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Use of Biostimulants To Address Climate Change Challenges Related to the Growth, Flowering and Fruit Set of Olive Trees in the Mediterranean

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Abstract : Olive (Olea europaea L.) culture in the Mediterranean basin faces significant challenges due to climate change, soil degradation, and the decline in biodiversity as a result of using agrochemicals. The effects of climate change are particularly severe because of the intense competition among plants for natural resources such as land, water, and available nutrients. Climate change, manifested through extreme weather events, drought periods, and high temperatures, directly affects the biological cycle of olive trees. As a result, critical processes such as bud differentiation, flowering, fruit set, and alternate bearing are adversely impacted. Consequently, in combination with other factors, the phenomenon of fruitlessness is increasingly observed in olive orchards of several regions. Addressing these challenges necessitates innovative and sustainable agricultural practices, among which biostimulants have emerged as a promising solution. Biostimulants, comprising natural substances or microorganisms, enhance plant growth, resilience, and productivity. Moreover, they promote root development, increase soil water retention, and boost microbial activity, thereby improving nutrient availability for plants. Acting as signal messengers such as phytohormones, biostimulants strengthen plants' tolerance to abiotic stresses. Furthermore, their application has been shown to improve the qualitative characteristics of olive oil, making them an appealing alternative for sustainable farming practices. This study investigates the effect of biostimulant formulations on the vegetative growth, flowering and fruit set of olive (cv. Kolovi) trees, on the island of Lesvos, Greece. Six categories of biostimulants (algae extracts, amino acids, humic acids, glycinebetaine, microorganisms, and plant growth regulators) were applied foliarly once in two olive orchards, one with pruned and the other with unpruned trees. The preliminary results of the first application period in May 2024 revealed that treatments with humic acids and algae extracts significantly improved vegetative growth in both orchards. Humic acid-treated trees presented the highest new shoot length, while algae extract-treated trees exhibited the greatest number of new leaves in the pruned orchard. Regarding reproductive development, the application of glycine-betaine led to the highest fruit setting in the unpruned orchard, while amino acid and microorganism treatments gave consistently the highest numbers of flowers in both orchards, compared to other treatments. All biostimulants treatments presented consistently highest values in all tested parameters, as compared to control, highlighting the positive impact of these products on olive tree performance. These initial research findings underscore the potential use of biostimulants, particularly humic acids, algae extracts, and glycine-betaine, as sustainable alternatives to conventional farming practices. Their ability to enhance vegetative growth, flowering, and fruit set offers a promising pathway to improving olive tree resilience and productivity amidst ongoing environmental challenges. This research is implemented by the Operational Group OLIVEUP (M16SYN2-00066), and co-funded by European Union and Greece under the RDP 2014-2020

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