

PERFORMANCE OF THE ADJUVANT ELASTO G5 IN COMBINATION WITH THE GROWTH REGULATOR DAMINOZIDE

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IN A NUTSHELL

Elasto G5 is an adjuvant based on polyglycerol. Adjuvants improve the performance of an active ingredient without functioning as a pesticide itself. The product promotes the wetting of a leaf surface and can improve the foliar uptake of an active ingredient. Tests of Elasto G5 with the growth retardant daminozide have demonstrated that addition of Elasto G5 can half the amount of daminozide that is needed for a certain level of growth retardation. It is calculated that, depending on the dose of daminozide, a cost reduction up to more than 40% is possible. At the moment of this writing (November 2012) the product is recommended by SURfaPLUS for the following ornamental crops:

Hydrangea	Viola cornuta
Petunia	Potted chrysanthemum
Verbena	Dahlia
Sutera	Dahlietta
Campanula	Solanum rantonettii
Sunflower	Lavender
Platycodon	Kalanchoë

In the Netherlands, the product is on the market since 2006, and so far no crop damage (phytotoxicity) has been reported. The product does not require a hazard warning label in accordance with EC Directives for Classification. The MSDS (English) can be downloaded at www.surfaplus.com under SURfaPLUS Trading International. Although Elasto G5 has not yet been tested with the growth regulators chlormequat and propiconazole alone, we have indications that the rates of these two plant growth regulators could also be reduced by 50% when Elasto G5 is included. SURfaPLUS Trading can deliver the product Elasto G5 to growers and distributors in various countries. We recommend verification of the local regulations for the application of adjuvants and to start at a small scale for ornamentals not listed here.

TESTS

The tests below have been conducted in the Netherlands by the independent consultancy and research agency [DLV-Plant](http://www.dlv-plant.nl). SURfaPLUS Trading B.V. is responsible for this summary.

In general, the following treatments were conducted with all species:

- 100% daminozide. This is the dose normally applied by a grower at a certain stage of development of the ornamental.
- 50% daminozide plus Elasto G5 at 0.25% (or 2.5 ml/L treatment solution)

Below, we summarize the tests in words. This document is aimed to give the reader quickly an overview of what has been done. On request we can send the data, pictures and further details of the tests.

Hydrangea



Tests have been conducted during the growth cycles 2006/2007 and 2008/2009. Elasto G5 has been tested during the vegetative growth as well as during the forcing of the flowering. When Elasto G5 was tested during the stage of vegetative growth, the 100% dose without Elasto G5 was applied during forcing of the flowering. When Elasto G5 was tested during the forcing of the flowering, it was the other way around. Daminozide was applied three or more times during the two stages. Water volume was 1000 L/ha.

Trade names: Renate Steiniger and Libelle

Experimental design 2006/2007 cycle: four replications per treatment during the vegetative growth and two replications per treatment during the forcing of flowering stage. One replication is a plot with a net number of 32 plants.

Experimental design 2008/2009 cycle: three replications per treatment during the vegetative growth and during the forcing of flowering. One replication is a plot with a net number of minimal 28 plants.

Method of evaluation during vegetative growth: length (height) of plants, number of (flower) buds.

Method of evaluation during forcing of flowering: length (height) of plants, length of shoots, number of flowers, number of leaf pairs, length of internodes

Note: 10 plants were picked from a plot for quantitative measurements. Five plants per plot were picked in the 2008/2009 cycle during the stage of vegetative growth.

Quality assessment at the end of the growth: color of leaves, color and size of flowers, compactness plants, uniformity plants, and total impression

Quality over a longer period (simulation transport, shop, consumer): duration of flowering, number of flowers and total impression

Results growth regulation in the 2006/2007 cycle: Application of the adjuvant Elasto G5 in combination with daminozide at 50% of the normal dose gave the same or a better growth regulation than application of 100% daminozide without adjuvant.

Results growth regulation in the 2008/2009 cycle: Application of the adjuvant Elasto G5 in combination with various reduced doses (15-30-45-60%) of daminozide indicates that a 50% dose of daminozide plus Elasto G5 will give sufficient growth regulation.

Results quality plants 2006/2007 cycle: Application of the adjuvant Elasto G5 in combination with daminozide at 50% of the normal dose gave the same or a better quality at the end of the growth and over a longer period (simulation transport, shop, consumer conditions).

Results quality plants 2008/2009 cycle: Application of the adjuvant Elasto G5 in combination with two reduced doses (45-60%) of daminozide gave the same quality at the end and over a longer period (simulation transport, shop, consumer conditions).

Petunia, Verbena and Sutera



Tests have been conducted in weeks 21, 22 and 23 of 2009. The 100% rate was 2 kg daminozide product/ha. Daminozide was applied four times at a water volume of 1000 L/ha.

