

Biosourced active ingredients and chemical nanotechnologies for sustainable plants protection

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The success of nanomedicine has paved the way for the development of agri-nanotechnology investigating different smart delivery systems. Our research approach concerns green chemistry strategies starting from biocompatible materials, exploiting biopolymers and biosourced active ingredients to obtain innovative tools in crops protection. Our work in the field of plant protection began in the context of the fight against pathogen *Xylella fastidiosa*, the causal agent of The Olive Quick Decline Syndrome. CaCO₃ nanocrystals were tested *in vitro* as antibacterial nanomaterial against *X. fastidiosa*. The regional project DEMETRA has given us the opportunity to test our systems in open field. The selected phytodrug is thymol, natural antimicrobial agent. DEMETRA is based on the living lab approach and provided 4 phases of design, technology transfer, experimentation and results valorization. As for technology transfer, it has been carried out the scale up of drug loading procedure. Curative and preventive trials have been conducted obtaining promising results. A good alternative to inorganic systems is represented by natural polymers. Chitosan is a promising material thanks to its antibacterial properties, its bioadhesion and ability to stimulate defense responses in plant tissues. We have developed chitosan coated nanocolloids of Fosetyl-Al and their activity was studied through *in vitro* and *in planta* experiments, confirming the synergistic effect of two components. The study of biopolymers continues investigating the application of nanocellulose from renewable recycled sources to obtain new smart delivery systems. The PON project NEMESI is focused on production of nanocellulose and active ingredients from biomass. Nanocellulose is manipulated to produce carriers which are used for essentials oil loading. The new formulations will be tested in *in vitro* test, *in planta* and open field trials to control 3 phytopathologies.