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NANOSTRUCTURED TITANIUM DIOXIDE AS AN ANTIMICROBIAL AGENT ON GRAPEVINE (*VITIS VINIFERA* L.) LEAVES: A PHYTOTOXICOLOGICAL STUDY

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In the past two decades, nanostructured materials including colloidal nanocrystals, semiconductor nanoparticles, nanotubes, nanowires and porous materials have received a great attention thanks to their unique physicochemical properties. Titanium dioxide nanoparticles (TiO_2 NPs) excited by UV light can produce different reactive oxygen species (ROS) such as hydroxyl radical, superoxide radical anion and singlet oxygen. This special feature of TiO_2 NPs so-called photocatalytic property can be exploited in numerous fields, especially in water treatment technologies for removing toxic compounds or inactivation various pathogens.

In this work we applied directly TiO_2 NPs on the grapevine (*Vitis vinifera* cv. Cabernet sauvignon) leaves as potential antimicrobial agent. Experiments were performed under field conditions where the plants were exposed to sunlight. Physiological responses, flavonol profile and micro- macroelements of the leaves were studied. We found that TiO_2 NPs with the concentration of 250–3 00 mg kg^{-1} increased the stomatal conductance whereas decreased the photosynthetic rate. Despite of their negative effect on photosynthesis, flavonol profile as a stress sensitive factor showed only minor changes after the foliar exposure as revealed by HPLC-DAD measurements. Elevated level of K, Mg, Ca, P and B were detected in the treated leaves which may be related to the increased stomatal opening. Our results indicate that TiO_2 NPs with the applied concentration can be phytotoxic in the presence of UV irradiation which probably stem from the excess of ROS production of nanoparticles. Consequently, further studies are necessary for determining the parameters which allows safety and efficient field applications of TiO_2 NPs.

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