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INDUCTION OF *Hippeastrum* × *hybr.* hort. SCAPE GROWTH BY AUXIN

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Introduction

Hippeastrum is the bulb plant that originated in the tropic. It is an evergreen plant and it is said to have no growth periodicity under proper climatic conditions. There is no real dormant period in the growth and developmental cycle of *Hippeastrum* [REES 1972; OKUBO 1992, 1993]. Low temperature treatment is not necessary for further scape elongation growth and flowering in high temperature. Flower initiation alternates with leaf formation without any interruption in growth throught the year under high temperatures and sufficient moisture. Therefore, factors controlling induction of bulb formation and development of flowers in *Hippeastrum* are not well known. Temperature is probably the most important factor for bulb development rate, and flower buds are initiated at regular intervals [DOORDUIN 1990; DOORDUIN, VERKERKE 2002; IJIRO, OGATA 1997]. A mature bulb of *Hippeastrum* can be > 30 cm in circumferences and the bulb has a sympodial branching system. At flower formation, a lateral growing point is formed on the side of the apex. It develops four leaves and a multiflowered inflorescence. The flowering process in *Hippeastrum* and terminology have been described by OKUBO [1993]. Flower formation is generally autonomous and independent from most factors that control flowering in many geophytes [OKUBO 1993]. *Hippeastrum* is used for plant forcing and as a cut flowers. The number of floral stalk is dependent on cultivar and bulb size, and the number of flowers per stalk is four in most cultivars, with the range being two to six, and cultivar-dependent [OKUBO 1992].

Limited research has been carried out in *Hippeastrum* on the occurrence of endogenous plant hormones and the effect of exogenous plant growth substances in growth and development [BOSE et al. 1980; OKUBO 1993].

The aim of the present work was to study the role of auxin in *Hippeastrum* scape growth.

Material and methods

Bulbs of *Hippeastrum* × *hybr.* hort. cv. 'Red Lion' with circumference about 25 cm were cultivated in greenhouse at a temperature 19–24°C. Directly after sprouting the inflorescence bud was removed and replaced by indole-3-acetic acid (IAA) at a concentration of 0.1% in lanolin paste. In control plants the removed inflorescence bud after sprouting was replaced by lanolin only.

Another part of *Hippeastrum* plants was intact, the inflorescence bud was not removed. Five plants per treatment were used and experiment was repeated twice. The length of stalk at different intervals after treatment were measured and photographed when the scape reached their final length.

