# THE EFFECTS OF GROWTH STIMULATORS ON *ACTINIDIA ARGUTA* SHOOT CUTTINGS

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***Abstract***

*Shoot cuttings of Actinidia arguta from opposite parts of shoots were prepared and treated with different types of commercially produced growth stimulators. Tests were conducted with shoots in three different vegetation stages during the year. The number of adventitious roots and the length of the longest root were recorded. Results were statistically analysed in the Randomised Block Design for factorial experiments. Selected growth stimulators and different parts of shoots proved to have statistically singnificant influence on root initiation and their length in all three phenological phases. However, their interactions were non-significant, which proved their relative independence. The combination of Gelstim B stimulator and apical cuttings appeared to be the most effective in case of cuttings collected in the end of February and in the first third of November. For best rooting of semi-woody cuttings collected in the first third of June, the most effective significant combination appeared to be Gelstim B and basal parts of shoots.*

**Key words:** *Actinidia arguta*; *Actinidiaceae*; propagation; root; shoot cutting; growth stimulator

## INTRODUCTION

*Actinidia arguta* belongs to the family *Actinidiaceae*. This family comprises of more then 60 climbing vine species and intergeneric taxa are divided into 4 sections according to fruit and vegetative characteristics [1]. Most of the species originally occur in mountainous range of southern China, especially from southern part of the basin of Jang ´C Tiang river. However, several species have expanded to neighbouring countries such as Siberia, Korea, Japan, India and Indonesia [2]. They bear edible berries, spherical or oblong in shape [3]. *Actinidia* species have got medicinal properties as well. Fruits and leaves of *A. arguta* are considered to be antipyretic, astringent, tonic, thirst – quenching and insecticidal [4].

The propagation by shoot cuttings is one of basic propagation methods within the genus *Actinidia*. The rooting percentage considerably depends on species, variety, period of propagation, type of the used growing medium and basal and atmospheric temperatures [5]. The treatment of herbal, semi - woody and woody cuttings of *A. chinensis* with growth regulator IBA significantly induces the length and the number of growing roots [6]. Rama and Verma (1993) confirmed the positive influence of IBA treatment on the length of roots within the different varieties of *A. deliciosa* during their tests in Himachal Pradesh, India [7]. Chesoniene and Paal (1998) used for tests semi – woody cuttings of 10 to 15 cm long with 2 or 3 buds of several varieties of *A. arguta* a *A. kolomikta* and growth stimulator in powder form containing 0.3 % of IBA, 0.1 % of benomil and 1 % of captan. Growing medium for the cultivation was the mixture of peat and sand (in ratio 5:1). Percentage of successfully rooted cuttings of *A. arguta* was high, 70 to 100 % [8]. Valenta (1996) declared that the percentage of rooted cuttings prepared in summer was higher than the percentage of rooted cuttings collected in winter. By his experiments he evaluated the influence of different growing media on rooting of *A. arguta* cuttings treated with powder containing IBA and fungicide KAPTAN, which does not inhibit root growth. The highest percentage (80%) of rooted cuttings was reached while using pure granular pearlite [9].

The aim of the research was to test the effect of selected commercial growth stimulators on *A. arguta* cuttings prepared from basal and apical parts of its shoots. For more accurate results shoots in three successive phenological phases have been tested.

## MATERIALS AND METHODS

Plant material – long shoots - was collected from mature plants of *Actinidia arguta* (Siebold & Zucc.) Planch. ex Miq. cultivated in outside greenhouse area of Czech Agricultural University, Prague, Suchdol. Shoots were taken and tests were conducted in three different periods of the year – 1. woody shoots before bud proliferation at the end of February, 2. semi – woody shoots in the first third of June (apical herbal parts were cut off) and 3. woody shoots after leaf fall in the first third of November.

The parts of 10 to 30 cm long from the base were cut off and then shoots were divided into three parts of the same length. Middle part was shifted out, basal and apical parts were separated and cuttings with 3 to 4 buds were prepared. Lower leaves of semi – woody cuttings

were shifted out, upper leaves reduced up to one third of their length. Both apical and basal cuttings were treated with two variants of commercial gel growth stimulators, Gelstim A and Gelstim B from Explantex Vondruš Company. Gelstim A contains α – naftylacetic acid (NAA) 2.5 mg . $l^{-1}$, indolylbutytic acid (IBA) 1.5 mg . $l^{-1}$, 2 – indolylacetic acid (IAA) 3.0 mg . $l^{-1}$, chinosol (8 – hydroxychinolinsulphate) 150 mg . $l^{-1}$. Gelstim B contains NAA 9,5 mg . $l^{-1}$, IBA 8.0 mg . $l^{-1}$, IAA 9.5 mg . $l^{-1}$, chinosol 150 mg . $l^{-1}$. One additional variant of non treated cuttings was prepared as control. Cuttings were potted to common trays of 12 cm in depth by each variation. The surface of cuttings was then sprayed with fungicide CAPTAN 50 WP – captan 50 % (Arvesta Corporation Company).

