Comparative Performance of the Microbial Supplements Voodoo Juice, Orca, and Great White on Flowering

Product Efficacy Test Report

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Introduction

Hydroponic gardeners and horticulturalists use microbial supplements to bring the best of the soil food web—its bottom tier, which consists of beneficial bacteria and fungi—into their hydroponic gardens.

In naturally rich soil, myriad beneficial microbes live symbiotically with plants, helping to strengthen their roots and increase their root mass. This relationship increases plants' ability to absorb nutrients, thus directly contributing to greater vegetative growth and bigger yields. Beneficial microorganisms also help to keep the rhizosphere healthy by improving the microecological equilibrium, helping to fight off pathogens, and fulfilling many other advantageous functions (van der Heijden et al., 1998; Vessey, 2003).

However, beneficial microbes are typically absent from hydroponic growing systems and substrates, putting hydroponic root systems at a disadvantage. Therefore, certain hydroponic fertilizer manufacturers have taken to producing microbial supplements containing beneficial rhizobacteria and/or rhizofungi in order to promote the colonization and inoculation of the rhizosphere by these naturally occurring, root-symbiotic microorganisms.

Theoretically, the application of microbial supplements should result in numerous, significant benefits for plants grown hydroponically, including:

- Greater availability of nutrients due to microbes breaking them down into more bioavailable forms (Landeweert et al., 2001) and building up more root mass, resulting in higher absorption of nutrients and water (Ames et al., 1983; Brownlee et al., 1983; Vessey, 2003).

- A healthier rhizosphere due to establishment of an ecological balance of rhizospheric microorganisms and better resistance to root diseases, such as those caused by the decay of old roots and other organic waste matter, which are recycled by microbial enzymes into bioavailable forms This recycling significantly increases the amount of available nutrients, such as nitrogen and phosphorus (Richardson et al. 2009). Several benefical bacterial species also increase the induced systemic resistance of plants and render them better able to fight off pathogens (Kloepper, Ryu and Zhang, 2004).

- Secretion of growth and bloom cofactors directly into plants (Gutiérrez-Mañero et al., 2001; Lebuhn, Heulin, and Hartmann, 1997; Strzelczyk and Pokojska-Burdziej, 1984; Timmusk et al., 1999).

Voodoo Juice is a microbial supplement produced by Advanced Nutrients, Ltd. (AN) containing beneficial bacteria. (To view the species it contains, see Appendix: Voodoo Juice label.)

Orca and Great White are beneficial microbial supplements produced by Plant Success. They contain both bacterial and fungal species. (To view the species they contain, click on the preceding live links.)

Based on our experience and on feedback from AN clients and customers, we have developed a hypothesis that Voodoo Juice is uniquely suitable for promoting flowering growth. Specifically, we speculated that Voodoo Juice is able to increase flowering even without the application of standard bloom-boosting supplements (i.e., those containing additional phosphorus and/or potassium augmenting the essential elements provided by the base fertilizer).

To test this hypothesis, we selected chrysanthemum as a good representative of a flowering plant. We also wished to compare Voodoo Juice to the competing microbial supplements Orca and Great White.

The aim of this experiment was to determine the influence of Voodoo Juice, Orca, and Great White when applied on top of base nutrients pH Perfect® Grow (pH P Grow), pH Perfect® Micro (pH P Micro)

and pH Perfect® Bloom (pH P Bloom) on the vegetative growth and flowering of chrysanthemum, a short-day plant.

Materials and methods

Procedure

The following products were obtained:

- 1 L bottles of pH P Grow, pH P Micro, and pH P Bloom
- 1 L bottles of Orca and Voodoo Juice
- 1 kg of Great White

Nutrient solutions (NSes) were prepared using deionized RO water as follows:

- Basic NSes:
  - Background 1 (weeks 1–4): 2g/L of Kristalon Blue + 1g/L of $CaNO^3$
  - Background 2 (weeks 4–9): 4 mL/L of pH P Grow + 4 mL/L of pH P Micro + 4 mL/L of pH P Bloom
- NSes with microbial supplements:
  - Background 2 + 2 mL/L of each of Orca and Voodoo Juice
  - Background 2 + 0.4g/L of Great White

Variant	**NS**
Control	Background 2
Orca	Background 2 + 2 mL/L of Orca
Great White	Background 2 + 0.4 g/L of Great White
Voodoo Juice	Background 2 + 2 mL/L of Voodoo Juice

Table 1. Test design for weeks 4–9.

