EU-NACOA

1st EU/North-African Conference on Organic Agriculture

11-12th November 2019
Hotel Palm Plaza, Marrakech-Morocco

BRIDGING THE GAP,
EMPOWERING
ORGANIC AFRICA.

BOOK OF ABSTRACTS

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Dr. Faouzi Bekkaoui

Director of INRA Morocco

Dear Audience,

Organic farming and agroecology systems are considered very relevant solutions for meeting the Sustainable Development Goals of the United Nations. Organic and agroecological farming includes strategies for reducing hunger, climate change mitigation and adaptation, increased biodiversity and its functional role in environmental friendly production.

FAO recently declared that organic farming and agroecology can enhance food security, rural development, sustainable livelihoods and environmental integrity by building capacities of stakeholders in production, processing, certification and marketing worldwide.

However, African Ecological and Organic Agriculture (EOA) is still a small sector. Many research and development institutes and scientists in Africa are developing innovative techniques for more productive organic and agroecological systems. These efforts need to be embedded in an international research context.

A further challenge is how to reduce the gap between smallholder farms and industrialized organic export farms. This is one of the main concerns in Morocco, where the Green Morocco Plan-GMP has been launched since 2008. The GMP has brought solutions, and has been a success to the level of being scaled up by the "Adaptation of African Agriculture (AAA) Initiative" to embrace more African countries.

In this context, Organic farmers and scientists, both in developed and developing countries, in **North Africa** and **European Union** are called to: Join their efforts, pool their financial and human resources, and, share their traditional and scientific knowledge in order to provide **quality food products** and ensure **food safety** while **preserving natural resources** (Soil, Water and Air).

During these conference's days we will try to bring the answer of the main questions raised from the conference title: ***How can research contribute to bridge the current gap between Africa and Europe, with respect to organic agriculture?***

Best wishes for a successful meeting.

Dr. Khalid Azim

Conference Chair

Ecological and Organic Agriculture (EOA) could bring a great contribution to climate change mitigation and adaptation by:

- Reduction of agricultural greenhouse gas (GHG) emissions of CO_2, N_2O, Methane, (The total share of emissions from the agriculture production practices and food processing sector would be at least one-third of total GHG emissions).
- Carbon sequestration in soils and enhancing organic matter content;
- Optimization of mineral fertilizers utilization;
- Building resilient food systems in the face of uncertainties,
- Securing markets for small stakeholders and thus food security at regional scale.

In order to discuss how EOA in Africa can be further developed as a sustainable and reliable model and how it could ensure **food safety** while preserving **natural resources**, in the framework of the **Adaptation of African Agriculture** (AAA) Initiative (Launched upstream of COP22 organized in Morocco in 2016). This initiative aims to reduce the vulnerability of Africa and its agriculture to climate change).

For those reasons, the conference aims to:

- Merge a critical mass of scientific capacity and skills from Europe and Africa, to deliver sustainable solutions by working at practical and theoretical levels;
- Bring together high profile scientists from both continents to discuss issues about organic inputs, innovation, organic research funding, ethics and address recommendations to relevant certification and regulation bodies;
- Address and confront African potentials to expand traditional organic agriculture in terms of genetic, agro-climatic and sociocultural diversity;
- Strengthen the "Organic Alternatives for Africa" initiative and to facilitate the integration of OA into strategic policies and the agricultural development program.
- And boost the cooperation between organic stakeholders in Africa and European Union at multilateral level.

I hope we will be able to answer to the main question raised during this event: ***How can research contribute to bridge the current gap between Africa and Europe, with respect to organic agriculture?***

Thank you for joining us in EU-NACOA2019.

Background

Ecological and Organic farming systems and food production are pertinent solutions reducing hunger, climate change mitigation and adaptation, increased biodiversity and its functional role in environmental friendly production. It intends to ensure fair conditions for all stakeholders of the food chain along with responsible consumption. FAO recently declared that organic farming can enhance food security, rural development, sustainable livelihoods and environmental integrity by building capacities of stakeholders in organic production, processing, certification and marketing worldwide. The revised EU regulation to be implemented in 2021 will affect the import of organic products from third parties, and there is a need to understand how and develop efficient ways for its success.

However, it still a small sector, African Ecological Organic Agriculture (EOA) is gaining success through the Ecological and OA Initiative (EOA-I) as confirmed during the last African Organic Conference held in Sally-Dakar (Senegal) in November 2018. African organic stakeholders and decision makers along with scientists were unanimous that African governments, continental and regional institutions, development partners, donors and private sector investors, should provide more support to develop OA in Africa.

The conference intends to boost the cooperation between organic stakeholders in Africa with many countries at multilateral level. Organic expertise will be strengthened for the benefit of all African countries.

Objectives of the conference

- Merge a critical mass of scientific capacity and skills from Europe and Africa, to deliver sustainable solutions by working at practical and theoretical level;
- Bring together high profiled scientists from both continents to discuss issues about organic inputs, innovation, organic research funding, ethics and address recommendations to relevant certification and regulation bodies;
- Address and confront African potentials to expand traditional organic agriculture in terms of genetic, agro-climatic and sociocultural diversity;
- Strengthen the "Organic Alternatives for Africa" initiative and to facilitate the integration of OA into strategic policies and the agricultural development program
- Discuss how OA in Africa can be further developed as a sustainable and reliable model to ensure food safety for all, in the framework of the AAA Initiative following the COP22 recommendations (Marrakech, Morocco 2016)
- Discuss the main question raised from the conference title: ***How can research contribute to bridge the current gap between Africa and Europe, with respect to organic agriculture?***

The Conference

The event is a two-day scientific conference, along with a welcoming evening on the 10th of November, and an optional tour to innovative organic farms on the 13th November 2019. In addition to opening and completing plenary sessions, scientific sessions will be arranged, allowing discussions on how the presented contributions (keynote speakers, oral communications and posters) answer the questions below.

The conference allowed 33 oral presentations and 62 posters to be presented from a total of 24 countries representing Africa, Europe, Asia and North America.

Selected contributions will be invited to publish complete papers in a special issue of ISOFAR journal "Organic Agriculture" (*https://link.springer.com/journal/13165*).

Conference Topics

1. Organic Food Systems, local products, state of art, socioeconomics aspects and marketing of organic products in Africa;
2. Organic agricultural systems design and management, diversification of organic farming and cropping systems, role of rotation, multi-cropping and intercropping. Agroforestry and agroecology;
3. Tailored techniques and practices for organic farming, soil fertility, preventive and curative measures for plant protection, organic weed management, post-harvest;
4. Agricultural waste management, nutrient cycling, environmental protection and role of bio-fertilizers bio-stimulant and bio-pesticides.

Conference Sponsors

INRA Morocco (Institut National de la Recherche Agronomique-Rabat-Morocco)
ISOFAR (International Society of Organic Agriculture Research-Germany)
UM6P (Mohammed VI Polytechnic University-Morocco)
FIMABIO (Federation of Organic Farming Movement-Morocco)
AfrONet (African Organic Network-Tanzania)
MAPMDREF (Ministry of Agriculture, Fisheries, Rural Development, Water Resources and Forests-Morocco)
UCAM (University of Caddy Ayad-Marrakesh-Morocco)
IAV Hassan II (Institut Agronomique et Vétérinaire Hassan II-Rabat-Morocco)

Strategic Partners

MICROBIANA Association (Research Foundation-Marrakesh Morocco)
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IFOAM-EU (Federation of EU Organic Movement-Belgium)

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Keynote speakers Panel.

Conf1.New Organic Regulation and Standards in the EU from 2021 onwards – a scientific assessment

Gerold Rahmann

Abstract

Organic Farming is a success story, particularly in the EU after 1992, the first global legal regulation came into action (2092/91/EC; only for plant food). From a tiny niche the sustainable food production has grown towards a 100 billion USD market and is practiced in nearly every country on the earth. Organic production enables farmers to work in harmony with environment and high animal welfare standards, and earn enough money. In 2000 livestock was added (1804/99/EC) and in 2007 a full revision (834/2007 and 884/2008) have amended the organic standards and regulations. The biggest change was the addition of goals into the regulation, to give orientation for development paths. The maturing organic sector was in need for another revision and the regulation 848/2018 will be implemented in 2021. The new Organic Agriculture regulation is more based on scientific knowledge as ever before, but has still deficits, due to lack of resources for research and development. The most important deficits and research needs will be addressed in the speech.

Key words: EU regulation, new amendment, scientific knowledge, research funding

Conf2. Organic Knowledge Centers for Africa

Markus Arbenz, Organics & Development, Kosovo[1], **Helmy Abouleish, Sekem, Egypt[2]**

Abstract

Knowledge of farmers and value chain actors on individual, institutional and system levels are one of the biggest constraints of achieving the Organic 3.0 objective of accelerating change towards sustainability in Africa. While in the EU, organic knowledge management is institutionalized, in Africa, there are only scattered efforts to facilitate access to knowledge. The German ministry of development cooperation (BMZ) identified recently the opportunity that organic farming and agroecology in Africa contribute to addressing food security, poverty alleviation, climate change, loss of biodiversity, depletion of natural resources and other social, economic and environmental challenges as integrated in the Sustainable Development Goals (SD). It recognised the power of knowledge management through African organic institutions and mandated GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) to implement an organic knowledge hub program together with regional African partner organizations considering the specific cultural and agro-ecological zones and conditions in each region. In East Africa, Biovision Africa Trust, Kenya launches a regional knowledge hub in Uganda. In Southern Africa, Sustainability Institute, South Africa establishes a hub in Zambia and in West Africa various institutions under the lead of FENAB (Federation National pour l`Agriculture Biologique) create a hub in Senegal. Starting from 2020, a North Africa organic hub covering Egypt, Morocco and Tunisia under the lead of Sekem, Egypt will be created. The hubs are capitalizing experience from the ground work of the many local initiatives and they use the African organic and agroecological networks such as AfrONet, AFSA, the Ecological Organic Agriculture Initiatives (EOA-I) or the Africa Organic Manual. They also link with European organic research e.g. through FiBL and they unite in the global organic umbrella, IFOAM Organics International. The organic knowledge hubs facilitate organic knowledge flow for farmers, value chain actors, civil society actors and policy makers. They act in the three steps of a) knowledge gathering and validation b) knowledge transfer and sharing and c) application of knowledge in the various contexts such as production, market development or policy setting. They organic hubs work from their centres with their knowledge bases and fields, they work through their regional network of Rural Service Providers (PSP) that are based in the villages and they establish a virtual and interactive knowledge management system for stakeholders.

Key words: Organic knowledge management, Africa, Sekem, German development cooperation, African Organic Hubs, Organic 3.0

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Conf3. ROLE OF EOAI IN THE DEVELOPMENT OF ORGANIC AGRICULTURE

Jordan Gama, AfrONet President

This paper presents essence, pillars and structural arrangement of the ecological organic agriculture Initiative and the strategic plan as endorsed by the African Union Commission and Chaired by the Department of Rural Economy and Agriculture (DREA).

After many years of ecological organic and sustainable agriculture interventions by several partners and actors in the field and through advocacy platforms, EOAI came in the mainstream of agricultural policy and programs at the AUC. In 2010, the African Head of States deliberated a decision on organic farming. In 2011, Actors met at Thika in Kenya to develop a continent wide initiative with six pillars for rolling and scaling out ecological organic agriculture.

The pillars are:

i. Research, Training and Extension
ii. Information and communication
iii. Value Chain & Market Development
iv. Networking & Partnerships
v. Policy & Development Program
vi. Institutional capacity development

The Continental Steering Committee of the Initiative chaired by the AUC –DREA welcomes projects, programs, stakeholders and partners to implementing related initiatives to align to the EOA Strategic Plan and Structure for effective coordination and reporting as emphasized in the Decision.

The paper will describe and illustrate the rolling out and scaling up of Ecological Organic Agriculture in the continent, implementation of the endorsed strategic plan and directives of the Continental Steering Committee.

Conf4. Regenerating our soils to increase adaptation to and mitigation of Climate Change

Andre Leu, International Director of Regeneration International

Abstract

Climate Change is the greatest immediate threat to viable farming and food security. We are already being adversely affected by longer and more frequent droughts and irregular, out season and destructive rainfall events. According to a peer reviewed scientific paper by Rohling et al. published in Nature, the last time the world had around 400 ppm of CO_2 was in the mid-Pliocene, 3–5 million years ago. The climate was up to 16°C (38.8°F) warmer, the Greenland and West Antarctic ice sheets had melted and some of the East Antarctic ice was lost, leading to sea levels that were 10–20 meters higher than today. A second study recently published in Nature has confirmed the 20-meter sea level rise.

Even if the world transitioned to 100% renewable energy tomorrow, this will not stop the temperature and sea level rises because it will take more 100 years for the CO2 levels to drop. There is an urgent need to drawdown the excess CO_2 now - and not wait until 2050 as agreed in the Paris agreement.

Soils are the greatest carbon sink after the oceans. According to Lal, 2008, there are over 2,700 gigatons (Gt) of carbon stored in soils. The soil holds more carbon than the atmosphere (848 Gt) and biomass (575 Gt) combined. There is already excess CO_2 in the oceans that is starting cause a range of problems. We cannot put any more CO_2 in the atmosphere or the oceans. Soils are the logical sink for carbon.

The scope of this presentation is to use examples of agricultural systems that regenerate soil organic carbon (SOC), such as organic agriculture, and show that scaling up these systems can make a significant impact towards reversing climate change. Data will also be presented on how increasing SOC increases the adaptation and resilience to the adverse weather events that are caused by climate change.

Conf5. Sustainable diets for a green planet

Ewa Rembiałkowska[1]

Abstract

There is an urgent need to increase the sustainability of the food production systems and diets in the current world. The big food paradox is that about 1 billion of people are hungry or undernourished (in that 25 % are sub-Saharan Africans) and 1,5 billion are overweight or obese (in Africa 9 % of citizens). The concept of sustainable diet has been published by FAO in 2012 and guidelines in 2016. Organic agriculture is meeting many demands of the sustainable food production and sustainable development goals: it is improving the quality of soil, air, ground water and landscape and increasing biodiversity of wild and cultivated species. Biodiversity of diet is the basic condition of healthy nutrition because it increases the content of necessary bio compounds and prevents malnutrition. Proper food choices are essential for individual health and for the future of Planet. There are several kinds of sustainable diets. Mediterranean, pescetarian and vegetarian diets contain much less empty calories compared to the reference diet, typical for the most of people. The main difference is less meat, animal fats, salt and sugars and more plant oils and plant foods in the sustainable diets compared to the reference diet. Another sustainable model is new Nordic diet, popular in Scandinavian countries. The optimal model of nutrition consists of the well contracted diet based on the organic products and close to the current dietary recommendations. According to recent studies regular organic consumers have better nutritional profile and less problems with common chronic diseases, as overweight / obesity, hypertension, metabolic syndrome, diabetes type 2, allergy and cancers. The above findings indicate that it is very relevant for Africa to introduce more organic agriculture and more sustainable diets. The research studies looking for such solutions are necessary in order to diminish the current gap between Africa and Europe. The local small projects with the participatory approach seem to be mostly desired in the African context.

Key words: sustainability, organic food, sustainable diet, food biodiversity, consumer health.

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Conf6. Organic Certification Process in the United States

Jessica Shade[1]

Abstract

Organic food and farming in the United States has been growing quickly, with a 56% increase in the number of organic farms over the last 8 years. In 2018 there were 17,648 certified organic farms covering 6.4 million acres in the United States. Sales of organic products in the United States have also been skyrocketing, with $52.5 billion dollars in organic retail sales in 2018.

Organic Certification is highly regulated in the United States, and all food and beverages that are labeled as organic must be grown, produced, inspected, and certified to be in compliance with the organic standards of the National Organic Program (NOP), a program of the United States Department of Agriculture (USDA). This talk with highlight the organic certification process, including three-year transition periods, third-party certifications, annual on-site inspections, transparency, and USDA-NOP oversight and enforcement. We will also cover key aspects of the United States organic regulations, including maintaining and building soil health and biodiversity, and the ban on synthetic fertilizers, sewage sludge, ionizing radiation, synthetic toxic pesticides, antibiotics, growth hormones, and artificial flavors, colors, and preservatives. Finally, we will examine efforts centered on maintaining the integrity of the organic label in the United States, and the National Organic Standards Board at the center of making recommendations on updates to organic regulations.

Key words: organic certification, United States National Organic Program, organic regulations, organic inspections, fraud prevention

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Conf7. Organic agriculture in Turkey: Lessons learned

Uygun Aksoy[1]

Abstract

In Turkey, organic agriculture started in mid-1980s with the demand of enlarging European market for organic dried fruit. The response of the Turkish exporters was to contract farmers, provide consultancy and supply required inputs to carry out organic production as demanded. The first regulation was adopted in 1994, and supported by the Law in 2004. The Association of Organic Agriculture Organization (ETO) was founded as the national umbrella. The development can be evaluated in three stages as 1984-2003, 2004-2010 and 2009-2019. The first stage included training as the main target activity carried out by ETO jointly with Ege University (İzmir) leading to training of 2500 agronomists either staff of the Ministry or young graduates and establishment of the department on organic agriculture at the Ministry of Agriculture and Forestry (MoAF). This strong basis helped to establish a network of provincial units for organic agriculture at the MoAF. The second stage relies more on the activities of the Department, development of support policies for organic farmers, for research and extension and development and alignment of the regulation to the EU. These first two stages were heavily oriented towards the export market led by Europe. The final stage where again NGOs became active focused on development of the domestic market and diversification of the export markets. The extension project of the MoAF created successful organic farmer groups dispersed throughout the country. The two NGOs, ETO and BUĞDAY supported open bazaars and established a system and set up rules. Today, organic goods are sold in 25 open bazaars and in retailers in major cities, and food and non-food commodities are exported to more than 50 countries led by the EU and USA. In Turkey, one of the strengths was the close cooperation among stakeholders and sharing of knowledge to enlarge the existing pool. The national symposium on organic agriculture under the auspices of ETO is being held at intervals since 1999 and aims at bringing applied science and practice together. The research and development work of the MoAF also embrace and interact with the private sector during its annual meetings. The objective of the paper is to evaluate how these tools triggered organic agriculture in-depth and derive lessons. The development of organic agriculture in Turkey with lessons learned through achievements or failures can be taken as examples in developing organic farming in African countries.

Key words: domestic market, export, support policies, research, extension

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Conf8. Smart Agriculture and Its Application to Organic Production Systems

Andrew M. Hammermeister[1]

Abstract

Smart Agriculture (SA) involves the utilization of advanced sensing and data collection technologies linked with advanced analytical capacity and modelling to provide information to farmers that supports management decisions. Access to modern communication technologies such as cell phones and to the Internet of Things allows farmers to access software and data that can support decision making in a reasonable amount of time. These tools can help both farmers and agricultural support personnel to access information and resources quickly. Organic agriculture is particularly dependent upon preventative and early management of pest pressure. Smart tools could support early detection and rapid identification of disease and insect pressure. Climate models can be used to predict timing of pest infestations as well as predicting ripening time. These technologies can be especially useful in remote agricultural regions of developing countries where access to agricultural support systems are not readily available. However, not all Smart Agriculture technologies will be easily adopted due to lack of access to equipment, technical support and localized data. Here a review of trends in Smart Agriculture and its potential application for organic farmers in developing countries will be discussed.

Key words: smart agriculture, sensing technology, internet of things, information and communications technology, organic agriculture

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Conf9. Farm level management of phosphorus: organic farmers need recycled fertilisers

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Organic farmers aim for self-sufficiency in nutrients, by optimal utilization of locally available resources. Even in a milk production system with dairy cows, where relatively small amounts of nutrients per hectare and year leave the farm gate, soil concentrations of phosphorus (P) have been shown to decline over time. At Tingvoll farm (NW Norway), the average topsoil P concentration was reduced by about 50% over 25 years, from 203 mg P-AL kg^{-1} air-dried soil in 1989 to 100 in 2015 (Løes and Ebbesvik 2017). A field experiment on this farm, applying medium or high levels of animal manure corresponding to about 30 or 60 tons of slurry per hectare and year to a low-P soil since 2011, has shown that the soil P concentrations increased with manure application, but only slightly. From a starting value of 26, in 2018 the value had decreased to 23 with no manure application in the control treatment. With low application, it was still 26, and with high application it had increased to 35 (Rittl et al., 2019). In 2018, struvite was applied to half the experimental plots, and P concentrations were analyzed in aboveground canopy of perennial ley. Mean values were 0.15% P in dry matter (DM) with no manure application, 0.19% with low and 0.21% with high manure application. With struvite, these numbers increased to 0.24, 0.22 and 0.23%. Struvite also increased soil concentrations of P significantly. The slow increase in soil P with high manure application shows that enhancing soil fertility may not be easy, since applied P may be taken up in the crop canopy instead of enriching the soil. Organic farmers should monitor their soil regularly. Too high P concentrations should be avoided, to reduce negative effects from leaching and runoff on waterbodies (eutrophication). However, when soil P decreases below a medium level, actions should be taken to avoid a further decrease. In Norway, 70 mg P-AL kg-1 soil is considered as optimal. Traditionally, rock phosphate has been the solution to P depletion in organic farming. However, the dissolution of phosphate from this material occurs very slowly. Animal-derived fertilizers, such as meat and bone meal, and various type of manure, have a higher P availability, but are often from non-organic production and hence impacts the integrity of the organic farming system. Recycled fertilizers may be a better option, to close the currently widely open nutrient gaps from agricultural land towards more closed cycles between farms and the surrounding societies. Compost and digestates are well established soil amendment products made from organic waste. Compost from park and gardening residues is a fertilizer which most consumers easily accept, whereas digestate can only be applied with restrictions and hence is not so commonly used in organic growing. However, composting implies large losses of greenhouse gases. From this perspective, anaerobic digestion is a better solution. A drawback is that this technology is much more advanced and costly to establish and manage than a compost plant, hence forcing centralization. Further, micro plastic pollutions may be at least as difficult to control in digestates as in composts. A large proportion of P available for recycling is found in human urine and feces (HUF). Current regulations, e.g. in the EU, do not allow the use of HUF-derived products, but EGTOP proposed in 2016 that struvite and calcined P will be included in Annex 1. Struvite has many benefits and could be an excellent tool to

close current P and N gaps. With a content of 5% ammonium (NH_4^+) following the 13 % of P, it challenges the ban on mineral nitrogen fertilizers. Stakeholders on organic regulations should find a way around this challenge, for the best of the environment and the long-term fertility of organically managed soil.

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Session 1.

