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THE EFFECT OF GROWTH REGULATORS ON THE QUALITY OF TWO-YEAR-OLD APPLE TREES OF 'ŠAMPION' AND 'JONICA' CULTIVARS

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Abstract. Studies were conducted at the Felin Experimental Station of the Agricultural University in Lublin in the years 2001–2003 and their aim was to estimate the effect of preparations Arbolin 036SL and Promalin 3,6 SL in the form of lanolin paste on the quality of two-year-old trees 'Šampion' and 'Jonica' cvs. grafted on rootstock M.26. It was shown that the greatest influence on the number of lateral shoots, sum of shoot length and their mean length was exerted by the cultivar and atmospheric conditions in a given year. It was observed that in the majority of trees more lateral shoots were formed by the trees after the application of growth regulators as compared to the control. A singular use of preparations stimulating the branching in the form of lanolin paste in the years with unfavourable weather conditions (2003) was not sufficient to obtain satisfactory effect. The genetic features of a cultivar and the weather conditions in the period of young shoots' growth had a significant effect on the growth of the studied trees. Preparations Arbolin and Promalin in the form of lanolin paste had no significant effect on the diameter of the rootstock trunks.

Key words: branching, preparations stimulating branching, lanolin paste, grafting

INTRODUCTION

The greatest influence on early and abundant yielding of fruit trees is exerted by genetic features of a cultivar and the rootstock as well as the quality of the nursery material. The productivity of apple trees in the first years after plenting is related to the thickness of the planted trees and the length of lateral shoots [van Oosten 1983, Green 1991, Clever 1994, Włodarczyk 1994,].

At present strong and branched maiden trees or two-year-old trees produced in 2-year- or 3-year-long cycles from the grafting with a one-year-old crown are recommended for planting apple tree orchards [Bielicki and Czynczyk 1999]. One-year-old

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maiden trees produced in a 2-year-long cycle can have a well formed crown consisting of a few lateral shoots. The quality of these trees is related to the growth strength of the applied rootstock, the tendency of the cultivars to produce branches, the weather conditions during the intensive growth of maiden trees as well as the efficiency of different treatments stimulating branching [Gudarowska 2002, Kapłan and Wociór 2005, Kapłan and Baryła 2006]. Two-year-old trees produced in a 3-year-long cycle through the cutting of one-year-old maiden trees at the height of about 60 cm from the ground often form the crown in a natural way. For certain cultivars, even in the production of 'knip-boom' trees, it can be necessary to perform additional treatments stimulating the branching [Gudarowska and Szewczuk 2002].

The purpose of the experiment was to evaluate preparations Arbolin 036SL and Promalin 3,6 SL in the form of lanolin paste on the quality of two-year-old apple trees 'Šampion' and 'Jonica' cvs. budded on rootstock M.26.

MATERIAL AND METHOD

The studies were conducted at the Felin Experimental Station of the Agricultural University of Lublin in the years 2001-2004. Two-year-old apple trees 'Šampion' and 'Jonica' cvs. budded on rootstock M.26 constituted the experimental material.

The rootstocks were planted at the spacing of 90×30 cm. In the summer of the same year grafting was performed with buds of 'Šampion' and 'Jonica' cvs. using the method of applied buds at the height of 15 cm from the soil surface on 15 July. In the second year the rootstocks were cut by means of non-plug method just above the taken bud and the sites of cutting were protected with Funaben 03 PA. During the months of May-July the outgrowths on the rootstocks and the sylleptic shoots on maiden trees were removed to the height of 60 cm. In spring of the third year the maiden trees were cut at the height of 50 cm. Lateral shoots were removed to the height of 60 cm. On the first days of July growth bioregulators were used in the form of lanolin paste, rubbing 6 buds on the leader. The paste applied to the buds was prepared a day before the application in the concentration of 2.20 ml Arbolin for 100 g lanolin (2.2%) and 2.20 ml and 3.75 ml Promalin for 100 g lanolin (2.2% and 3.75%).

The experiment was established in a scheme of random blocks. It included 8 combinations in 5 repetitions. Plots where 10 plants grew on each were the repetitions.

