

8th World Congress and Expo on Recycling

June 25-26, 2018 | Berlin, Germany



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Agro-reminders, municipal bio-wastes and sulfur recovered from refineries as sulfur-based organic fertilizer

In the ongoing work, we assessed environmentally sound technologies to produce soil improver with balanced level of nutrients, and optimal agronomic characteristics. Sulfur obtained from the residues of the desulfurization of natural gas and oil, was linked with agricultural wastes (orange pulp or olive pomace) or compost from municipal wastes to produce amendments. The experiment was a randomized complete block design with three replications. Our results showed that the pastilles of sulfur bentonite improved soil quality in respect to control (not amended soil). Pastilles of sulfur bentonite linked with agricultural and/or municipal wastes were more effective than sulfur bentonite itself. They were capable of lowering the pH of soils and positively affect the biological soil properties, increasing significantly the labile fraction of soil organic matter. The greatest increase was observed by using sulfur bentonite mixed with orange pulp or orange pulp and municipal waste. Regarding crop productivity, all the species utilized (red onion: *Allium cepa*, garlic: *Allium sativum*) grew better in amended soils. A fertilizer specie-specificity was also demonstrated for the first time. Red onion grew better (leaf and root length, leaf number and fruit size) with sulfur-bentonite pelletized with orange waste, while garlic grew better with sulfur-bentonite tied up with olive pomace. In short, this study demonstrated that recalcitrant agro-remainders, municipal bio-wastes and sulfur represent a great resource for producing sustainable organic fertilizers. The effects are strictly dependent on the amount and composition of wastes used, and on the type of crop species. Therefore, this waste management system represents an opportunity for providing valuable products with reduction of environmental pollution.



Figure 1: Sulfur-based organic fertilizer production.

Recent Publications

1. Muscolo A, Mallamaci C, Settineri G and Calamarà G (2017) Increasing soil and crop productivity by using agricultural wastes pelletized with elemental sulfur and bentonite. *Agronomy Journal* 109(5):1–11.
2. Muscolo A, Settineri G, Papalia T, Attinà E, Basile C and Panuccio M R (2017) Anaerobic co-digestion of recalcitrant agricultural wastes: Characterizing of biochemical parameters of digestate and its impacts on soil ecosystem. *Science of the Total Environment* 586:746-752.
3. Panuccio M R, Attinà E, Basile C, Mallamaci C and Muscolo A (2016) Use of recalcitrant agriculture wastes to produce biogas and feasible biofertilizer. *Waste and Biomass Valorization* 7:267–280.

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4. Al Barakah F N, S M Radwan and R A Abdel Aziz (2013) Using biotechnology in recycling agricultural waste for sustainable agriculture and environmental protection. *International Journal of Current Microbiology and Applied Sciences* 2(12):446–459.
5. Arshad J, M Yong Sun Moon and A Zainul (2010) Sulphur- a general overview and interaction with nitrogen. *Australian Journal of Crop Science* 4(7):523–529.

Biography

Muscolo Adele has graduated in Biological Sciences (MSc) and has completed her PhD in Food Science from the Policlinic Federico II University of Naples, Italy. In 1988 she started her professional carrier as Researcher at Mediterranea University of Reggio Calabria where she is still working as Full Professor in Soil Chemistry and Ecology. Since 1990 she is Reviewer for International Scientific Journals and since 2008 she is Evaluator of projects for European Community, International Funding Research Agencies and Italian and Foreign Research Ministries. She is Examiner of International PhD dissertation. She has over 180 papers in international journals with IF. Citations: 1702; H index: 22. She has been serving as an Editorial Board Member of many international journals. She is an Associate Editor for *Journal of Forestry Research*.

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