Petunia trade names: Hot Pink and White

Verbena trade names: Vegas White and Tapien Violet

Sutera trade name: Snowflake

Experimental design: two replications per treatment. One replication is a plot with a net number of 25 plants.

Method of evaluation: measurement of the length (height) of plants and a visual assessment of the plant quality were conducted at the end of the growth. Colour of leaves, plant anatomy, branching, flowering and total impression were used for the quality assessment.

Results growth regulation: In each of the tested species and cultivars, the growth regulation of the plants using 50% daminozide plus Elasto G5 was the same as the 100% daminozide dose without adjuvant.

Results quality plants: In each of the tested species and cultivars, the quality of the plants using 50% daminozide plus Elasto G5 was the same as the 100% daminozide dose without adjuvant.

Campanula



The test has been conducted in weeks 14-21 of 2010. The 100% rate was 1.5 kg daminozide product/ha. Daminozide was applied eight times at a water volume of 1000 L/ha.

Campanula trade name: Blue Star

Experimental design: two replications per treatment. One replication is a plot with a net number of 25 plants.

Method of evaluation: measurement of the diameter of plants and a visual assessment of the plant quality were conducted at the end of the growth. Colour of leaves, compactness, time of flowering and total impression were used for the quality assessment.

Results growth regulation: the growth regulation of the plants using 50% daminozide plus Elasto G5 was the same as the 100% daminozide dose without adjuvant.

Results quality plants: the quality of the plants using 50% daminozide plus Elasto G5 was the same as the 100% daminozide dose without adjuvant.

Sunflower (potted plants)



The test has been conducted in weeks 14-22 of 2010. The 100% rate was 2.5 kg daminozide product/ha. Daminozide was applied eight times at a water volume of 1000 L/ha.

Sunflower trade name: Sunsation

Experimental design: two replications per treatment. One replication is a plot with a net number of 25 plants.

Method of evaluation: measurement of the length (height) of the plants and a visual assessment of the plant quality were conducted at the end of the growth. Colour of leaves, compactness, time of flowering and total impression were used for the quality assessment.

Results growth regulation: the growth regulation of the plants using 50% daminozide plus Elasto G5 was the same as the 100% daminozide dose without adjuvant.

Results quality plants: the quality of the plants using 50% daminozide plus Elasto G5 was the almost the same as the 100% daminozide dose without adjuvant. Plants treated with 50% daminozide plus Elasto G5 were a little less compact.

Platycodon



The test has been conducted in weeks 14-23 of 2010. The 100% rate was 1.25 kg daminozide product/ha. Daminozide was applied ten times at a water volume of 1000 L/ha.

Platycodon trade name: Astra wit

Experimental design: two replications per treatment. One replication is a plot with a net number of 25 plants.

Method of evaluation: measurement of the length (height) of plants and a visual assessment of the plant quality were conducted at the end of the growth. Colour of leaves, compactness, time of flowering and total impression were used for the quality assessment.

Results growth regulation: the growth regulation of the plants using 50% daminozide plus Elasto G5 was better (stronger) as the 100% daminozide dose without adjuvant.

Results quality plants: the quality of the plants using 50% daminozide plus Elasto G5 was the same as the 100% daminozide dose without adjuvant.

Viola cornuta



The test has been conducted in weeks 34-36 of 2010. The 100% rate was 2 kg daminozide product + 0.62 L chlormequat product per ha. In the 50% daminozide plus Elasto G5 treatment, both the daminozide and chlormequat concentrations were halved. Daminozide was applied three times at a water volume of 1000 L/ha.

Viola cornuta cultivar: mix of varieties

Experimental design: two replications per treatment. One replication is a plot with a net number of 25 plants.

Method of evaluation: measurement of the diameter and the length (height) of plants and a visual assessment of the plant quality were conducted at the end of the growth. Colour of leaves, compactness, time of flowering and total impression were used for the quality assessment.

Results growth regulation: the growth regulation of the plants using 50% (daminozide + chlormequat) plus Elasto G5 was the same as the 100% (daminozide + chlormequat) dose without adjuvant.

Results quality plants: the quality of the plants using 50% (daminozide + chlormequat) plus Elasto G5 was the same as the 100% (daminozide + chlormequat) dose without adjuvant.

Potted chrysanthemum



The test with potted chrysanthemum has been conducted in weeks 30-34 of 2011. The 100% rate was 2 kg daminozide product/ha. Daminozide was applied five times at a water volume of 1000 L/ha.

Test with chrysanthemum mult has been conducted in weeks 26-32 of 2011. The 100% rate was 3 kg daminozide product/ha. Daminozide was applied nine times at a water volume of 1000 L/ha.

Chrysanthemum trade name: Memories Yellow

Chrysanthemum mult trade name: Tardero Geel

Experimental design: three replications per treatment. One replication is a plot with a net number of 25 plants.

