Dynamic Soil, Dynamic Plant

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Scope and target readership: *Dynamic Soil, Dynamic Plant* publishes research papers, reviews, short communications and techniques papers on a wide range of applications of soil science, applying scientific principles to understand and solve important soil problems as they affect plant growth, development, flowering and other processes linking the plant to the soil environment. *Dynamic Soil, Dynamic Plant* also covers all aspects of soil biology which deal with floral ecology or the plant-microbe ecology and activity in soils, at different levels of organization: individuals, populations, communities, ecosystems using a range of approaches: molecular biology, genetics, ecophysiology, biogeography, ecology, soil processes, organic matter, nutrient dynamics and landscape ecology.

Papers covering the following themes are acceptable:

1) Biological transformations of plant nutrients in soil;
2) Community ecology and functioning processes: interactions between plants and mineral or organic compounds; involvement of such interactions in soil pathogenicity; transformation of mineral and organic compounds, cycling of elements; soil structure;
3) Modelling of plant processes and population dynamics;
4) Nitrogen fixation and denitrification;
5) Pathogenesis: soil-borne phases of plant parasites, the ecological control of soil-borne pathogens;
6) Pesticides and their influence on soil organisms;
7) Physical, chemical and biological parameters of the soil environment brought about by biotic and abiotic influences;
8) Population biology and molecular ecology: methodological development and contribution to study microbial and plant populations; diversity and population dynamics; genetic transfers, influence of environmental factors;
9) Soil biology, physics and chemistry: occurrence of physicochemical parameters and surface properties on plant processes and population behaviour;
10) Soil pollution: the biochemistry of pesticide and pollution decomposition in soil, microbial aspects of soil pollution;
11) Soil tillage: characterization or modelling of tillage and field traffic effects on the soil environment; tillage systems (including reduced cultivation and direct drilling) suitable for specific conditions of soil, climate, topography, irrigation and drainage with the objective of improving crops, crop rotations, intensities for fertilization, degree of mechanization, and crop production for sustainable agriculture with minimum environmental impacts; tillage in weed, pest and disease control.

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Cover photos: Top plate: Sequence of different treatments in experiments to assess the productivity of rice with different bio-fertilizers and organic manure (Shaban *et al*., pp 55-60). Bottom plate: Competitive potential of *Penicillium* sp. against *Verticillium* species observed after 9 days of dual culture on PDA at 20°C (Jabnoun-Khiareddine *et al*., pp 70-79).

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ABSTRACT

Invited Review: Integrated nutrient management (INM) has been a popular area of investigation in crop production research, with varied concepts and applications. Better responsiveness of soil microbial biomass over a chemically available nutrient pool to nutrient input has led to an increased interest in measuring the quantum of nutrients held microbially. This has advocated the possibility of using changes in microbial biomass and soil enzymes (phosphatase, catalase, and urease) as potential diagnostic tools to measure soil fertility. The differential efficacy of two conventional methods of fertilization (soil versus foliar application) has undoubtedly helped in improving the yield and quality of both, although of late, continuous fertilization has failed to maintain the same yield expectancy on a long-term basis due to the depletion of soil carbon stock. Consequently, the occurrence of multiple nutrient deficiencies raised serious concerns about sustained crop production, irrespective of soil type. The gradual shift from purely inorganic to organic fertilization started to gain wide-scale use for enhanced biogeochemical nutrient cycling. These later formed the basis for INM involving three basic components viz., microbial inoculants (biofertilizers), inorganic and organic fertilizers. The approach involving multiple microbial inoculation along with enrichment of organic manures or crop residues by loading with inorganic fertilizers, the substrate, is increasingly been shown to modulate nutrient dynamics within the rhizosphere. The present review highlights the research work on various issues of INM-based production management, targeting several popular annual and perennial crops.

ABSTRACT

Original Research Paper: Nutrient management has been a concern for table grape growers for several years. Using soil analysis and recommendations as a guideline has had little or no effect on yield in various assessments. A guideline model linked to a database, known as the Table Grape Nutrition Management Model (TGNMM) has been developed for application of nutrition management advised to improve the table grape industry in Zanjan province, Iran, which is one of the main grape-producing areas in Iran. This practical model monitors the grapevine nutrient status, using the soil and tissue analysis (STA), provides further refinement of the fertilizer programme, and determines mineral deficiencies and excesses. TGNMM considers the total mineral flux within the grapevine ecosystem and derives a budget of the amount of main nutrients requirement for grape. The data for generation of TGNMM were collected from the same set of experimental vines during the period of 2002-2005.