In the years 2003–2004, after the trees growth was completed measurements were performed of the diameter of rootstock trunks at the height of 10 cm above the soil surface, the diameter of the maiden trees at the height of 30 cm from the ground, the height of the trees on the day of the treatment, 2 weeks after the application and in autumn, the number of sylleptic shoots and the length of all the shoots.

The results obtained in the experiment were statistically analyzed using the method of variance analysis. T-Tukey's test was used to estimate the significance of differences at the level of significance of 5%.

RESULTS

In the years 2003–2004 'Jonica' cv. trees were characterized by a higher mean sum of shoots length than 'Šampion' (tab. 1). The studies did not show any significant effect of Arbolin or Promalin preparations on the sum of all lateral shoots within particular cultivars.

In the first year 'Šampion' cv. trees in the control combination had a significantly smaller sum of the length of all shoots as compared to 'Jonica' cv. No significant differences were observed between particular combinations of a given cultivar.

In the second year of studies no significant differences were found out between the control trees of the studied cultivars. It was found out that 'Šampion' trees treated with Promalin in a higher concentration were characterized by a significantly smaller sum of shoots than the trees treated with Arbolin and Promalin in a lower concentration. A significantly higher sum of the length of sylleptic shoots was observed in 'Jonica' cv. trees after the application of Arbolin than after using Promalin in the concentration of 2.2%.

No significant differences were found out between the years of studies in 'Jonica' cv. trees in the control combination and the one treated with 3.75% Promalin. 'Šampion' cv. trees treated with Promalin in a higher concentration in 2003 gave a significantly bigger lateral shoots sum than in 2004, a reverse situation was observed in the other combinations.

The mean number of all lateral shoots on a tree ranged from 3.2 to 8.2. It was observed that the trees in control combinations formed fewer shoots than in the combinations treated with growth regulators, with an exception of 'Šampion' cv. trees treated with 3.75% Promalin.

In the first year the studies did not show any significant effect of the applied treatments on the number of sylleptic shoots of the examined cultivars. Significantly more shoots grew in the control combination of 'Jonica' cv. as compared to 'Šampion'. A similar relationship was observed in the combinations where Arbolin and Promalin preparations were used in the concentration of 3.75%.

In the last year of studies 'Šampion' cv. trees in the combinations in which 2.2% Promalin and Arbolin were used were characterized by significantly better branching than the maiden trees treated with 3.75% Promalin. In the case of 'Jonica' cv. no significant effect of the treatments was observed on the branching of the trees.

The statistic analysis of 'Šampion' cv. trees where Promali was applied in the concentration of 3.75% did not point to any significant differences between the years of studies. The trees of the other combinations had significantly the poorest branching in 2003 as compared to 2004.

The mean shoot length on a tree ranged from 16.9 to 30.9 cm. The studies showed no significant effect of the cultivar on the mean length of control shoots. It was found out that a little longer shoots were formed by 'Jonica' cv. trees than the trees of 'Šampion' cv.

In the first year of studies significant differences were found in the shoot length between the trees of 'Jonica' cv. and those of 'Šampion' cv in the combinations with Arbolin. It was observed that significantly longer shoots of 'Šampion' cv. were obtained

Table 1. The effect of growth regulators on the branching of two-year-old apple trees of 'Šampion' and 'Jonica' cultivars
Tabela 1. Wpływ regulatorów wzrostu na rozgałęzianie drzewek dwuletnich jabłoni odmiany 'Szampion' i 'Jonica'