The NSes were tested in an open hydroponic system on chrysanthemum seedlings in 0.5-liter pots with four replications for each variant. The type of substrate was peat Sunshine Mix #4™.

The plants were cultivated in a glass greenhouse without artificially shortening the growing day. The rooted cuttings were planted on June 23, 2012; the mature chrysanthemums were harvested on September 12, 2012.

The NSes containing the tested products were introduced at the beginning of the fourth week (Table 1). Before each irrigation, the NSes were stirred vigorously so as to absorb gases from the atmosphere.

Types of analysis

Biometrical measurement of the weight of the fresh shoots and the dry shoots, the number of flowers per plant, and the total weight of the dried flowers.

Results and discussion

The data presented in Table 2 show the results of the biometrical measurements.

Metric	Control	Orca	Great White	Voodoo Juice
Fresh shoots, ave. g/plant	50.79	49.30	50.23	52.21
Dry shoots, ave. g/plant	9.46	9.26	9.91	9.87
Number of flowers, ave. per plant	32.75	35.50	32.25	36.50
Total weight of flowers, g	17.45	17.85	18.70	19.95

Table 2. Biometric data of the tested chrysanthemum plants.

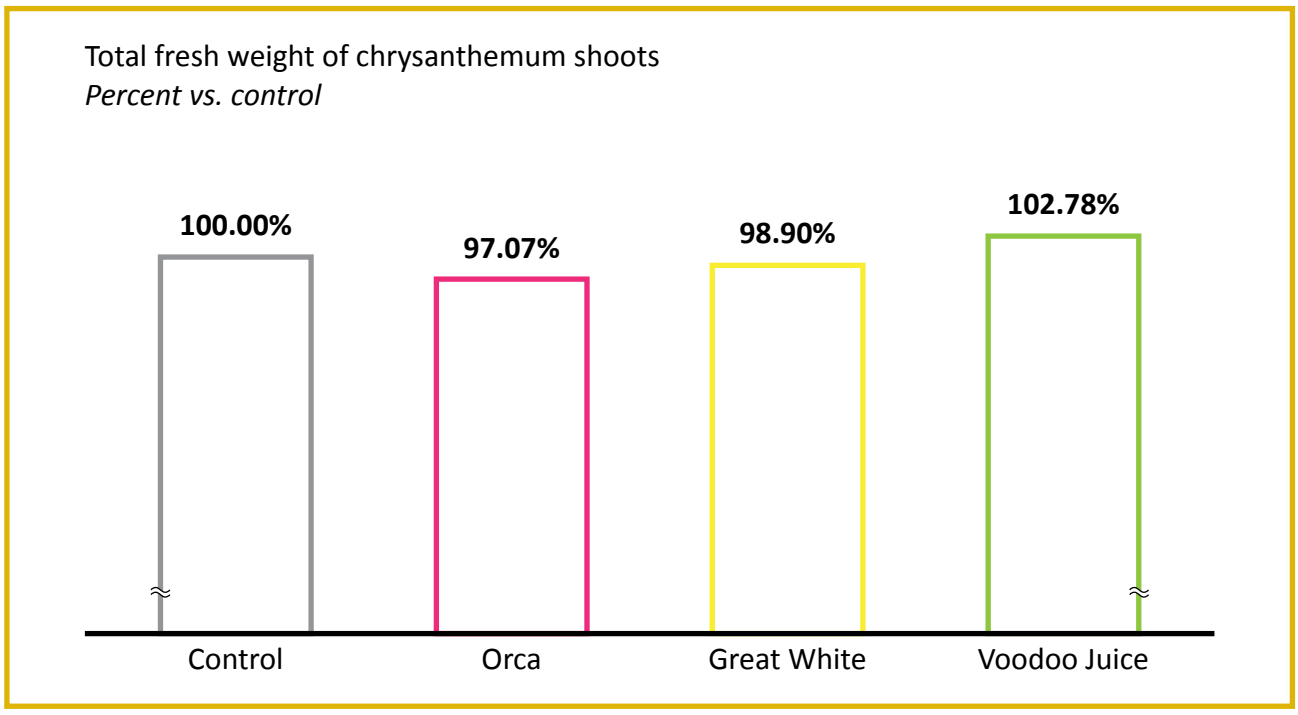

Figure 1. Voodoo Juice increased fresh vegetative biomass by ~3%; Orca and Great White decreased it.