ABSTRACT

Original Research Paper: *Solanum villosum* is an important leafy vegetable in Kenya whose production faces low yields. Two potentially high leaf-yielding genotypes of *S. villosum*, T-5 and an octoploid have been developed. Field experiments were conducted at Jomo Kenyatta University of Agriculture and Technology to evaluate the vegetative and reproductive growth characteristics and leaf nitrogen of the genotypes under varying N levels. The experiments were carried out as split plots in a randomized complete block design with three replications. Nitrogen supply levels of 0, 2.7 and 5.4 g N/plant formed the main plots while the T-5, octoploid and the wild-type genotypes were allocated to the sub-plots. Periodic harvests were done at 5-10 days interval to quantify growth and leaf N. The octoploid plants had up to 30-50% more leaf area and up to 35-50% more leaf dry weight compared to wild-type plants. However, all the genotypes had similar shoot dry weight. The wild-type genotype had about 2-4 times higher flower/fruit dry weight as compared to the octoploid and T-5 genotypes. All the genotypes responded to N supply similarly by increasing leaf area and shoot dry weight 1.7-2.5 times. Leaf N on a dry weight basis was significantly higher in plants supplied with N, but these differences were not observed when the leaf N was expressed on leaf area basis. In conclusion, the *S. villosum* genotypes responded similarly to N limitation by drastic reduction in leaf area and dry matter production and maintaining the leaf N content on leaf area basis. The octoploid is a suitable candidate for increasing leaf yield of *S. villosum*.

Preetha Nair, Navya Laxman, Swayam Prabha, Mythili Jagannath, Radha D. Kale (India) Comparison of Soil Enzyme Activities as Biochemical Fingerprints of Soil Health: Effect of Vermicompost on Gold Mine Tailings (pp 48-54)

ABSTRACT

Original Research Paper: Soil health can be defined as the ability of a specific kind of soil to provide a natural or artificial ecosystem, which helps to maintain balanced plant and animal life. Soil organisms act as the primary agents of nutrient cycling and regulate the dynamics of soil organic matter. Activities of soil enzymes have great potential to assess the health of soil biota, as soil enzymes control mineralization and therefore influence availability of N, C and P. Soil enzymes provide an easy, relatively rapid and low cost procedures to monitor soil health as they are considered to be indicators for measuring the degree of soil degradation. The present investigation was aimed at evaluating the basal soil respiration, total microbial activity and potential enzymatic activities of β-glucosidase, urease, phosphatase and dehydrogenase in gold mine tailings and was compared with fertile soil types like vermicompost, garden soil and control soil from mine area. Differences in the respective analyses reflect the changes in the N, C and P metabolism in the soil, which is the result of total microbial activity. Amending the mine tailings with vermicompost showed significant effect in restoring the soil quality, which is reflected as increased enzyme activity, with different levels of amendment on increasing time interval.

Khaled A. Shaban, Awatef A. Mahmoud, Ahmed Mansour, Mona G. Abd El-Kader (Egypt) Bio-fertilizer and Organic Manure Affects Rice Productivity in Newly Reclaimed Saline Soil (pp 55-60)

ABSTRACT

Original Research Paper: Bio-fertilizers and organic manure are two known enhancers of soil quality and productivity. Agriculture in newly reclaimed soils usually encounters a high level of salinity which hinders plant productivity and causes substantial economic losses. In this field experiment, the effect of applying different rates of bio-fertilizers, either a special isolate of *Azospirillum brasilense* (NO40), chicken manure (10 m^3/feddan; 1 feddan = ~0.42 million ha) or mineral nitrogen fertilization, were studied in rice (*Oryza sativa* cv. 'Sakha 101') straw and grain production. Overall rice productivity in newly reclaimed saline soil was estimated in two successive summer seasons of 2007 and 2008 at a newly reclaimed experimental farm in Sah-El-Hossinia, El-Sharkia governorate, Egypt. The land area was irrigated with El-Salam canal water, which contains a 1: 1 mix of water from the Nile River and drainage water. All applied fertilization treatments resulted in significant increases in the productivity of straw and grain/plant and in the total weight of 1000-grains. In addition, the N, P and K concentrations in grains and straw increased by increasing the rate of N addition, but decreased by adding bio-fertilizer. Concomitantly, there was a more pronounced increase in Fe, Mn, Zn, and Cu concentrations with a resulting decrease in soil pH. Bio-fertilizers significantly increased N, P and K content in plants, and increased the Fe, Mn, Zn and Cu concentration in the soil compared to the control experiment in which the land was singularly treated with mineral N.