Organic Food Systems, local products, state of art, socioeconomics aspects and marketing of organic products in Africa

COM1. IFOAM in the Mediterranean

Constantinos Machairas[1]

Abstract

In The Mediterranean countries share many common aspects. A diverse climate, culture, and diet. And however complex this diversity is, we all share it. In most Mediterranean countries, most of our water resources are used in irrigated agriculture. However, the increasing frequency and magnitude of droughts has become more and more evident, and the existing water quality and scarcity issues of North African countries such as Morocco and Egypt, and Southern European countries such as Italy and Spain can only be intensified if left untreated. Such impacts of climate change have cascading effects on our food supply. Investing in organic agriculture can address not only water use, hunger and malnutrition but also other challenges including poverty; climate change; and unsustainable production and consumption. IFOAM AgriBioMediterraneo (ABM), is the official regional group of IFOAM Organics International, for the countries of the Mediterranean. IFOAM ABM members come from three different continents (Africa, Asia, Europe) and 16 Mediterranean countries, bordering the Mediterranean Sea. Our goal is the adoption of organic agriculture in the Mediterranean as a system which combines tradition, innovation, science and sustainable rural development. IFOAM's work has, and is aimed to achieve the Sustainable Development Goals through organic agriculture. Zero Hunger (Goal 2), Good Health and Well Being (Goal 3), Clean Water and Sanitation (Goal 6), Responsible Consumption and Production (Goal 12), Climate Action (Goal 13) and Life on Land (Goal 15) are all supported by the results of organic farming. Organic agriculture, if implemented in a truly sustainable manner, offers viable solutions to many of the problems the SDGs are meant to tackle, as they have clear links to the 4 Principles of Organic Agriculture: Health, Ecology, Fairness and Care. This is why campaigns such as #GoodFoodForAll and #HonestFood are support by all IFOAM OI bodies such as IFOAM ABM. Furthermore, we support growing associations such as BIOFACH, AgroEcology Europe and Asian Local Governments for Organic Agriculture (ALGOA) which promote similar agendas and work for a sustainable and organic world. We believe that most importantly, we must cooperate, and create synergies, as well as opportunities between Europe, North Africa, as well as Asia and the Americas, to tackle today's most urgent dangers, and to achieve a better world, together.

Key words: Organic, Agriculture, Organics International, Mediterranean, Synergy, IFOAM

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COM2. Organic Agriculture Movement in Morocco (FIMABIO)

Charif Guessous[1*], Abdelhamid Aboulkassim[2] and Khalid Azim[3]

Abstract

Organic agriculture in Morocco has long been rooted in the traditional practice of its small farmers. Smallholders and peasant farmers practice "traditional" or "natural" agriculture in Morocco for centuries. Most of these smallholders grow organically without organic certification. Certified Organic farming in Morocco has significantly evolved since 1986, the certified area has substantially grown and a regulatory framework was successfully set up. Obviously, the development potential of organic agriculture in Morocco is tremendous. FIMABIO is a young Organic Movement with a clear, audacious and ambitious vision that advocates "for an Organic Morocco". FIMABIO is unique among organic organizations in the world. Indeed, this Federation brings together three professional associations representing the three key organic actors in the entire Kingdom:

- Production with "ANAPROBIO" the Moroccan Association of Organic Producers;
- Valorisation with "VALBIO MAROC" The Moroccan Association of Organic Processors and;
- Distribution with "ANADEXBIO" The Moroccan Association of Organic Distributers and Exporters.

In addition, in accordance with the provisions of the Moroccan Law 03.12 on Agricultural and Fisheries Interprofessional, FIMABIO was recognized as the single representative of the organic sector in November 2016. In 2011, FIMABIO has signed a "Program-Contract" with the Moroccan government to develop and promote the organic sector with a budget up to 100 million Euros between 2011 and 2020. The Moroccan Organic movement embraces the Organic 3.0 vision and shares the belief that the next paradigm for decades to come is bringing organic out of a niche into a mainstreaming organic system as part of the multiple solutions needed to solve the tremendous challenges faced by our planet and our specie.

Keywords: Organic Morocco, Interprofessional organization, organic strategy, Program-Contract, challenges.

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COM3. Building the Participatory Guarantee System for agro-ecology label in Morocco

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Abstract

In Morocco, a growing number of farmers are committed to taking better account of the environment and social factors in their production methods. In addition, this socio-environmental quality is nowadays demanded by a significant number of urban consumers looking for quality signs to guide their purchases. In the absence of the public label for organic farming in Morocco until autumn 2018, some stakeholders have chosen to turn to a private agro-ecology brand and a participatory guarantee system (PGS). PGS are defined as "locally focused quality assurance systems. They certify producers based on active participation of stakeholders and are built on a foundation of trust, social networks and knowledge exchange" (IFOAM, 2008). More than just a certification process, PGS also seek to contribute to a continuous learning process and permanent social exchanges within a community network In this contribution, we present the participatory process, launched at the initiative of the Network of Agro-ecological Initiatives of Morocco (RIAM) and in partnership with the international research institute CIRAD, that allowed this PGS to emerge. We wonder to what extent the participatory process used in this action research project has led to a common vision and led to ownership and improved rules. The results of the participatory process and the indicators of the monitoring and evaluation protocol show both that the different components of the PGS are now available to the user community and that - despite the tensions inherent in collective action - these components seem to make sense to the participants. Nevertheless, it seems too early to assess the factors of sustainability of this organisation over time, and many challenges still remain for the development of the PGS in Morocco.

Key words: agroecology, organic farming, participatory guarantee system, participatory research, Morocco

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COM4. Organic Agriculture Development in Tunisia: 20 years of experience

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Abstract

Tunisia is an interesting example of a country where a strong public support for organic agriculture has contributed significantly to develop a strong organic sector, including research to support organic production and processing and exports.
The Tunisian government has been the main driver of the country's organic sector and it has been able to do this by establishing specialized administrative, technical and research-oriented OA institutions. The roles of each of the dedicated OA institutions were well defined and so were the responsibilities that they have had to carry out with one another. This largely helped drive, provided the focus, and synergy needed to sustain the growth of Tunisia's sector.
Other than the specialized OA institutions, there were public institutions and non-governmental stakeholders playing roles instrumental to the development of the country's organic sector. Among others, such roles include the organization of human development capacity trainings, organic agriculture awareness creation and the provision of technical support for organic operators.
There exists also a high level of collaborative relationships between the specialized organic institutions and other public and non-governmental establishments supporting the development of the sector. Furthermore, to facilitate the development of its organic sector, the Tunisian government had to develop a national organic regulatory framework that is internationally recognized and also adapted to the country's local agro-climatic and farmers' socio-economic conditions. Likewise, the government cooperated with non-governmental stakeholders to develop vigorous organic market development activities, awareness creation, organic national action plans and policy measures to steer the growth of the sector. The government provided sufficient financial support for the organic sector, and established the institutional structures needed to conduct research on organic food production systems and to provide training and technical support to organic operators.
Finally, the sector's development was inspired by the government's well directed interventions covering all aspects of OA. In this sense, the Tunisian OA development experience illustrates that as an infant sector, to foster its development and make it compete favorably and succeed in established markets, a country's organic sector needs the support of the state.

Key words: Organic agriculture, Tunisia, Experience, Government support

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COM5. Input limitations –major concern for organic vegetable progress in North Macedonia

Rukie Agic

Abstract

In R.N.Macedonia, recent years, the area under organic production is slowly but continuously growing reaching 3909 ha (certified and under conversion) in 2018 with total of 799 operators. Despite the increase of total organic plant production area, vegetables cover very small portion in the total organic area 165,65ha (4,24%). Several major constraints are identified for successful development of the organic vegetable sector in the country: still small operational farms, lack of organic seeds and other inputs, lack of machines for cultivation of the soil, inappropriate application of agro-technical measures (cultivation, crop rotation, plant protection, fertilizing, irrigation, harvest), lack of continuous supply of organic plant products, , lack of storage facilities, inadequate transportation and very important package. First and most important is the availability and sufficient quantities of organic seed material. Farmers often use local varieties and produce the seed by themselves which leads to a problems with seed quality, regeneration and maintenance of the characteristics of the varieties. Additionally, this type of seed material is not enough for larger production areas, where conventional non-treated seed is currently used. Since 2017 one company become a local representative for organic seed but the import is limited because of the high prices.

Taking into consideration that Europe has widely open doors only for organic products, it would be necessary to build more serious approach towards the organic agriculture in Macedonia. Efforts should be done for increasing education among experts, farmers and other stakeholders in organic chain. Also there is a need for upgrading the extension services, strengthening university partnerships, increasing the exchange of academic staff and promoting membership in various international associations for organic production.

Key words: organic vegetable seeds, inputs, constrains, supply

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COM6. Cost-Benefit Analysis of degraded land restoration for a sustainable land management in Tahoua (Niger)

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Abstract

This study is conducted to assess the economic impact of degraded land restoration in Niger, specifically in the Tahoua region. To evaluate the investments made, the calculation of the financial / economic profitability of the practices (bench, half-moon and stony cord) was planned on two horizons (4 and 8 years). Thus, in order to assess the financial justification, two criteria are considered: the net present value (NPV) and the internal rate of return (IRR) of the additional benefits provided by the investment (NPV and IRR calculated on the "+" brought by the development compared to the situation without development). The results of this study show a clear difference between the treated sites and the control sites (untreated). Products from bench sites, half-moons and stone bunds are much more numerous and have a higher economic value than those from the control sites. NPVs are positive for all developments and IRRs are non-calculable. This indicates that the developments are viable from the point of view of the land users. The NPV increases when cash for work is added. This implies that without cash for work, the development remains viable even if the producers's income is lower.

Key words*:* Cost-benefit, Analysis, land, restoration, impact, Tahoua

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Session 2.

Organic agricultural systems design and management, diversification of organic farming and cropping systems, role of rotation, multi-cropping and intercropping. Agroforestry and agro ecology

COM7. Does natural soil microbiota reduce harmful effects induced by Cyanotoxins exposure in Vicia faba seedlings

Majida Lahrouni[1,2], Loubna Benidire[1,5], Khalid Oufdou[1], El Mehdi Redouane[1], Mountassir Douma[4], Vitor Vasconcelos[3], Brahim Oudra[1]

Abstract

Microcystins (MCs) are frequently produced by some bloom-forming cyanobacteria in eutrophic fresh water lakes. In the past years, toxic cyanobacterial blooms producing cyanotoxins mainly MCs have become more frequent in many large surface freshwater lakes in Morocco, especially "Lalla Takerkoust" lake. Consequently, it is suspected that agricultural lands adjacent to "Lalla Takerkoust" lake, which is one of the most intensive crop areas in Marrakech region, is contaminated by microcystins introduced via irrigation water. The aim of this study is to evaluate the role of soil microorganisms to protect agricultural plants from cyanotoxins introduced via irrigation water. To this purpose, young *faba bean* seedlings were grown for 28 days in greenhouse under natural environmental conditions of Marrakech city. Plants were treated with cyanotoxins 2.5 mg/L MC-LR, the control group received 0 mg/L MC-LR. Three independent exposure experiments were performed in this work i) agricultural soil was maintained intact (this soil contained natural soil microbiota), ii) agricultural soil was sterilized iii) agricultural soil was sterilized and inoculated with rhizobia strain *Rhizobium Leguminosarum* RhOF34. The obtained results showed that chronic exposure to MCs in absence of rhizosphere microorganisms reduced the plant growth, photosynthesis and nitrogen uptake. Whereas, the presence of these microorganisms enhanced significantly all the previous studied parameters. Furthermore, we determined also the MCs uptake by plants. This study showed the role of natural rhizosphere microbiota to protect plants from cyanotoxines introduced via irrigation water. These microorganisms may be of great value and a friendly biotechnological pathway in order to improve crop productivity and tolerance towards cyanotoxins stress.

Keywords: Microcystins bioaccumulation, *V. faba*, soil rhizobacteria, rhizobia, photosynthesis, nitrogen uptake

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COM8. Agro-ecological solution by the spreading of vegetable water: effect on the macroinvertebrates abundance of soils under Olea europea

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Abstract

The extraction process of olive oil produces a large amount of liquid waste, also called vegetable water, which is a constraint for the environment. These by-products of the olive tree can be used to improve the production for a sustainable olive growing, respectful of the environment. In this context, our work consists of studying the impact of the spreading of the vegetable water on the abundance of macroinvertebrates considered as bioindicators of soil quality. The field trial is conducted in an orchard in Kabylia (northern Algeria), on 12 basic plots with an area of 288 m^2 with two olive trees each. The soil has a silty-clay-sandy texture, with a slightly to moderately alkaline pH, a low EC, high total limestone levels and a deficiency in organic matter. Three doses of vegetable water were tested for three years: in addition to the control (5l/m^2) we used (10l/m^2) and (20l/m^2). We sampled soils and macro invertebrates at two depths (0-10 cm and 10-20cm) over two seasons (winter and summer) under each tree. The collection of macrofauna was carried out according to the Berlèse-Tullgren method. The groups identified in the two levels surveyed for the winter season are the Annelids, Gastropods, Coleoptera, Diptera, Myriapods, Hymenoptera and Isopoda. These same groups were also inventoried for the summer season with the presence of Aranéides. The organic carbon, total nitrogen and bioavaible phosphorus levels have increased in all amended soils. These results reveal that the waste water input has contributed significantly to improving soil fertility. The analysis of variance shows that the dose and depth factors affect faunal groups in relation to the season. These results allow us to make a prioritization of the edaphic factors and to have a new way of reasoned (rational) and integrated culture, allowing this orchard to sustainably develop its best potential.

Key words: margins, macroinvertebrates, *Olea europea*, soil, agroecology, recovery

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COM9. Performance of mixtures of wheat varieties to control fungal diseases in organic agriculture

Wissal Bozalmat[1], Fatima Ez-Zahra Khalil[1], Si Bennasseur Alaoui[1], Abdelkarim Hennoun Loukili[2], Lhoussine Baamal[3]

Abstract

The mixing of several varieties, genetically complementary, in the same field, is one way to remedy the lack of the "perfect variety". This strategy has gained more attention and interest because it doesn't only allow controlling diseases, but it also stabilizes or increases yields. Despite the interest that this practice represents, its application remains limited especially in the organic farming and there has been no scientific research on this technic in the Moroccan context. The objective of the present study is to evaluate the performance of this practice to control fungal diseases and to stabilize yield in the organic production system. To test this, an experiment was conducted in a certified farm "Boté Farm", situated in Benslimane region, Morocco. We compared the mixture of four durum wheat varieties and the mixture of four soft wheat varieties. Varieties were also conducted in a field of mono varieties at the same time so we can compare the results with the mixtures. On the field; we evaluated the impact and severity of three fungal diseases: stripe rust, helminthosporiose leaf blight, fusarium head blight and their impact on yield. For the impact of the diseases, only Fusarium head blight showed a highly significant difference on durum wheat. The other fungal diseases, showed no differences between treatments. For diseases severity, the difference between treatments was significant for rust, helminthosporioum leaf blight, and fusarium on durum wheat, but not on soft wheat. For the wheat grain yields, there was no significant difference between the different treatments.

Key words: Varietal mixture, fungal diseases, impact, severity, grain yield

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COM10. Performance of oilseeds in crop rotation under organic and conventional production systems

Victor Olowe[1], Patience Odueme[2], James Fadeyi[2]

Abstract

A five-year study (2018-2022) was initiated in Nigeria in 2018 to determine the agronomic performance of sesame, soybean, sunflower and cotton under mono-cropping (no organic fertilizer), mono-cropping (with organic fertilizer), rotation (with organic fertilizer), rotation (no organic fertilizer) and conventional system in a randomized complete block design and replicated thrice. Sesame and cotton seed yield was significantly ($p<0.05$) higher under conventional system than other treatments in 2018.

Key words: conventional system, crop rotation, oilseeds, organic system, seed yield, tropics

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COM11. Landscape of research on organic farming in North Africa: A bibliometric analysis

Noureddin Driouech[1], Hamid El Bilali[1], Khalid Azim[2]

Abstract

Organic farming can play a crucial role in the context of the 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs) also in North Africa. Nevertheless, it is widely recognized that the development of organic agriculture requires investments in research and development. The paper casts light on research dealing with organic farming in North Africa. A systematic review was carried out in September 2019 on Scopus and addressed issues included geography of research (i.e. countries), bibliometric parameters (e.g. sources/journals, affiliations/institutions, subject areas) as well as thematic focus (crops/animals, stages of the food chain). The search yielded 53 records and 37 documents were selected. Most of the selected articles were published on Acta Horticulturae and New Medit journals. The research field is dominated by Egypt followed by Tunisia and Morocco. Indeed, also affiliations are dominated by Egyptian research institutions such as the National Research Centre. Research on organic farming focuses on crop production, while animal husbandry and fisheries/aquaculture are largely overlooked. Regarding crops, the focus is mainly on vegetables but there are some studies dealing with pulses, aromatic and medicinal plants and, even, non-food plants (e.g. cotton). As for the food chain stages, most studies focus on challenges in production stage (e.g. soil fertility management, pest management) while processing, distribution and, especially, consumption are underserved. The bibliometric analysis clearly shows the marginality of research on organic farming in North Africa. Therefore, more attention should be paid to organic farming in the national agronomic research agendas.

Key words: organic agriculture, agronomic research, bibliometrics, agri-food chain, articles, research centres.

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COM12. Synergy effects between organic agriculture and Farming with Alternative Pollinators (FAP)

Stefanie Christmann[1]*, Catherine Numa[2], Rachid Mrabet[3], Patrick Lhomme[1], Moulay Chrif Smaili[3]

Abstract

Organic agriculture is not necessarily pollinator-friendly same as Farming with Alternative Pollinators (FAP) is not necessarily organic, however there is high potential for a win-win-situation for farmers, environment and both approaches. Farmers starting with organic agriculture first have income losses, particularly as long as they cannot sell their products as *certified organic*. In particular, in Africa, this transition period is a challenge for many farmers. According to recent studies in several African countries, farmers also lack knowledge on insects and often regard all insects as potential pests. Therefore, they might hesitate to shift to organic and avoid chemicals. FAP uses 25% of the field to attract a higher diversity of wild pollinators by seeding strips of marketable habitat enhancement plants and adding nesting and water support out of local materials. FAP highly increases farmers' incomes already in the first year for pollinator dependent crops. Thus, FAP can reduce the income loss for farmers shifting to an organic regime. A partial shift to FAP and a higher share of pollinator dependent crops might be advised to farmers starting organic agriculture. FAP also highly reduces the abundance of pests by attracting high diversity and abundance of natural enemies and thus reduces the chemical load. FAP builds on visual, low-cost knowledge-sharing approaches also understandable by illiterate farmers. Capacity building includes insect diversity and habitat requirements of insects. FAP proved replicability across continents. Broad introduction of FAP and shift to more organic agriculture can be further supported by the low-cost cross-sector policy mix developed within the FAP approach. An international stewardship for pollinator protecting agriculture (WPP) is under development. The transition period of WPP will be shorter than for organic agriculture, so farmers might certify for WPP during the application period for organic farming. Both stewardships might use the same chain of custody to market certified products. So, there are various options for synergies for farmers and biodiversity.

Key words: Farmers' knowledge; income; pollinators; stewardship; win-win-situation

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COM13. Relationship between Bt maize and ecosystem functionalities of biological fertilizers

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Abstract

Risks associated with genetic modification of plants on essential ecosystem functions are not limited to the pre-existing microbial communities in the rhizosphere but could also affect ecosystem functionalities of microbes associated with biological fertilizers. Our aim was to investigate potential impact of genetic modification of Bt maize on the ecosystem functionalities of two biological fertilizers: Arbuscular Mycorrhizal Fungi (AMF) and Vermicompost (VC). A maize pot trial experiment was conducted with treatment combinations that consisted of Bt maize and non-Bt maize under different soil amendments of AM and VC. Rhizospheric soil and fine root samples were collected at 60, 90 and 120 days after planting. Ecosystem functionalities were studied by means of AM colonization of root samples, DNA metabarcoding of the rhizobacteria, soil chemical properties and enzyme activities.

For soil chemical properties, the pH and potassium showed significant differences at 120 days after planting. For enzymatic activity results, differences were only observed for urease and acid phosphatase activities in soils amended with AMF and VC. Mycorrhizal colonization of maize roots were most pronounced in treatment combinations containing vermicompost.

In conclusion, the rhizobacteria of Bt maize differed from those of non-Bt maize across plant growth stages and between bio-inoculants as well as bio-fertilizers. These differences were more pronounced between the diversity and abundance of particular species, rather than in the species richness of the maize bacterial community. Our study also confirmed that application of AMF and VC had an enhancing effect on the total number of bacterial community in both maize treatments.

Keywords: biological fertilizers, arbuscular mycorrhizal fungi, vermicompost, ecosystem, functionalities, Bt and non-Bt maize

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COM14. Magnetic treatment of culture medium enhances growth and minerals uptake of tomato (Solanum lycopersicum) in Fe deficiency conditions

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Abstract

The global climate change and competing water demands have put enormous pressure on water resources. Therefore, the optimal water management is essential to avoid risk to future water supplies and play a critical role in the sustainable development of agriculture. Magnetic treatment of water is a physical factor that improves water productivity and stimulates plant growth and development both quantitatively and qualitatively. This method is getting more popular as an organic friendly technique to promote plant.

The present study aims at gaining more insight on the effect of magnetic treatment of culture medium on growth and development of tomato plant, and its effect on plants development and iron uptakes in a Fe deficiency condition. 5 weeks plants were cultivated for 3 weeks on BD liquid medium under four different treatments. Our results showed that the magnetic treatment lead to a significant increase in the number of leaves, the shoot length, the shoot fresh weight, the root length, the root fresh weight, and the Mg, Ca, Fe, K, P, and Na uptake. The use of magnetic treatment in Fe-deficiency condition represents a significant increase in all aforementioned growth parameters and in the ratio shoot-to-root. These results suggest that magnetic treatment of culture medium improves plant growth in an environmentally friendly way. Moreover, it alters Fe uptakes which can be an interesting evolutionary solution to problems inherent in the calcareous soil.

Key words: Magnetic fields, Strawberry, Tomato, culture medium, Iron deficiency

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Session 3.

Tailored techniques and practices for organic farming, soil fertility, preventive and curative measures for plant protection, organic weed management, post-harvest

COM15. Bio-herbicidal potential of the essential oils from different *Rosmarinus officinalis* L. chemotypes

Jihane El Mahdi[1], Waad Taraff[2], Lea Piscitelli[3], Adel Aly[4], Claudia Ruta[5] Giuseppe De Mastro[6]

Abstract

Weeds account for the most compromising pest to the yield in organic agriculture, especially when no alternatives to herbicides are available like in the context of the African countries. Essential oils (EOs) constitute promising potential bio-herbicides, notably those from *Rosmarinus officinalis* L. presenting a considerable importance to the Mediterranean region, but which is not enough valorised. For this, the current study aimed to assess the allelopathic effect of the EOs from specific *R. officinalis* chemotypes for utilization in organic weed management. The ones from eight accessions were extracted, their components were identified by gas chromatography then four chemotypes were defined; C1 (a-pinene), C2 (camphor), C3 (a-pinene/1,8cineole), C4 (a-pinene/1,8cineole/camphor). Two concentrations of the EOs (1200 and 2400µl/l) were tested in a greenhouse experiment against a natural weed population of the collected soil in pre and post-emergence. The EOs did not affect the weed density in pre emergence, while it caused a reduction of the growth in the post-emergence test in a chemotype dependent manner. The results report a bio-herbicidal potential of *R. officinalis* EOs. They also interestingly suggest differences in effect between chemotypes, which is important for standardization purposes and can help in the development of bio-herbicides, and thus increase the availability of organic inputs.

Key words: Rosemary, organic weed management, post-emergence, pre-emergence.