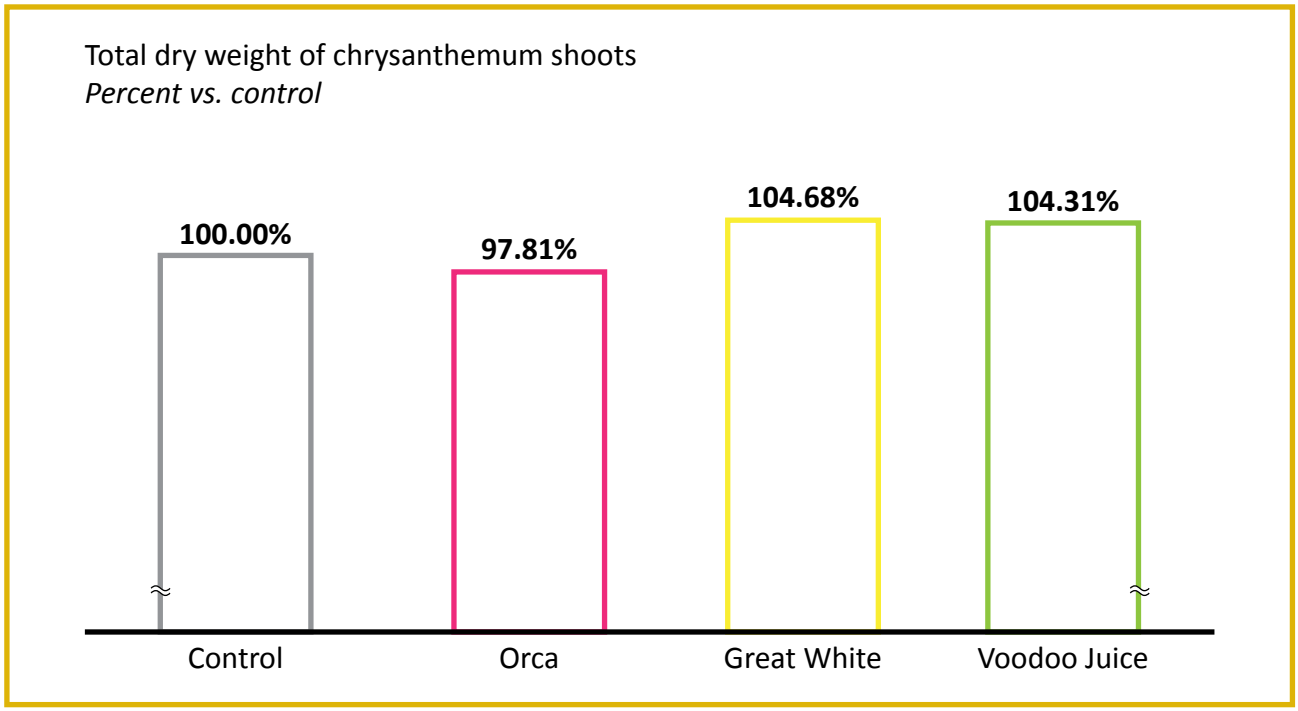

Figure 2. Voodoo Juice increased dry vegetative biomass by ~4%, Great White by ~5%; Orca decreased it.

