NatuCrop Publishable Summary

The NatuCrop consortium came together to address a global need for effective and sustainable solutions for reducing crop stress in order to deliver greater crop yields. The NatuCrop consortium consisted of 4 Small to Medium Enterprises (SME's) and 3 Research Institutes from 5 European countries, each of which brought significant knowledge and expertise to the consortium. The consortium was funded under the FP7 instrument "Research for the Benefit of SME's" which meant that technology development was strongly guided by end-user and market requirements. The consortium primarily focussed on developing next generation plant biostimulant based solutions for plant abiotic stresses such as heat, drought and salinity. Plant biostimulants contain substance(s) and/or micro-organisms whose function when applied to plants or the rhizosphere is to stimulate natural processes to enhance/benefit nutrient uptake, nutrient efficiency, tolerance to abiotic stress, and crop quality.

During the 2 years of the NatuCrop project a significant amount of new knowledge was generated on the impact of biostimulants and their combinations on plant biotic and abiotic stress. The project was primarily focussed on alleviating abiotic stress in plants with the primary indicator of success being increased height, biomass or fruit/grain yield. The consortium utilised 5 different plants/crops to evaluate efficacy, these included; Tomato, Barley, Wheat, Potato and Arabidopsis Thaliana. A library of biostimulant formulations was screened for efficacy to reduce a range of biotic stresses such as: Phytophthora infestans; Rhynchosporium commune; B. graminis (powdery mildew) and Fusarium Oxysporum and abiotic stresses including; salt, heat, cold and drought.

The project led to the development of a number of tools to allow manipulation of natural biomolecules by changing their molecular mass, degree of substitution and solubility characteristics. In addition an analytical toolbox was developed to allow a more extensive characterisation of seaweed derived biostimulants. This knowledge allows for better control of product composition and enhancement of the efficacy of biostimulants to deliver more yield with better performance consistency.

The performance of the developed biostimulants exceeded expectations in growth room, glasshouse and field trials. In some instances performance far exceeded the original targets of the project. In a tomato field trial in Spain the best performing biostimulant delivered a 33% increase in fruit yield over conventional farm practice. An additional benefit of this biostimulant was that the performance was delivered with 50% of the normal fungicide rate. This reduced fungicide feature provides an important benefit in a sustainable agriculture context. A field trial in winter Barley in Scotland reported the best performing biostimulant delivered a 9% increase in yield even when little biotic or abiotic stress was experienced by the crop. These results illustrate the potential of NatuCrop developed biostimulants to consistently deliver enhanced crop yields in a number of crop systems when subjected to varying degrees of stress. Validation of the NatuCrop biostimulants in alleviating specific abiotic stresses (salinity, heat, and drought) was achieved using trials in controlled environments. The results were extremely encouraging with consistent dry matter yield increases of >10% being obtained in tomato plants for the best performing biostimulants. Molecular tools allowed the establishment of the mode of action for the biostimulants in alleviating stress and have provided important information on how to further optimise the effect for further increases in yield. Gene microarrays provided results on the unique contribution of different biostimulants to the dysregulation of genes expressed in barley.

The NatuCrop project has allowed development of a biostimulant platform which provides scientifically tailored biostimulant formulations to meet specific crop productivity challenges and deliver the increased crop yields required to feed a growing world population.