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COM16. Co-application of compost and mineral fertilizers improve soil properties and crop yield

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Abstract

Achieving sustainable intensification is a key challenge of current agriculture. More so in a context where the pressure induced by climate change has become a palpable reality. Combining practices of both organic farming and mineral fertilizers-based farming could constitute a concreate solution to address this issue. Such approach fully integrates the circular economy and the agriculture sustainability concepts and offer the advantage of specifically addressing the soil degradation problematic, thus improving soil fertility and crop productivity in developing countries. Organic amendment was previously prepared through composting sludge from olive oil processing. Pots experiment, was carried out to evaluate the effect of various combination of compost and mineral P matrixes, namely rock phosphate, phosphate washed sludge and DAP on maize growth and soil physic-chemical properties. The experiment lasted for 3 months and was arranged according to a complete randomized block design with 5 replicates and 8 different treatments. Additionally, for all treatments, the same levels of irrigation water were used. All treatments affected positively physiological parameters such as chlorophyll and plants respiration. The plants yields production increased compared to the control by 25, 42, 46 and 47% for treatment with compost, rock phosphate, phosphate washed sludge and DAP, respectively. Furthermore, the use of compost improved the water retention capacity of soil by 12%. The simultaneous application of organic amendments and mineral fertilizers, improved the biomass production, the fertilizer use efficiency, and the water retention capacity of soil. The used approach proved to be a potential solution to address soil degradation issue and to achieve a better sustainability of agriculture.

Key words: Compost, phosphate, mineral, yields production

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COM17. Effect of organic amendments on soil fertility and the production of organic green bean

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Abstract

Soil salinity is one of the most important abiotic stresses causing a reduction in agricultural productivity in the world, and particularly in arid and semi-arid regions. Remediation to soil salinity remains a major challenge, and the success of which depends on the scale of the problem, the physic-chemical conditions of the soil and crop tolerance levels. The addition of organic amendments is one of the methods to remedy this problem. In this context, the present study aims to show the effect of organic fertilization on soil fertility, and to select the best organic amendments that are both promising and yielding the best yield. Two commercial composts (compost A and compost B) and a control were applied during this experiment on greenhouse green beans. Different parameters were analysed on the soil samples: pH, conductivity, active carbon, organic matter, phosphorus, total nitrogen and exchangeable bases. Yield and quality of production were also evaluated. The results obtained revealed variations in soil composition during the days after planting but also between applied treatments. Indeed, the amendment of the compost contributed the increase of the PH compared to the initial state. Electrical Conductivity has experienced a variation during the production cycle for all types of amendments. Soil amended with compost A contains significantly higher levels of active carbon, organic matter (OM) and phosphorus (P2O5). Regarding the productivity of Green Beans, the comparison between the amendments showed that the amendment of Compost A at 15 T / ha gave the best yield (10.35 T / Ha), followed by Compost B at 15 T / ha which gave a yield of 9.88 T / Ha. The experiment defines an effective treatment in terms of nutrient enrichment of the soil: compost A. This effect is interesting, aiming to improve the soil structure which generally results in the increase of the capacity of the soil of retention a significant portion of the nutrient ions by the clay-humic complex (CAH) and thus mitigate the effect of salinity and the maintenance of the stock of organic matter constant which is an important indicator of the degradation of soil quality and contribute to stability, unlike un-amended soil, which is declining over time.

Key words: Organic amendment, yield, green beans, compost, soil fertility, organic farming

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COM18. Contribution to the assessment of ozonated water on nematodes associated with tomato

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Abstract

Root-knot nematodes *Meloidogyne spp.* are the most devastative pests on tomato crop affecting considerably the yield. As a consequence, producers often tend to use chemical nematicides massively. This study aims to evaluate the effect of ozonated water on Meloidogyne associated with tomato crop as an alternative to the use of chemical nematicides to alleviate the impact on the environment and human health. Two trials were conducted: the first one was conducted in pots inside greenhouse. Three doses of ozonated water were tested (OZN1; OZN1 and OZN3). The reference product is Fluopyram (VelumPrime). An organic product made ground seeds of *Ruta graveolans* was also tested. The control used was untreated infested soil. The second trial was conducted In vitro to determine the nematostatic effect of ozonated water on *Meloidogyne spp*. second stage larvae (J2). The three ozonated water treatments showed that the reduction rates of Meloidogyne were 81%, 86% and 90% respectively compared to the control. The rate of reduction related to Velum Prime was 92%. The same trend was observed with the root gall index. The three ozonated water treatments and the chemical treatment reduced the galls. The root gall indexes obtained were 3, 2.3, 2.2 and 1.3 respectively. Control and the organic product values were 4.3 and 3.5 respectively. The length of the plant stems treated with ozonated water was greater than the stems of reference and control by 215.4cm, 221.4cm and 224.4cm respectively. The amount of harvested fruits compared to the control were 28gr, 127gr and 141gr respectively for OZN1, OZN2 and OZN3 dose treatments, corresponding to the rate of 6%, 24% and 27%, while no gain was recorded for the chemical nematicide treatment and the organic product. Analysis of the results of the fruit quality attributes did not show any significant difference between treatments except for proline level in the leaves of ozone treated plants which was reduced by 41%,38% and 43%.

Key words: Meloidogyne spp., ozonated water, In vitro, In vivo, Root-knot nematode, Tomato, VELUM Prime, *Ruta graveolens*.

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COM19. Plant-parasitic nematodes associated with organic vegetables in Souss Massa region: diversity, abundance and frequency of genera

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Abstract

Plant-parasitic nematodes (PPN) are considered as a serious threat for several vegetables in different crop farming systems. In organic agriculture, management tools of plant-parasitic nematodes (PPN) are very limited and still lack efficiency. Ecological studies of nematode communities provide knowledge that help to develop an agro-ecological management approach of threatening species. This work aims to describe PPN community structures and identify the main genera with high risk on crops and their mean drivers. Soil sampling was performed in sixty fields where organic vegetables are produced at least for 3 years in the region of Souss Massa. Nematodes were extracted by elutriation and identified at the genus level. Taxonomical and functional diversity with the structure of nematode communities were evaluated and compared according to sampled zones and crops. The study revealed a great diversity of soil nematodes: 25 genera of plant parasitic nematodes were inventoried and a total of 45 genera of nematodes with other trophic groups. The most frequently detected phytoparasite taxa are: *Aphelenchus, Scutylenchus*, *Tylenchorynchus spp*., *Longidorus ssp*. and *Meloidogyne spp*. PCA analyzes demonstrated that the functional diversity (c-p and trophic groups) was less affected by crop than taxonomic diversity (total number, species richness, site diversity, and uniformity). The results also indicated that NPP communities were more influenced by crop types. Based on their frequency and abundance, Hoplolaimidae can be considered to be well associated to the organic vegetable crops in growing conditions of Souss Massa. The *Meloidogyne spp*. was detected at low abundance and does not cause a serious damage to the most crops grown in the region. The mains drivers for nematodes in organic vegetables in this area are soil texture, soil humidity, organic matter and crop. These results help to refine our understanding of soils functioning to adopt suitable soil monitoring and management of aggressive species to crops, which could be more helpful for the establishment of sustainable agro-ecological management.

Key words: phytonematodes, diversity, soil ecology, organic, multivariate analysis, sustainability

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COM20. *Euphorbia guyoniana* efficiency against tomato leaf miner in Southeastern Algeria

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Abstract

This study was conducted on the insecticidal effect of the spontaneous plants from the arid regions of Algeria (Southeast). The crude ethanolic extract of Euphorbia guyoniana was tested against eggs and larvae of the tomato leaf miner Tuta absoluta with 3 doses (D1: 20 µg, D2: 30 µg, D3: 40 µg). Experimentation showed that this plant has a larvicidal effect that varies with doses and times. Mortality rates of 45.42 ± 15.36 and 74.58 ± 07.12% were obtained at the beginning and the ending of the test, respectively, for D1. Larger values were recorded in D2 with a mortality of 50.00 ± 12.77% noted after 2 h only by the contact of the larvae with the extract and 90.42 ± 04.38% after 96 h. The greatest mortality was obtained with the D3 because values of 50.83 ± 19.54 and 95.42 ± 03.15% were noted after 2 h and 96 h of the treatment respectively. Mortality in the control was between 33.18 ± 07.98 at the beginning and 48.34 ± 12.17% at the ending of the test. The extract shows lethal doses (DL_{50}) of 22.72, 22.69, 21.37 and 19.49 µg/larvae after 24 h, 48 h, 72 h and 96 h respectively, involving 50% of mortality. The treatment of eggs of T. absoluta by the extract showed mortality rates of 15 ± 05, 35 ± 05 and 95 ± 05% at the end of the test for control, D2 and D3 respectively. This bio-insecticide provides the protection of sustainable and organic agriculture with an eco-friendly product.

Key words: Bio-insecticide, Euphorbia guyoniana, Tuta absoluta, South-eastern Algeria.

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COM21. Nitrogen use efficiency in organic melon production under greenhouse of Morocco conditions in South West

Aouass Kaoutar, Kenny Lahcen

Abstract

Organic melon production under greenhouse condition is widespread in South West of Morocco. It covers 2000 ha and ranks second as winter crops after tomatoes. Organic melon producers are, however, facing serious problems in optimizing nitrogen supply to the crop under greenhouse conditions due to the lack of scientific data on nitrogen use efficiency (NUE), knowing that for an average yield of 60T/Ha, melon nitrogen needs for melon is about 400 kg/Ha. In order to investigate NUE for the most common organic fertilizers used by farmers as compared to a mineral fertilizer, an experiment was conducted in Souss Massa area using a randomized bloc design with five treatments replicated four times. The first treatment, used as positive control, consist of feeding program based solely on mineral fertilizer (20-20-20). For the other treatments, organic nitrogen wa-s applied as compost (2.5-3-2.5), Eveilorga(7-4-7), Altér-Orga(8-12-0), Algiactiv -bio (10-0-0). Phosphate and potassium levels were adjusted accordingly to meet the crop needs estimated at 200 Kg/Ha of P and 700 Kg/Ha of K . Nitrogen use efficiency was evaluated based on four different parameters: Agronomic Efficiency (yield increase per unit of N applied, **AE**), Recovery Efficiency (increase in N uptake per unit of N applied, **RE**), Physiological Efficiency (yield increase per unit of N uptake, **PE**) and Nitrogen Equivalencies (N equivalencies of organic fertilizer as a mineral fertilizer). The result showed that the form of organic nitrogen applied to the crop has a significant impact on biomass, yield and nitrogen use efficiency. The average yield with organic fertilizers was about 31 T/Ha as compared to the mineral fertilizer (29.5 T/Ha). Within the organic treatments, a significant difference in yield, AE, RE and PE were observed. The highest yield (40.5T/ha) and the highest AE coefficient was obtained with compost and the lowest with the ternary (7-4-7) organic fertilizer (Alter-Orga). Foliar analysis showed that mineral uptake was also significantly faster and higher when compost is added. As to the PE coefficient, values ranged from 48 to 100 kg fruit kg^{-1} N with the highest value associated with compost. The overall performance of the organic materials tested with melon as compared to the mineral fertilizer showed that the highest performance was obtained with simple type of organic fertilizer (Algiactive-Bio) which showed the highest N equivalencies (1.4).

Key words: Organic melon, Nitrogen Use Efficiency, Compost, Organic fertilizers

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COM22. Management of plant parasitic nematodes paraziting saffron corms by botanical nematicides

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Abstract

Phytonematodes cause annually significant major agricultural loss globally. In organic farming, considerable attention was given to the development of biological management strategies, including botanicals with nematicidal properties. In this context, antinematode effect of aqueous and powder extracts of *Ricinus communis* and *Artemisia herba-alba* were evaluated for their in vivo activity against PPNs associated with saffron. Plant extracts were tested at different concentrations and exposure times. Our results showed that nematode responses to aqueous plant extracts and their powders of both plants showed a significant reduction of population densities of *Aphelenchoides spp*., *Ditylenchus spp., Pratylenchus spp*. and *Helicotylenchus spp*. Soil fumigation by *R. communis* at 1% was more effective than the application in water solution. The high antinematode effect of the majority of the tested plant extracts and their huge availability make them a potential source of new bionematicide formulations. In conclusion, *R. communis* and *A. herba-alba* derivatives could be a possible major component of an integrated management strategy for phytoparasitic nematodes damaging saffron crops in organic production system.

Keywords : Botanicals, nematicidal activity, phytoparasitic nematodes, *Ricinus, Artemisia*, *Crocus sativus*.

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Session 4.

Agricultural waste management, nutrient cycling, environmental protection and role of bio-fertilizers bio-stimulants and bio-pesticides

COM23. Partial acidulation of rock phosphate for increased productivity in organic and smallholder farming

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Abstract

Smallholder organic producers are in need of locally available and affordable substrates that can enhance phosphorous (P) availability in manure or compost, as well as in soils. As such, there is a need to investigate and identify locally available organic substrates with acidifying potential, which can be used as an additive in rock phosphate (RP)-organic material composting mixtures. This paper reviews attempts to increase P availability in the context of smallholder, low-input and organic farming, and presents a case study from Central India that used a participatory approach to address P deficiency issues in cotton-based organic systems. Study was conducted from 2010 to 2014 through 61 on-farm trials and investigated the agronomic effectiveness of buttermilk-acidulated RP compost. The application of buttermilk-acidulated RP manure resulted in higher yields of cotton in all field trials and higher yields of soybean in all but one field trials. While on majority of the farms (18 out of 28), wheat yields increased with the application of buttermilk-acidulated RP compost, a quarter of the field trials (7 out of 28) exhibited yields lower than farmers' practices. Project showed that it was possible to develop a locally adoptable solution to an agronomic constraint using locally available resources including the indigenous knowhow. Buttermilk proved to be an effective acidulating agent that can be added to RP-amended compost.

Key words: Phosphorus, organic agriculture, smallholder farming, partial acidulation of rock phosphate, participatory technology development.

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COM24. Optimization of tomatoes leaves composting by integration of different feedstock

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Abstract

Valorisation of tomato leaves (TL) by composting is becoming an suitable management options have been proposed for converting these organic waste into valuable organic amendment, thanks to its low cost and technology. The physic-chimical composition of tomatoe leaves could limit the efficiency of the process. In fact, TL has a low C/N ratio which may result in nitrogen loss as mineral forms, in addition to the excess of moisture content and low porosity, result in a lack of aeration. To overcome these challenges, different mixtures was investigated by integration of olive pomace (OP), sheep manure (SM) and chicken manure (SHM) for optimisation of composting process. Evaluation of composting process and compost quality are mainly related to the temperature, organic matter (OM) losses, concentrations of humic substances and macro-nutriments especially potassium and phosphorus fractions. According to the result, The type of feedstock and there ratio in the mixture influenced temperature profile and OM mineralisation. Also, Phosphorus and Potassium fraction were significantly affected by composting mixture.

Keywords: Tomato leaves, Composting, mineralization of organic matter, humification and plant macro-nutriment

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COM25. Composting of Agricultural Wastes in China: Situation and Perspectives

Bo Wang, **Ji Li**

Abstract

Aerobic composting was practiced quite early in China since 202 B.C.. Since 1949, the generation of organic solid wastes in China grew rapidly and the total quantity was estimated as 2 bt (dry weight) in 2016, including 790 mt of crop stalk and 880 mt of animal manure. The major treatment technologies of organic solid waste were traditional composting and landfill, and industrial composting was less applied comparatively. The major problems existed in the composting industry were: firstly, composting plants had a relatively small production capacity (45% of plants less than 5000 t/a-1); secondly, the production of many plants was unstable and the raw materials also provided unstable; thirdly, the composting equipment, like turning machine, forced aeration were used limited; fourthly, the quality of compost was also low and needed control and management. In present year, Chinese government launched a number of incentive policies on compost application in agriculture. The main policies included promotion plan on the beneficial treatment and use of animal manure and slurry, the act plan on integrated use of chemical fertilizers with organic fertilizers, regulation on the organic fertilizer use in green food bases, the promotion plan on the soil organic matter and tax free policy for the production and marketing of organic fertilizers. Last year, the national composting standard was released and named 'technical specification for animal manure composting' (NY/T 3442-2019). In future, the composting industry in China will enter a rapid growth stage, and the directions of composting industry will be developing rapid, closed and automatically controlled systems and different functional compost products will be developed to meet various demands.

Key words: Agricultural wastes, Composting, Industry

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COM26. Ergosterol Analysis for Biomass Estimation on Solid State Fermentation (SSF) and Evaluation of Physiological State of Ericoid Fungi

A. Hamim[1,2], S. Roussos[3], R. Duponnois [4], R. Mrabet [1], M. Hafidi [2]

Abstract

Mycorrhizal fungi constitute an important source for carbon in most ecosystems. This carbon is used for building extensive mycelia networks in the soil as well as for metabolic activity related to nutrient uptake. A number of methods have been developed recently to quantify production of fungal mycelia. Among the most important methods is ergosterol determination. This compound is a membrane lipid, found almost exclusively in membranes of living fungal cells, and is the most common sterol of Ascomycota and Basidiomycota. It is a good indicator to assess fungal biomass. In this study, we used a known conventional technique associated to a rapid extraction and HPLC analysis of ergosterol in the mycelium of four ericaceous endophyte fungi in order to estimate indirectly the biomass produced on a substrate by solid state fermentation (SSF). The standard curve of biomass was obtained using pure mycelium produced on liquid Modified Melin-Norkrans medium (MNM), sugarcane bagasse and peat. After 35 days of incubation at 28°C biomass produced either by liquid or solid fermentation was lyophilized. The extraction was carried out by adding methanol (1 mL) to 50 mg of mycelium fungi, incubated at 8°C for 12 h. This study has shown a direct correlation between the concentration of ergosterol in solid media and the amount of biomass produced by ericaceous endophyte fungi. The quantity of ergosterol was significantly different, affected by mycelia age and fungi strains.

Key Words: Ergosterol, HPLC, fungal biomass, SFF, Ericaceous fungi.

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COM27. Importance of Microbial Enriched Organic Fertilizer for Cultivation of Desert Truffles

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Abstract

Dry lands are characterized by water scarcity and extreme seasonal weather conditions with unpredictable rainfall. In general, the prevailing ecological conditions over these regions are very restrictive to the spontaneous survival of living beings. Since ecosystem productivity is very low in arid regions and therefore natural nutrient sources are, too. Desert truffles are an edible hypogeous ascomycetes fungi. The fungi are living in mycorrhizal association with annual or perennial xerophyte *Helianthemum spp*. plants (Cistaceae). They are growing in harsh conditions in arid and semiarid regions largely lacking organic matters and other nutrients, beneficial soil microorganisms and proper moisture content of the soil. The need to boost food production is on the increase everywhere in the world today as world's population is geometrically increasing day by day, thus farmers regularly use different forms of fertilizers and other organic manures to enhance productivity. Microbes are alive and must-have nutrition to survive, and that nutrition comes from organic matter. We have developed a Microbial Enriched Organic Fertilizers (MEOF) composed of Vermicompost, different types of beneficial soil microorganisms including Arbuscular Mycorrhizal Fungi, *Trichoderma,* PGPR (Plant Growth Promoting Rhizobacteria), PSM (Phosphorus Solubilizing Microorganisms), as well as molasses, oil cake, fish meal etc. The MEOF is found very effective for increasing the production of agricultural crops. Organic fertilizers (MEOF) will help in providing an optimum environment in the rhizosphere for the survival of host plants as well as to grow truffles (sporocarps). So the MEOF with microbial components and natural fertilizers will be very useful to create an environment for the growth of beneficial soil microorganism, provide nutrients and retain moisture for the production of Desert Truffles under arid and semiarid conditions in Africa, Middle East and Europe. There is a growing interest in introducing desert truffle cultivation into dry environments as a useful way of exploiting lands, which until now have been regarded as unproductive. In addition, cultivation of desert truffles will be improving the ecotourism sector and also the host plants indirectly may help preserving land from erosion. So MEOF will be an innovative technology to enhance sporocarps production of Desert Truffles.

Key words: Desert Truffles, Cultivation, Microbes, Organic Fertilizers, Soil Amendments.

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COM28. Use of biofertilizers to improve the tolerance of date palm to biotic and abiotic constraints and physicochemical parameters of soil

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Abstract

In arid zones, oases appear to be a major threat model in the soil component. These ecosystems play multiple socioeconomic and environmental roles. Nevertheless, they remain fragile and undergo impacts of human and/or natural origins permanently especially drought, salinity, diseases as bayoud, and low contents in organic matter and native fertility. In order to partly overcome these problems, multiple researches were undertaken and/or are in progress and which are innovative approaches oriented. The current study was carried out to improve the biomass and tolerance of date palm (Phoenix dactylifera L.) to biotic and abiotic stresses via the enrichment of soil by setting up an efficient biological protocol integrating arbuscular mycorrhizal fungi (AMF), bacteria PGPR (Plant Growth Promoting Rhizobacteria) and compost resulting from green waste. Our results confirmed the advantages of various biological and organic fertilizers in improving the growth, mineral nutrition, biochemical, physiological and water parameters of date palm. On the other hand, mycorrhizal consortium of Tafilalet palm grove used was infectious and slightly affected by drought, salinity and attacks by Fusarium oxysporum fsp. albedinis (Foa). Whatever the attacks by Foa, water regime and saline conditions imposed to the soil, the effect of biofertilizers tested on the biomass production and biochemical and water parameters of date palm occurred for amended plants. The mortality rates among the palm trees infected by Foa were lower among mycorrhizal plants than among the non-mycorrhizal plants. Indeed, the different biological treatments had an important effect on the physicochemical properties of the soil. The tripartite combination AMF-PGPR-Compost was more efficient and improves date palm tolerance against the negative impacts of the aforementioned constraints by moderating the stress induced oxidative damage. Finally, we have elucidated the role of native biofertilizers used and the interest of adopting the innovative practices improving soil fertility, preserving water resources, respecting the environment, and ensuring the development of sustainable organic agriculture.

Key words: Drought, bayoud, salinity, soil degradation, mycorrhizae, compost, PGPR, soil management, sustainable agriculture, date palm

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COM29. Plant growth enhancement of *Chenopodium Quinoa* induced by bacterial inoculation under shadehouse conditions

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Abstract

In order to meet the worldwide food demand, several initiatives were launched to ensure a smart management of arable lands. This could be achieved through sustainable and eco-friendly approaches as the use of plant growth promoting microorganisms including bacteria. Phosphate (P) solubilization is one of the major mechanisms of plant growth promotion (PGP) by associated microbes. Their use, as biofertilizers, provides a promising solution to enhance fertilizers efficiency. The current study focuses on the screening of two phosphate solubilizing bacteria (PSB) from the rhizospheric soil of Chenopodium quinoa plants. The isolates named QA1 and QF11 were respectively identified as Bacillus and Enterobacter strains using 16S rRNA gene sequencing. The selected PSB showed dispersed capacities in terms of P solubilization. QA1 isolate generated the highest rate of solubilized P (346 mg.L^{-1}) in NBRIP broth. We also assessed their abilities to produce indole acetic acid (IAA), solubilize zinc, produce siderophores, cellulase and protease, and tolerate salt stress. QF11 strain produced remarkable amounts of IAA (795 µm.ml^{-1}) and QA1 strain tolerated salinity with a maximum tolerable concentration (MTC) of 2% NaCl and total inhibition of growth occurred at 14% NaCl. The seed germination assay followed by pot experiment study conducted under shadehouse conditions showed that sterilized seeds of Chenopodium quinoa manifested greater seedlings and increased plant growth under bacterial treatments. The phytobenefic effects of selected PSB strains suggest that they possess intrinsic abilities of PGP through P solubilization, salt tolerance, and IAA production which could be exploited for improvement of plant growth and productivity.