Results and discussion

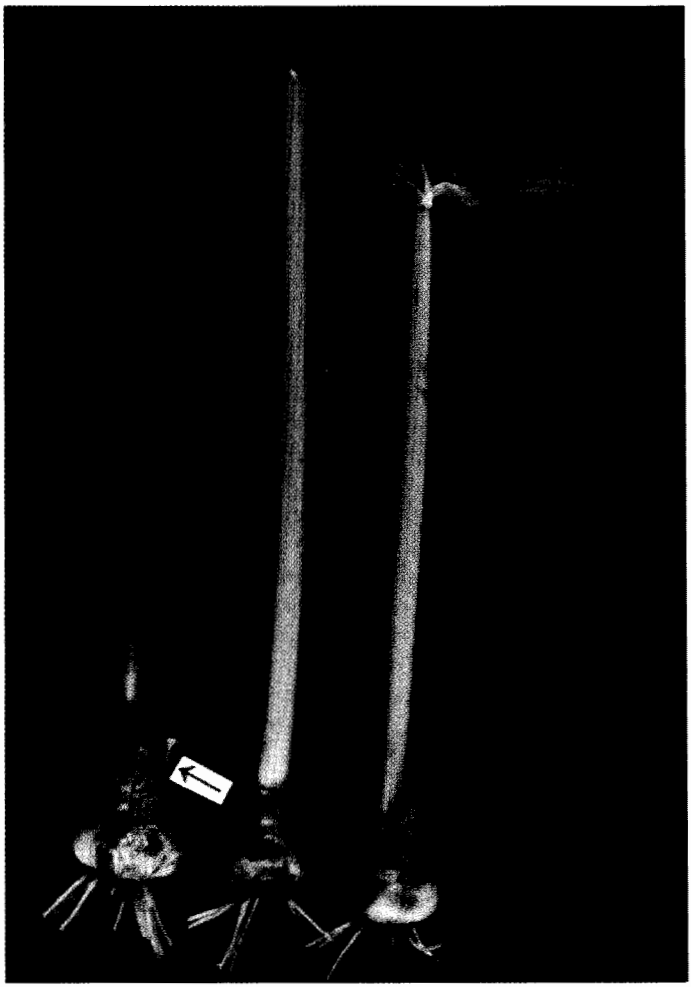

Photo 1.

The effect of IAA 0.1% applied in the place of removed inflorescence bud directly after its sprouting, on *Hippeastrum* stalk growth; treatment made on January 11, photographed (after excision of all leaves) on February 3 on left – died stalk after excision of inflorescence bud (arrow) and sprouted a new inflorescence bud can be observed, in middle – removed inflorescence bud was replaced by IAA 0.1%; induction of normal elongation of stalk can be seen, on right – intact *Hippeastrum* plants; natural elongation of stalk in the presence of inflorescence bud and flowering

Fot. 1. Wpływ IAA 0,1%, podanego w miejsce usuniętego pąka kwiatostanowego bezpośrednio po jego wybiciu, na wzrost pędu *Hippeastrum*; traktowanie wykonano 11 stycznia; zdjęcie (po obcięciu wszystkich liści) 3 lutego: na lewo – zamarły pęd po obcięciu pąka kwiatostanowego (strzałka) i wybijający nowy pąk kwiatostanowy, w środku – usunięty pąk kwiatostanowy został zastąpiony przez IAA 0.1%; indukcja normalnego wzrostu pędu, na prawo – nienaruszona roślina *Hippeastrum*; naturalny wzrost pędu w obecności pąka kwiatostanowego i kwitnienie

In previous studies it was shown that in the cooled bulbs of narcissus, tulips and hyacinths, the elongation growth of stem can be induced by auxin (IAA), applied in the place of excised flower buds and after removal of all leaves [OP DEN KELDER et al. 1971; HANKS, REES 1977; SANIEWSKI 1981; SANIEWSKI, DE MUNK 1981; OKUBO et al. 1986]. Thus, auxin is mainly responsible for stem growth in these bulbous species. It is suggested that in natural conditions the growth of stem in tulips is controlled by auxin produced in gynoecium and leaves, and transported basipetally, and interaction of auxin with gibberellins, possibly produced in the stem [SANIEWSKI 1989; SANIEWSKI et al. 2000].

Hormonal control of scape growth in *Hippeastrum* is unknown. Excision of inflorescence bud directly after sprouting totally inhibited further scape growth and its dying (Photo 1). It was showed that indole-3-acetic acid (IAA) at a concentration of 0.1% in lanolin paste, applied in the place of removed inflorescence bud directly after its sprouting, induced scape growth similarly to intact plants (Fig. 1, Photo 1). Thus, the growth of *Hippeastrum* scape, similarly to other bulbous plants, depends upon the development of flower buds and flowers, and auxin production in these plant organs. Auxin transported basipetally probably control in someways biosynthesis of gibberellins in stem and then in interaction with gibberellins are responsible for stem growth. Exogenously applied auxin can to replace flower buds (flowers) and to control all processes accompanied with stem growth.