	Rootstock-cultivar Podkładka-Odmiana	Preparation Preparat	2003	2004	Mean Średnia	2003	2004	$LSD_{0.05}$ NIR $_{0,05}$
Sum of shoots length, cm Suma długości pędów sylepłycznych, cm	Šampion M.26	Kontrola	56.6 cd	124.9 de	90.7 cd	B	A	32.6
		Arbolin 2.2%	32.4 d	161.5 cd	96.9 cd	B	A	68.3
		Promalin 2.2%	54.7 cd	236.5 bc	145.6 bcd	B	A	79.4
		Promalin 3.75%	97.4 bcd	45.0 e	71.2 d	A	B	47.0
	Jonica M.26	Kontrola	169.0 ab	208.7 bcd	188.8 abc	-	-	ns ni
		Arbolin 2.2%	171.2 ab	359.7 a	265.5a	B	A	52.6
		Promalin 2.2%	132.5 abc	254.4 bc	193.5 abc	B	A	33.8
		Promalin 3.75%	186.4 a	288.6 ab	237.5 ab	-	-	ns ni
	$LSD_{0.05}$ NIR $_{0,05}$		86.2	97.9	108.2			
Number of shoots per tree Liczba pędów, szt. drzewo $^{-1}$	Šampion M.26	Kontrola	3.0 cd	4.8 cd	3.9 bc	B	A	1.3
		Arbolin 2.2%	1.9 d	7.8 abc	4.8 abc	B	A	3.1
		Promalin 2.2%	3.0 cd	11.0 a	7.0 ab	B	A	1.9
		Promalin 3.75%	3.7 bcd	2.8 d	3.2 c	-	-	ns ni
	Jonica M.26	Kontrola	5.3 ab	6.9 bc	6.1 abc	B	A	1.3
		Arbolin 2.2%	4.7 bc	9.2 ab	6.9 ab	B	A	1.8
		Promalin 2.2%	4.4 bc	8.1 ab	6.2 abc	B	A	1.7
		Promalin 3.75%	6.8 a	9.7 ab	8.2 a	B	A	1.2
	$LSD_{0.05}$ NIR $_{0,05}$		2.0	3.2	3.6			
Shoot length, cm Długość pędu, cm	Šampion M.26	Kontrola	19.7 bc	26.6 bc	23.1 bcd	-	-	ns ni
		Arbolin 2.2%	12.7 c	21.1 bc	16.9 d	-	-	ns ni
		Promalin 2.2%	19.5 bc	21.4 bc	20.4 cd	-	-	ns ni
		Promalin 3.75%	26.2 ab	18.7 c	22.5 bcd	-	-	ns ni
	Jonica M.26	Kontrola	31.7 ab	29.9 abc	30.8 ab	-	-	ns ni
		Arbolin 2.2%	36.9 a	39.2 a	38.1 a	-	-	ns ni
		Promalin 2.2%	29.9 ab	31.9 ab	30.9 ab	-	-	ns ni
		Promalin 3.75%	26.3 ab	29.9 abc	28.1 bc	-	-	ns ni
	$LSD_{0.05}$ NIR $_{0,05}$		12.9	11.8	8.8			

Explanation: Means in columns followed by the same letter are not significantly different at $\alpha = 0.05$
Objaśnienie: Średnie w kolumnach oznaczone tą samą literą nie różnią się istotnie przy $\alpha = 0,05$

after the application of Promalin in the concentration of 3.75% than after using Arbolin. The situation was reverse in 'Jonica' cv. trees: the longest shoots were found in the combination with Arbolin and the shortest after using Promalin in a higher concentration; however, those differences were not significant.

In the second year of studies no significant effect of growth regulators was found on the mean shoot length of a given cultivar. It was observed that the shortest lateral shoots were obtained in the trees treated with 3.75% Promalin.

No significant differences in the lateral shoot length between the years of studies were observed.

The height of apple trees on the day of the treatment ranged from 104.0 to 122.9 and the statistical analysis did not show any significant differences in the mean value from two years of studies (tab. 2). It was found out that this feature depended on the cultivar and 'Jonica' cv. trees were higher than the trees of 'Šampion' cv. The analysis of the height of the trees in successive years of studies did not show any significant differences between the trees of the same cultivar. Evaluating the differences between the years it was observed that in 2004 the trees of both studied cultivars were significantly higher than in the first year of studies.