Key words: PSB, Chenopodium Quinoa, Plant growth promotion, IAA, Salt stress.

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COM30. Metals in some edible organic and conventional crops and their cultivation soils in Tunisia

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Abstract

In this work, we evaluated the concentrations of heavy metals (Zn, Cu, Ni and Cd) in soils and in edible parts of two vegetables: Tomato (*Solanum lycopersicum* cv. Amal) and Lettuce (*Lactuca sativa* L. cv Augusta), and a fruit : Strawberry (*Fragaria x ananassa* cv. Sabrina) from conventional and organic farming in the eastern-central region of Tunisia.

A principal component analysis (PCA) was conducted to investigate correlations between metals in the edible parts of the crops and metals in soil. The bioconcentration factors (BCF) were calculated to evaluate the ability of plants to absorb and accumulate metals from the soil. Our data indicated that toxic metals loads significantly increased in crops from conventional agriculture, unlike that of organic farming. This should be carefully considered in view of the potential health risk assessment for consumers.

Key words: Heavy metals, soil, Crops, Conventional, organic, Risk assessment.

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COM31. Potential use of beneficial microorganisms for increasing productivity of *V. faba* and *T. durum*

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Abstract

There is a growing body of evidence that demonstrates the great potential of various microorganisms to enhance plant productivity and yield in cropping systems. In the present study, the purpose was to evaluate the inoculation effect with rhizobacteria and AMF on soil quality and growth of Vicia faba and Triticum durum. The effect of the inoculation, was studied in a field experiment in agricultural soil with six treatments: Control without inoculation (C), PGPR alone (PG), rhizobia alone (R), mixture of PGPR and rhizobia (PR), AMF alone (M) and a mixture of PGPR, rhizobia and AMF (PRM). The bacterial strains used are able to: (i) solubilize potassium, (ii) solubilize three sources of phosphorus, (iii) produce auxin and (iv) produce exopolysaccharides. Furthermore, the molecular identification showed that the PGPR and rhizobia strains are similar to Rahnella aquatilis, Acenitobacter sp and Ensifer meliloti. The greatest effects were observed in the inoculation with a mixture of PGPR-rhizobia-AMF. This inoculation improved the growth parameters evaluated with length, fresh and dry weight of shoot and root, number of leaves. Furthermore, this inoculation enhanced the productivity of the plants tested presented by the number of bean pods and wheat ears. The application of these inoculations (PRM) improved soil quality at harvest (after 4 month-culture) by enhancing the concentrations of nitrogen, phosphorus, total organic matter and carbon. The mixed inoculation significantly stimulated the growth and the productivity of crops and could be used as potential bio-fertilizers to optimize plant growth and yield.

Key words: Arbuscular mycorrhizal fungi, rhizobia, growth, fields, molecular identification, biofertilizers.

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COM32. Valorization of poultry manure by composting between opportunity and obligation

Rachid Aboutayeb

Abstract

The purpose of this book, divided into two parts, is to present the fundamentals of composting techniques and to highlight the importance of poultry manure compost in preserving the quality and fertility of agricultural soils. The first part is devoted to the presentation of the principles of composting where are treated the types of composting and its phases as well as the parameters of monitoring and evaluation of the maturity and stability of the compost. Effective composting requires the mastery of several parameters to obtain a stable, hygienic and mature product. The temperature profile indicates the presence of several distinct phases: an active or bio-oxidative phase and a maturation phase. These phases reflect the biodegradation activity that occurs during composting. Besides, an overview of environmental legislation and composts regulation was discussed to highlight the evolution of environmental laws and regulations related to the environment and the quality of composts. Several standards and criteria for evaluating composts have been adopted. These criteria relate mainly to heavy metals, physicochemical composition, burden of pathogens and phytopathogens, potentially toxic elements, and maturity. The second part includes evaluating the impact of heap composting on the physicochemical and microbiological parameters of chicken and turkey manure. For this purpose, it was noted that the composting induces a rise in temperature in the heaps, a stabilization of the pH around the neutrality, a reduction of the total nitrogen content, in organic matter, in ammonium and the ratio Ammonium / Nitrates (NH4+/NO3-), a low Carbon/Nitrogen (C/N) ratio and a strong mineralization resulting from the increase in nitrate contents. In parallel with the improvement of the physicochemical properties, the rise of the temperature, incurred during the thermophilic phase, induces also a significant reduction of the load in total aerobic mesophilic flora, indicators of fecal contamination (Fecal coliforms, Enterobacteriaceae and Escherichia coli), sulphito-reducing Anaerobes, Staphylococcus aureus, and yeasts and molds. Compost application revealed that the amended soils showed better organic status and higher levels of mineral nutrient and electrical conductivity as well as an improvement of farming production. In the light of the research discussed in this book, composting heaps of poultry manure generates products of good physicochemical and microbiological quality and limit or reduce any transfer of pollution to other natural resources. Furthermore, manure-amended soils show an improved physicochemical composition and increased yields.

Keywords: Poultry manure, composting, pathogens, organic amendment, soil

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COM33. Trace elements contents and human health risk of vegetables of Marrakech urban market garden

Younes Laaouidi[1,2], Ayoub Bahmed[1], Ahmed Naylo[1,2], Stéphanie Ouvrard[2], Christophe Schwartz[2], Ali Boularbah[1,3]

Abstract

Urban agriculture constitutes a promising strategy regarding its contribution to feeding the local population and to reduce temperature and greenhouse gas emissions at the level of cities. However, agriculture in urban areas may present risks for humans' health and their environment, due to the potential contamination of soils by trace elements (TEs) resulting from the anthropogenic activities. This study aims to assess human health risk related to TEs contamination of soil in Marrakech urban market gardens. The concentration of As, Cd, Co, Cr, Cu, Ni, Pb and Zn in soils from urban areas in Marrakech city was measured and the hazard coefficient (HQ), non-carcinogenic hazard index (HI) and carcinogenic risk (RI) were determined. The results showed that HI and HQ of Cr and As are above the acceptable limit (>1), which indicates the presence of a direct risk to human health in the studied areas. These elements also present higher cancerogenic risk ($IR>10^{-4}$) for children than for adults. The data revealed that contact with potentially contaminated soils in urban areas can present a high risk to the population and therefore requires special attention by gardeners, local and national authorities.

Key words: Urban agriculture; Urban soil; Heavy metal; Health risk; non-carcinogenic risk, carcinogenic risk.

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Poster Panel

Session 1.

Organic Food Systems, local products, state of art, socioeconomics aspects and marketing of organic products in Africa

P1. Analysis of Seasonal Variation of Contamination of Groundwater and Soil with Heavy Metals in the M'nasra region, Morocco

Serine Omrania[*1], Najib El Khodrani[2], Abdelmajid Zouahri[2], Ahmed Douaik[2] , Hamza Iaaich[2], and Souad El Hajjaji[1]

Abstract

The objective of the study is to reveal the seasonal variations in the groundwater and soil quality with respect to heavy metal contamination. Water samples from wells and samples from soil near them were taken during dry (July 2017) and wet (January - March 2017) seasons and concentrations of Cd, Cu,Cr, Mn, Ni, Pb, Co and Zn were determined. Contamination factor for each heavy metal and Nemerow pollution index were calculated. They showed an increase in contamination degree from summer to winter for soil and an increase decrease in case of groundwater. Vertical transfer of pollutants from topsoil to groundwater was assessed using Hierarchical Cluster Analysis, significant correlations between concentrations and composition of soil had being found. In case of Ni and Cr, the variables corresponding to the concentrations from soil and groundwater were part of the same cluster, in both seasons, the distribution maps of concentrations confirmed the pattern of transfer.

Key words: Contamination factor, Groundwater, Hierarchical Cluster Analysis, Nemerow index, soil, vertical transfer.

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P2. Bioactive constituents of *Moringa oleifera* leaves and prevention of degenerative chronic diseases.

OPIRO Kenneth Lakuma

Abstract

There is more and more scientific evidence which supports a positive relationship between a diet based on plant foods and the prevention of certain degenerative chronic diseases such as obesity, coronary disease, arterial hypertension, diabetes, cancer and others. *Moringa oleifera*, a mycorrhizal plant from the family of Moringacea is grown in many Asian and African countries, including Uganda. *Moringa oleifera* plant has been extensively studied and found to have important health-promoting properties, attributed to numerous bioactive constituents including vitamins, polyphenols, alkaloids, glucosinolates, isothiocyonates, tannins and saponins which are present in various parts of the plant. The bioactive constituents in *Moringa oleifera* leaves have been researched for their role in prevention of obesity, cardiovascular disease, hypertension, diabetes and cancer. Chlorogenic acid in *Moringa oleifera* leaves has anti-obesity property probably by inhibiting dietary lipid absorption. The alkaloids in the leaves have cardio protection activity through free radical scavenging property. The bioactive compounds in the leaves including nitrile, mustard oil glycosides and thiocarbamate glycosides have been used for stabilizing pressure possibly through calcium antagonist effect. The quercetin in *Moringa oleifera* leaves is a strong antioxidant. It has anti-diabetic property by correcting pancreatic beta-cell dysfunction and insulin resistance thereby increasing insulin secretion. Isothiocyanates in the leaves is anticancerous by inhibition of the growth of several human cancer cells. Therefore, there is valid pharmacological basis for consuming *Moringa oleifera* leaves for those purposes. *Moringa oleifera* leaves should not be used only when looking for a cure when disease appears. Rather, it should also be used to prevent diseases.

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P3. Comparative analysis and benefit/cost assessment of organic treatments applied to vegetable crops

Fouad Elame[1], Khalid Azim[1], Hayat lionboui[2]

Abstract

Organic farming is an agricultural production system ensuring a sustainable development approach. It is a certified agricultural production system that does not use chemical fertilizers, pesticides, synthetic products or GMOs (Genetically Modified Organisms). The main objective of this study is to evaluate the impact of 4 different organic treatments (combinations of compost and microbial enrichment) (T1, T2, T3, T4) on the profitability of 4 vegetable crops. The partial budgeting approach was used to compare the use benefits of these treatments. It is a decision-making tool for any change in the production system and could be useful for economic planning process at the farm level. Dominance analysis showed that, for pepper and cucumber, both T3 and T4 treatments are dominated because they require higher production costs with lower net benefits than the other treatments. While the two treatments T2 and T4 were dominated for beans and squash crops. The Marginal Return Rate of the Comparative Analysis shows that T1 treatment remains the best choice in terms of economic and marginal profitability, followed by T3 treatment. Thus, organic amendments without enrichment (T1, T3) are the most attractive for farmers because they generate less cost and more profit since the yield is higher for these two treatments.

Key words: organic vegetables, treatment, partial budgeting, dominance, marginal return rate

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P4. Efforts to use soft Pesticides for the Control of Insect Pests as contribution towards Green Chemistry

Hayder Abdelgader

Abstract

In the last decades during the post-war period, the agriculture has developed towards methods that are more intensive. Among these is increased use of agrochemicals. In the Sudan Gezira, as an example, cotton spraying started as early as season 1945/46 when only 1% of the cotton area was sprayed once. By 1978/79 the problem caused by the cotton insect pests, particularly the cotton whitefly (*Bemisia tabaci*) flared up. The number of sprays per season went up, reaching 9.25 sprays in season 1978/79, which might be attributed partly to the rapid resurgence of insects' pests as a result of the use of non-selective insecticides, which badly affected the natural enemies of these pests. The joint use of natural enemies and selective pesticides might attribute to combat this problem. Studying the side effects of pesticides is of prime importance to save natural population and encourage their role as biological control agents. This paper discusses the various methods which can be used to study the side effects on natural enemies and the results of some studies carried on the side effects of some insecticides on natural enemies both at small and large scale levels in Sudan. The study includes testing the side effects of some insecticides and their impact on bio-safety (Talstar, Polo, Metasystox, Marshal and the mixture Reldan + Endosulfan) on two Predators at small-scale level at the Gezira Research Farm, Wad medani. The Impact of Polo (diafenthiuron) on natural enemies in the cotton-based ecosystem of the Gezira Scheme (Large Scale) was tested in the Study. The results indicated that Polo was relatively safe both at small scale and large-scale level to the natural enemies observed during the study. This study can be considered as a begin of regional testing program in Africa with collaboration of international organization interested on conserving bio-agent.

Keywords: Cotton, Sudan, Biodiversity, insecticides, side effects[1]

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P5. Impact of organic fruits and vegetable production on the livelihoods of organic farmers in South-West Nigeria

Linda Familusi[1]

Abstract

Agriculture is usually categorised into organic agriculture and non-organic agriculture. The share of organic agricultural land to world agricultural land was recorded at 1.4 percent. This implied that organic agriculture is still at the initial development stage in most countries. Africa as a whole occupies about 3 percent (2.1 million hectares) of organic lands with an almost insignificant portion rising from Nigeria. In order to create the justification for the adoption of organic agricultural practices, the study determined the impact of adopting to organic fruit and vegetable production on the livelihoods of organic farmers in South-West Nigeria. The specific objectives of the study was to assess the factors influencing the famers' decision to participate in organic farming, determine the efficiencies in production, assess the potential of using income from organic farming as an alternative source of income for farmers, assess the gender disparities related to organic fruits and vegetable farming with the aim of comprehending the gender role played in organic farming as well as gender friendliness of organic farming and to compare non-organic fruits and vegetable farmers' production to organic fruits and vegetable farmer' production for welfare change. The study is at the thesis proposal stage. Cross-sectional data will be used and questionnaire method will be adopted for the study. The econometrics models proposed to be used were double hurdle model, stochastic frontier production and cost function, ordered choice model and selected statistical methods for measure of central tendency and measure of dispersion. Organic agricultural research would bridge the current gap in African's organic food production by increased focus on the creation of the awareness of organic agricultural food and production with emphasis on the environmental, health, socioeconomic and cost effective benefits. This would increase the adoption, demand and increase in skill acquisition for organic farming in Africa.

Keywords: Organic farming, adoption, gender, Nigeria

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P6. Peroxidase involvement in the resistance of cactus ecotypes to cochineal *Dactylopius opuntiae* (hemiptera) in Morocco

Kohaich K. & Baaziz M.

Abstract

Opuntia ficus-indica is the most agronomically important species for the production of edible cladodes and fruits. This last, is an important food and feed crop for smallholder farmers in North Africa and the Middle East. Barbary fig is a cactus well adapted to arid and semi-arid conditions; the fruit can be used for human consumption and to produce medicine and cosmetics. The pads serve as animal feed, especially in the arid zones on degraded lands where shortages of water and feed resources challenge animal production. The plant also plays an important role in soil and biodiversity conservation. In order to determine a strategy of improvement and management of the genetic resources, biochemical and molecular markers of genetic diversity have to be developed. The present study was designed to evaluate the impact of cladode peroxidase (POX) contents on the plant resistance against the carmine cochineal *Dactylopius Opuntiae*. In this experiment, cladode peroxidases (stress enzymes) were checked in resistant and susceptible ecotypes to the *Dactylopius opuntiae* mealybug. The Skhour Rhamna ecotype (SKH), relatively more resistant than the Sidi Bennour ecotype (SBN), was characterized by a rate of constitutive POX (121.30 to 336 U.g^{-1} FW), higher than that of SBN ecotype (52.50 ± 1.64 U. g^{-1} FW). Induced POX recorded increases of 177% and 28.9% for the SKH and SBN ecotypes, respectively. Electrophoresis of the acid isoforms of POX revealed anodic isoperoxdases of Rf 0.78-0.80, in the ecotype relatively resistant to cochineal (SKH). The POX markers can be determined cactus ecotypes resistant to the cochineal

Moreover, the cactus ecotypes resistant to the *Dactylopius opuntiae* can be used to re-establish cactus plantations through Pillar II of the Green Morocco Plan, the government's initiative to boost the agricultural sector.

Key words: *Opuntia ficus indica*, ecotype, peroxidase, electrophoresis, cochineal *Dactylopius opuntiae*

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P7. Phytochemical profile and antioxidant potential of *Anvillea radiata* Coss. & Dur. var. *genuina* M.

Beddou F[1], Bekhechi C[2], Ksouri R[3], Atik Bekkara F[2]

Abstract

The present study aimed to evaluate the potential of *Anvillea radiata* Coss. & Dur. var. genuina M. (Asteraceae) as a source of antioxidant compounds. The preliminary evaluation of the phytochemical composition of the different organs highlighted the presence of some chemical groups. This was confirmed by a quantitative analysis based on the measurement of total phenolics, flavonoids, flavonols and condensed tannins content. We have shown that aqueous methanol is the best extractor of flavonoids, while acetone has the ability to extract more of tannins. Considering organs, flowers of *A. radiata* have the highest levels of these compounds. Thus, in order to obtain an extract enriched with metabolites of interest - flavonoids, we opted for a liquid-liquid extraction using different solvents with increasing polarity. The quantitative determination of total flavonoids by the aluminum trichloride method revealed that butanol and ethyl acetate fractions were the richest with respective holders of (55.910 ± 1.022 mg CE/g DW) and (47.394 ± 1.497 mg CE/g DW) for *A. radiata* flowers. These fractions showed also remarkably strong antioxidant activities on 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging, ABTS radical scavenging and reducing power, which were almost comparable to capacities of the positive controls (Vit E and BHT). Conversely, a very high inhibition of lipid oxidation was obtained in the hexane fraction of *A. radiata* flowers (IC_{50} < 0.094 mg/ml), yet very low concentrated on polyphenols. This is probably due to the presence of other substances which may act independently or synergistically. HPLC analysis of the most active fraction revealed the presence of eleven compounds, including procatechuic acid (3.21%), caffeic acid (3.83%), naringenin-7O-glucoside (1.46%), morin (27.09%) and coumarin (1.64%), some of them not previously reported in *A. radiata*. In conclusion, these results indicate that *Anvillea radiata* organic extracts can be considered as a promising source of phenolic acids and flavonoid compounds, with remarkable antioxidant properties.

Key words: *Anvillea radiata*, Antioxidant, Flavonoids, HPLC, Phenolic acids.

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P8. Production of prickly pear peel powder: Impact of drying on physicochemical and biochemical criteria

Fatima Ettalibi [a,b], Hamza Elmahdaoui [a], Chemseddoha Gadhi [b], Hasnaâ Harrak [a]

Abstract

Wastes and by-products generated during prickly pear (*Opuntia spp*.) fruit processing constitute a great source of high added value compounds, which have the potential to be used as food additives, nutraceuticals or cosmetics. This fruit has a high amount of peel, which is generally discarded. However, powder production is a way of adding value to this peel which can be a good source of bioactive compounds or a natural color ingredient. The aim of this research was to study the peel drying impact at 60 °C of *Safra* (yellow) and *Aakria* (red) varieties (*Opuntia ficus-indica*) on physicochemical criteria (water activity (a_w), pH, acidity and L*a*b* color parameters) and biochemical criteria (betalain pigments and phenolic compounds). Drying fresh peel at 60 °C allows obtaining powders with high conservation aptitude, their a_w varied from 0.173 to 0.304 and the powder obtained from red variety was very interesting with high contents of betacyanin pigments and phenolic compounds. The results also showed slight variations in physicochemical criteria between fresh peel and peel powder containing 15 % and 10 % moisture contents. In contrast, biochemical criteria are the most influenced by drying. Total reduction rates of betalain pigments were 42 % and 9 % for red and yellow varieties, respectively. These reductions were correlated with color parameters changes. The phenolic compounds degradation rates were 28 % and 8 % for red and yellow variety, respectively. The changes observed after drying prickly pear peel emphasize the need to carry out further stability studies, especially for red variety peel powder for a better valorisation of this prickly pear by-product.

Keywords: Prickly pear peel / By-product / Powder / Biochemicals criteria / Physicochemicals criteria / Valorisation.

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P9. Quality criteria, antibacterial and antioxidant activities of fruit seed oils of ten Moroccan pomegranate cultivars

Sarah Loukhmas[1, 2*], Abderraouf EL Antari[2], Sara Elgadi[2], Fatima Ettalibi[2], Hibat Allah Kharbouche[2], Ebrahim Kerak[1], Hasnaâ Harrak[2]

Abstract

Pomegranate seeds (*Punica granatum* L.) are quantitatively and qualitatively a relevant agri-food by-product which is rich in beneficial molecules to human health. In order to valorize this resource, this study aims to evaluate and compare the characteristics of fruit seed oils of ten pomegranate cultivars grown in Morocco (Marrakesh, Casablanca and Beni Mellal regions). Oil yield, fatty acids composition, physicochemical criteria (L*a*b* color parameters, chlorophylls and pheophytin), antioxidant and antimicrobial activities were determined. The seeds yielded oil contents ranging from 17.59 % to 24.69 % and presented high contents of polyunsaturated fatty acids (92.86 - 93.89 %). The main fatty acids were punicic acid (73.81 - 81.46 %), linoleic acid (4.08 - 7.74 %), elaidic acid (3.89 - 6.56 %) and palmitic acid (4.03 - 4.69 %). Oils showed a yellow color with parameters L* (63.97 - 95.12), a* ((-15.29) - 3.70) and b* (88.16 - 101.1). They are rich in chlorophylls (0.12 - 2.17 mg/kg) and pheophytin (0.39 - 7.23 mg/kg)) which are important pigments providing protection against oxidation. In addition, oils presented a high antioxidant activity (IC_{50}: 0.69 - 1.80 mg/ml). Although, these oils didn't show significant antibacterial activity by disk diffusion test against the following bacteria: *Klebsiella pneumonia*, *Escherichia coli* and *Staphylococcus aureus*. The results also showed significant differences between the ten studied cultivars. Thus, pomegranate seed oils presented an optimal fatty acid composition and high levels of antioxidant activities and could be useful in the formulation of novel foods or used as preservatives and functional components in food, cosmetic and pharmaceutical industries.

Keywords: *Punica granatum*, seed oil, quality criteria, antioxidant activity, antimicrobial activity, valorization.

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P10. The comparison and improvement of green terraces

Raouj Naoual

Abstract

In the last years, the terrace's coverage in plants come about more and more spread. The topic of dissertation treats the comparison and improvement of some methods of terrace's vegetation to make it live and they participate in environment's improvement. A lot of plant's species can be used, but this topic chooses firstly the plantations which resist on terrace's conditions, secondly, that need a limited upkeep, finally, the granulation of terrace's mineral which don't need an upkeep. A vegetative terrace need some precautions of construction and plantation because not all plants can be suitable to this kind of support characterized by a small depth of his substrate. We must count with local climate, the thickness of substrate to place on terrace and his composition. To arrange a terrace, its recommended to use vivacious plants which can resist to temperature variation, and characterized by a speed growing. this can facilitate to cover quickly the terrace and to protect the building from extreme temperature, high in summer and cold in winter. We must make account of typical plants like depth of root, quantity and nature of waste which produce because some of them are not adapted to vegetal terraces and even can damage in term the isolation and tightness. In this topic, some test will be effected to compare the effects of different vegetal terraces about the variation of temperature and humidity inside the building according to seasons. For this, we present the techniques, methods used and experimental protocol. Also, we specify the economic aspects and source of topic's financing.

