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YIELD RESPONSES OF "BEN SHEMEN" ONION (*ALLIUM CEPA* L.) TO GIBBERELIC ACID AND FOLCISTEINE APPLICATION

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ABSTRACT

An experiment was conducted to determine the effects of gibberellic acid (GA_3) and the biostimulant folcisteine on growth and yield of yellow onion (*Allium cepa* L.) "Ben Shemen" under the conditions of Santo Domingo, Dominican Republic. Application of 10 ppm GA_3 plus 10 ppm folcisteine gave the best results for bulb fresh weight, dry weight and diameter, which were significantly increased over those of control plants and the other combinations of the regulators tested.

RESUMEN

Se realizó un experimento para determinar los efectos del ácido giberélico (GA_3) y de la folcisteina en el crecimiento y el rendimiento de la cebolla amarilla (*Allium cepa* L.) "Ben Shemen" en las condiciones de Santo Domingo, República Dominicana. Los mejores resultados se obtuvieron con la aplicación de 10 ppm de GA_3 más 10 ppm de folcisteína, que incrementaron significativamente el peso fresco, el peso seco y el diámetro de los bulbos, comparados con los valores obtenidos con las demás combinaciones de los reguladores estudiados y respecto al control.

INTRODUCTION

In the Dominican Republic, onion is one of the major horticultural crops. Around 2000 hectares are dedicated to this crop every year. For yellow onion, which is used mostly for salads, the consumers prefer large diameters. From the producer's point of view, larger onions usually translate into more produce per area, increasing his income.

The biostimulant folcisteine, a folic acid and cysteine derivative that stimulates the activity of anabolic enzymes in plants, and the plant growth regulator GA_3 have been shown to improve the yield and/or the quality of several crops in the conditions of the Dominican Republic. At present, there are no documented experimental works about the use of either substance on yellow onion and their effects on this crop.

The objective of the experiments reported in this paper was to determine the possible effects of foliar sprays of GA_3 and folcisteine (FOLC), individually or combined, on the growth and yield of the "Ben Shemen" onion (*Allium cepa* L.).

MATERIALS AND METHODS

The experiment was conducted in Santo Domingo, Dominican Republic, It was performed two times, using a completely randomized design with six replications. "Ben Shemen", a yellow bulb cultivar of onion, was used. Individual plants were grown on sandy loam soil in plastic containers (15 cm height X 15 cm diameter), receiving the same nutrition, watering and pest/disease protection, following the recommendations for the crop. Treatment consisted of foliar spraying of GA_3 and/or FOLC at rates 0, 5, 10 and 15 parts per million (ppm) in water. The application of treatments

was done only once, 50 days after the emergence of the plants, when bulbing is initiated. The variables evaluated were bulb fresh weight, bulb dry matter, bulb diameter, bulb height, foliar dry weight and foliage length, measured at harvest.

RESULTS AND DISCUSSION

The effect of the combination treatments on bulb fresh weight and diameter are shown in tables 1 and 2, respectively. Bulb fresh weight was significantly higher in plants receiving 10 ppm of GA₃ plus 10 ppm of FOLC than in any other treatment; the combinations 15 ppm of FOLC plus 5 or 10 ppm of GA₃, and 10 ppm of FOLC plus 5 ppm of GA₃ resulted in bulb fresh weights statistically lower than the best treatment, but were significantly superior than the other combinations tested and the control. Neither GA₃ nor FOLC applied individually had significant effects on fresh weight or on any of the variables evaluated.

Bulb diameter was significantly larger in plants that received 10 ppm FOLC plus either 10 or 15 ppm of GA₃. Control plants and those receiving any of the other treatment combinations did not differ significantly in terms of bulb diameter. Bulb dry matter (data not shown) showed significantly higher values when plants were treated with 10 ppm of FOLC plus either 5 or 10 ppm of GA₃ than when treated with 15 ppm of FOLC plus either 5 or 10 ppm of GA₃. Bulb dry weight values recorded for control plants and those treated with the other combinations tested were not statistically different among themselves, but they were significantly lower than the combinations previously described.

Bulb height (data not shown) was significantly higher with the combinations 10 ppm FOLC plus either 10 or 15 ppm GA₃. No significant effect was found for the variables foliar dry weight and foliar length (data not shown). Folcisteine has been reported having a positive effect on growth and/or yield of different horticultural crops in the Dominican Republic, like eggplant (Morales, 1994b), green pepper (Valera, 1986), and radish (Morales, 1989), although it has produced significant differences in the yield of cabbage (Francisco, 1983), potato (Morales, Castillo and Vittini, 1990) or table beet (Morales, 1994a). There are no reports as to its effects in onions. As in other plant stimulants, response depends upon cultivar sensitivity, time of application, rate and climatic conditions. Its mode of action is the stimulation of the anabolic enzymatic processes, increasing enzymatic activity.

