into consideration and this cultivation was evaluated in terms of energy balance and carbon footprint. The evaluation was performed based on the data derived from whole life cycle of this crop i.e., a 6 year period. The assessment of energy balance demonstrated that on average, the total input energy consumed was 99,236 MJ ha(-1). More specifically, the average of energy indices i.e. energy ratio, energy productivity, and net energy were calculated 0.0044, 0.0003 kg MJ(-1), and -98,818.5 MJ ha(-1), respectively. The results clearly revealed that Nitrogen based fertilizers, farmyard manure and Phosphor based fertilizers dominated the total energy consumption meaning that their consumption management need to be given a priority. The total greenhouse gas emissions in saffron production was calculated on 10,897 kg CO2eq ha(-1) which showed a high degree of mismanagement in farm practices in the region meaning that without considerable reduction in saffron yield energy saving can be achieved. [M. Khanali*, M. Movahedi, M. Yousefi, S. Jahangiri, B. Khoshnevisan (Univ Tehran, Fac Agr Engn & Technol, Dept Agr Machinery Engn, Karaj, Iran) Journal of Cleaner Production, 2016, 115, 162-171].

NPARR, 7(3), 2016-318 Traditional cultivation of sunnhemp (Crotalaria juncea) in eastern India

Traditional farming method plays an important role in human civilization. Indigenous knowledge is declining because of new agricultural technology has replaced traditional cultivation. But in the some part of country like Eastern Uttar Pradesh and Northern Madhya Pradesh (Bundelkhand Region), social/tribal communities are keeping preserve the traditional knowledge. A survey was made in the villages of five districts of Eastern Uttar Pradesh (Mahoba, Banda, Rath, Chitrkoot and Hamirpur) and one district of Northern part of Madhya Pradesh (Chhattarpur). The study was conducted on indigenous knowledge of sunnhemp (Crotalaria juncea L.) fibre cultivation in Bundelkhand region in India where the social/tribal communities are still preserving the traditional cultivation of sunnhemp as fiber crop which belong to the subfamily Panicoideae. Millets are one of the major food sources in arid and semi-arid areas of the world and they have been important crops in the prehistory of Africa and Eurasia. In this paper, we discuss phytoliths and starch grains from two of the less studied major millets (Pennisetum glaucum and Sorghum bicolor) as well as from some small millet species that are not normally considered of much importance (so-called forgotten millets: Digitaria ciliaris, Echinochloa colona, Echinochloa frumentacea, Brachiaria ramosa, Setaria pumila and Setaria verticillata). The preliminary results of this study on phytolith morphology, both at single and joined (silica skeletons) morphotypes, and starch grains show great potentials for the identification of different genus or species on the basis of microremains [M. Madella*, C. Lancelotti, J. J. G. Granero (CSIC, Dept Archaeol & Anthropol, Complex & Socioecol Dynam CaSEs, IMF, C Egipciaques 15, Barcelona 08001, Spain) Archaeological and Anthropological Sciences, 2016, 8(1), 17-28].
Recycling of residual substrate from *Ganoderma lucidum* mushroom cultivation as biodegradable containers for horticultural seedlings

Cultivation of the medicinal mushroom *G. lucidum* leaves a residual substrate with a matrix that is bound by the mycelium net and presents the necessary mechanical properties to be cut and hollowed. This material was used to make biodegradable containers (Ganocetas) which were evaluated for growing horticultural seedlings. Residual substrates from *G. lucidum* cultivation on sunflower seed hull, rice straw and rice husk agro-residues were used for making Sunflower Seed Hull-based Ganocetas (SFG) and Rice agro-based residue Ganocetas (RG).

Utilization of SFG did not affect the germination in 15 of the 17 plant species tested and it improved seedling growth and/or vigor in 31% of them. A good porosity in these containers produced a cooling effect which reduced the maximum temperature by up to 3 degrees C on the warmest days.

In the second assay, we evaluated both types of Ganocetas (SFG and RG) in tomato seedling transplantation, seedling establishment and tomato production. On transplanting day, seedling growth and vigor in SFG did not differ from the control, whereas both parameters were reduced in RG. Results of seedling establishment under ideal conditions indicated that growth, flowering and early fruit production of tomato using SFG was comparable to the control, whereas plants were reduced in all three parameters when using RG. Tomato production yields were similar between SFG and the control treatments; moreover, physicochemical analysis predicts a promising performance in transplanting and growth of SFG under stress conditions. However, in spite of presenting comparable physical and chemical properties, tomato production using RG was lower. More research is needed to look for possible allelopathic substances coming from the biodegraded lignocellulosic matrix in these RG containers [P. D. Postemsky*, P. A. Marinangeli, N. R. Curvetto (UNS, CONICET, CERZOS, Lab Biotechnol Edible & Med Mushrooms, Camino La Carrindanga Km 7, RA-8000 Bahia Blanca, Buenos Aires, Argentina) *Scientia Horticulturae*, 2016, **201**, 329-337].