On average, the height of trees 2 weeks after the treatment did not differ significantly and it was found out that 'Jonica' cv. trees were slightly higher than the trees of 'Šampion' cv. In the first year of studies in the period of two weeks after the treatment no significant effect of the applied treatments was shown on the height of both cultivars trees. A similar phenomenon was observed in 2004 for 'Šampion' cv. After applying Promalin on 'Jonica' cv. trees in the dose of 2.2% significantly higher trees were obtained as compared to the control combination and the treatment with Promalin in a higher concentration. Analyzing the growth of apple trees in successive years of studies, two weeks after the application of the preparation in the form of lanolin paste it was found out that in 2004 significantly higher trees were obtained in all combinations than in 2003.

The mean height of trees in autumn ranged from 146.1 to 175.6 cm. The greatest influence on the height of the studied trees was exerted by the cultivar; 'Jonica' cv. trees were higher than 'Šampion' cv.; in the control combination those differences were significant.

In the first year of studies no significant effect of the treatment on the height of the trees of both examined cultivars was shown. It was found out that this feature was significantly related to the cultivar and 'Šampion' cv. trees were characterized by significantly lower height as compared to 'Jonica' cv. trees.

It was found out that in 2004 the trees of both studied cultivars treated with Arbolin and Promalin in the concentration of 2.2% were significantly lower than the control. It was observed that the trees treated with Promalin in a higher concentration were significantly lower than after the application of Promalin in the dose of 2.2%.

The studies did not show any significant differences between the years of studies in control trees or in 'Šampion' cv. trees, whose buds were treated with Promalin in a higher concentration. In the other combinations considerably higher trees were obtained in 2004 as compared with 2003.

Table 2. The effect of growth regulators on the height of two-year-old apple trees of 'Šampion' and 'Jonica' cultivars
Tabela 2. Wpływ regulatorów wzrostu na wysokość drzewek dwuletnich jabłoni odmiany 'Szampion' i 'Jonica'

	Rootstock-cultivar Podkładka-odmiana	Preparation Preparat	2003	2004	Mean Średnia	2003	2004	$LSD_{0.05}$ NIR $_{0,05}$
The height of the trees on the day of the treatment, cm Wysokość drzewek w dniu zabiegu, cm	Šampion M.26	Kontrola	92.0 ab	121.9 b	107.1	B	A	13.5
		Arbolin 2.2%	82.5 b	125.5 b	104.0	B	A	11.3
		Promalin 2.2%	90.2 ab	124.1 b	107.2	B	A	8.9
		Promalin 3.75%	92.8 ab	118.3 b	105.6	B	A	9.2
	Jonica M.26	Kontrola	93.4 a	134.4 ab	113.9	B	A	7.7
		Arbolin 2.2%	99.1 a	146.8 a	122.9	B	A	10.0
		Promalin 2.2%	95.6 a	150.0 a	122.8	B	A	12.7
		Promalin 3.75%	96.8 a	135.3 ab	116.1	B	A	8.0
	$LSD_{0.05}$ NIR $_{0,05}$		10.5	17.8	ns ni			
The height of the trees on the 2 weeks after the application, cm Wysokość drzewek 2 tyg. po zabiegu, cm	Šampion M.26	Kontrola	106.4 bc	130.7 cd	118.5	B	A	7.8
		Arbolin 2.2%	98.2 c	131.7 cd	114.9	B	A	9.5
		Promalin 2.2%	104.7 bc	131.4 cd	118.1	B	A	9.3
		Promalin 3.75%	107.3 abc	125.9 d	116.6	B	A	6.9
	Jonica M.26	Kontrola	108.9 ab	139.4 cd	124.2	B	A	8.1
		Arbolin 2.2%	116.6 a	155.3 ab	135.9	B	A	8.3
		Promalin 2.2%	114.1 ab	158.2 a	136.2	B	A	12.2
		Promalin 3.75%	109.6 ab	140.9 bc	125.3	B	A	8.2
	$LSD_{0.05}$ NIR $_{0,05}$		10.0	14.7	ns ni			
The height of the trees on the autumn, cm Wysokość drzewek jesienią, cm	Šampion M.26	Kontrola	144.6 b	151.5 d	148.1 d	-	-	ns ni
		Arbolin 2.2%	143.2 b	165.6 c	154.4 cd	B	A	8.5
		Promalin 2.2%	145.0 b	167.2 c	156.1bcd	B	A	8.8
		Promalin 3.75%	147.0 b	145.1 d	146.1 d	-	-	ns ni
	Jonica M.26	Kontrola	168.5 a	170.1 c	169.3 abc	-	-	ns ni
		Arbolin 2.2%	165.9 a	184.5 ab	175.2 a	B	A	13.0
		Promalin 2.2%	162.4 a	188.7 a	175.6 a	B	A	7.3
		Promalin 3.75%	164.1a	175.8 bc	169.9 ab	B	A	10.9
	$LSD_{0.05}$ NIR $_{0,05}$		14.7	12.4	15.1			