Key-words: Terrace, vegetation, plantation, improvement, environment.

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Poster Panel

Session 2.

Organic agricultural systems design and management, diversification of organic farming and cropping systems, role of rotation, multi-cropping and intercropping. Agroforestry and agro ecology

P11. Agro-morphological response of maize (*Zea mays L.*) to a bio stimulant based on antagonistic fungi

Lakhdari wassima[1], Dehliz Abderrahmene[1], Mlik Randa[1], Benlamoudi Wiam[1], Lakhdari Fatma[2], Hammi Hamida[1], Chergui Salima[1]

Abstract

Organic farming is a mode of production limited by a regulation that prohibits the use of synthetic chemical products (fertilizers, pesticides, etc.) and encourages the use of physical and biological means. For this, the present study highlights the effect of a bio stimulant based on Trichoderma harzianum, indigenous antagonistic fungus from the region of Touggourt, on the development of a local variety of maize. This study was conducted at the experimental station of INRAA (Sidi Mehdi, Touggourt) as a complete random block. The agro-morphological parameters examined showed that the application of this product stimulates vegetative growth of the plant. Besides, better germination and earliness of seeds were noted. In fact, more interesting values were obtained in the treated plots (height = 135.9 cm, diameter = 28.9 mm, surface of leaves = 318 cm2, Pan = 10.2 panicles/plant) compared to those of the controls (height = 98.6 cm, diameter = 23.7 mm, surface of leaves = 260.4 cm², Pan = 7.4 panicles/plant). Statistical analyzes confirmed the existence of a very highly significant difference between treated and control subjects. This bio stimulant provides a sustainable crop production, organic agriculture, and eco-friendly pest management that is essentially required and applicable.

Key words: Bio stimulant, *Trichoderma*, maize, biological agriculture, Touggourt, Algeria.

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P12. Antimicrobial activities of a diversity of wild mushrooms on agrifood microorganisms

Yasmine Ait Hamaouche[1], Soulef Dib[1], Zohra Fortas[1]

Abstract

Fungicides *are often used to control phytopathogenic diseases of agricultural crops, but which have adverse effects on humans and ecosystems. Wild mushrooms (Basidiomycota) are the most valuable forest products. They are considered as a valuable resource worldwide used as an antimicrobialbecause of the production of bioactive compounds (phenolic acids, flavonoids…). It is for this same reason that the present study concerns the evaluation of antimicrobial activity of 16 fungi in the western Algerian ecosystem, 5 of which are edible and 11 non-edible.*

Extracts are obtained from wild mushrooms by Soxhlet and are tested on pathogenic bacteria responsible for food poisoning (Staphylococcus sp.) and a fungal strain responsible for gray rot of vegetables (Botrytis sp.), and this by the disc diffusion method.

The results *showed interesting antimicrobial activity of the extracts. The bacteria were more sensitive than the tested fungi. This leads us to explore other pathogenic microorganisms with agrifood interest.*

In conclusion*, it is suggested that wild mushrooms can be used in biological control to preserve crops and public health.*

Key words: wild mushroom, Basidiomycota, extract, Bacteria, fungal strain.

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P13. Antioxidant activity, phenolic and flavonoid content in leaves, flowers, stems and seeds of mallow (*Malva sylvestris* L.) from north western of Algeria

Mohammed Choukri Beghdad[1*], Fatima-Zohra Sabri[1], Meriem Belarbi[1] and Farid Chemat[2]

Abstract

The nutraceutical composition (phenolics and flavonoids) of all leaves, flowers, stems and seeds of mallow, Malva sylvestris L., as well as their antioxidant properties were studied using in vitro methods: Ferric Reducing Antioxidant Power (FRAP) assay, by scavenging of 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical and total antioxidant capacity (TAC) based on the reduction of molybdenum (VI) to molybdenum (V). Results show that all extracts possessed concentration-dependant antioxidant activity. Leaf extracts have a highest amount of total phenolics with 24.123 ± 0.718 mg GAE/g, and total flavonoids with 0.694 ± 0.017 mg RE/100 g. However, the seed extracts presented the lowest amount in the two assays used. In addition, the AcOEt (EC50 = 3.10 mg/ml) fraction showed the highest value of antioxidant activities for almost all parts of leaves.

Key words: Malva sylvestris L., antioxidant activity, ferric reducing antioxidant power (FRAP), 2,2-diphenyl-1- picrylhydrazyl (DPPH), total antioxidant capacity (TAC).

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P14. Breeding strategies for quinoa biomass valorization toward a sustainable production management

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Abstract

Agrobiodiversity *holds significant resources to adapt and mitigate climate change. It is also one of the most sustainable approach to manage crop production through orga*nic agriculture. Human has been using the potential of genetic resources by selecting the best for his land and climate for a better yield and an efficient use. By the time breeding interest changes and several traits of great interest that escaped to the primary selection, including nutritional quality and secondary metabolite. In a changing climate, human start predicting multiple genotypes through in-silco selection to ovoid surprises. By creating adaptative genotypes, the era of quaternary selection begun.

Our research contributes to the development of agriculture and its resilience in Africa through the constitution of an African gene bank. More than 300 Chenopodium quinoa accessions have been acquired from different gene banks to create germplasm that will be a source of diversity for further research projects. This collection has been evaluated for primary and secondary traits to select the most adapted accessions to the local environment. Many traits have been measured: agro-physiological traits, phenological traits, response to downy mildew, and morphological traits. The same collection was the subject of secondary metabolites assessment like saponins by evaluating the foam apparition and fibers like xylan through dry matter evaluation and preparation for further analysis. 30 genotypes were interesting and 7 among them show a multi-trait positive response and may be a subject of other investigation. The identified genotypes will be cultivated non-only for their ability to produce seed for human consumption but also to produce biomass that will be valorized.

This approach is a starting point to contribute to food security in Africa where malnutrition is threatening life and developed countries where the claim of a sustainable protein source is increasing.

Key words: Breeding strategies, Quinoa, Biomass, Sustainable agriculture, Resilience

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P15. Diversity of epiphytic fungi in *Punica granatum* leaves, Messaad variety (Djelfa, Algeria).

Kahina Bourenine, Nait Kaci-Boudiaf Malika, Smail-Saadoun Noria.

Abstract

Introduction: the exploration of the fungal diversity associated with arboreal species cultivated in the arid Mediterranean environment, in particular with regard to the local varieties, offers a significant potential for a better understanding of the interactions of these plants and their associated microorganisms. In this context, we are interested in the grenadier: *Punica granatum* and its variety Messaad. Our study concerned an inventory of epiphytic fungi present on the leaves of this species, resulting from an orchard conducted according to the principles of conservation agriculture.

Methods: Sampling was carried out in the Messaad region (Djelfa, Algeria) on twelve vigorous and healthy trees in the summer season (July 2018). The isolation of epiphytic fungi from the leaves was carried out according to the protocol of Pusz et al. (2015). The recovered supernatant is cultured on PDA at room temperature. The determination of these strains was made using macroscopic and microscopic features.

Results: A total of eighteen genera was isolated. The most abundant genera are *Alternaria, Ulocladium, Phoma, Aureobasidium.* These are fungi whose hyphal walls are melanized. Within these dominant genres, there is a high degree of intraspecific diversity. With regard to the number of species, *Alternaria* has six species, followed by four species for *Ulocladium,* three for *Phoma* and two for *Aureobasidium.*

Conclusion: our results show that *Punica granatum* leaves are lined with epiphytic fungi. The interaction of these with the plant is usually of the commensal type. But some can penetrate inside the plant, mainly through stomata and become endophytic, to participate in the adaptation of the tree to the many biotic and abiotic constraints of these arid environments.

Key words: agriculture conservation, epiphytic fungi, interactions, Messaad grenadier, local variety.

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P16. Effect of agriculture conservation on the yield of durum wheat crop (*Triticum durum*)

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Abstract

Cereal yields in Algeria are often limited by edaphoclimatic characteristics and applied cultivation techniques. Agriculture conservation aims to improve production by optimizing the use of agricultural resources, integrated soil management to limit erosion, a water saving with a better knowledge of available biological resources. This study aims to evaluate the rhizosphere effect under durum wheat (Triticum durum) cultivation, Chen's variety, with the impact of different types of tillage: conventional agriculture, simplified cultivation technique and direct-seeding. The experimental device adopted is a complete random block with three repetitions during the companion (2016-2017) in the experimental station of the Technical Institute of Field Crops Oued Smar Algiers. The results obtained highlight a negative effect of conventional techniques. The highest yields are observed on semi-direct plots of 35.57qx / ha with an increase in the organic carbon content and a significant variation in the chemical and biological properties of soils compared to conventional soils.

Key words: durum wheat, rhizosphere, direct seeding, organic matter, yield

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P17. Effect of algae extract and compost on plant growth and yield of gardening crops under field conditions

Abderrahim Boutasknit [1], Mohamed Ait-El-mokhtar [1], Mohamed Anli [1] Raja Ben-Laouane [1] Abdel-ilah Tahiri [1,2], Raklami Anas [1,2], Youssef Ait-rahou [1], Khalid Oufadou [2], Said Wahbi [1] and Abdelilah Meddich [1]

Abstract

Algae extracts and compost are an important source of nutrition for plants. They contribute to the improvement of the microbiological activity and to the growth of the plants. Nowadays, the use of algal extracts and compost as organic fertilizers is one of the best ways to maintain and restore soil quality and crop productivity. The objective of our study is to determine the effect of an algal extract and compost on the growth and yield of some market gardening crops widely used in Morocco such as onion and zucchini. We carried out a field experiment on an agricultural soil poor in phosphorus, which could be assimilated to three treatments, namely the control plants and those amended by the algal liquid extract (*F. spiralis*) and compost (10 tons / hectare). The results recorded showed no depressive effect of the application of the two amendments applied. In addition, we observed a significant improvement in the growth, physiological and yield parameters in amended plants compared to control. The extract of algae and compost can be considered as a local biofertilizer and an alternative to chemical fertilization, which generally leads to the degradation of most cultivated fields, causing risks to both the environment and sustainable agriculture.

Key words: *Algae extract, compost, growth, yield, Allium cepa, Cucurbita pepo and field.*

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P18. Effects of salinity on growth, nutrient accumulation and ion uptake of four faba bean (*Vicia faba* L. minor) cultivars differing in salt tolerance

A.Chaker-Haddadj[1], H. Sadji[1], F. Halladj[2],F. Nabi[3] Et S.M. Ounane[3].

Abstract

The principal agronomic advantage of faba bean is its ability to fix nitrogen by symbiosis with *Rhizobium* bacteria, and thereby substantially contribute to the supply of protein for human food and animal feed and greatly reduce dependence on energy-consuming mineral N fertilizers. Selection and improvement of cultivars that can grow and provide good yields under saline conditions is a permanent solution to minimize the impact of this constraint. The inclusion in Algeria, of faba bean in the cropping systems is still rather low despite their beneficial function. In order to re-launch this culture, it was essential to identify salt tolerant cultivars to improve agricultural production in soils subject to salinity. The effect of sodium chloride (NaCl) salinity, on growth responses and tissues organic solutes and mineral content, was investigated from four cultivars of faba bean (Espresso, Maya, Castel and Sidi Aich).

Plants were grown in pot in the greenhouse experiments at salinity levels of 0, 50, 75 and 100mM NaCl. Faba bean plants responded to salinity by decreasing the content of dry plant biomass and by increasing the root to shoot ratio. This depressive effect of salt on growth is associated with a decrease in tissue hydration and concentrations of chlorophyll pigments, resulting in a production of carbohydrates that is insufficient to support the growth. An increase in proline content in 4 cultivars registered, at 100 mM NaCl in cultivars Sidi Aich and Espresso. Moreover, the Castel and Maya cultivars accumulate more Na^+ ions in their leaves and roots in comparison to others varieties. The analysis of the main components under different salt treatments revealed two groups, the first one is salt tolerant this include Sidi Aich and Espresso cultivars, the second is salt sensitive and this include Castel and Maya cultivars. Indeed, Sidi Aich and Espresso cultivars have chlorophyll pigment content less affected by salt, better production of dry matter, the Na^+ lowest in the leaves, better survivability and contents higher proline.

Keywords: Salt Stress, Cultivars, *Vicia faba* L., Dry Weight, Proline Content, Na^+.

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P19. Effect of direct seeding on the physiochemical properties of Moroccan soil (region of Rabat- El Koudia).

Maher Hassnae[1,2], Moussadek Rachid[2], Ghanimi Ahmed[1], Zouahri Abdelmjid[2], Douaik Ahmed[2], Dakkak Houria[2].

Abstract

In Morocco, agriculture has a heavyweight in the economy, weighing between 15% and 20% of BIP. However, it has experienced several difficulties: intensive plowing of land that has accelerated water erosion, severely threatening water and soil potential, low density of vegetation covers and the misuse of conventional farming practices, causing a decrease in soil moisture content. organic matter and destroying the stability of aggregates.

Climate change is making water and soil management in agriculture more and more complicated. The major challenge for Moroccan agriculture is to increase agricultural production while preserving natural resources.

Our study aims to evaluate the effect of Direct Seeding (DS) on the physicochemical properties of the soil in the place that we call el koudia our experimental area. The adapted type of wheat is Arrehane.

Soil samples are pre-dried, crushed and sieved to 0.2mm for analysis of Organic Matter (OM) and 2mm for the rest of the analyzes. Packed clumps are subsequently sintered, sieved and dried for structural stability testing.

The results show that direct seeding (DS) favors the accumulation of OM at the surface, especially at the 0-5cm horizon, contrary to conventional seeding (CS).

DS promotes structural stability, with a mean weight diameter (MWD) moy = 0.94mm for DS versus 0.83mm for CS. These results show that CS plowed soil is more exposed to erosion degradation than soils plowed in DS. In addition, the DS preserves soil moisture and promotes additional water retention (5 to 10%).

Key words: Water; Irrigation; Erosion, Soil; Direct Seeding; Agriculture.

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P20. Evaluating of salt stress tolerance in selected groundnut mutant

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Abstract

In different ecosystems, salinity is one of the main factors responsible for the degradation and reduced productivity of agricultural lands. Two experiments of salt stress gamma irradiated peanuts (*Arachis hypogaea L.*) varieties KP29 and Fleur 11 were conducted in the Regional Center for Agricultural Research of Tangier, to assess tolerance levels of salt in groundnut mutant lines. The first experiment was conducted on germination rate, the seed of 24 genotype mutants were allowed to germinate for 14 days at 28±1 C, 9 seeds of each genotype were subjected to four levels of salinity stress, [0Mm (Control), 50 mM, 100 mM, 150 mM of NaCl]. we evaluated the effect of salt by, germination rate, germination length, fresh weight and dry weight of root, seed hypocotyl and epicotyl. In the Second experiment, we conducted study on the effect of salty soil on the physiology of genotype mutants of peanuts. The seeds of genotype mutants were allowed to germinate for 10 days, after that seedlings were then transferred to 192 plastic pot, 8 pot for each genotype mutants, the seedlings were irrigated with filtered water two to three times a week for 1 month. [Filtered water (Control), 50Mm, 100Mm and 150Mm of NaCl). The electrical conductivities of the soil, including control, were determined by Conductometer throughout the treatment period. After each treatment, we measured the chlorophyll content and stomatal conductance. In both experiences, some genotype mutant seeds appeared resistant/tolerant to salt stress, and some genotypes have been selected for future research. We concluded that the salinity tolerance level could be controlled by the mutation induction through rayon gamma.

Key words: groundnut, salt stress, germination, physiology, mutation.

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P21. Evaluation of β-glucosidase activity of soil under some oasis cropping systems

Mokhtar Karabi[1], Salah Zenkhri[2]

Abstract

In order to study the effect of cropping systems on the microbial compartment of oasis soils (microbial biomass and enzymatic activity), we have chosen four most popular cropping systems in the southeastern region of Ouargla, namely phoeniculture (PHO), greenhouse (GRH), alfalfa (ALF) and cereal (CER) compared to bare soil (BS) located in the area of Hassi ben abdallah.

The results of the microbiological analyzes of the surface layer (0-30 cm) of the studied soils reveal that the microbial biomass values represented by the $C_{microbial}$ are higher in soil cultivated compared to (BS) with a slight predominance for (ALF) and (PHO). The values of the activity of β-glucosidase are between 0.137 and 0.376 µg of glucose.g-1 of dry soil. The amplitude of the reactions obtained for this parameter follows the organic matter content in the five soils in the order ALF> PHO> CER> GRH > BS. This makes it possible to appreciate the introduction of the alfalfa cropping system because it reliably minimizes the problem of soil depletion in arid area.

Key words: cropping system, soil, microbial biomass, enzymatic activity, Algerian Sahara

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P22. Genetic relationships of date palm varieties (*Phoenix dactylifera* L.) in Algeria, based on nuclear and chloroplast markers

Moussouni Souhila[1], Pintaud Jean-Christophe[2], Bouguedoura Nadia[1].

Abstract:

The date palm (*Phoenix dactylifera* L., Arecaceae) is a perennial monocotyledon (2n = 36). It is an ecologically, culturally and economically important crop, widely cultivated in arid and semi-arid Mediterranean regions, in the Sahara, and in the Middle East. Date palms are cultivated in Algerian oases in most of the regions south of the Saharan Atlas Mountains. Nearly 1,000 cultivars clonally propagated from offshoots have been inventoried and their distribution shows a very marked breakdown into eastern, central and western parts of the country. Exploring this diversity is a prerequisite for the identification and characterization of the Algerian cultivar to controlling genetic erosion to aid its conservation and protection.
Six microsatellite markers (SSR) and a chloroplast minisatellite were used to study polymorphism and discriminate 135 date palm genotypes. Based on the multilocus genotypes a cultivar's identification key has been established and permitted to unambiguously differentiate between varieties. The chloroplast minisatellite (CpfM12) was used as a first marker, and two major alleles were found in the chloroplast. The most polymorphic microsatellite (mPdCIR78) was used as a last marker.
A chloroplast minisatellite and six microsatellite loci were sufficient to discriminate among all accessions studied, and allowed the establishment of an identification key with a discriminating power of 100%. Therefore, the synonyms and homonyms were confirmed.
The obtained results are discussed in term of establishment and management of an Algerian collection of date palm varieties, conformity checks, identification of homonyms and synonyms, and screening of the local resources.

Keywords: *Phoenix dactylifera*, genetic resources, identification key, microsatellite, chloroplast minisatellite.

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P23. Growth and development of groundnut (*Arachis hypogaea* L.) varieties under organic and inorganic conditions

Mukhtar, A.A[1*]., Michael, V. B[2]., Mohammed, S.G[3]., Ahmad A[1]., Sada, S.S[1]. and Eche, C[4].

Abstract

Performance of three newly released varieties of groundnuts SAMNUT 24, SAMNUT25, and SAMNUT 26, was investigated during the growing wet season of 2017 and 2018. An experiment was conducted in the 2017 wet season in a conventional and in 2018 wet season in an organic plot. In each year, the crop was grown at three inter-row (I_1,-25cm; I_2-50cm; I_3-75cm) and three intra row (E_1-10cm, E_2-15cm; E_3-20 cm) spacing. The experiment was laid out in a randomized complete block design in a split plot arrangement. The essence was to determine the effect of varying the inter and intra row spacing on the growth and development of the groundnut crop. It also aimed at finding out if differences exist between the crop grown on the organic plot and that grown on the conventional plot. Data was collected on plant height, canopy spread, number of branches per plant and number of leaves per plant. Means of the canopy spread obtained from the organic plots were higher than those obtained from the conventional plots while taller plants were observed in the conventional plots than in the organic plots.

Keywords: Groundnut, intra-row, organic, conventional.

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P24. Impact of Conservation Agriculture on Organic Matter and Humic Acid of Vertisols

Malika Laghrour[1,2], Rachid Moussadek[2], Rachid Mrabet[2], Mohamed Mekkaoui[1]

Abstract

Soil organic matter (SOM) plays a crucial role in the functioning and development of terrestrial ecosystems and agro-ecosystems. Its increase is often considered beneficial while its loss leads to soil quality degradation. In Morocco, the adoption of inappropriate techniques, such as intensive tillage in semi-arid regions, leads to the depletion of soil in organic matter. However, conservation agriculture, particularly no-till (NT) is proposed as an alternative solution limiting these losses in SOM contents.

This work aims to evaluate the important effects of the NT system on SOM and humic acid (HA) of Moroccan soils. Three experimental sites were chosen at different durations: site I (on the short-term), site II (on the medium-term) and site III (on the long-term). Compared to conventional tillage (CT), the student test showed that, the no tillage system gave the best results for SOM and HA. Indeed, the SOM contents were observed to be significantly high (P -value <0.05) at soil surface for sites I and II, and up to 40 cm depth for site III. A significant improvement in humic acid was also observed as a function of depth under the NT system versus CT.

Key words: no tillage, conventional tillage soil organic matter, humic acid, Vertisol, Morocco

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P25. Impact of cyanotoxins contained on irrigation water on crops and agricultural production (e.g *Medicago sativa*)

Fatima El Khalloufi[1,2], Khalid Oufdou[2], Wafa Achouak[3,4,5], Brahim Oudra[2]

Abstract

Prolific growth of cyanobacteria (blooms) is basically related to nutrient enrichment of water bodies (Eutrophication) enhanced by global climatic changes. The occurrence of toxic cyanobacterial blooms in freshwater bodies becomes more frequent. Those are responsible for several ecological disruptions, related to cyanotoxins production.

The phytotoxic impact of cyanotoxins on plants have recently attracted great interest, due to contamination of irrigation water. In fact, our studies were based on the evaluation of the effects of cyanotoxins contamination of irrigation water on plants with significant economic interest.

Thus, exposure of *Medicago sativa* to cyanotoxins has identified both biological and physiological negative effects. A reduction in seed germination and plant growth, in addition to induction of oxidative stress, were the major disturbances generated by cyanotoxins contained in irrigation water. In addition, cyanotoxins have also shown negative effects on agricultural soils and their bacterial communities. PCR-based 454 pyrosequencing analysis of rhizospheric bacterial communities of *Medicago sativa* in response to cyanotoxins revealed an important decrease of bacterial species diversity, from unplanted soil to root tissues. The bulk soil was essentially inhabited by *Gemmatimonas, Actinobacteria* and *Deltaproteobacteria*, while, the root-adhering soil and the root tissues were inhabited by *Gammaproteobacteria* and *Alphaproteobacteria*. The main bacterial populations showed several variations under cyanobacterial toxins exposure.

Consequently, the obtained results showed negative impact of cyanotoxins on plant growth and development. In addition to changes on soil bacterial communities which may alter the rhizosphere functioning. The contamination of irrigation water with cyanotoxins conceals several allelopathic effects related to crop quality and production.

