INFLUENCE OF THE CLONAL ROOTSTOCKS MAC 9, M 9, M 26 AND MM 106 UPON GROWTH AND REPRODUCTIVE BEHAVIOUR OF THE GOLDEN RESISTANT CULTIVAR

ВЛИЯНИЕ НА ВЕГЕТАТИВНИТЕ ПОДЛОЖКИ MAC 9, M 9, M 26 И MM 106 ВЪРХУ РАСТЕЖНИТЕ И РЕПРОДУКТИВНИ ПРОЯВИ НА СОРТА ЗЛАТНА РЕЗИСТЕНТНА

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ABSTRACT

The influence of the rootstocks MAC 9, M 9, M 26 and MM 106 upon the temperate growing cultivar Golden Resistant was studied over three years. The rootstock MAC 9 induced the lowest tree sizes, while MM 106 induced the largest sizes. The decreasing effect of MAC 9 is expressed also in the lowest total growth during the studied period.

Regarding the reproductive behaviour totally for this period MAC 9 has formed the significantly highest number of fruit-buds compared to all the rest of the rootstocks.

KEY WORDS – clonal rootstocks; growth vigour; apple variety

РЕЗЮМЕ

В продължение на три години след засаждането е проследено влиянието на подложките MAC 9, M 9, M 26 и MM 106 върху умеренорастящия сорт Златна резистентна. Най-малки размери на дърветата индуцира подложката MAC 9, а най-големи – подложката MM 106. Отслабващият ефект на MAC 9 се изразява и в реализирането на най-малък сумарен прираст през проучвания период.

По отношение на репродуктивните прояви MAC 9 е заложила сумарно за периода доказано най-голям брой плодни пъпки спрямо всички останали подложки.

КЛЮЧОВИ ДУМИ: клонови подложки; сила на растеж; сорт ябълка

РАЗШИРЕНО РЕЗЮМЕ

В продължение на три години след засаждането бе проучено влиянието на четири ябълкови клонови подложки – MAC 9, M 9, M 26 и MM 106 върху умеренорастящия сорт Златна резистентна.

Проучванията бяха насочени към отчитане вегетативните прояви на сорта и влиянието, което оказват върху него различните подложки. В края на проучването с най-малък сумарен прираст и най-малки размери на дърветата е сортоподложковата комбинация Златна резистентна / MAC 9.

Друг важен показател, характеризиращ влиянието на различните подложки върху сорта, с голямо значение за овощарската практика, са репродуктивните прояви. В края на проучването се оказа, че сортоподложковата комбинация Златна резистентна / MAC 9 е заложила за периода сумарно най-голям брой плодни пъпки, спрямо всички останали подложки, като разликите са статистически доказани.

INTRODUCTION

The studies on the effect of different apple rootstocks upon the growth and reproductive behaviour of the grafted upon them apple cultivars are numerous, but taking into account the variety in the methods of growing and in the ecological conditions there is not a “universal” rootstock [1, 4]. That is why such studies are still being conducted in various regions in the world [2, 3, 5 ,6].

The purpose of the present investigation is to compare the influence of the not so popular in our country rootstock MAC 9 with the more popular and studied rootstocks M 9, M 26, MM 106 in the temperate growing cultivar Golden Resistant.

MATERIAL AND METHODS

In the autumn of 1998 standard one-year old trees from the cultivar Golden Resistant grafted on four clonal rootstock - MAC 9, M 9, M 26 and MM 106, were planted in the Experimental field of the Department of Fruit-Growing at the Agricultural University of Plovdiv by the planting scheme 5 m x 1.80 m.

The trial was set using the block method with four replications in each variant with three trees in each replication.

All the plants were grown using the same agricultural methods of growing. The following parameters were observed for determining the growth behaviour: height and volume of crown, cross section of stem and total growth. The number of fruit-buds in the beginning of bloom at the time of button separation was registered for determining the reproductive behaviour.

RESULTS AND DISCUSSION

The vegetative behaviour of Golden Resistant upon the rootstocks MAC 9, M 9, M 26, MM 106 were traced in three successive vegetative periods.

The combination Golden Resistant / MAC 9 was with the lowest trees in all the threes studied years, as in 2001 the differences with the all rest variants were significant. The other rootstocks included in the investigation do not have significant differences between themselves by this parameter (Table 1)

Regarding the volume of crown the combination Golden Resistant / MAC 9 also has lower values in the last studied year, but only the difference with the rootstock MM 106 was statistically significant (Table 1).

Another important parameter characterizing the growth behaviour of trees is the trunk cross-section area of stem. Despite the fact that MAC 9 has induced the smallest trunk cross-section area of the stem, the difference with M 9 and M 26 is not significant. At the end of the investigation the stems of Golden Resistant upon the rootstock MM 106 were with the largest cross section and this variant was significantly better than the rest of the variants (Table 2).

