Centre d'Etudes Doctorales
« Sciences et Technologies » Tétouan

AVIS DE SOUTENANCE DE THESE

En vue de l'obtention du DOCTORAT EN SCIENCES

Le Doyen de la Faculté des Sciences de Tétouan annonce que

Madame Rajaa Kholssi soutiendra une thèse intitulée

OBTAINING BIO-FERTILIZERS BASED ON MICROALGAE, CYANOBACTERIA AND RHIZOBACTERIA EXTRACTED FROM SOIL

Discipline : Biologie, Géologie, Chimie
Spécialité : Agriculture et Science d'environnement

A la Salle des Soutenances, Faculté des Sciences de Tétouan
Le Mardi 14 Janvier 2020 à 16h

Devant le jury composé de:

Pr. MOUKRIM Abdellatif	Facultés des sciences de Tétouan	Président
Dr. Olimpio Montero Domínguez	CSIC de Valladolid	Rapporteur
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Dr. ZAKARIA MADANI	CER Biomasse	Invité
Pr. Carlos Rad Moradillo	Universidad de Burgos	Co-encadrant
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Résumé

In recent years, the attention of most of agronomic studies was turned towards the use of so-called clean agriculture or organic farming to conserve and save surrounding environment via minimizing the excessive use of chemical fertilizers. Concept of integrated nutrient management involving combined use of biofertilizers, organic and chemical fertilizers have been developed. Use of biofertilizers is one of the important components of integrated nutrient management, as they are cost effective, eco-friendly and are renewable source of plant nutrients to supplement the chemical fertilizers for sustainable horticulture.

The results suggest that it is possible to use cultivation of *Chlorella sorokiniana* as potent strain in large scale for use in agriculture. Microalgae extracts prepared from this species were shown to have positive effects on the physiological parameters under investigation of wheat plants it seems to be promising as biostimulants. Above-ground wheat plant mass was improved by 40% in treatments with cyanobacterial biomass (*Anabaena cylindrica*), as compared to the control and filtrate, demonstrating that the co-cultivation with living cyanobacterial biomass was key to plant improvement. Chlorophyll contents were also increased by nearly 50% in treatment with *Anabaena cylindrica*, and nitrogen by over 10%, clearly signaling that nutrients in the filtrate were irrelevant to the beneficial effects on plant growth.

The combined effect of plant growth promoting rhizobacteria (PGPRs) and cyanobacteria on *Triticum aestivum* L. was examined in a hydroponic growth system. The study results indicate that the consortium of the five isolates (*Calothrix* sp. and *Anabaena cylindrica* used as cyanobacterial strains, and *Chryseobacterium balustinum*, *Pseudomonas simiae* and *Pseudomonas fluorescent as PGPRs)* gave the best performance in terms of growth parameters. The dry shoot mass was increased by 80%, 77%, and 76% under the combinations of *A. cylindrica* with *C. balustinum*, *P. simiae*, and *P. fluorescent*, respectively. The ability to produce indolacetic acid (IAA) was confirmed in the treatments with cyanobacteria, with PGPR strains, and in treatments combining the different microorganisms, using both colorimetric and chromatographic methods.

Growth of filamentous microalgae and filamentous cyanobacteria can be enhanced when porous substrates are introduced into photo bioreactors as solid supports. Growth of *A. cylindrica* was enhanced by 80% in the presence of biochar as compared to the cultures without biochar. Also, the total nitrogen content of the material harvested from the solid support cultures with *A. cylindrica* was enhanced by about 10%. Scanning Electron Microscopy (SEM) images showed biofilm formation on the surface of the biochar with extension of the filaments attached to the external surfaces.

Words keys: *biofertilizers, cyanobacteria, microalgae, agriculture*