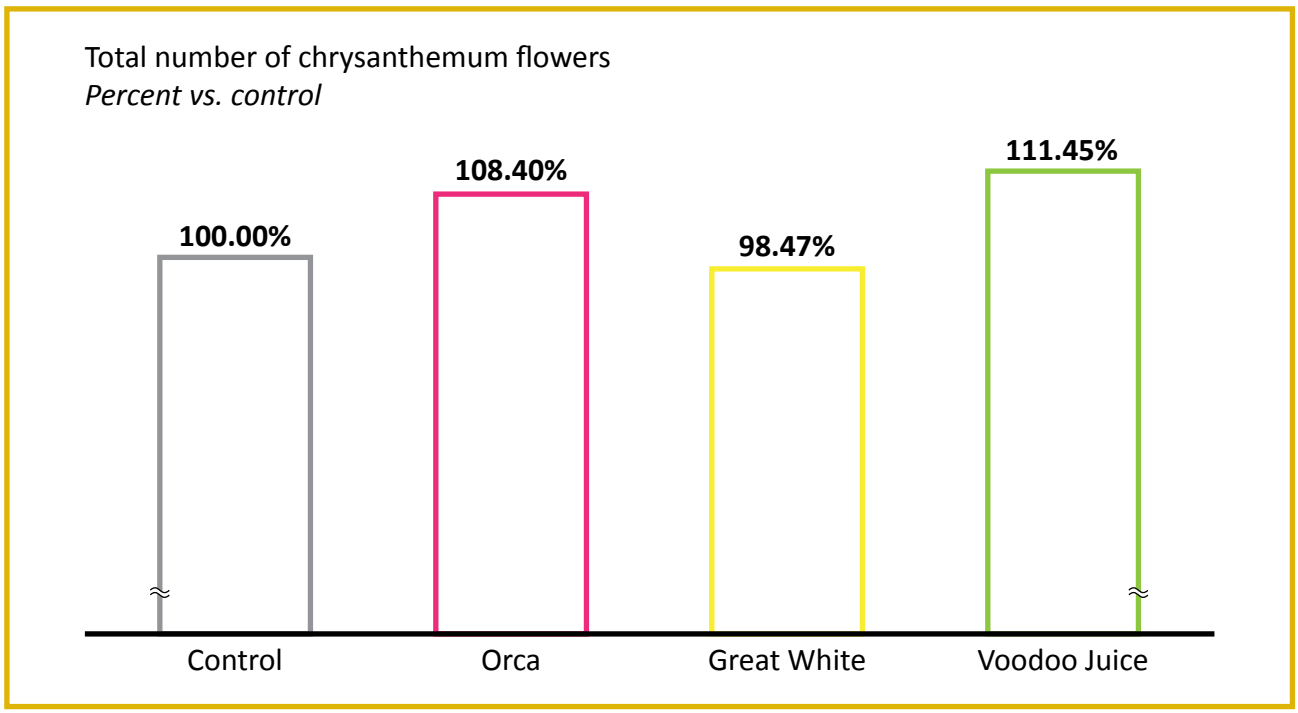

Figure 3. Voodoo Juice increased budding sites by ~11%, Orca by ~8%; Great White decreased them.