Similar tendency was observed regarding the total growth too. The cultivar Golden Resistant has the highest values with the rootstock MM 106, while it has the lowest values with MAC 9, as the difference was significant. The other two rootstocks M 9 and M 26 are intermediate by this parameter (Table 2).

The rootstocks M 9 and M 26 induced the highest average length of growth in Golden Resistant in the three studied years, and the lowest one was registered in MAC 9, as the differences were not statistically significant (Table 3).

The combination Golden Resistant / MM 106 forms a very large number of twigs with length over 5 cm and by this parameter it was better than MAC 9, M 9 and M 26 in the last two studied years (Table 3).

The number of fruit-buds formed by the trees is enlightening the influence of the different rootstocks upon the reproductive behaviour. In all the three years of investigation the trees grafted on the rootstock MAC 9 had the largest number of fruit-buds (Table 4), as in 2000 they were with statistically significant larger number and in 2001 they were statistically significant only in the combination Golden Resistant/M9.

The total number of fruit-buds in Golden Resistant / MAC 9 is significantly higher than all the rest variants. The differences between the combinations with the rootstocks M 9, M 26 and MM 106 were not statistically

Table 1: Height of the trees and volume of the crown
Таблица 1: Височина на дърветата, обем на короната

Variants Варианти	Height of the trees, cm Височина на дърветата, cm			Volume of the crown, m3 Обем на короната, m^3		
	1999	2000	2001	1999	2000	2001
Golden Resistant/MM 106	198.23	240.83	266.25	0.80	1.43	2.82
Golden Resistant/M 26	187.19	223.23	268.13	0.85	1.39	2.41
Golden Resistant/M 9	191.88	242.81	268.33	0.90	1.29	2.07
Golden Resistant/MAC 9	169.06	211.56	220.63	0.91	1.37	1.71
GD при P = 5 %	30.65	16.23	41.00	0.50	0.65	1.07

Table 2: Trunk cross- section area of the stems and anual growth
Таблица 2: Напречно сечение на стъблата и годишен прираст

Variants Варианти	**Trunk cross- section area, cm^2** Напречно сечение на стъблата, cm^2			**Anual growth of the trees, cm** Годишен прираст на дърветата, cm			
	1999	**2000**	**2001**	**1999**	**2000**	**2001**	**Total** Сумарно **(1999-2001)**
Golden Resistant/MM 106	3.64	7.74	13.55	764.92	1171.19	3367.75	5567.67
Golden Resistant/M 26	3.74	8.18	12.77	776.23	1187.61	2180.13	4367.29
Golden Resistant/M 9	4.07	8.07	12.89	736.36	1055.06	2288.83	4302.10
Golden Resistant/MAC	3.63	7.68	11.89	756.75	1069.63	1774.67	3818.04
GD при P = 5 %	1.08	2.12	1.45	206.62	337.93	844.54	1386.67

significant.

Due to a strong attack of Epicometis hirta during the bloom we could not register the other parameters characterizing the reproductive behaviour of the trees.

CONCLUSIONS

The primary data obtained up to the end of the third year after planting show that the rootstock MAC 9 most strongly reduces the growth behaviour of the cultivar Golden Resistant, while there are no significant differences between the rootstocks M 9 and M 26. Expectedly, the strongest vegetative growth was observed in the variants with MM 106. For the studied period the rootstock MAC 9 has induced formation of the largest number of fruit-buds and it is significantly better than the rest of the variants with M 9, M 26 and MM 106, among which there are no significant differences.

Table 3: Structure of growth
Таблица 3: Структура на прирастта

Variants Варианти	**Average lehght of one twig, cm** Средна дължина на едно клонче, cm			**Number of the twigs, above 5 cm** Брой клончета над 5 cm		
	1999	**2000**	**2001**	**1999**	**2000**	**2001**
Golden Resistant / MM 106	42.92	37.73	38.12	17.50	40.87	80.58
Golden Resistant / M 26	58.47	47.21	41.70	17.27	26.86	52.38
Golden Resistant / M 9	48.18	48.76	41.07	16.04	22.77	55.67
Golden Resistant / MAC 9	38.44	36.15	31.77	18.19	31.50	50.50
GD при P = 5 %	21.41	12.88	38.12	5.19	13.40	14.10

Table 4: Fomation of the fruit - buds
Таблица 4: Залагане на плодните пъпки

Variants Варианти	**Number of fruit -buds** Брой плодни пъпки			
	1999	**2000**	**2001**	**Total** Сумарно **(1999-01)**
Golden Resistant / MM 106	7.7	16.17	42.83	66.71
Golden Resistant / M 26	11.1	13.21	58.56	82.88
Golden Resistant / M 9	8.04	15.00	25.67	48.71
Golden Resistant / MAC 9	16.3	40.65	93.04	149.98
GD при P = 5 %	10.17	15.12	53.85	64.98

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