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with a lower content of dry matter than plants without PMPA treatment or receiving the application just once. The negative effect was even greater when the frequency of application was every 7 days, resulting in bulb diameter and weights significantly lower than in the less frequent spraying. The responses of bulb fresh and dry weight as well as of bulb diameter to the rates and frequencies were consistent, clearly showing that at these rates, this product does not have positive responses in terms of the variables studied when it is applied at these rates on "Red Creole" onion.

## CONCLUSIONS

The highest yield, dry matter accumulation and bulb diameter were found in the control and when PMPA was applied only once. No significant difference was found between the rates, but higher frequencies of application decreased the value of all three variables. According to these results, PMPA should not be expected to produce any significant increases in yield and/or bulb size in "Red Creole" onion, at least not when using the rates, frequencies and times of application used in these experiments. Further experiments are being performed, including other cultivars, rates, plant regulators, frequencies and times of application.

## EFFECTS OF TWO PLANT GROWTH REGULATORS ON THE EARLY GROWTH OF GARLIC (*ALLIUM SATIVUM* L.) PLANTS

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## ABSTRACT

In a replicated container experiment, gibberellic acid 3 ( $GA_3$ ) and the cytokinin, N-Phenylmethyl-1H-purine, 6-amine (PMPA) were evaluated for their influence on early growth and dry matter accumulation in "La Flor" garlic grown at sea level during the summer season (June-August) in the Dominican Republic. Cloves were treated with either regulator at rates up to 200 ppm and evaluated seven weeks after treatment. The main finding was a significant change in the dry weight accumulated in the bulb at high rates of both regulators, associated with a significant reduction in leaf dry weight at the same rates.

## INTRODUCTION

In the Dominican Republic, garlic is a very profitable crop. It is grown in the high altitude valleys of the country because of its climatic requirements of cool temperatures for bulbification. Attempts to grow garlic in the low altitude areas have resulted in low quality and yield, because plants produce abundant foliage but fail to develop bulbs of commercial size. Plant growth regulators can change the pattern of dry matter partitioning in crops, and such approach could be useful in "forcing" the plant to produce larger bulbs under unfavorable climatic conditions.

The objective of this research was to determine the possible effects of gibberellic acid ( $GA_3$ ) and the cytokinin, N-phenylmethyl-1H-purine, 6-amine (PMPA) on the growth of "La Flor" garlic during its early stages, as an exploratory work for future research.

## MATERIALS AND METHODS

The experiment was conducted in Santo Domingo, located at sea level, during the period of June to August 1993. Temperatures averaged 29.56 °C during the experiment. A completely randomized design with four to six replications was used. Garlic cloves were treated with GA<sub>3</sub> or PMPA by immersion for 24 hours in aqueous solutions of either regulator at rates 0, 10, 50, 100, 150 and 200 parts per million (ppm). After treatment, the cloves were individually planted in a sandy loam soil, in plastic containers of 15 cm diameter and 15 cm height. Plant nutrition and protection was provided according to the recommendations for this crop. Plants were harvested seven weeks after emergence. The variables evaluated were plant height, number of leaves, pseudostem diameter, total plant dry weight, bulb dry weight, pseudostem dry weight and leaf dry weight.

## RESULTS AND DISCUSSION

No significant difference was found for the variables number of leaves, pseudo-stem dry weight and pseudo-stem diameter. Plant height was significantly higher in all the treated plants than in the control plants. Plants receiving 100 ppm GA<sub>3</sub> or 200 ppm PMPA were significantly taller than those receiving other rates. This promotion of growth might be expected for GA<sub>3</sub> treatment, since GAs work primarily on the elongation of stem and pseudostem tissue. For PMPA this result was similar to the responses found in other Allium crops like chive and leek in unpublished works of Morales-Payán. The possible mechanism of plant height promotion by PMPA is not certain, but it is likely that it is related to stimulation of cell division in the early stages of plant growth. Bulb dry weight is closely related to yield. High yielding plants tend to accumulate higher amounts of dry matter in the bulb during their early stages of development. The highest values for bulb dry matter accumulation were found in plants treated with 200 ppm of GA<sub>3</sub>, being significantly different than the results of the other rates tested. Control plants were not statistically different than the other treatments, except 200 ppm GA<sub>3</sub> and 10 ppm PMPA, which gave the highest and the lowest bulb dry weight, respectively.

Since no significant difference was found for total plant dry weight (data not shown), a higher accumulation of dry matter in the bulb indicates that there has been a shift in dry matter partitioning favoring bulb over leaves. In fact, foliar dry weight was significantly lower at high rates of both regulators, which gave the highest results for bulb dry weight. The reason for such change in dry weight partitioning is not clear for GA<sub>3</sub>, since this regulator tends to promote stem growth but not the growth of storage organs. However, the results were practically the same both times the experiment was conducted. For the cytokinin PMPA the results are more in agreement with the reports that cytokinins are involved in the development of storage organs such as tubers and bulbs.

## CONCLUSIONS

Both plant growth regulators had significant effects on plant height, all treatments resulting in taller plants than the control. High rates of GA<sub>3</sub> and PMPA (150 and 200 ppm) were related to significant differences in dry matter accumulation, which increased in the bulb and decreased in the leaves, as compared to control plants and those treated with lower rates of both regulators. These findings might lead to important applications for the production of garlic under climatic conditions unfavorable to the crop, if the response is similar on field grown garlic. There is also the possibility that these treatments might also improve yield under favorable climatic conditions. Such possibilities will be explored in future experiments.