Method of evaluation pot-chrysanthemum: measurement of the length (height) and diameter of plants and a visual assessment of the plant quality were conducted at the end of the growth. Colour of leaves, compactness, flowering and total impression were used for the quality assessment.

Method of evaluation pot-chrysanthemum: measurement of the diameter of plants and a visual assessment of the plant quality were conducted at the end of the growth. Colour of leaves, compactness, flowering and total impression were used for the quality assessment.

Results growth regulation: with both chrysanthemums, the growth regulation of the plants using 50% daminozide plus Elasto G5 was the same as the 100% daminozide dose without adjuvant.

Results quality plants: with both chrysanthemums, the quality of the plants using 50% daminozide plus Elasto G5 was the same as the 100% daminozide dose without adjuvant.

Note: the 2011 growing season for these species was such that growth regulation by daminozide was less urgent than usually. This may have masked possible differences between treatments under normal conditions.

In 2012 an additional test has been performed with the aim to investigate whether chrysanthemum varieties normally used for cutting can also be grown as pot-chrysanthemums, using a lowered dosage of daminozide combined with an adjuvant. Cut-varieties are usually vigorous and need a substantial number of applications with growth retardant.

The test was performed in weeks 36-44 of 2012. The 100% rate was 3.5 kg daminozide product/ha. Daminozide was applied 17 times at a water volume of 1000L/ha.

Chrysanthemum trade names: 'Rossano', 'Zembla' and 'Anastasia'.

Experimental design: two replications per treatment. One replication is a plot with a net number of 20 pots, each pot containing 3 plants.

Method of evaluation pot-chrysanthemum: measurement of the length (height) and diameter of flowers and a visual assessment of the plant quality were conducted at the end of the growth. Colour of leaves, compactness, flowering and total impression were used for the quality assessment.

Results growth regulation: The growth reduction of the plants using 50% daminozide plus Elasto G5 was only slightly less than the 100% daminozide dose without adjuvant. Probably a reduction to 60% daminozide would give identical results.

Results quality plants: High dosages of growth retardant generally slightly delay flowering (up to 3 days) and may have a negative effect on flower colour. The use of Elasto G5 in combination with a lower dosage of daminozide seemed to reduce these negative effects. With regard to the other quality aspects, using 50% daminozide plus Elasto G5 equaled the results of the 100% daminozide dose without adjuvant.

Dahlia and Dahlietta



The test has been conducted in weeks 9-13 of 2011. The 100% rate was 1.5 kg daminozide product/ha. Daminozide doses 100% and 50% were applied 11 times at a water volume of 1000 L/ha. In an additional treatment the 100% dose of daminozide was halved by halving the watervolume till 500 L/ha. Elasto G5 was included at the standard concentration of 2.5 ml/L treatment solution, thus this treatment resulted in halving the amount of Elasto G5 as well. Running name of this treatment is "50% daminozide by volume".

Dahlia trade name: Piccolo Coral

Dahlietta trade name: Margareth

Experimental design: two replications per treatment. One replication is a plot with a net number of 25 plants.

Method of evaluation: measurement of the length (height) of plants and a visual assessment of the plant quality were conducted at the end of the growth. Colour of leaves, compactness, time of flowering and total impression were used for the quality assessment.

Results growth regulation: the growth regulation of the plants using 50% daminozide plus Elasto G5 was a little less than the growth regulation of the 100% daminozide dose without adjuvant. The growth regulation of the plants treated with the "50% daminozide by volume" treatment (Elasto G5 included) at 500 L/ha was the same as the 100% daminozide dose without adjuvant at a water volume of 1000 L/ha.

Results quality plants: the quality of the plants using 50% daminozide plus Elasto G5 and the quality of the plants treated with the "50% daminozide by volume" treatment was the same as the 100% daminozide dose without adjuvant.

Solanum rantonettii



The test has been conducted in weeks 1-13 of 2011. The 100% rate was 2 kg daminozide product + 1 L chlormequat product per ha. In the 50% daminozide plus Elasto G5 treatment, both the daminozide and chlormequat concentrations were halved. Daminozide was applied eight times at a water volume of 1000 L/ha.

Solanum rantonettii: blue flowering type

Experimental design: two replications per treatment. One replication is a plot with a net number of 25 plants.

Method of evaluation: Visual assessment of the growth regulation of plants and a visual assessment of the plant quality were conducted at the end of the growth. Colour of leaves, compactness, time of flowering and total impression were used for the quality assessment.

Results growth regulation: the growth regulation of the plants using 50% (daminozide + chlormequat) plus Elasto G5 was the same as the 100% (daminozide + chlormequat) dose without adjuvant.

Results quality plants: the quality of the plants using 50% (daminozide + chlormequat) plus Elasto G5 was the same as the 100% (daminozide + chlormequat) dose without adjuvant.