There are no reports of onion yield improvement by GA₃ application either. In the Dominican Republic, Alcántara-Suero (1994) did not find significant differences in yellow onion plantlets (in nursery) treated with several GA₃ rates. Pimentel and Encarnación (1994) did not find significant effects on red onion plantlets treated with GA₃ or a cytokinin. According to those results, onion is not responsive to GA₃ during its early growth. However, in experimental work done by Morales (1994c, 1994d) and by Morales and Cuello (1994) in the Dominican Republic with other *Allium* crops, GA₃ treatment has yielded promising results.

GA₃ mode of action is primarily by promotion of cell elongation and/or division, mainly in subapical meristems, although activity has been found in other tissues. Since individual applications of either GA₃ or FOLC did not produce significant changes in any of the variables evaluated, but the combination of both products at certain levels did have significant effects, there is a clear interactive effect of both compounds. The mode of action of this combination of stimulant-regulator remains to be elucidated.

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REFERENCES

- Alcantara-Suero, R. 1994. Efectos de ácido giberélico y nitrógeno sobre el crecimiento de cebolla amarilla (Allium cepa L.) en semillero. Trabajo presentado para optar por el título de Ingeniero Agrónomo, mención Producción de Cultivos. Universidad Nacional Pedro Henríquez Ureña. Rep. Dominicana.
- Francisco, J. 1983. Efecto de la imbibición de la semilla de repollo en un bioestimulante sobre su productividad. Trabajo presentado para optar por el título de Perito Agrónomo. Instituto Politécnico "Loyola", San Cristóbal, Rep. Dominicana.
- Morales-Payan, J.P. 1994a. Efecto de la aplicación de folcisteína y fenilmetil-aminopurina en remolacha (Beta vulgaris L.) "Detroit Dark Red" en el valle de Constanza. (In press).
- Morales-Payan, J.P. 1994b. Effect of kinetine, folcisteine and humic acid on the yield of egg plant (Solanum melongena L.). Oral paper presented in the 30th Annual Meeting of the Caribbean Food Crop Society (CFCS). St. Thomas, U.S.V.I.
- Morales-Payan, J.P. 1994c. Effects of gibberellic acid (GA3) on growth and yield of leek (Allium porrum L.). Poster presented in the 30th Annual Meeting of the Caribbean Food Crop Society (CFCS). St. Thomas, U.S.V.I.
- Morales-Payan, J.P. 1994d. Effect of two plant growth regulators on growth and yield of Allium fistulosum L. Poster presented in the 30th Annual Meeting of the Caribbean Food Crop Society (CFCS). St. Thomas, U.S.V.I.
- Morales-Payan, J.P. 1989. Efecto de la imbibición de la semilla de rábano (Raphanus sativus) "Crimson Giant" en folcistina sobre su crecimiento y productividad. Escuela de Agronomía, UNPHU.
- Morales-Payan, J.P. and C. CUELLO-BATISTA. 1994. Effects of two plant growth regulators on the early growth of garlic (Allium sativum L.) plants. Poster presented in the 30th Annual Meeting of the Caribbean Food Crop Society (CFCS). St. Thomas, U.S.V.I.
- Morales-Payan, J.P., CASTILLO, J.C. and Y. VITTINI. 1990. Efecto de diferentes dosis de folcisteína en aplicaciones foliares a papa (Solanum tuberosum) var. Kennebec. Resúmenes de actividades de investigaciones agrícolas. Depto. De Investigaciones Agropecuarias (DIA), Secretaría de Estado de Agricultura de la República Dominicana. p. 58.
- Pimentel, A. and H. ENCARNACION. 1994. Efectos de ácido giberélico, fenilmetil-aminopurina y nitrógeno sobre el crecimiento de cebolla (Allium cepa L.) "Red Creole". Trabajo presentado para optar por el título de Ingeniero Agrónomo mención Producción de Cultivos. Universidad Nacional Pedro Henríquez Ureña (UNPHU). Rep. Dominicana.
- Valera, R. 1986. Efecto de un bioestimulante sobre la productividad del ají (Capsicum annum). Trabajo presentado para optar por el título de Ingeniero Agrónomo, mención Producción de Cultivos. Universidad Nacional Pedro Henríquez Ureña (UNPHU). Rep. Dominicana.

Table 1. Effect of Gibberellic Acid (GA3) and Folcisteine (Folc) on Bulb Fresh weight (g) of "Ben Shemen" onion.

FOLC (ppm)	GA3 (ppm)			
	0	5	10	15
0	102.45 c*	100.06 c	107.42 c	106.50 c
5	101.99 c	102.21 c	100.41 c	106.28 c
10	108.89 c	154.48 b	189.41 a	112.33 c
15	109.06 c	160.01 b	154.52 b	110.04 c

* Means followed by the same letter are not significantly different.

Table 2. Effect of Gibberellic Acid (GA3) and Folcisteine (Folc) on Bulb Diameter (cm) of "Ben Shemen" onion.

FOLC (ppm)	GA3 (ppm)			
	0	5	10	15
0	7.25 b*	7.29 b	7.28 b	7.31 b
5	7.41 b	7.40 b	7.41 b	7.42 b
10	7.39 b	7.33 b	7.75 a	7.72 a
15	7.32 b	7.29 b	7.36 b	7.33 b

* Means followed by the same letter are not significantly different.