Keywords: Blooms, Cyanotoxins, *Medicago sativa*, Biological and physiological impacts, Rhizospheric bacterial communities, Agricultural production.

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P26. Management and exploitation of soil microbial resources for sustainable development

Ibrahima Ndoye

Abstract

More than half of the population growth by 2050 is expected to take place in Africa, and a combination of environmental and anthropogenic factors is jeopardizing its ability to feed this population.

Among the most important factors are droughts related to the steady decline in rainfall and land degradation: a loss of biodiversity, a decrease in agricultural productivity and ultimately an increase in food insecurity and its effects (migrations, Conflicts...).

It is therefore urgent to identify new sustainable solutions to feed this growing population while facing the expected negative impacts of climate change on agricultural production. It will be necessary (1) to develop new strategies to exploit the diversity of plants and associated symbiotic microorganisms (rhizobia and mycorrhizal fungi) with a view to improving agricultural production and sustainably rehabilitating degraded ecosystems (2) presenting new approaches and research results aimed at improving the agricultural productivity and incomes of rural people, increasing resilience and mitigating the effects of land degradation and climate change.

Particular emphasis should be placed on technology transfer activities, commercialization of innovations and preservation of agricultural biodiversity for the coming years.

P27. Mapping of the Physico-Chemical Quality of the Soil in the Sidi Yahya Region, Gharb, Morocco

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Abstract

The coastal area of Sidi Yahya Gharb enjoys the undeniable advantage of the existence of a water table of good quality and accessible to users at relatively low depths. The productivity of catchments is generally good, going hand in hand with the quality of fertile soils, which explains the important development of irrigated agriculture associated with an agro-food industry. Several studies have focused on the physico-chemical quality of soils in irrigated areas in Morocco. The present work aims to make a diagnosis of the current situation of soil quality prevailing in the perimeter of Sidi Yahya Gharb.

A survey of thirty points was carried out. Firstly, pH, electrical conductivity, organic matter, assimilable phosphorus and exchangeable potassium measurements were made. In a second step, a geographic information system (GIS) was established in order to study the spatial variations of its parameters.

The results of the analyzes show that the majority of soils analyzed are moderately basic with a texture varying between heavy clay and sand, and that these soils belong to the class of non-saline soils. In addition, 85% of these soils are very poor to medium in organic matter, and they are characterized by a high level of potassium content and low phosphorus levels. Then, a thematic cartography for each parameter was established using a Geographical Information System (GIS), to assess the spatial distribution of the various parameters studied.

Key words: Sidi Yahia Gharb, Soil, Quality, GIS.

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P28. PROJECT TOPIC EU-NACOA 2019

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MIoT 2030 "*Made In our Terroir*" 2030 is a project which aim to *enhance and implement partnerships to create a new concept of "Agri-Circularity" from Field to Fork by a structural approach concerning : Agri-Culture and Agri-Technologies-Productivity (ACT-P); AgriTransformation and Valorization-Profitability (ATV-P); Agri-Commercialization and AgriBusiness-Sustainability (ACB-S), in atlas mountains rural areas using new technologies & IoT to create a structured model for a modern, sustainable and inclusive socio-economic development of* 2030 *Sdg's Agenda.*

Abstract:

Between 2015 and 2016, the unemployment rate of the Kingdom of Morocco increased by 0.5 percentage points, from ***6.6% to 7.1%***. The largest increase occurred among youth aged ***15 to 24***, whose unemployment rate fell from ***14.9% to 18%***, an increase of *3.1* percentage points. In 2011, as small farms could not provide for their families, men were forced more and more often to emigrate to the cities in order to reach higher wages, while women have taken over responsibilities related to the agricultural context. Due to the emigration of men, women have had to work more and more on their own land and / or as cooperative workers on land owned by others. Despite the increase and the significant contribution of women to agriculture, they unfortunately still remain largely marginalized in the labor market in Morocco and represent only ***2%*** of beneficiaries with participation rates in the labor market and in public life the lowest (respectively 23% and 17%) and an average working time of women on farms is estimated at 29.6 hours / week. Taken together, the marginalization of extension councils, employment and public life and the heavy workload limit women's ability to generate income and ensure food security in their households and beyond. In the light of these challenges, we propose a holistic approach that targets the three key pillars of rural employment: ***Productivity, Profitability, and Sustainability (PPS).*** Strategic interventions along these elements will define a self-sustaining circular economy that will generate employment and income in rural areas, provide a central role to rural women, and foster new opportunities for growth.

The partnership envisaged for the *MIoT* project is an excellent example of transnational **PPP** (PublicPrivate Partnership) collaboration under the aegis of civil society, certainly the best example of implementation of the ODD 17. This could be an important possibility to implement the ODD 17 by three kind of partnerships: - ***Transregional*** (with the possibility of collaboration and twinning between Moroccan regions and replicate this model all over the kingdom); ***- Transnational*** (with the possibility of collaboration and twinning between Moroccan and International regions concerned by the same problematics in *North-South* and *South-South* Agri circular new way of development & decentralized cooperation; - ***Transactional*** (where the trans actionality became the collaboration between different partners *Public/Private/Institutional/Moroccan/Foreigner* on different activities concerning the *Agrivalue chain* implementation.

P29. New sources of resistance to hessian fly in durum and bread wheat under Moroccan conditions

Satia Laila[1], Amamou Ali[2]

Abstract

Hessian fly, *Mayetiola destructor* (Say), is the major pest of wheat in Morocco. Losses due to this pest have been estimated at 30 % and can reach 100 % if high infestations occur during the early stages of crop development. In order to control Hessian fly infestations in friendly environmental production context without chemicals, the use of resistant wheat cultivars and early planting dates remain the most practical, economic and sustainable means for smallholder farms in developing countries. However, the evolution of virulent biotype requires continued research of new sources of wheat resistance. The objective of this study was the screening of a large collection of bread wheat (*Triticum aestivum L. subsp. aestivum*) and durum wheat (*Triticum turgidum L. subsp. durum (Desf*) cultivars for resistance to Hessian fly. A total of 304 cultivars of bread wheat and 196 cultivars of durum wheat were tested under greenhouse conditions with artificial infestation and using two Moroccan bread wheat checks ("Rajae" as susceptible and "Arrihane" as resistant). A number of 100 of bread wheat cultivars have expressed high resistance to Hessian fly infestation and 43 of cultivars were heterogeneous. Whereas for durum wheat cultivars, 14 were highly resistant to Hessian fly and 10 were heterogeneous. These sources of resistance will be used by Moroccan breeders to develop resistant durum and bread wheat varieties.

Key words: Resistance, Hessian fly, Morocco, *Triticum turgidum, Triticum aestivum*

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Poster Panel

Session 3.

Tailored techniques and practices for organic farming, soil fertility, preventive and curative measures for plant protection, organic weed management, post-harvest

P30. Amelioration of saline soil fertility and plant growth by phosphorus solubilization

Sadji-Ait Kaci[1] H, Chaker- Haddadj[2]a, Abdellaoui[3] K, Aid[4] F

Abstract

Phosphorus (P) deficiency in soil can severely limit plant growth productivity, particularly in legumes, where both the plants and their symbiotic bacteria are affected, and this may have a deleterious effect on nodule formation and function. In the soil, the availability of phosphate is depended to microbial production of metabolites leading to lowering of pH and release of phosphate from organic complexes or by adding of phosphorus fertilizers. Consequently, it enhances mineral of the plants nutrition in the soil. However, in arid and semi-arid zone, the saline soil reduces severely the plant growth and crop production.

In fact, exploitation of saline soils in agricultural domain is possible either by selection tolerant chickpea genotypes to salinity and/or improvement of culture conditions of plants regardless to genotypes selection in objective to enhance field crop and obtain a tolerant symbiosis with *Rhizobia* strains. The aim of this work is to study the effect of salt stress combined to phosphorus application on root growth of chickpea plants and on phosphate solubilizing ability of *Rhizobium* strains. Results indicated that, salinity increased root length but reduced strain number colonies and phosphorus solubilization. However, application of low phosphorus level to saline soil enhanced root growth, strain number and induced high phosphate solubilizing ability of *Rhizobium* strains.

These results indicate that phosphorus added could be an alternative for rehabilitate the saline soils by reducing negatives effects of NaCl. Besides, the inoculation of this soil with phosphate solubilizing strains selected could ameliorate the availability of orthophosphates ions from the organic and inorganic complexes in the saline soils.

Key words: salinity, root length, phosphorus solubilization, inoculation.

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P31 Antibacterial ability of *Allium sativum* L. ethanolic extracts

Maroua Merah [1], Mohammed Messaoudi [2], Mokhtar Benreguieg [3].

Abstract

The emergence and spread of multidrug resistance among bacteria has created an immense clinical global problem and threat to human health. Furthermore, infectious diseases remain one of the leading causes of mortality and morbidity both in developing and developed countries. Plant derived antimicrobial agents represent group of medicinally important secondary metabolites, among which polyphenols are ubiquitously distributed in all higher plants. There is a rich local ethnobotanical bibliography describing the species most frequently used by the population to cure bacterial infections. *Allium sativum* L. is one of those species that was largely used due to its antibacterial and nutritional capacities.

We were interested to test the antibacterial properties of *A. sativum* ethanolic extracts via the disc diffusion assay. After that, the total phenolic content (TPC) and total flavonoid content (TFC) were deduced using ciocalteu reagent and trichloride aluminium tests.

An important antibacterial ability was registered; on the growth of *Salmonella typhimurium* and *Staphylococcus aureus* by the ethanolic extract. The diameter inhibition zone were 11 and 14,5 mm, respectively.

On the other hand, both bacterial species *Klebsiella pneumoniae* and *Escherichia* coli were highly resisted to that extract.

The most part of this antibacterial ability was due to the richness of ethanolic extract on phenolic and flavonoid substances classes known for their bioactive properties. TPC and TFC resulted were 41.88 ± 1.32 mg GAE/g and 19 ± 3.58 mg QE/g, respectively.

Keywords: secondary metabolites - antibacterial ability - *Allium sativum* - polyphenols - ethanolic extract.

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P32. Antifungal activity of three essential oils against plant pathogenic fungus *Zymoseptoria tritici*

Mehdi El Ghazouani, Samuel Bua, Rugemandinzi Joseph, Elanrewanju Suleiman

Abstract

Septoria tritici blotch (STB) caused by the ascomycete fungus *Zymoseptoria tritici* is the most economically damaging disease of wheat worldwide. By infecting leaves and causing necrosis Z. tritici reduces the grain filling capacity of wheat and can, if left unchecked, result in significant yield losses with associated economic repercussions.

In order to cope with the threats posed by this disease, several means of control have been used. Chemical control remains by far the most used by farmers. However, this chemical control is postponed because of the risks of water and soil pollution and the induced resistance of pathogens. To counter these developments in fungicide resistance there is an increased need to develop alternative control strategies, including biological control.

The study aims to evaluate the Antifungal activity of Essential oils from three species of Moroccan medicinal plant against the causal agent of the sesease, An agardilution method was used to determine the inhibitory effect and effective dose of essential oils extracted. All essential oils used in our experiment affected signinficantly the growth of this fungus. The chemical compositions of the essential oils were determined by gas chromatography/masspectrometry analysis.

Key words: Antifungal activity, Z. tritici, essential oil, biological control

P33. Assessment of the Groundwater Salinity used for Irrigation and Risks of Soil Degradation in the Gharb, Morocco.

Najib El Khodrani[*1,3], Serine Omrania[2], Abdelmjid Zouahri[1], Ahmed Douaik[1], Hamza Iaaich[1], and Mohammed Fekhaoui[3]

Abstract

The Gharb plain (Northern Morocco) benefits from a privileged geographical situation, very fertile soils, and relevant water resources. In the Sfafaa region of the Gharb Plain, under a semi-arid climate, the use of irrigation is inevitable for most crops. Therefore, groundwater is increasingly being used. Hydrochemical and statistical studies were conducted; they were carried out on the major and secondary elements of water (EC, pH, Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, CO_3^{2-} , HCO_3^{-} , Cl^{-}, SO_4^{2-}, TDS, and SAR). The sampling period lasted over 2 years (2013 and 2014) starting from March to June. The seventeen wells that were analysed were spread across six different zones (A, B, C, D, E and F). The values recorded during the sampling period showed that 17.6 % of the analysed wells are highly saline in which EC > 3 dS/ m. Chemical analysis revealed a wide variety of chemical composition. The samples are divided in a chloride sulphated-and calcium-magnesium facies. Then, statistical analyses of the studied parameters showed great variability and the results of analysis allowed maps of salinity and the SAR risk of irrigation water to be drawn.

Key words: Agricultural pollution, Irrigation, Groundwater salinity, Soil quality, Gharb, Morocco.

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P34. Efficacy of different bio-fungicides to control *Botrytis cinerea* in strawberry in Morocco

Ghita EL Hilali[1], Nuray Baser[2], Amal Nakro[3], Ahmed Bamouh4

Abstract

Grey mold, caused by Botrytis cinerea, is one of the most important plant diseases of strawberry in Morocco. This problem is more pronounced under the organic system where synthetic pesticides are not allowed and plant protection measures show only a limited efficacy. Furthermore, there is still a gap of knowledge regarding the bio control of this pathogen in the Moroccan organic strawberries.

The aim *of this study was to evaluate the efficacy of four bio-fungicides: Orange essential oil, Bacillus amyloliquefaciens D747, Bacillus subtilis IAB/SO3 and Pythium oligandrum M10 against Botrytis cinerea, tested in the laboratory and field conditions. In the laboratory phase, the bio-fungicides* significantly *reduced the mycelial growth and the* conidial *germination of the pathogen and demonstrated high efficacies.*

The field experiment was carried out on strawberry in Morocco. The objectives of the investigation were to determine the effect of the preparations on the yield, *Botrytis cinerea* disease control, products persistency and the shelf life of the harvested fruits. Preparations did not show any positive effect on the yield and on the disease control.

Key words: *Fragaria* x *annanasa*, Prev-Am Plus, Amylo-X, Fungisei, Polyversum, Organic agriculture.

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P35. Future Green Skies: Re-Invention of Organic Fertilizers (a review)

Karen Ayabei[1]; Mphatso Chongo [2]; James Stewart [3]; Oumnia Ennaji [4]

Abstract

The population is globally increasing and it's estimated to reach 9 billion by the year 2050 according to the World Bank. Climate change is also anticipated to cut crop yields by 25%. The need for innovative farming to meet the growing demand for food security has seen an increase in vertical farming especially in the populated urban areas where each area of space is valuable, and the skies are becoming greener. The threats to human and environmental impacts linked to synthetic fertilizers, has resulted in increased proponents of organic agriculture. The research, therefore, needs to rethink about the future use of organic fertilizers especially the farmyard manures, vermicomposts, phosphate rocks among others to purely meet the needs of vertical farms. Organic farming is considered to be eco-friendly, sustainable while vertical farming offers the opportunities of mass production of organic food, sustainable urban growth and recycling of natural resources like water. This research critically reflects on the upward trend in adoption of vertical farming in countries like Singapore, and cities like New York and the need to reinvent or redesign the organic fertilizers to supply the required crop nutrient efficiently without compromising on the crop yields of such farms. The farmyard manure commonly used in agricultural lands are considered organic fertilizers but its use is pegged on other agronomic activities such as crop rotations and nutrient recycling which might not be feasible in vertical farming. The nutrient–plant interactions in vertical farming, the microbes involved in organic fertilizers and the Nano sizing of organic manures such as the compost, to enhance plant nutrient uptake need be exploited. A need for concerted efforts in the research and development of vertical farming and organic fertilizers such as leveraging on root exudates and on other microbes apart from rhizobia and mycorrhiza to be further pursued to achieve the potential sustainability of all these strategies.

Key Words: Vertical Farming, Organic Farming, Fertilizers.

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P36. In vitro and in vivo antifungal activities of some essential oils against *Ascochyta* blight of chickpea

Amal Ennouri *[1,2], Sanae Krimi Bencheqroun [2] , Abdeslam Lamiri[1]

Abstract

The aim of this study was to investigate the antifungal efficacy in vitro of essential oil obtained from the leaves of *Oregano* (*Origanum compactum*), *Thyme* (*Thymus vulgaris*), *Eucalyptus* (*Eucalyptus camaldulensis*), Mint (*Mentha pulegium* L) and Myrtle (*Myrtus communis*), against chickpea blight pathogen, Ascochyta *rabiei*, and to evaluate the possibility to use them as protective or curative treatment in vivo. The essential oils of Oregano, Thyme, Mint and Myrtle revealed high antifungal effects in vitro against A. rabiei in the inhibition of mycelia growth. A total inhibition of 100% was observed at MIC values ranged from 0.15 to 5µl/ml. A significant effect on inhibition of spore germination of A. rabiei was also observed using all essential oils with kinetic inhibition depending on the concentration. Oregano oil was the most effective and inhibited100% of spore germination at a concentration of 0.15µl/ml. The phytotoxicity test of these essential oils on chickpea germination indicated that Mint and Myrtle oil can have an effect on reducing the germination percentage of chickpea seeds, while Oregano and Thyme oils have no phytotoxic effect at concentrations up to MIC×2. A further experiments were carried out in greenhouse to evaluate the efficacy of Oregano and Thyme oils as protective or curative treatment in comparison to chemical fungicide using susceptible and moderately resistant cultivars of chickpea. In curative treatments, a concentration of 0.15µl/ml, 0.3 and 0.75µl/ml of Oregano essential oil and the chemical fungicide (Azoxystrobine 250g/l) displayed a significant decrease in disease severity of *Ascochyta* blight on chickpea of 65.78% and 71.05% respectively. The essential oil of Thyme had also a significant protection effect by reducing 52.63% of disease severity using a concentration of 0.5µl/ml. The analysis of chemical composition of Oregano and Thyme oils using a GC-MS analysis (Gas chromatography-mass spectrometry) showed the dominance of two compounds (Thymol and Carvacrol) that are absent in the other oils and can represent the principal active ingredient in the pathogen control. This study showed that essential oils of Oregano and Thyme are both potential and can constitute promising antifungal product that could be investigated for seed or foliar treatment of chickpea against *Ascochyta* blight. It can contribute to control the disease under the organic system in Morocco.

Key words: antifungal activity, ascochyta rabiei, chickpea, essential oils.

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P37. In vitro tests of *Trichoderma* strain against *Fusarium* wilt of tomato in southeastern Algeria

Benlamoudi Wiam [1,2], Lakhdari Wassima [1], Dehliz Abderahmane [1], Guezoul Omar [2]

Abstract

For decades, the antagonistic species belonging to *Trichoderma* genus are sought after by their very lucrative potential in organic agriculture. In the Algerian southeast, these pathotypes have a very interesting power because of their success in experiencing the most severe pedo-climatic conditions that allow not only Africa but Europe to valorize them in vivo as very powerful biopesticides in the reduction of various phythopathological disorders. For that, three modes of action of Trichoderma strain have been evaluated through in vitro tests, in order to verify the potential of this antagonist towards *Fusarium oxysporum* f. sp. *lycopersici* isolated in Wadi Righ region, Algerian southeast. 56, 65 and 70% are Inhibition rates of the pathogen that have been respectively obtained with antibiosis, competition and mycoparasitism antagonistic mechanisms. Results, based on ANOVA, have confirmed that the biological agent showed significant fungistatic effect towards *Fusarium oxysporum* f. sp. *lycopersici*. However, mycoparasitism has been the most effective mechanism among all the tests applied.

Key words: Trichoderma, potential, Fusarium oxysporum f. sp. lycopersici, inhibition, in vitro, mechanisms, Algerian southeast

P38. Induction of pea plant defensing system against *Aphanomyces euteiches* using PGPR Moroccan Actinobacteria

Oubaha Brahim[1,3], Nafis Ahmed[1,2], Katif Chaima[1], Mauch Felix[3], Barakate Mustapha[1,2]

Abstract

Aphanomyces euteiches is a pathogenic oomycete that is responsible for root rot and damppin-off in legumes. The work presented deals with the study of the ability of actinobacteria isolated from Moroccan ecosystems to induce the defense system in pea plants. A preliminary study of the elicitor effect of strains OB22b and AC3B2 (1). Thus, we have shown that these two strains of actinobacteria stimulate the plant's defense mechanisms differently by inducing gene expression of PR1, BGL, DRR276, LOX and POX in *Pisum sativum* L. This induction is of particular agronomic interest because it can be artificially induced in plants and subsequently could be a means of limiting the input of chemicals in fields for a sustainable agriculture.

Keywords: actinobacteria, *Aphanomyces euteiches*, damping-off, root rot, *Pisum sativum* L., PGPR, natural induction of defense.

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P39. Minimization the effects of herbicide stress on bean (*phaseolus vulgaris* L.) plants by exogenous protectant application: salicylic acid

Karima Boulahia, Chaima Ouldsaid, Ouzna Abrous-Belbachir

Abstract

The use of herbicides in agricultural practice has allowed considerable time and productivity gains. However, the massive use of these molecules is often damage to cultivated plants and to the environment. When exposed to herbicides, plants usually suffer oxidative stress caused by the generation of reactive oxygen species (ROS).

Salicylic acid (SA) is one of the components in plant defense signaling pathways and regulates diverse physiological responses to biotic and abiotic stresses. In this work, SA was used to alleviate the oxidative stress caused in response to prometryne herbicide in bean (*Phaseolus vulgaris* L.) leaves.

Prometryne [2,4-bis (isopropylamino)-6-(methylthio)-s-triazine] is a selective herbicide of the s-triazine chemical family, widely used for controlling weed/grass in agricultural practice. It affects electron transport through photosystems II leading to ROS generation potentially damaging.
Our study showed the effects of exogenous SA (0.2, 0.5 and 1mM) on the physiological and biochemical behavior of bean seedlings subjected to 100 µM of prometryne. These effects were estimated by the evaluation of the growth of the seedlings (growth in length and weight growth), their relative content water (TRE), their content of chlorophyllous pigments (chlorophyll and carotenoids), their membrane integrity (malondylaldehyde, MDA) and their antioxidant systems (glutathione, proline, catalase, glutathione S-transferase).
The results obtained show that the herbicide stress affects the whole of the studied parameters. Exogenous application of SA attenuated the negative effects of the stress by the improvement of the growth in length, the dry matter weight of the air part, of the content of pigment, the content of MDA and it modifies nonenzymatic and enzymatic antioxidant systems level (glutathione, proline, catalase, glutathione S-transferase). These results indicate that the prometryne induces various physiological and biochemical responses in non-target plants and that treatment with exogenous SA can increase stress resistance by altering these responses.