For explanations: see table 1
Objaśnienie: patrz tabela 1

Table 3. The effect of growth regulators on the diameter of rootstock and diameter of maiden of two-year-old apple trees of 'Šampion' and 'Jonica' cultivars
Tabela 3. Wpływ regulatorów wzrostu na średnicę pni podkładek i pni drzewek dwuletnich jabłoni odmiany 'Szampion' i 'Jonica'

	Rootstock-cultivar Podkładka-odmiana	Preparation Preparat	2003	2004	Mean Średnia	2003	2004	$LSD_{0.05}$ NIR $_{0,05}$
Diameter of rootstocks, mm Średnica podkładek, mm	Šampion M.26	Kontrola	24.2 bc	27.7 bc	25.9	B	A	2.9
		Arbolin 2.2%	27.6 ab	31.5 ab	29.6	-	-	ns ni
		Promalin 2.2%	22.0 c	32.0 ab	27.0	B	A	3.2
		Promalin 3.75%	30.8 a	23.3 c	27.0	A	B	2.5
	Jonica M.26	Kontrola	27.0 ab	31.1 ab	29.1	-	-	ns ni
		Arbolin 2.2%	25.9 bc	35.9 a	30.9	B	A	4.1
		Promalin 2.2%	26.5 abc	31.9 ab	29.2	B	A	3.7
		Promalin 3.75%	26.7 abc	30.3 b	28.5	B	A	2.4
	$LSD_{0.05}$ NIR $_{0,05}$		4.8	5.1	ns ni			
Diameter of maiden tress, mm Średnica okulantów, mm	Šampion M.26	Kontrola	16.0 bc	15.9 bc	15.9 ab	-	-	ns ni
		Arbolin 2.2%	16.7 abc	16.8 ab	16.8 ab	-	-	ns ni
		Promalin 2.2%	15.5 bc	18.7 a	17.1 ab	B	A	2.0
		Promalin 3.75%	20.2 a	13.8 c	16.9 ab	A	B	1.9
	Jonica M.26	Kontrola	13.2 c	15.4 bc	14.3 b	B	A	1.8
		Arbolin 2.2%	17.0 ab	17.6 ab	17.3 a	-	-	ns ni
		Promalin 2.2%	15.3 bc	16.6 ab	15.9 ab	-	-	ns ni
		Promalin 3.75%	16.6 bc	16.4 ab	16.5 ab	-	-	ns ni
	$LSD_{0.05}$ NIR $_{0,05}$		3.5	2.4	2.8			

For explanations: see table 1
Objaśnienie: patrz tabela 1

The diameter of the rootstock trunks in the third year of the nursery ranged between 25.9 and 30.9 mm (tab. 3). The statistical analysis did not show any significant differences in the rootstock diameter between the studied cultivars.

In the first year of studies no significant effect was shown of treating the buds with lanolin paste with an addition of Arbolin or Promalin on the rootstock thickness at the height of 10 cm in 'Jonica' cv. trees. In the case of 'Šampion' cv. the rootstocks in the combination treated with a higher concentration of Promalin were significantly thicker than the control.

In 2004 the thinnest rootstocks were obtained from the trees treated with Promalin in a higher concentration. Significant differences were observed in 'Šampion' cv. between the trees treated with Promalin in the concentration of 3.75% on the one hand, and Arbolin and Promalin in the concentration of 2.2.% on the other, whereas in 'Jonica' cv. those differences were observed between Promalin 3.75% and Arbolin.