The growing substrate was composed of peat and white granular pearlite in 1: 1 ratio. Common trays with cuttings were put into propagating frame inside of production greenhouse in Palkovice, Czech Republic. Winter and spring temperatures varied from 20 to 25 ˚C, humidity ranged 80 %, summer temperatures varied from 25 to 30 ˚C and humidity from 80 to 85 %.

Experimental unit consists of 30 cuttings for each variant. Experiment was repeated twice, the evaluation of tests was done two and half months after the cuttings establishment.

The experiments were conducted in the Randomised Block Design for factorial experiments. The data were statistically analysed using analysis of variance method (Stávková a Dufek, 2000).

## RESULTS AND DISCUSSION

Average measured values of the number of roots (Table 1) and the length of the longest root (Table 2) of shoot cuttings varied and depended on the phenological phase of the selected plants, the type of the shoot and growth stimulator. Statistically evaluated results are divided into three sections.

Differences in root number and root length of woody cuttings collected at the end of February were statistically significant within selected experimental terms. Growth stimulators used for tests and different parts of shoots showed statistically important influence on root initiation and their length. But their interactions were not statistically significant and differences in root numbers and the longest root length were relatively same in case of all possible combinations between used stimulators and cuttings from different parts of shoots, which confirmed their relative independence. Nevertheless, it is possible to declare that the combination of Gelstim B stimulator and apical parts of shoots used for cuttings showed itself as the most effective while considering root number and root length.

Differences in root number and root length of semi – woody cuttings collected in the first third of June were statistically conclusive within selected experimental terms. Stimulators used for tests showed statistically important influence on root initiation and their length. However, the influence of different parts of shoots was statistically significant only in case of length of the longest root; the influence on the number of roots was not significant. The interaction between monitored factors confirmed their relative independence. The combination of Gelstim B stimulator and basal parts of shoots showed itself as the most effective considering root number and the longest root length.

Differences of root number and root length of woody cuttings collected after leaf fall in the first third of November were statistically conclusive within selected experimental terms. Stimulators used for tests had statistically important influence on root initiation and their length. The interaction between the monitored factors (stimulators and shoot parts) confirmed their relative independence and consequently their statistically significant difference. Their combinations were determined from the best to the worst: Gelstim B x apical part of the shoot, Gelstim A x apical part of the shoot, Gelstim B x basal part of the shoot, Gelstim A x basal part of the shoot, no stimulator x apical part of the shoot, no stimulator x basal part of the shoot, all concerning to the number of roots and the length of the longest root.

Finally, it is possible to conclude that the treatment with Gelstim B stimulator with higher concentration of growth regulators showed better results. Cuttings from apical parts of shoots treated with Gelstim B showed better results on rooting than cuttings from basal parts. The highest percentage of rooted cuttings and the best quality of rooting were achieved using semi – woody cuttings prepared in the first third of June. Stronger callogenesis was observed alongside woody cuttings, especially those prepared at the end of February, at the expense of rooting. Bulky callus was often formed on basal part. Little callogenesis on apical part of cuttings was observed too.

**Tab. 1. : The average number of roots**

| | Gelstim A x basal part | Gelstim B x basal part | No stimulator x basal part | Gelstim A x apical part | Gelstim B x apical part | No stimulator x apical part |
|---|---|---|---|---|---|---|
| Woody cuttings end of February | 1,45 | 2,5 | 0,9 | 3 | 4,35* | 1,75 |
| Semi - woody cuttings 1st third of July | 3,7 | 4,2* | 2,3 | 2,95 | 4,15 | 1,9 |
| Woody cuttings 1st third of November | 1,8 | 2,95 | 1,15 | 2,85 | 4,95* | 1,95 |

**Tab. 2. : The average length of the longest root (mm)**

| | Gelstim A x basal part | Gelstim B x basal part | No stimulator x basal part | Gelstim A x apical part | Gelstim B x apical part | No stimulator x apical part |
|---|---|---|---|---|---|---|
| Woody cuttings end of February | 16,65 | 32,12 | 10,95 | 44,3 | 58,15* | 26,4 |
| Semi - woody cuttings 1st third of July | 50,65 | 59,4* | 32,1 | 44,4 | 58,85 | 27,5 |
| Woody cuttings 1st third of November | 23,25 | 40,7 | 14,8 | 39,7 | 68,8* | 26,05 |

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