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Myths and truths about the use of biostimulants in crop production

Mitos y verdades del uso de los bioestimulantes en la producción de cultivos

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Biostimulants are microorganisms or substances that, when applied to plants, can promote growth and promote tolerance to stress; but its benefits depend on the crop and the product.

Biostimulants have been reported to improve growth in cucumbers, melons and tomatoes[1]; in other cases, they have resulted in a 37 % increase in yield in soybeans with hormonal mixtures[2]. In coffee, they observed an increase in yield of up to 74 % using algae extract[3]. In basil, the use of biostimulants derived from sugar cane and humic substances improved biomass under salinity conditions[4,5]. Chitosan zinc nanoparticles were observed to increase water use efficiency in green beans during drought[6]. Better nutrient uptake associated with better root development was observed[7,8].

Claims that biostimulants are universally effective or equally beneficial across products are unfounded. Evidence indicates that differences in efficacy relate to crop species, specific stress conditions, formulation details, and even timing of application. No studies reported adverse effects or economic data to support cost-benefit superiority.

Biostimulants can improve plant tolerance to abiotic stresses such as salinity, drought, and extreme temperatures[6,7]. Pérez et al.[9] reported a favorable response of bioinputs to drought in native potato cultivars. *Bacillus mycoides* and humic acids increased the water content, chlorophyll and proline in cowpeas under salinity[10]. Some studies suggest that biostimulants facilitate nutrient absorption[9], possibly through chelation.

Several studies report increases in plant height, stem diameter, leaf area, and yield. BioRemedy and Fossil improved the growth and yield of cucumber, melon and tomato[1].

The evidence does not support the idea that all biostimulants are universally effective across all crops and conditions. Effectiveness is context-dependent and varies depending on the culture species, type of stress, and biostimulant formulation. Gabriel-Ortega et al.[1,11] determined that XP-amino was only superior for melon stem diameter, while BioRemedy was better for other characteristics. Not all products or combinations produced significant benefits in all settings.

Some studies highlight the importance of the time of application[3]. However, there is not enough evidence to generalize the optimal timing for all crops and products.

The efficacy of biostimulants varies depending on the cultivar used. Field, greenhouse, hydroponics, and laboratory studies yielded different results. Stress conditions (such as salinity and drought) modulated the performance of biostimulants. The external validity of greenhouse and laboratory studies is limited.

The method of administration of the biostimulant (foliar, soil, seed, hydroponics) influenced the results[3]. They do not report differences between foliar and seed application in soybeans[3]. Other studies used only one method, so comparisons between methods are limited.

In conclusion, it can be pointed out that, despite the multiple experiences reported in the use of biostimulants, it is still a questionable issue, because while biostimulants demonstrate real benefits in agricultural production, the myth of their universal effectiveness is false, since their success depends on specific factors such as the type of crop, the conditions of application and other factors already mentioned.

Conflicts of interest

This publication has no conflict of interest with any public or private entity.

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Ethical considerations

For the presentation of this document, the names of institutions or people that are affected to any extent have been avoided.

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Not applicable.

Generative Artificial Intelligence

Generative artificial intelligence was not used

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