Lavender



The test has been conducted in weeks 20-24 of 2010. The 100% rate was 3 kg daminozide product/ha. Daminozide was applied five times at a water volume of 1000 L/ha.

Lavender trade name: Anouk

Experimental design: five replications per treatment. One replication is a plot with a net number of 16 plants.

Method of evaluation: measurement of the length (height) of plants in the mid of the test period and at the end of the growth period. A visual assessment of the plant quality was conducted at the end of the growth period. Colour of leaves, compactness, flowering and total impression were used for the quality assessment.

Results growth regulation: the growth regulation of the plants using 50% daminozide plus Elasto G5 was the same as the 100% daminozide dose without adjuvant.

Results quality plants: the quality of the plants using 50% daminozide plus Elasto G5 was the same as the 100% daminozide dose without adjuvant.

Note: With Platycodon the effect of the 50% daminozide plus Elasto G5 is stronger than the effect of the 100% daminozide. Sometimes the effect of the 50% daminozide plus Elasto G5 is a little less (Dahlia and Dahlietta). Growers can create an optimal application by varying the dose of daminozide with inclusion of Elasto G5: either further reduction to 40% or increasing to 60% of the normally applied daminozide dose.

Kalanchoe



Two tests have been conducted: one in spring (weeks 16-21) and one in summer (weeks 23-29) of 2012. The 100% rate was 2.5 kg daminozide + 1 L CCC/ha. Growth regulators were applied 2-5 times at a water volume of 1000 L/ha.

Kalanchoe trade names: La Douce and Frederico (spring test), Nando and Frederico (summer test)

Experimental design: three replications per treatment. One replication is a plot with 100-160 plants. Measurements were performed on 10 plants per plot.

Method of evaluation: measurement of the length (height) of plants and flowers and visual assessment of the plant quality were conducted at the end of the growth period. Colour of leaves, compactness, flowering and total impression were used for the quality assessment.

Results growth regulation: In spring as well as summer the growth regulation of the plants using 50% daminozide/CCC plus Elasto G5 was the same as the 100% daminozide/CCC dose without adjuvant.

Results quality plants: In spring as well as summer the quality of the plants using 50% daminozide plus Elasto G5 was the same as the 100% daminozide dose without adjuvant.

In the autumn of 2012 an additional test was performed with a mix of growth retardants including propiconazole (Tilt). The 100% rate was 2 kg/ha daminozide (85% a.i.), 1L/ha chlormequat and 0.1 L/ha propiconazole. Growth regulators were applied 2 times at a water volume of 1000 L/ha.

Kalanchoe trade names: 'Leonardo' and 'Han'.

Experimental design: three replications per treatment. One replication is a plot with 80 plants. Measurements were performed on minimal 10 plants per plot.

Method of evaluation: measurement of the length (height) of plants and flowers and visual assessment of the plant quality were conducted at the end of the growth period. Colour of leaves, compactness, flowering and total impression were used for the quality assessment.

Results growth regulation: Also in this experiment the growth regulation of the plants using 50% daminozide/CCC/propiconazole plus Elasto G5 was the same as the 100% daminozide/CCC/propiconazole dose without adjuvant.

Results quality plants: The quality of the plants using 50% daminozide plus Elasto G5 was the same as the 100% daminozide dose without adjuvant.

BENEFITS TO GROWERS

The amount of daminozide needed for sufficient growth regulation can be reduced by 50% for the species listed. In this document we limited ourselves to the species tested by the independent agency [DLV-Plant](#), but growers use the adjuvant Elasto G5 also successfully with species not listed here. Depending on the standard dose of daminozide used by grower for certain species, the reduction in cost varies but is substantial (Table 1). Taking into account the large number of daminozide treatments used for the growth of a certain species, the cost and daminozide reduction on a yearly basis is great.

Table 1. Effect of Elasto G5 addition on the total costs of daminozide treatments*.

Standard dose daminozide (g product/100 L)	Cost reduction (€/1000 m²)	Cost reduction (%)
100	3.80	29
200	10.30	39
300	16.80	43
400	23.30	45
500	29.80	46
600	36.30	46

* This table is based on the following:

- The standard dose in the first column is the dose normally used by a grower (the 100% dose).
- The numbers in the 2nd and 3rd column refer to a 50% reduction of daminozide dose with inclusion of Elasto G5 at 250 ml/100 L treatment solution. Costs of Elasto G5 have been included in the calculation.
- Assumed costs of daminozide product € 130/kg; costs of Elasto G5 (2012) are € 11/L.

CONTACT INFORMATION SURFAPLUS TRADING B.V.

SURfaPLUS Trading can deliver the product Elasto G5 to growers and distributors in various countries. We recommend verification of the local regulations for the application of adjuvants.

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