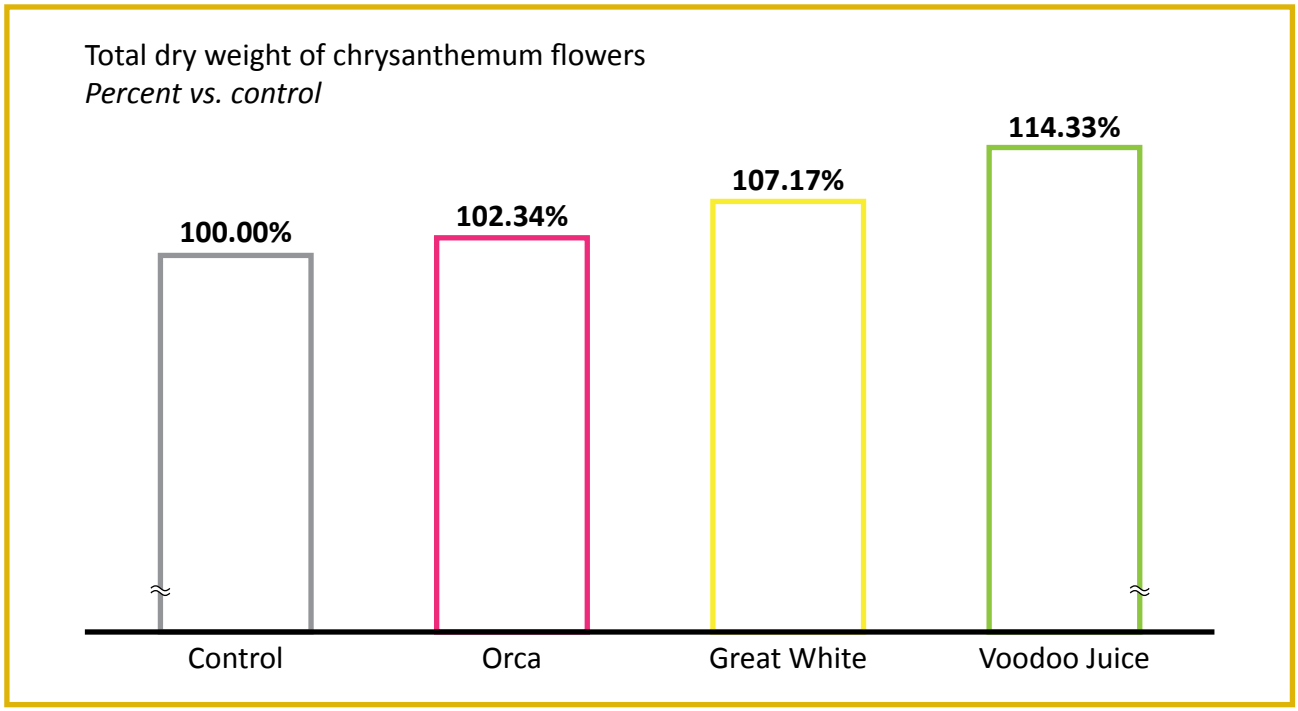

Figure 4. Voodoo Juice increased yields by ~14%, Orca by ~2%, Great White by ~7%..

Vegetative growth

None of the tested microbial supplements significantly influenced the formation of fresh shoots. The NSes with Orca and Great White resulted in less fresh-shoot weight than the control, although the differences were not significant. The NS with Voodoo Juice had a slightly stimulatory effect on fresh-shoot development (Figure 1).

The results for the dry-shoot weight were more impressive for the NSes with Great White (~5% increase) and Voodoo Juice (~4% increase) than for the NS with Orca, which remained below the control (Figure 2).

Flowering

As we had hypothesized, Voodoo Juice increased flowering even without the application of standard bloom-boosting supplements. Although Voodoo Juice contains no phosphorus, potassium, or other essential elements, it had a direct positive impact on yields:

- Voodoo Juice significantly increased the number of flowers. Compared to the control, the NS with Voodoo Juice increased budding sites by ~11%. This was ~3% more than Orca and ~13% more than Great White, which fell beneath the control (Figure 3).

- Voodoo Juice also significantly increased the total weight of the dry flowers (yields). Compared to the control, the NS with Voodoo Juice increased yields by ~14%. This was ~12% more than Orca and ~7% more than Great White, both of which did, however, exceed the control, although Orca's gains were not significant (Figure 4).

We speculate that the flowering increases were the result of increased nutrient absorption due to a larger and healthier root system, as well as possible hormone-like activity of one or more of the beneficial bacteria. We suggest testing Voodoo Juice in accompaniment with standard bloom-boosting supplements to determine if synergies exist—and, if so, what further increases in flowering can be achieved.

This study demonstrated greater positive influence of Voodoo Juice on flowering than the control (Figure 5), Orca, or Great White.

These positive results on flowering were echoed in an experiment run with Voodoo Juice, as well as with Piranha and Tarantula, two other Advanced Nutrients microbial supplements, on poinsettias.

We assume that Voodoo Juice would be highly beneficial when applied to the feeding programs of high-value short-day crops.

* * *

To learn more about the scientifically proven efficacy of Advanced Nutrients products and the science of hydroponics, download more white papers, efficacy reports, and special reports from the Hydroponics Research website at www.hydroponicsresearch.eu.