Mejda Daami-Remadi, Ahmed Souissi, Hedia Ben Oun, Mohsen Mansour, Bouzid Nasraoui (Tunisia) Salinity Effects on Fusarium Wilt Severity and Tomato Growth (pp 61-69)

ABSTRACT

Original Research Paper: The aim of the present study was to elucidate the effects of water salinity and *Fusarium oxysporum* f. sp. *lycopersici* (FOL) on tomato (cv. 'Ventura') growth, wilt severity and subsequent yield loss. The six salt treatments tested showed no significant effect on pathogen mycelial growth *in vitro* but increased sporulation was recorded with the highest NaCl doses (8 and 10 g/l). Increasing salinity stress (2 to 10 g of NaCl/l) to the inoculated tomato plants enhanced the severity of Fusarium wilt disease and resulted in a significant increase in the leaf damage index (LDI) recorded from 35 to 62 days post-planting (DPP). Moreover, the LDI noted on plants under highest salt stress (8 and 10 g of NaCl/l) was increased by 55 and 60%, respectively compared with the LDI recorded on unstressed plants. Salinity treatment in watering tomato plants (inoculated or not with FOL), from 15 DPP until the end of the assay (i.e., 62 DPP), decreased plant height by 9.7 and 35% when the salinity level varied from 2 to 10 g/l. A similar effect was noted after inoculation with FOL. The fresh and dry weights of the aerial part were generally lower with the increase in NaCl dose; these parameters were reduced by 45-50% and by 34-41% with higher salt treatments tested (8 and 10 g of NaCl/l), respectively, compared to the non-saline water. The range of decrease in root fresh and dry weights was 12-74 and 13-70%, respectively, when salinity levels were 2 and 10 g of NaCl/l, compared to the unstressed plants. Fruit fresh weight was also adversely affected by the highest NaCl doses tested (8 and 10 g/l) and was reduced by 40 and 78%, respectively compared to non-saline water.

Hayfa Jabnoun-Khiareddine, Mejda Daami-Remadi, Fakher Ayed, Mohamed El Mahjoub (Tunisia) Biocontrol of Tomato Verticillium Wilt by Using Indigenous *Gliocladium* spp. and *Penicillium* sp. Isolates (pp 70-79)

ABSTRACT

Original Research Paper: Endogenous *Gliocladium* spp. and *Penicillium* sp. isolates were tested *in vitro*, *in vivo* and *in situ* for their antagonistic activity against *Verticillium* spp. causing tomato vascular wilt in Tunisia. *Gliocladium catenulatum*, *G. roseum* and *Penicillium* sp. isolates reduced the radial growth of *V. dahliae*, *V. albo-atrum* and *V. tricorpus* in comparison to the untreated controls. Antagonistic potential of *Gliocladium* spp. and *Penicillium* sp. against tested wilt agents showed intra- and inter-specific variations. Additionally to the sclerotinization inhibitory activity and to the reduced abundance of resting structures of *Verticillium* spp. observed, compared to untreated controls, antagonists tested caused several alterations of *Verticillium* spp. mycelium at the confrontation zone. The germination of *V. dahliae* microsclerotia, exposed for 30 min to liquid cultures of antagonists tested and incubated at 20°C, was completely suppressed compared to the control microsclerotia treated with sterile distilled water. Furthermore, germinating microsclerotia dual cultured with *Gliocladium* spp. and *Penicillium* sp. became inable to germinate and mature microsclerotia progressively lost their typical dark colour. All tomato cv. 'Ventura' plants, when treated at planting with *Gliocladium* spp. and *Penicillium* sp. spore suspensions and inoculated with *V. dahliae*, showed after 60 days of culture under growth chamber conditions, reduced severity of Verticillium wilt in comparison to inoculated and untreated control plants. Plants treated with antagonists tested showed increased height and root and stem fresh weights in comparison to the inoculated and untreated control. The discoloration index, noted on tomato plants treated at planting by *G. catenulatum, G. roseum* and *Penicillium* sp. and grown under greenhouse conditions, was significantly reduced compared to the untreated control. Plants treated with *Penicillium* sp. showed, after 90 days of culture, an increase of more than 40% of their roots and stem fresh weights in comparison to the untreated control.

Khalil I. Al-Mughrabi (Canada) A Simple Technique to Test for the Presence of *Phytophthora erythroseptica* in Soil (pp 80-82)

ABSTRACT

Techniques Paper: Pink rot of potato, caused by *Phytophthora erythroseptica*, is one of the most important potato tuber diseases worldwide. To help identify fields with soils infested with *P. erythroseptica*, a simple and cost-effective technique was developed to test for the presence of this organism in soil. Disease-free potato tubers were surface disinfested with 0.6% NaClO, rinsed in sterile distilled water, and then left to dry in a laminar hood. A potato core, 5 mm in diameter and 20 mm deep, was removed from the stem end of a tuber, filled with 1 g of soil, and then covered by inserting a portion of the core that had been removed. Positive (vermiculite and sterilized field soil mixed with *P. erythroseptica* mycelium) and negative (vermiculite and sterilized field soil free of *P. erythroseptica*) controls were included. Tubers were then stored in clear polyethylene containers padded with a sheet of moistened cheese cloth. Tubers were misted with distilled water and the containers were covered and incubated at 10°C and 95% RH. After three weeks of incubation, each tuber was cut longitudinally and then exposed to air for 30 min. Tubers with pink-black flesh were considered positive for pink rot.