

## Vitamin-Humic-Algal Root Biostimulant Increases Yield of Green Bean

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Over the past decade there has been a notable increase of research on the use of naturally derived or organic materials in agriculture (Poincelot, 1986; Russo and Berlyn, 1990). Some of these are biostimulants, i.e., nonnutritional products that may reduce fertilizer use and increase yield and resistance to water and temperature stresses. Among the materials that stimulate plant growth in relatively small amounts (Aitken et al., 1964; Berlyn and Russo, 1990; Kinnersley et al., 1989; Senn, 1987; Senn and Kingman, 1973) are humic acids, marine algae, polymers of lactic acid, B vitamins, and ascorbic acid. Under certain conditions, biostimulants work well (Russo and Berlyn, 1990) and suggest possible uses in horticulture.

We tested "Roots" (Lisa Products Corp., New Haven, Conn.), a proprietary mixture of humic acids, marine algae extracts, thiamine, and ascorbic acid. The objective of this study was to assess the effectiveness of this organic biostimulant (OB) on pod production of green beans (*Phaseolus vulgaris* L.).

Seeds of beans cv. Bush Blue Lake 274 (Agway Inc., Syracuse, N.Y.) were sown and germinated in trays filled with vermiculite. In test A, the first set of 120 seedlings was transplanted, one seedling per pot, to 2.8-liter pots that contained a 1 potting soil (Agway) : 1 vermiculite (v/v) mix. The statistical design was a completely randomized factorial (Statview II, Abacus Concepts,

Berkeley, Calif.) The seedlings were grown in three treatments of 40 plants each to evaluate Roots: 1) 0% (control), 200 ml tap water/plant when others were treated with OB; 2) 1%, two applications of 200 ml to each plant (at transplanting and on day 26 after transplanting as a soil drench), and 3) 3%, two applications of 200 ml to each plant on the same dates as in 2) above. In test B, a second set of 120 seedlings was transplanted and grown in two treatment groups of 60 plants each to further test the effectiveness of the OB at 1%: 1) control, 100 ml tap water/plant when others were treated with OB; and 2) three applications of OB at 100 ml to each plant (at transplanting and on days 26 and 45 after transplanting). An analysis of the medium by the Morgan method (Lunt et al., 1950) before any treatment showed the mix was slightly acidic (pH 6.4), was medium-low in nitrate nitrogen (<4 ppm), low in ammonium nitrogen (<12 ppm), medium in P (<100 ppm), high in Ca (>1500 ppm), and high in Mg (>100 ppm). Temperature in the greenhouse was always between 15

and 30C. Relative humidity was not controlled, and it ranged from 70% to 100%. Pollutants were not filtered out. Plants were fertilized once with 150 mg N/liter (15N-13P-12.5K, Stem's Miracle-Gro Products, Port Washington, N.Y.) 2 weeks after transplanting in both tests.

In test A, pods were harvested 85 days after sowing and 59 days after transplanting; in test B they were harvested 64 days after sowing and 56 days after transplanting. Pod maturity was gauged subjectively on the basis of experience and pod physical properties. Pod fresh and dry weights per plant were determined. Water content (WC) was determined by using the formula:  $WC = (Wf - Wd)/Wf \times 100$ ; where Wf is fresh weight and Wd is dry weight. Analysis of variance was performed on pod fresh weights.

The fresh weights of the pods of all biostimulant-treated groups were significantly higher than those of the control ( $P < 0.05$ ). In test A, the values were 14% and 16% over the control, respectively, and in the validation test (test B), fresh weight for OB at 1% was 18% higher than that of the control (Table 1). The fresh weights were similar for OB at 1% and 3% in test A (Table 1). No vegetative growth differences were observed in these experiments, and pod water content (mean 92%) was similar for all treatments.

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**Table 1. Pod production of green beans treated with organic biostimulant (OB) at 0%, 1%, or 3% (test A) and at 0% or 1% (test B).<sup>2</sup>**

OB concn (%)	Mean pod fresh wt (g/plant)	SE
<b>Test A (n = 40)</b>		
0	33.7 a	1.1
1	38.4 b	1.4
3	39.1 b	1.2
<b>Test B (n = 60)</b>		
0	30.1 a	1.1
1	35.6 b	0.9

<sup>2</sup>Mean separation by Fisher's protected LSD,  $P = 0.05$ , SE = standard error of the mean.

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