Keywords: exogenous salicylic acid, prometryne herbicide, bean (*Phaseolus vulgaris* L.), oxidative stress, antioxidant systems

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P40. Organic fertilizer and its effect on vegetable production A case study of vegetable farmers in kwara state Nigeria

Babasola J.O.,[1] Olaoye I.J.[1], Bolaji M.[1]

Abstract

Organic fertilizer use over the years has been encouraged for the production of almost all crops due to the health benefits derived from its utilization. This study was carried out in Kwara State Nigeria in order to determine the effect of using organic fertilizer for vegetable production. Data was collected through the use of questionnaires augmented with an interview schedule. Data obtained were analysed using both descriptive and inferential statistics. The result revealed that quality vegetables produced was the highest effect of the use of organic fertilizer with the mean score of (3.265). The efficient waste management of animal waste had a mean rating of 2.35 and environmental friendliness of the perceived effect of the use of organic fertilizer on vegetable production had the least ranking with a mean score of 1.95. The hypothesis tested revealed that there was a positive relationship between farm size (0.548), years of experience (0.381), household size (0.279) and the perceived effect of the use of organic fertilizer on vegetable production in Kwara state which was significant at Pvalue of 5%. Thus, it was recommended that vegetable farmers should be encouraged to use more organic fertilizers given its positive effect on the quality of the vegetables produced.

Key words: Organic Fertilizer, Production, Quality, Yield

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P41. Population dynamics of the olive fly, to develop a program, highlighting constraints of its application, in Essaouira, Morocco

Abdellaziz Ait Mansour[1], Ali Boumezzough[1], Mohamed Hafidi[1],

Abstract

The coastal climate, in the region of Essaouira, is favorable to the development of the most harmful pest of olive fruits, the olive fly Bactrocera oleae (Gmel) (Diptera., Tiphritidae) . This causes an extension to the duration of the pest life cycle with an additional generation which occurred in summer. Therefore, the region can be considered a potential source of this olive pest that spreads in other regions of the country. The study of the life cycle and seasonal fluctuations in the population dynamics of this Pest, leads to develop an integrated control program based on the establishment of an agricultural warning calendar along with phytosanitary measures, adapted to the region and highlight constraints to their application.

Key words: Bactrocera oleae, population dynamics, integrated pest management, contraints, Essaouira (Morocco)

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P42. Rapid activation of the phenylpropanoid pathway in BLD affected date palm

Latreche Khaled, Rahmania Fatma

Abstract

The involvement of the different metabolic pathways in plant defenses against aggressors has been explicitly studied. This response varies considerably according to the nature (biotic or abiotic), of the stress. In *Phœnix dactylifera* L., the defense responses are usually composed of a multitude biochemical events. In many cases, the activation of phenylpropanoid metabolism is included in the initial reaction pathway leading to the synthesis of compounds regarded as important for the survival of cells under stress. The work reported here is the first attempt to analyze the soluble and extracellular phenolics in the date palm affected by the brittle leaf disease. It aims to understand the biochemical basis of the date palm resistance to this pathology whose the causal agent is still unknown. The GC/EI-MS study of phenolic compounds separated from cell wall of healthy and affected leaves, revealed several modifications. In leaves presenting moderate symptoms, an enhanced extracellular accumulation of p-hydroxybenzoic acid, p-hydroxycinnamic acid and p-hydroxybenzaldehyde, was highlighted. This accumulation was accompanied with a significant decrease in abundance of acetophenones, particularly 20-Hydroxy-40,50-Dimethoxyacetophenone and acetosyringone.It was assumed that p-hydroxybenzoic acid and p-hydroxybenzaldehyde were formed as the major degradation products of p-coumaric acid. Further investigations and analyses have also shown

Keywords: *Phoenix dactylifera* L., Brittle leaf disease, Phenylpropanoid, Algeria.

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P43. *Senecio glaucus* essential oil as a potential biopesticide against post-harvest pathogens

Khadija Basaid[1], Bouchra Chebli[1], El Hassan Mayad[2], Rachid Bouharroud[3], James Nicholas Furze[2]

Abstract

Plant essential oils offer safe alternatives to synthetic pesticides. They have been shown to control agricultural pests and diseases of economic importance. In this context, the present work aims to evaluate the inhibitory effects of *Senecio glaucus* ssp coronopifolius essential oil against post-harvest pathogens *Botrytis cinerea, Meloidogyne javanica* and *Tetranychus urticae* Koch under laboratory conditions. On the root knot nematode, mortality of second stage juveniles (J2) and hatch inhibition of *M. javanica* eggs surpassed 90% at 16µl/ml. In the case of mites, a leaf dip bioassay revealed complete mortality of *T. urticae* adults, and repellency of 24% after exposure to the oil at 80% concentration. The essential oil gave over 80% inhibition of mycelial growth of *B. cinerea* in contact and volatile phase assays at 16 µl/ml and 0.8 µl/ml air respectively. The findings indicated that the essential oil of *S. glaucus* may be useful in the search of effective natural materials as biopesticides, to be used in management of post-harvest pathogens, provided that it produces similar results in field experiments as well. This type of research can contribute to bridge the current gap between Africa and Europe, as it helps implementing organic agriculture by finding sustainable solutions for crop protection.

Key words: Essential oil, *Senecio glaucus* ssp *coronopifolius, Botrytis cinerea*, *Meloidogyne javanica*, *Tetranychus urticae* Koch

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P44. Stimulating growth and development of lettuce (*Lactuca sativa* L.) by using compost as an alternative to conventional inorganic fertilizers

Mohamed Anli[1,3,*], Abderrahim Boutasknit[1], Abdel-Ilahtahiri[1,2], Anas Raklami[1,2], Youssef Ait Rahou[1], Mohamed Ait-El-Mokhtar[1], Raja Ben-Laouane[1], El Amerany Fatima[1], Salma Toubali[1], Mohamed Hafidi[3] , Khalid Oufdou[2], And Abdelilah Meddich[1]

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Abstract

The use of organic amendments to enhance plants growth and vigor has become a necessity for the environment protection. Composts are considered as biofertilizers which enhance growth, mineral nutrition and plants tolerance to biotic and abiotic stresses. The aim of our study is to evaluate the effect of two composts on growth of lettuce plants (*Lactuca sativa* L.), after 2 months of culture in open field. The growth has been evaluated on lettuce plants subjected to three different treatments: Control without compost, C1 with compost 1 and C2 with compost 2. Both composts C1 and C2 were produced locally from olive pomace and green waste and grass waste and phosphate mud respectively. These amendments are mature, stable and have a C/N ratio of 13.2 and 7.13 respectively.

The results showed the important impact of the two composts applied to lettuce grown in open field. The used composts improving the growth, yield and physiological and biochemical parameters of lettuce plants. In addition, C1 and C2 improved lettuce yield by 16.87% and 105.25% respectively compared control.

Results confirm that used composts can be used as an alternative in lettuce crop cultivation, leading to similar or even higher yields.

Keywords: *Lactuca sativa,* compost, growth, physiological, biochemical parameters and yield.

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Poster Panel

Session 4.

Agricultural waste management, nutrient cycling, environmental protection and role of bio-fertilizers bio-stimulants and bio-pesticides

P45. Characterization and identification of phenol degrading bacteria isolated from industrial waste in Oran

Maghnia djamila[1] et bensoltane ahmed [1]

Abstract

Phenol is a toxic organic pollutant to living cells and its biodegradation is considered the best method due to its environment friendly nature and cost effectiveness. In this study, 15 bacterial strains were isolated from industrial waste in industrial zone of Oran, through enrichment on mineral salt media supplemented with 100 mgL-1 phenols. The isolated strains were identified on the basis of morphological, biochemical characteristics and 16S rDNA sequence and found to be analysis and belonged to genera: *Pseudomonas, Bacillus, Raoultella*. The results of phenol biodegradation experiments (conducted at pH 7 and 30°C temperature) showed that the strains could degrade 750 mg L-1 phenol within 40 to 96 hours as sole carbon and energy source. The average phenol degradation rate by the strains was 12.5 to 34.8 mgL-1h-1. The most rapid phenol degradation was observed for *pseudomonas* sp. The results of our study suggested that these strains are efficient in phenol biodegradation and can be used for the bioremediation of waste water containing phenol.

Key Words: phenol, biodegradation, *Pseudomonas, Bacillus, Raoutella* .

P46. Compost application mitigates oxidative stress in Date palm seedlings under salt stress

Mohamed Ait El Mokhtar*, Said Wahbi, Raja Ben Laouane, Mohamed Anli, Abderrahim Boutasknit and Abdelilah Meddich.

Abstract

Compost amended and non-amended date palm seedlings were subjected to salt stress in order to study the effect of compost (made from green waste) in alleviation of oxidative stress induced by salinity. Two months after germination, the plants were amended by compost and were subjected to 0 mM and 240 Mm NaCl after five months. The activities of antioxidant enzymes such as superoxide dismutase (SOD), peroxidase (POD), ascorbate peroxidase (APX), catalase (CAT) and polyphenol oxidase (PPO) were assessed besides of malondialdehyde (MDA) and hydrogen peroxide contents. Antioxidant enzyme activities were significantly increased in both amended (C) and non-amended (NC) plants grown under NaCl salinity while MDA and hydrogen peroxide contents decreased. The results showed that all enzymes activities were very high in roots compared to shoots especially for the PPO. The application of the organic amendment was found to significantly enhance the activities of antioxidant activity of date palm seedlings under salt stress. MDA and hydrogen peroxide contents were high in roots than in shoots and under salt stress; the application of compost significantly reduced the both contents.

Keywords: Date palm, compost, salt stress, antioxidant system.

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P47. Contribution to the understanding of the phospho-solubilization mechanism by bacteria isolated from Moroccan phosphate deposits: Application on *Arabidopsis thaliana*

Ilham Mardad*[a,b,c], Aurelio Serrano [b], Abdelaziz Soukri [c]

Abstract

In this study, we focused on the isolation and characterization of different bacteria from Moroccan phosphate deposits, then the use of the most performant ones, with high solubilization capacity. This performance was quantified by monitoring several parameters: the concentration of orthophosphates released, the bacterial growth, the culture medium pH and the release of organic acids detected by HPLC. In the same perspective, biochemical & physico-chemical study of Phosphate Solubilizing bacteria (PSB) were conducted to determine the optimum conditions of their work, secondly we were able to demonstrate the involvement of proteins or enzymes in the phosphate solubilization, through the analysis of extracellular proteins by SDS- PAGE and MALDI -TOF.

And always in the vision of using these PSB on the agriculture, with natural phosphate amendments, it was necessary to ensure their ability to solubilize Rock Phosphate (RP) and see their behavior in culture on free and immobilized state.

Once confirmed, we decided at this point to continue our study to biotechnological application, analyzing the ability of our PSB to promote plant growth, by checking various parameters such as the production of indole acetic acid, siderophores and organic volatile compound detected by GC / MS through the use of Arabidopsis thaliana (Col -0) as a model plant.

Analyzing the results, we could conclude that these PGPB belongs to the family of Enterobacteriaceae with close phylogenetic relationships. Thanks to their ability to produce Indole Acetic Acid, siderophores, volatile organic compounds including acetoin, not to mention their capacity to circumvent the stress and grow in extreme conditions in addition to the versatile use of different sources of carbon and nitrogen, to solubilize phosphates, making it bioavailable for use by plants and thus our bacteria (PSB) provide a basis and a new approach for a successful preparation of a biofertilizer

Key words: PSB, TCP, Rock Phosphate, a-ketoglutaric acid, Enterobacter, acetoin, Indole acetic acid, *Arabidopsis thaliana*.

P48. Development of a Prototype Smart Composter for Improved Production and Efficiency of Vermicomposting

Mohamed Jaouahar[1], Toyib Aremu[2], Reda Mohammed[3] & Anne Marie Ntangere[4]

Abstract

Given the rising demand for food products that are produced safely and ethically, organic agriculture continues to gain prominence in global food production. But even organic farming requires replenishing the soil with important nutrients to sustain production. To address soil nutrient deficits, organic farmers use organic sources of nutrients such as manure, plant residues, composts etc. The current production of compost however is manual involving days of verifying and controlling factors such as humidity and temperature in the composting process. But these parameters can be automated using microcontrollers such as ARDUINO. The microcontrollers can automatically measure physical and chemical parameters in order to take decisions such as adding water or cooling temperature by sending an electrical signal to components like the pump, step motor etc. This research seeks to develop an automatic composting machine that can automatically monitor and control factors like pH, temperature, humidity etc. Overall, we find that the automatic set up has a higher productivity and conversion rate than a manual set up, requires less time to produce vermicompost and is economically viable and easy to code.

Key words: organic agriculture, composting, vermicompost, Arduino, IoT, smart agriculture.

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P49. Does decoction of *Atriplex halimus* have an antibacterial ability?

Maroua Merah [1], Mohammed Messaoudi [2], Mokhtar Benreguieg [3].

Abstract

Plants impose themselves on the planet by their appearance, their exuberance and their mystery. Since the most remote times Man has sought a way to satisfy his hunger. He found nourishing foods in plants, but also remedies for his ills, and he learned the hard way to discern poisonous plants. The herbal drug is a complex of molecules, derived from one or more plant species. Many galenic forms are now proposed, some more innovative than others, leaving the original infusion more or less obsolete. This work was devoted to examine some biological effects of medicinal plants indigenous to the south Algeria, the case of *Atriplex halimus*. The vegetable parts of *Atriplex halimus* have been extracted under decoction, the resulting aqueous extracts were examined to confirm or disprove their antibacterial ability against highly pathogenic bacterial strains. Then, the phenolic content of these extracts was estimated using test of Folin–Ciocalteu's reagent. Decoction extract has prevented the growth of *Staphylococcus aureus* and *Escherichia coli* species inside inhibition areas with diameter of 11 and 8 mm, respectively. This extract has contained a polyphenol content of 18.66 ± 3.14 mg gallic acid equivalents by gram dry powder.

Keywords: *Atriplex halimus* - decoction - antibacterial ability - phenolic content - medicinal plants.

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P50. Efficiency of organic farming using the lagoon sludge and green waste compost: case study of wheat and faba bean

El Mezouari El Glaoui Ghizlen[1,2], El Fels Loubna[1,3], El HayanyBouchra[1], Rihanni Mohammed[2], Hafidi Mohamed[1,4]

Abstract

Organic farming systems rely on organic amendments to achieve the requirements of crop fertility, and weed control, exhaling the use of industrial inputs (fertilizers, phytosanitary products).This study has as objective to investigate the effect of compost (½ lagooning sludge + ½ green waste) and mineral fertilizers (NPK) on the different soil properties in order to compare their effectiveness on soil properties improvement and the plants growth.Faba bean (leguminous culture) and wheat (cereal cultivation) were used to evaluate the treatment efficiency by testing compost at the rate of (D1=5t/ha, D2=10 t/ha, D3=20t/ha and D4= 40t/ha), inorganic fertilizer (N : 80 kg/ha, P : 40 kg/ha and K : 30 kg/ ha).The results revealed that the pH of the various treatments increasedto reach 8.57 for faba bean and 8.55 for wheatcompared to the pH of the control T (8.16).For D4 the EC and Olsen phosphoruswere significantly higher in the treated plots than control T, (85.9 (µs / cm), 0.0044 (mg of P / 1g soil) faba bean, 84.2 (µs / cm), 0.0110 (mg of P / 1g of soil),that is respectively of about 134 (µs / cm), and 0.0385 (mg of P / 1g of soil) for faba bean, and 111.2 (µs / cm), and 0.0625 (mg of P / 1g of soil) for Wheat.Overall, the D4 treatment marked the maximum yield of 71q/ha forfaba bean, and 73,57q/ha for wheat compared to NPK (17.34 q/ha (faba bean), 39.17 q/ha (wheat)) and control T (9.44 q/ha (faba bean), 26.88 q/ha (wheat).This study provided experimental evidence in the field that compost is gainfulfor the productivity of crops and the improvement of soil properties and one of the main strategies in bio-agriculture.

Key words: Compost, soil, organic farming, faba bean, wheat, plant growth

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P51. Evaluation of compost stability and Enteric pathogens removal before agricultural spreading

El Hayany Bouchra[1], El Fels Loubna[1,2], El Mezouari El Glaoui Ghizlen[1,3] , Rihanni Mohammed[3], Hafidi Mohamed[1,4]

Abstract

Composting is a green technology for sewage sludge valorisation. Evaluation of maturity and hygienization of compost is required before agricultural spreading.

A composting trial of sewage sludge (SS) with green waste (GW) was carried out at three mixtures: M1: (½ SS + ½ GW), M2: (⅔ SS + ⅓ GW), and M3: (⅓ SS+ ⅔ GW) for 200 days.

Physicochemical analysis showed a C/N values of: 8.24; 8.34 ;9.40, a decomposition rate: 47.62%; 47.38%; 36.41% respectively for M1; M2 and M3. Result of fecal Coliforms and fecal *Streptococci*, reveals an important abatement (> 95 %) after 200 days for the three mixtures.

According to compost quality standards, the three composts are mature and sanitized; and can be used as biofertilizer.

Keywords: Compost, Maturity, Hygienization, Biofertilizer

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P52. Green nanoparticles: a new efficient and ecofriendly tool for agronomy

Raoudha Khanfir Ben Jenana[1*], Siwar Jebril[2, 3], Chérif Dridi[2]

Abstract

Aqueous leaf extracts of the three following species: *Melia azedarach*, *Eucalyptus gomphocephala* and *Ruta chalepensis* were performed to synthesize green silver nanoparticles (AgNPs). We studied the effects of each leaf extract and its corresponding AgNPs solution on the agronomic parameters in common bean (*Phaseolus vulgaris*): Six treatments were assessed by applying 15 ml/day of each solution for 10 days: three treatments with the different leaf extracts and three others with their respective AgNPs at 20 ppm concentrations. Application of deionized water was considered as control. At day 70 after planting, the following parameters were measured: i. germination parameters (germination percentage and radical length); ii. growth parameters (leaf number, shoot and root length, fresh and dry weight); iii. yield parameters (number, weight, length and diameter of pods); iv: biochemical parameters (total sugar, chlorophyll a and b and carotenoids). Our results showed that growth parameters and biochemical compounds (chlorophyll a and b and carotenoids) were enhanced by the application of biosynthesized AgNPs from *E. gomphocephala* and *R. chalepensis* leaf extracts. On the other hand, all the investigated parameters decreased by the application of AgNPs biosynthesized from *M. azedarach* leaf extract. Regarding the leaf aqueous extracts, we notice that the highest values of all the parameters were obtained by the application of *M. azedarach* leaf extract. We registered a negative effect on growth parameters by applying the other tested leaf extracts and this effect was more pronounced with *E. gomphocephala* leaf extract. This study demonstrated that biosynthesis of AgNPs is cost effective, environmentally friendly and may be considered as an efficient tool for agronomy.

Keywords: *Leaf extracts, Green synthesis, Silver nanoparticles, Phaseolus vulgaris, growth parameters.*

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P53. Growth performance and bio sorption potentials of *Pleurotus tuberregium* (Fr.) Sing in lead and cadmium polluted soil

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Abstract

Aims: Assessment of the growth performance and bio-sorption potentials of *Pleurotus tuberregium* in lead and cadmium polluted soil.

Methods: Four kilograms each of humus soil samples were weighed into eight different black nursery cellophane bags and were polluted with 0.5g, 1.0g and 2.0g of lead and cadmium in triplicates respectively. The *Pleurotus* sclerotia were then planted in these polluted soil samples and distilled water added *ad libitum*.

Results: The results showed that the growth performance was dose-related in lead polluted soil. The *Pleurotus tuberregium* mushroom in the lead polluted soil samples indicated a dose-dependent absorbed lead concentration as shown in the results while cadmium polluted soil samples did not support the growth of the *Pleurotus tuberregium* of the sclerotia at the various concentration of cadmium used after 30 days. This point the toxicity or inhibitory characteristics of cadmium at the levels used.

Conclusion: Therefore, lead supported the growth of *Pleurotus tuberregium* and its bio-sorption potentials were dose-dependent while cadmium did not, indicating its inhibitory behaviour.

Keywords: Biosorption, sclerotia, soil, lead, cadmium.

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P54. Heavy metals mobility during the solar drying of sewage sludge from an activated sludge treatment

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Abstract

Heavy metals constitute a serious concern in sewage sludge when this latter is intended to be recycled in agriculture. Heavy metals toxicity is relied on their speciation rather than their total content. Different processes could be adopted for sewage sludge stabilizing. For instance, liming and/or solar drying are used in order to reduce the volume of this byproduct and probably to stabilize micropollutants, including heavy metals, involving two ways: pH increase and temperature rise. This study aimed to assess the effectiveness of these two processes in terms of reducing heavy metals content as well as their mobility. Dewatered sludge is generated from an activated sludge wastewater treatment plant in Marrakesh city (south of Morocco, 30% of dry matter). The solar drying process was conducted in a pilot scale tunnel (2,5 m^3; T° over 50 °C) during 45 days in summer season. Speciation of heavy metals was monitored using modified BCR protocol. Data showed that the agronomic value of the studied sludge is considerably appreciated (2.5, 4 and 0.5% of P, TN and K respectively). The total quantification of heavy metals indicated a high concentration of Chromium (Cr), Cooper (Cu), Lead (Pb) and Nickel (Ni) (2879.8, 187.5, 77.1 and 39.5 mg/kg respectively). At the first stage of drying, speciation analysis showed that Cr, Pb and Cu are mostly associated to the oxidizable fraction (79%, 64%, 79% respectively); contrariwise, Ni is mostly associated to the reducible fraction (43.7%). By the end of the treatment, the studied heavy metals (Cr, Pb, Cu and Ni) were mostly associated to the residual fraction (79%, 71%, 73% and 55% respectively). Through this study, we have also pointed out that there is no additional significant impact of liming on heavy metals stability. The whole outcomes highlighted the effectiveness of solar drying in terms of heavy metals stabilizing. So, the dried sewage sludge could be used safely in agriculture.

Key words: sewage sludge, solar drying, liming, heavy metals, mobility, speciation.

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P55. Hygienization of turkey manure and olive pomace by co-composting aerobically.

Rachid Aboutayeb[1], Soufiane El-mrini[2], Khalid Azim[3], Abdeljalil Zouhri[2]

Abstract

Generally, olive pomace is not associated with microbiological hazards, while poultry manure may present a health risk when applied as an organic amendment without prior treatment. The objective of this work is to study the effect of aerobic co-composting of olive pomace and turkey manure on the microbiological properties of the final compost according to a complete factorial plan 22: two-level initial C/N ratio (C/N=20 and C/N=28) and two-level aeration (Once and twice weekly). Four compost piles were installed and monitored for 6 months in three stages: At the beginning, in the 46th days and the end of composting. The microbiological evaluation concerned 5 microflora hygiene indicators, namely: Total Aerobic Mesophilic Flora (TAMF), Sulphite-Reducing Anaerobes (SRA), *Escherichia Coli* (*E. Coli*), *Salmonella spp*. and *Staphylococci.* Initially, the olive pomace showed a high density of TAMF due to poor hygiene conditions in the olive crushing units and a low density of SRA, E. coli, Staphylococci and absence of Salmonella spp.; while turkey manure, considered as natural host, showed a high density for all the studied germs except salmonella which was absent in all of analyzed samples. The microbiological assessment showed a significant reduction in populations except for SRA for which there was a non-significant reduction at the end of composting. The final values expressed as colony-forming unit per gram (CFU/g), were as follow: Total aerobic mesophilic flora (≤1,4.106 CFU/g), sulfite-reducing Anaerobes (≤2,9.103 CFU/g), E. Coli germ used as an indicator of fecal contamination (<10 CFU/g), and Staphylococci (<102CFU/g) and absence of *Salmonella spp*. In conclusion, aerobic co-composting made it possible to obtain a sanitized final compost for different levels of C/N ratio and Aeration. This technique has prevented contamination and reduced the density of all studied germs, used as hygiene indicator microorganisms, except for SRA.
This work could contribute, on the one hand, to controlling the health risks associated with the production of composts from contaminated organic waste and to establishing a health safety management approach, such as Hazard Analysis Critical Control Point (HACCP), in compost production units, on the other hand.