The studies showed no significant differences between the years of studies in the trees of 'Šampion' cv. treated with Arbolin and the control ones in 'Jonica' cv. In 2004 'Šampion' cv. trees treated with 3.75% Promalin had significantly thinner rootstocks than in 2003. A reverse regularity was found out in the other combinations.

The diameter of the tree trunks at the height of 30 cm ranged from 14.3 to 17.3 mm (tab. 3). It was found out that the tree trunks treated with growth regulators were thicker than in the control. The application of Arbolin in the trees of 'Jonica' cv. significantly increased the thickness of trunks as compared with the control combination.

In the first year significantly thicker trees of 'Šampion' cv. at the height of 30 cm were obtained in the combination where 3.75% Promalin was applied as compared to the trees treated with Promalin in a lower concentration and the control. Significantly thinner trees of 'Jonica' cv. were obtained in the control than after the application of Arbolin.

In the successive year of studies no significant effect of growth regulators on the trunk thickness of 'Jonica' cv. trees was found out. It was observed that slightly thinner trees were found in the control than in the remaining combinations. Significantly thicker trees of 'Šampion' cv. were obtained in the combination where Promalin was used in the dose of 2.2% as compared to 3.75%.

DISCUSSION

The quality of the nursery material is one of the more important factors conditioning the earliness of fructification start and the size of the yield. One of the main features of the planted trees is the proper number of lateral shoots. The ability to form sylleptic shoots is first of all related to the genetic features of a given cultivar, then to the rootstock and, finally, to the soil-climatic conditions connected with the localization of the nursery the course of the weather in the initiation period and the time of the growth of young shoots [Tromp 1992, Bielicki et al. 1994, Jankiewicz 1997, Kapłan and Baryła 2006].

The present studies conducted in the years 2001–2004 proved that the greatest influence on the number of lateral shoots was exerted by the cultivar and the kind of preparation as well as atmospheric conditions in a given year. The obtained results confirmed the opinion that 'Jonica' cv. is characterized by poorer top domination, greater growth

strength and greater susceptibility to the effect of preparations stimulating the branching as compared to 'Šampion' cv [Rejman et al. 2002, Kapłan and Wociór 2005]. It was observed that more lateral shoots were formed by the control trees of 'Jonica' cv than 'Šampion' cv and in the first year those differences were significant. On average, more lateral shoots were obtained in the combinations treated with the preparations than in the control, an exception being 'Šampion' cv. trees treated with 3.75% Promalin.

The sum of the shoot length and the mean shoot length were related to the cultivar. 'Šampion' cv. trees had a smaller sum of shoot length and a smaller length of the shoot than the trees of 'Jonica' cv. No significant differences were observed in any of the studied cultivars between the control trees and the treated ones. An exception was 'Šampion' cv, where shorter shoots were obtained after applying Promalin in the concentration of 3.75% than after using Arbolin. Slightly different results were achieved by Gudarowska and Szewczuk [2002], who used Arbolin in the dose of 25 ml/1 l of water on two-year-old trees of 'Alwa' and 'Gala' cvs. and they achieved a significantly greater sum of shoot length as compared to the control.

Studies on the effect of preparations stimulating the branching in the form of lanolin paste on the quality and the degree of branching in two-year-old trees of 'Jonica' and 'Šampion' cvs. grafted on M.26 point out that the effectiveness of the treatment is significantly related to the weather conditions in a given year. It can be supposed on the basis of the obtained results that a singular application of preparations stimulating the branching in the form of lanolin paste in the years with unfavourable atmospheric conditions (the year 2003 – high temperature and small rain fall) is insufficient for the achievement of satisfactory results. Gąstoł et al. [1999] emphasize that the number of sprays is an important factor, especially in the years of bad atmospheric conditions. These authors achieved very good results after a singular application of Arbolin preparation. Wertheim and Estbrooks [1994] as well as Hrotko et al. [1996] found out the greatest effectiveness after four, or even eight treatments, which is hard to realize from the practical point of view.