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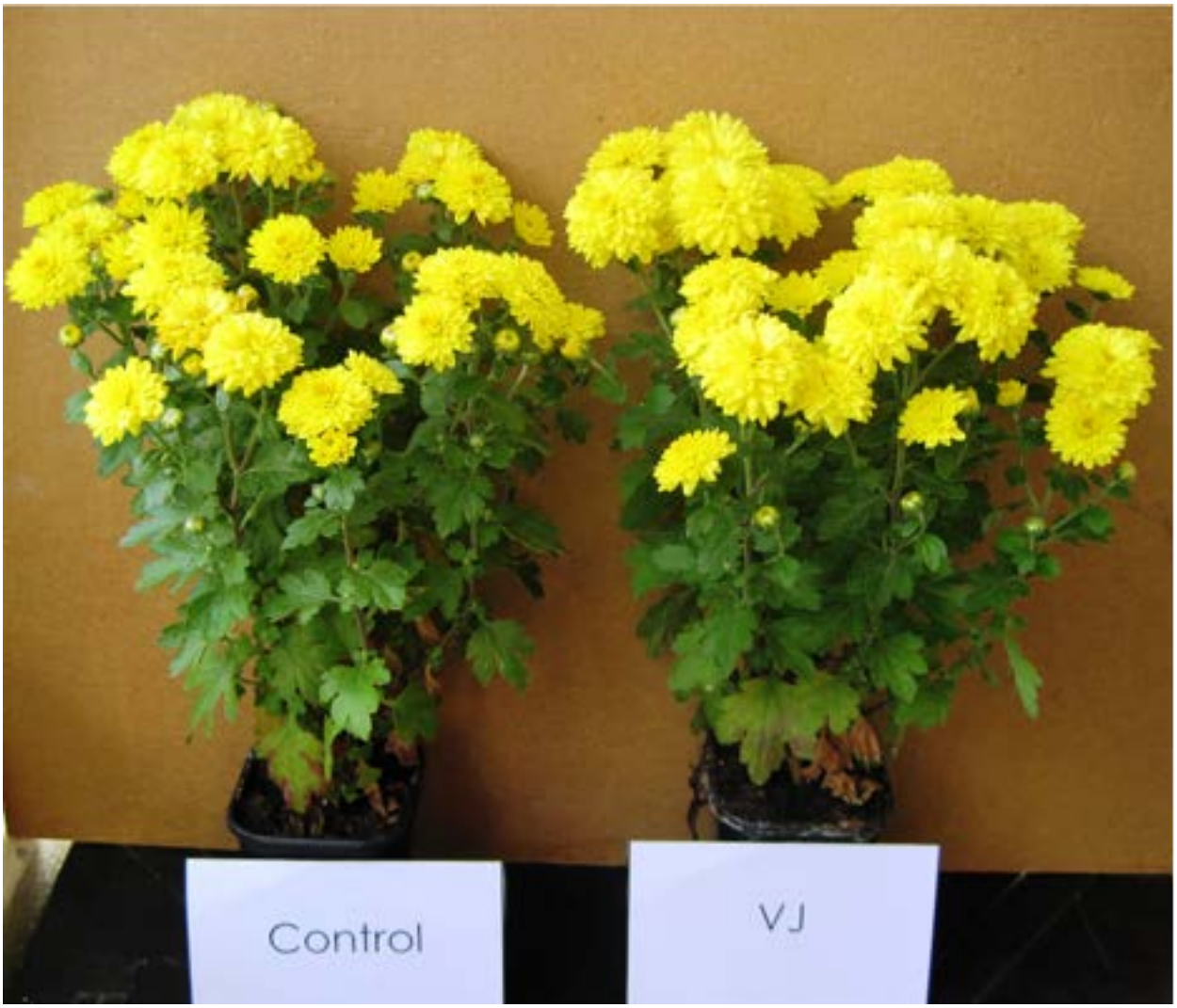

Figure 5. An example of two chrysanthemums from the experiment: a plant grown with the control on the left; a plant grown with Voodoo Juice on the right.

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Appendix: Voodoo Juice label*

* The label featured here was current at the time this efficacy report was published. Since that time, the label may have been updated or amended. Therefore, the label you see here may be obsolete. Do not print, copy, or distribute this label.