

PGRP response to elemental sulfur coated fertilizers application in a calcareous soil under wheat cultivation

D.L. Bouranis¹, A. Venieraki², M. Margetis¹, S.N. Chorianopoulou¹, F. Maniou¹, B. Zechmann³, D. Gasparatos⁴, H. Mavrogiannis⁵, D. Benardos⁵ and P. Katinakis²

¹*Plant Physiology and Morphology Laboratory, Crop Science Department, Agricultural University of Athens, Iera Odos 75, 11855 Athens, Greece (E-mail: bouranis@aua.gr);*

²*General and Agricultural Microbiology Laboratory, Crop Science Department, Agricultural University of Athens, Iera Odos 75, 11855 Athens, Greece;* ³*Center for Microscopy and Imaging, Baylor University, One Bear Place 97046, Waco, TX 76798-7046, USA;* ⁴*Soil Science Laboratory, Department of Hydraulics, Soil Science and Agricultural Engineering, School of Agriculture, Faculty of Agriculture, Forestry and Natural Environment, Aristotle University of Thessaloniki, 54124 Thessaloniki, Greece;* ⁵*Sulphur Hellas S.A., Leoforos Athinon 142, 104 42 Athens, Greece*

A durum wheat crop established in Central Greece, served as the reference crop that received conventional fertilization scheme, whilst the nearby field (0.9 acres each) received the same combination of fertilizers additionally coated with 2% elemental sulfur (the treatment SG-crop; SG stands for Sulfogrow[®] produced by Sulphur Hellas S.A.). Soil testing revealed that the SG-crop was established in a field with low soil fertility compared to the reference field. Each field was divided into five parts and nutrient dynamics in crop's aerial part was monitored during cultivation period, along with fertility dynamics and microbial population dynamics in crop's rhizosphere.

Dry mass accumulation and plant robustness were the same despite the significant difference in rhizosphere's characteristics, whilst yield of SG-crop was 3.5% less. Iron concentration in the aerial part was significantly higher especially 20 days after the additional fertilization at days 100 and 110 after sowing. Total colonies found to be significantly higher from day 60 onwards and among them the colonies that presented sulfatase activity were prominent, especially after the additional fertilization. In the rhizosphere of reference crop the following species have been identified: *Pseudomonas orientalis*, *P. libanensis*, *P. fluorescens*, *P. moraviensis* and *P. putida*, whilst in the rhizosphere of the SG-crop the identified species included *Pseudomonas fluorescens*, *P. azotoformans*, *P. reactans*, *P. libanensis*, *P. koreensis*, *Xanthomonas sp.*, *Bacillus sp.* and *Paenibacillus polymyxa*, along with *Cellulosimicrobium cellulans*, and *Cellulomonas sp.*

Our data support the hypothesis that the elemental sulfur coating of the applied fertilizers significantly boosted the action of the above mentioned plant growth promoting rhizobacteria, which in turn contributed to the mobilization of immobilized sulfate, phosphorus, iron and manganese in quantities capable to support the SG-crop.