The present studies, conducted in the years 2001–2004, proved that a significant effect on the height of 'knip-boom' trees was exerted by the cultivar and the atmospheric conditions in a given year. In the successive vegetation seasons greater increases of the length were observed on 'Jonica' cv. trees as compared with 'Šampion'; in autumn those differences were significant. Similar results were achieved studying the apple maiden trees [Kapłan and Wociór 2005, Kapłan and Baryła 2006]. The growth of nursery trees depended on the weather conditions in a given year; in the majority of the studied combinations significantly higher trees were obtained in 2004 than in 2003. In the first year of studied the applied preparations did not significantly affect the height of trees of the examined cultivars. In 2004 it was found out that the trees treated with Arbolin and Promalin in the concentration of 2.2% were considerably higher than in the control. Similar results were achieved by Gudarowska and Szewczuk [2002] using Arbolin on two-year-old apple trees of 'Alwa' cv.

It was also shown that increased doses of Promalin significantly weakened the growth of both studied cultivars. Poniedziałek and Porębski [1992] found out that the application of Arbolin affected the height of maiden apple trees on rootstock MM 106 only in a small degree. Those authors observed a similar relationship using Paturyl

preparation [Poniedziałek and Porębski 1995]. This effect was observed in a lesser degree in the case of using growth stimulators as compared to topping. Hrotko et al. [1996] observed that after the application of BA temporary inhibition of the main shoot growth took place but eventually the trees achieved sufficient height.

It was found out that applying lanolin paste with an addition of Arbolin or Promalin preparations to the buds did not have any significant effect on the rootstock trunk diameter. On the other hand, it was observed that in the majority of combinations the applied preparations had a slight influence on the diameter of the tree trunks, but the differences between the treatment and the control turned out to be insignificant. Similar results were achieved by [Poniedziałek and Porębski 1995], who studied the maiden trees of 'Red Boskop'. Wertheim [1989] studied the maiden trees of 'Gloster' and 'Red Boskop' and the did not observe any effect of Promalin on the trunk diameter of the maiden trees, either. In 2003 it was found out in 'Šampion' cv. trees that Promalin in the concentration of 3.75% significantly affected the rootstock trunk diameter.

CONCLUSIONS

1. The number of lateral shoots, the length sum and the mean length of one shoot were related to the cultivar. It was observed that in the majority of the studied trees more lateral shoots were formed by the trees after the application of growth regulators as compared to the control.

2. The genetic features of a cultivar and the weather conditions in the period of the growth of young shoots had a significant effect on the growth of the studied trees.

3. Arbolin and Promalin preparations in the form of lanolin paste did not have any significant effect on the diameter of the rootstock trunk.

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WPŁYW REGULATORÓW WZROSTU NA JAKOŚĆ DRZEWEK DWULETNICH JABŁONI ODMIANY 'SZAMPION' I 'JONICA'

Streszczenie. W latach 2001–2003 w Gospodarstwie Doświadczalnym Felin Akademii Rolniczej w Lublinie, przeprowadzono badania mające na celu ocenę wpływu preparatów: Arbolin 036SL i Promalin 3,6 SL w postaci pasty lanolinowej na jakość drzewek dwuletnich jabłoni odmiany 'Szampion' i 'Jonica' okulizowanych na podkładce M.26. Wykazano, że największy wpływ na liczbę pędów bocznych, sumę długości i średnią ich długość miała odmiana oraz warunki atmosferyczne w danym roku. Zaobserwowano, że u większości badanych drzewek więcej pędów bocznych wytworzyły drzewka po zastosowaniu regulatorów wzrostu niż w kontroli. Jednorazowe zastosowanie preparatów stymulujących rozgałęzianie w postaci pasty lanolinowej w lata o niekorzystnych warunkach atmosferycznych (rok 2003) było niewystarczające do uzyskania zadawalających efektów. Cechy genetyczne odmiany oraz warunki pogodowe w okresie wyrastania młodych pędów miały istotny wpływ na wzrost badanych drzewek. Preparaty Arbolin i Promalin w postaci pasty lanolinowej nie miały istotnego wpływu na średnicę pni podkładek.

Słowa kluczowe: rozgałęzianie, preparaty stymulujące rozgałęziające, pasta lanolinowa, okulizacja

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