Keywords: Sanitation, composting, pathogens, olive pomace, manure, Microbiological Hazard.

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P56. Impact of co-composting in heap on turkey manures and olive cakes physicochemical properties.

Soufiane El-mrini[1], Rachid Aboutayeb[2], Khalid Azim[3], Abdeljalil Zouhri[1]

Abstract

Poultry livestock and olive oil manufactures produce huge quantities of organic wastes, such as turkey manure and olive pomace respectively. The objective is to study the effect of heap co-composting of olive pomace and turkey manure on the physicochemical properties of the mixture. All of the composts heap were installed and monitored for 6 months.

The temperature evolution of the heap shows the typical appearance of composting in two phases: a first active phase divided into two sub phases: mesophilic and then thermophilic, and a second maturation phase where the temperature converges towards an equilibrium with the ambient temperature in the top, middle or bottom of the heaps, thus indicating the stability of the 4 composts.

For the 4 heaps, the monitoring of the physicochemical parameters in the following steps shows an increase in the total nitrogen content, a reduction of the organic matter content due to its degradation, a reduction of the C/N ratio to values between 10 and 15 after composting period for all the heaps proving their stability. The increase in nitrate levels reflects good nitrification of organic nitrogen and CEC/TOC ratios greater than 1.7 indicate the maturity of the studied heaps.

Keywords: Co-composting, olive cake, manure, physicochemical properties, maturity.

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P57. Role of PGPR bacteria, arbuscular mycorrhiza and compost in tolerance of Tomato (*Solanum lycopersicum* L.) plants to drought stress under greenhouse conditions

Abdel-ilah Tahiri*[1,2], Anas Raklami[1,2] , Noura Bechtaoui[1], Mohamed Anli[2], Salma Toubali[2], Abdelilah Meddich[2] and Khalid Oufdou[1]

Abstract

Drought is considered as the major abiotic constraint in arid and semi-arid regions limiting plant growth and yield. In this context, this study aims to improve tomato growth, yield and tolerance under drought conditions using beneficial plant-growth promoting rhizobacteria (PGPR), arbuscular mycorrhizal fungi (AMF) and compost (Comp). The experiment consisted of a randomized complete block design with sixteen treatments, divided into two groups: i) tomato plants cultivated under well-watered (WW) conditions (75 % field capacity (FC)) throughout the entire experiment and a second group ii) where the plants were drought stressed (35 % FC) after one month of transplanting the tomato seedlings. Plant growth (including plant height and weight of the shoot and root and leaves number and area) and chlorophyll content were higher for well-watered than for water-stressed plants. The growth of plants inoculated with PGPR bacteria and/or AMF and/or amended with compost was higher than the non-inoculated plants regardless of water status. The used biofertilizers increased considerably the yield than control plants. For instance, PGPR bacteria increased yield by 191 % over than non-inoculated plants. Water stress affected negatively leaf water potential (leaf Ψ), chlorophyll fluorescence (Fv/Fm) and gas exchange. The tripartite combination (PG+AMF+Comp) increased the leaf Ψ under drought conditions compared to water stressed control. Moreover, shoot and root soluble proteins and sugar contents showed a significant decrease in water-stressed plants. However, inoculated plants showed higher content of protein than control plants. Drought induced an increase of polyphenoloxydase (PPO) and peroxidase (POD) activities. While, AMF, PG+Comp, PG+AMF+Comp decreased the amount of POD in water-stressed plants than well-watered. PGPR bacteria, AMF and compost application improved the drought tolerance of *S. lycopersicum* plants by increasing the accumulation of osmotic adjustment compounds, nutritional and antioxidant enzyme activity.

Keywords: PGPR bacteria, AMF, Compost, yield, Drought, *S. lycopersicum* L..

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P58. Innovative methods to enhance composting process in Organic date production

Ibrahim El-Akram Znaïdi [1], Yacine Hidri [2], Gassen Abid [3], Hatem Cheikh Mhammed [4] Anil C Somenahally [5], Khaled Sassi [1]

Abstract

The organic date production system in the oasis requires large quantities of organic matter that can be produced through the composting process and the recovery of date palm waste. This research was carried out in the oasis of Chenini Gabès, located in the South East of Tunisia. The objective is to develop new composting methods in order to enhance composting process to a faster decomposition of organic matter and a good compost quality results for improvement of soil fertility in a sustainable way. All oasis wastes were soaked in water for five days. Three Composting windrows (swaths) were carried out by the wastes (about 6 000 kg) in pyramidal form (height 1.5 m with base of 6m x 2 m), in every windrows we have used crushed date palm fronds (30%) and sheep manure (70%). The Swaths I (Test), with alternative layers of crushed date palm fronds and sheep manure, method used by farmers in Oasis. Swaths II, oasis wastes soaked in water with cow dung (innovation 1) and Swaths III, just two layers, crushed date palm fronds down and sheep manure in top (innovation 2). Windrows were watered every time is necessary and turned over after 15 days. The physico-chemical parameters of composting process revealed that the highest temperature of windrows in thermophilic phase has reached 67°C. The pH has fluctuated between 7.6 to 7.9 . The electrical conductivity ranged from 1.3 to 1.6 dS/cm, the highest total organic carbon content was about 28g/kg MS. The microbiological study revealed that the number of Total Mesophilic Germs was 12.3 x 10^6 and 48.53 x 10^6 CFU/g of dry compost Swaths I (Test) and swaths II (Innovation 1) respectively. The fungal biomass was about 13 x 10^3 CFU/g of dry compost for Swaths 3 (Innovation 2), 15 x 10^3 CFU/g of dry compost for Swaths I (Test) and 35 x 10^3 CFU/g of dry compost for Swaths 2 (Innovation 1).

Keywords: Composting, Innovation, physico-chemical parameters, microbiological parameters

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P59. Study of phytochemical content and antibacterial effects of *Haloxylon articulatum* ethanolic extracts

Messaoudi Mohammed [1], Maroua Merah [2], Mokhtar Benreguieg [3].

Abstract

Aromatic plants synthesize secondary metabolites endowed with important biological activities. More than 100,000 secondary metabolites are currently identified, the most studied between them, are phenolic compounds. Clinical phytotherapy used in a scientific and medical setting, and its integration into health systems, also provides a socio-economic response in both emerging and developed countries.

It allows traditional approaches to overcome their shortcomings, to solve problems related to health costs, to respond to people's demands.

To achieve these objectives, the antibacterial effects of ethanolic extracts resulting from maceration of aerial parts of *Haloxylon articulatum* recovered from the Sahara of Algeria were examined using disc diffusion assay. Then, phytochemical screening was made to deduce the levels of total polyphenols (TPL) and total flavonoids (TFL). Significant inhibitory activities have been noted against *Enterobacter cloacae* and *Staphylococcus aureus* with diameters of inhibition zone of 13.5 and 9 mm, respectively.

No inhibitory effects were observed on the other strains tested: *Enterococcus faecalis*. The TPL and TFL values measured were 44,12 ± 4.621 mg GAE / g (Gallic acid equivalents for dry weight) and 21,55 ± 1,112 mg EQ / g (quercetin equivalents for dry weight), respectively. These phytochemical low levels, do not clearly explain the observed inhibition activity.

Keywords: secondary metabolites - *Haloxylon articulatum* - polyphenols - antibacterial effects - aromatic plants.

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P60. The PGPR effect bacteria: Impact on phosphate solubilization

Taguett Farida et Kaci Yahia.

Abstract

The restoration of soil fertility relies on the exploitation of microbial resources. PGPR effect bacteria such as *Pseudomonas* and *Bacillus* play a major role in plant growth through the solubilization of inorganic phosphates, the synthesis of antimicrobial effect molecules or the secondary metabolites production.

However, the availability of phosphorus in the soil causes a real problem in many agricultural systems; it is considered as limiting element whose access is difficult because it is present in forms not available for plants. It is in this context that bacterial populations with PGPR effect such as *Pseudomonas* and *Bacillus* bacteria are important solubilization partners (rhizomicrobiome) making it accessible to plants.

The *Pseudomonas* and *Bacillus* strains solubilize phosphate and forms a clear halo around the colony. The phosphate- solubilizing index varies from 2.5 to 3.14. The highest solubilization levels are obtained by *Pseudomonas fluorescens* (29.38 µg / ml). The mineralization activity appears to be related to the polysaccharide production capacity as shown by the results obtained in the presence and absence of high concentrations of sodium chloride

The objective of this study is to evaluate the ability of *Pseudomonas* sp and *Bacillus* sp strains to solubilize tricalcium phosphate and thus evaluate the impact of polysaccharide production in salinity condition on the solubilization activity.

Key Words *Bacillus.* Effet PGPR Rhizosphre. *Phosphate-solubilizing* activity. *Pseudomonas*

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P61. The synergic effect of soil microorganisms and Phosphate/Potassium Rocks for plant growth promotion

Boubekri Kenza[a], Soumare Abdoulaye[a], Lyamlouli Karim[a], Hafidi Mohamed[a,c], Ouhdouch Yedir[a,b], Lamfeddal Kouisni[a]

Abstract

Rock Phosphate (RP) has been considered as a naturel source for manufacturing P-based fertilizers. However, the poor bioavailability of the form used by plants is the major drawback for its direct application in agriculture. Therefore, several approaches have been suggested to increase its solubility and bioavailability. Among these approaches, the use of solubilizing soil microorganisms with RP has been suggested. This combination of microorganisms and RP and/or Potassium Rock (RK) could be used for organic agriculture.

The objectives of this study were to evaluate the ability of 10 strains in dissolving 5 different sources of rock phosphate, one source of Potassium rock and subsequently investigate their plant growth-promoting (PGP) activities. The P and K weathering capacities of these strains were evaluated through *in-vitro* screening using NBRIP and Alexandrov media. P and K solubilization efficiency of these isolates was monitored after 3, 7, and 11 days of incubation. All bacterial isolates solubilized RP and RK (Mica). All strains were able to solubilize rock phosphates by forming halo zones. The most efficient ones had more that 217 % of solubilization efficiency as compared to the control and they produced 33 % more IAA as compared to the control. Besides these characteristics, they were able to produce high level of siderophore and Hydrogen cyanide (HCN). The *in-vitro* screening that was done by inoculating wheat *(Triticum aestivum)* seeds with the all the PSB showed a significant increase in shoot and root length especially with the strains S6 – S7 -S8 and S9. The current study revealed that these selected PSB are good biofertilizers candidates for growth promotion and yield enhancement of wheat crop.

Keyword: Soil Microorganisms, Phosphate & Potassium Rock, Solubilization, AIA, Siderophore.

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P62. Valorization of agricultural wastes by composting process

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Abstract

Souss-Massa region is considered one of the biggest producers and exporters of citrus fruits and vegetables in Morocco through more than 450,000 hectares of cultivated land. This activity has an important impact at socioeconomic level of the region.

However, horticultural activity generates each year a large quantity of agricultural wastes, which constitutes a serious issue at economic and ecological level if released into the environment without any treatment.

The valorization of these wastes by the composting process can therefore be an effective solution as a treatment approach. It allows removing pathogenic microorganisms, recovering organic matter, nutrients and producing an amendment for organic agriculture and carbon sequestration to depleted soils. Circular economy would be enhanced through composting what will fill the gap to empower organic agriculture in Africa.

This study aims to follow the different physicochemical and microbiological characteristics of several compost samples prepared from these agricultural wastes and to study their fertilizing potential, their effects on pathogenic fungi and nematodes, and the fate of different pollutants in the presence of these composts.

Key words: composting, agricultural wastes, composts, pathogenic fungi, nematodes, organic agriculture

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P63. Use of compost as strategy to improve the tolerance of date palm vitro-plants to water stress

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Abstract

Date palm (*Phoenix dactylifera L.*) is an important crop in arid zone. For several years, date palm groves were subjected to degradation due to drastic environmental conditions especially drought stress. The current study was carried out to assess the response of date palm vitro-plants to water deficit and to examine the effect of local selected compost, made from green waste mixture and having a good maturity with a C/N ratio of 20.64. Vitro-plants were grown under well-watered or drought conditions (75 and 25% of field capacity), amended and non-amended with compost. After six months of water stress, growth and physiological parameters were evaluated. Vitroplants growth parameters including number of leaves, shoot height, root length, leaf area and shoot dry weight were significantly improved in amended plants despite water deficit conditions compared to control. Furthermore, compost application improved physiological parameters such as stomatal conductance, photosynthetic efficiency and concentrations of photosynthetic pigments. Nevertheless, compost application enhanced growth and physiological traits of date palm vitro-plants under water stress, when compared to control plants, indicating that this organic amendment could be used to develop an eco-friendly biofertilizer for date palm and possibly other crop plants to enhance sustainable production in arid zones.

Key words: Compost, growth, water stress, tolerance, date palm.

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Scientific program

10 November 2019		
14h00-21h00	**Registration at the Conference Venue (Hotel Palm Plaza-Marrakesh)**	
11 November 2019		
09h00-10h00	**Opening ceremony** Director of INRA President of Cadi Ayyad University Director of ESAFE (Mohammed VI Polytechnic University) Director General of IAV Hassan II President of ISOFAR President of AfrONet President of FIMABIO President of MICROBIONA Coordinator of FTN CIHEAMBari Organizing Committee	 Dr Faouzi Bekkaoui Pr My Hassan Hbid Dr Aziz Yasri Pr Ali Hammani Dr Gerold Rahmann Mr Jordan Gama Mr Abdelhamid Aboulkassim Pr. Nour-eddine Mezrioui Dr Noureddine Driouech Dr. Khalid Azim
10h00-13h45	**Session 1.** **Organic Food Systems, local products, state of art, socioeconomics aspects and marketing of organic products in Africa**	
	Keynote Speakers Panel **Moderator and Reporter: Pr. Mohamed Hafidi, and Pr. Mohammed Boulif**	
10h00-10h30	**Conf. 1**: New Organic Regulation and Standards in the EU from 2021 onwards – a scientific assessment	**Gerold Rahmann-Germany**
10h30-10h50	**Conf. 2**: Organic Knowledge Centers for Africa	**Markus Arbenz-Kosovo**
10h50-11h10	**Conf. 3**: Role of EOAI in the Development of Organic Agriculture in Africa	**Jordan GAMA-Tanzania**
11h10-11h30	**Discussion**	
11h30-11h50	**Coffee break (Poster Session)**	
	Oral communications (Session 1) **Moderator and Reporter : Pr. Nour-eddine Mezrioui and Pr. Khalid Oufdou**	
11h50-12h00	**Com. 1**: IFOAM in the Mediterranean	**Constantinos Machairas-Greece**
12h00-12h10	**Com. 2**: Organic Agriculture Movement in Morocco (FIMABIO)	**Charif Guessous-Morocco**
12h10-12h20	**Com. 3**: Building the Participatory Guarantee System for agro-ecology label in Morocco	**Sylvaine Lemeilleur-France**
12h20-12h30	**Com. 4**: Organic Agriculture Development in Tunisia: 20 years of experience	**Khaled Sassi-Tunisia**
12h30-12h40	**Com. 5**: Input limitations –major concern for organic vegetable progress in North Macedonia	**Rukie Agic-North Macedonia**
12h40-12h50	**Com. 6:** Cost-Benefit Analysis of degraded land restoration for a sustainable land management in Tahoua	**Hassimi Moussa-Niger**
12h50-13h10	**Discussion**	
13h10-14h30	**Lunch break**	

14h30-18h00	**Session 2.** **Organic agricultural systems design and management, diversification of organic farming and cropping systems, role of rotation, multi-cropping and intercropping. Agroforestry and agro ecology**	
	Keynote Speakers Panel **Moderator and Reporter: Pr. Daniel Neuhof and Dr. Khalid Azim**	
14h30-14h50	**Conf. 4** : Regenerating our soils to increase adaptation to and mitigation of Climate Change	**Andre Leu-Australia**
14h50-15h10	**Conf. 5** : Sustainable diets for a green planet	**Ewa Rembiałkowska-Poland**
15h10-15h25	**Discussion**	
	Oral communications (Session 2)	
15h25-15h35	**Com. 7** : Does natural soil microbiota reduce harmful effects induced by Cyanotoxins exposure in *Vicia faba* seedlings	**Majida Lahrouni-Morocco**
15h35-15h45	**Com. 8**: Agro-ecological solution by the spreading of vegetable water: effect on the macroinvertebrates abundance of soils under *Oleaeuropea*	**Boudiaf Nait Kaci M-Algeria**
15h45-15h55	**Com. 9**: Performance of mixtures of wheat varieties to control fungal diseases in organic agriculture	**Wissal Bozalmat-Morocco**
15h55-16h05	**Com. 10**: Performance of oilseeds in crop rotation under organic and conventional production systems	**Victor Olowe-Nigeria**
16h05-16h20	**Discussion**	
16h20-16h50	**Coffee break (Poster Session)**	
	Oral communications (Session 2, continued) **Moderator and Reporter : Pr. Yedir Ouhdouch and Dr. Aziz Yasri**	
16h50-17h00	**Com. 11**: Landscape of research on organic farming in North Africa A bibliometric analysis	**Noureddine Driouech-Italy**
17h00-17h10	**Com. 12**: Synergy effects between organic agriculture and Farming with Alternative Pollinators (FAP)	**Stefanie Christmann-Morocco**
17h10-17h20	**Com. 13**: Relationship between Bt maize and ecosystem functionalities of biological fertilizers	**Rasheed Adeleke-South Africa**
17h20-17h30	**Com. 14**: Magnetic treatment of culture medium enhances growth and minerals uptake of tomato (*Solanumly copersicum*) in Fe deficiency conditions	**Houda Taimourya-Morocco**
17h30-17h45	**Discussion**	
12 November 2019		
09h00-13h00	**Session 3.** **Tailored techniques and practices for organic farming, soil fertility,** **preventive and curative measures for plant protection, organic weed management, post-harvest**	
	Keynote Speakers Panel **Moderator and Reporter: Pr. Abdelilah Meddich, and Dr. Ahlam Hamim**	
09h00-09h20	**Conf. 6**: Organic Certification Process in the United States	**Jessica Shade-USA**
09h20-09h40	**Conf. 7**: Organic agriculture in Turkey: Lessons learned	**Uygun Aksoy-Turkey**
09h40-10h00	**Discussion**	

	Oral communications (Session 3) **Moderator and Reporter: Pr. Victor Olowe and Pr. Brahim Bouizgarne**	
10h00-10h10	**Com. 15**: Bio-herbicidal potential of the essential oils from different *Rosmarinus officinalis* L. chemotypes	**Jihane El Mahdi-Italy**
10h10-10h20	**Com. 16**: Co-application of compost and mineral fertilizers improve soil properties and crop yield	**Youness Bouhia-Morocco**
10h20-10h30	**Com. 17**: Effect of organic amendments on soil fertility and the production of organic green bean	**Khalid Azim-Morocco**
10h30-11h40	**Com. 18**: Contribution to the assessment of ozonized water on nematodes associated with tomato	**Lamiae Khoubane-Morocco**
10h40-11h00	**Discussion**	
11h00-11h30	**Coffee break (Poster Session)**	
	Oral communications (Session 3, continued) **Moderator and Reporter: Pr. Mustapha Barakate and Pr Hassan Mayad**	
11h30-11h40	**Com. 19**: Plant-parasitic nematodes associated with organic vegetables in Souss Massa region: diversity, abundance and frequency of genera	**Ilyass Filali Alaoui-Morocco**
11h40-11h50	**Com. 20**: *Euphorbia guyoniana* efficiency against tomato leaf miner in South eastern Algeria	**Abderrahmene Dehliz-Algeria**
12h00-12h10	**Com. 21**: Nitrogen use efficiency in organic melon production under greenhouse of South West of Morocco	**Kaoutar Aouass -Morocco**
12h10-12h20	**Com. 22**: Management of plant parasitic nematodes paraziting saffron corms by botanical nematicides	**Hinde Benjlil-Morocco**
12h20-12h40	**Discussion**	
12h40-14h30	**Lunch break**	
14h30-18h40	**Session 4.** **Agricultural waste management, nutrient cycling,** **environmental protection and role of bio-fertilizers bio-stimulants and bio-pesticides**	
	Keynote Speakers Panel **Moderator and Reporter: Pr. Ali Boularbah and Dr. Rachid Aboutayeb**	
14h30-14h50	**Conf. 8**: Smart Agriculture and Its Application to Organic Production Systems	**Andrew Hammermeister-Canada**
14h50-15h10	**Conf. 9** : Farm level management of phosphorus: organic farmers need recycled fertilizers	**Anne-Kristin Løes-Norway**
15h10-15h30	**Discussion**	
	Oral communications (Session 4)	
15h30-15h40	**Com. 23**: Partial acidulation of rock phosphate for increased productivity in organic and smallholder farming	**Harun Cicek-Switzerland**
15h40-15h50	**Com. 24**: Optimisation of tomatoes leaves composting by integration of different feedstock	**Ilyass Tabrika-Morocco**
15h50-16h00	**Com. 25**: Composting of Agricultural Wastes in China: Situation and Perspectives	**Ji Li-China**
16h00-16h10	**Com. 26**: Ergosterol Analysis for Biomass Estimation on Solid State Fermentation (SSF) and Evaluation of Physiological State of Ericoid Fungi	**Ahlam Hamim-Morocco**
16h10-16h20	**Com. 27**: Importance of Microbial Enriched Organic Fertilizer for Cultivation of Desert Truffles	**Saif.Alharbi-Saudia Arabia**
16h20-16h40	**Discussion**	

16h40-17h15	**Coffee break (Poster Session)**	
	Oral communications (Session 4, continued) **Moderator and Reporter: Dr. Khalid Azim and Pr. Loubna EL Fels**	
17h15-17h25	**Com. 28**: Use of biofertilizers to improve the tolerance of date palm to biotic and abiotic constraints and physicochemical parameters of soil	**Meddich Abdelilah-Morocco**
17h25-17h35	**Com. 29**: Plant growth enhancement of *Chenopodium quinoa* induced by bacterial inoculation under shadehouse conditions	**Ismail Mahdi-Morocco**
17h35-17h45	**Com. 30**: Metals in some edible organic and conventional crops and their cultivation soils in Tunisia	**Sabrine Hattab-Tunisia**
17h45-17h55	**Com. 31**: Potential use of beneficial microorganisms for increasing productivity of *V. faba* and *T. durum*	**Anas Raklami-Morocco**
17h55-18h05	**Com. 32**: Valorization of poultry manure by composting between opportunity and obligation	**Rachid Aboutayeb-Morocco**
18h05-18h15	**Com. 33**: Trace elements contents and human health risk of vegetables of Marrakech urban market garden	**Younes Laaouidi-Morocco**
18h15-18h25	**Discussion**	
18h25-19h00	**Conference closure**	
19h30-22h00	**Gala Diner**	

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