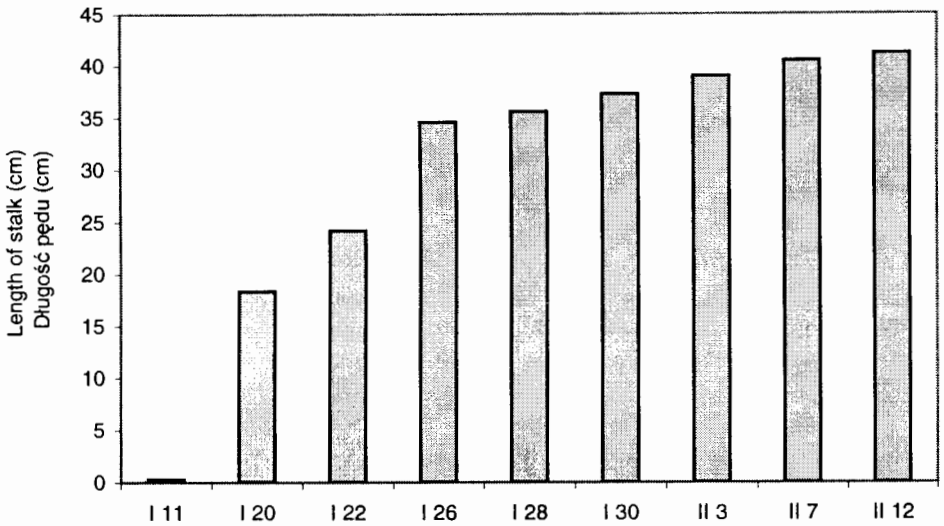

Fig. 1. Dynamic of scape growth of *Hippeastrum* induced by IAA 0.1%, applied in the place of removed inflorescence bud directly after its sprouting; treatment made on January 11. No growth of scape after the removal of inflorescence bud and the application of lanolin paste only in the same way as IAA 0.1%

Rys. 1. Dynamika wzrostu pędu kwiatostanowego *Hippeastrum* indukowanego przez IAA 0,1%, podanego w miejsce usuniętego pąka kwiatostanowego bezpośrednio po jego wybiciu; traktowanie wykonano 11 stycznia. Brak wzrostu pędu po usunięciu pąka kwiatostanowego i nałożeniu tylko pasty lanolinowej w ten sam sposób jak IAA 0,1%

Probably the extension scape growth of *Hippeastrum* is due to the elongation of cell produced during earlier developmental stages, as it was showed in the case of stem elongation in tulips [GILFORD, REES 1973].

Conclusion

Auxin produced in flower buds (flowers) and transported basipetally is main responsible factor for the extension growth of scape in *Hippeastrum* × *hybr.* hort.; the inhibition of scape growth of *Hippeastrum* after excision of flower buds can be totally restored after application of auxin (indole-3-acetic acid).

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Key words: *Hippeastrum* × *hybr.* hort., scape, auxin, growth

Summary

It was showed that indole-3-acetic acid at a concentration of 0.1% in lanolin paste, applied in the place of excised flower bud of *Hippeastrum*, directly after sprouting of the flower bud from the bulb, induced scape growth similarly to intact plants in the presence of flower bud. Removal of the flower bud in *Hippeastrum* totally inhibited scape growth and its dying. It is suggested that the mechanism of hormonal control of flower stalk in different species of bulbous plants is the same or similar.

INDUKCJA WZROSTU PĘDU KWIATOSTANOWEGO *Hippeastrum* × *hybr.* hort. PRZEZ AUKSYNĘ

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Słowa kluczowe: *Hippeastrum* × *hybr.* hort., pęd kwiatostanowy, wzrost, auksyna

Streszczenie

Wykazano, że kwas indolilo-3-octowy (IAA) w stężeniu 0,1% w paście lanolinowej, podany w miejsce usuniętego pąka kwiatostanowego *Hippeastrum*, bezpośrednio po wybiciu pąka z cebuli, indukuje wzrost pędu podobnie jak to ma miejsce w naturalnych warunkach u roślin z pozostawionym pąkiem. Usunięcie pąka kwiatowego u *Hippeastrum* powoduje całkowite zahamowanie wzrostu pędu i jego zamieranie. Można przypuszczać, że mechanizm hormonalnej regulacji wzrostu pędu kwiatowego u różnych gatunków roślin cebulowych jest taki sam lub podobny.

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