EFFECT OF THINNING "IDARED" APPLE VARIETY USING NAD AND ETHEPHON

EFECTUL RĂRIRII FRUCTELOR DE SOIUL IDARED UTILIZÂND PRODUSE PE BAZĂ DE NAD ŞI ETHEPHON

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Abstract. *The experimental plot is placed in the orchard "Codru-ST" Ltd. founded in 2009 with trees of a „knip boom" canopy type. The study subject of the experience was Idared apple variety grafted on M 9 rootstock. The distance of plantation is 3.5 x 1.2 m. The research was conducted during the period of 2012 year. The tested agents were NAD (Geramid-New) and Ethiphon (Cerone 480SL), which was sprayed in different thinning period. During the research, it was studied the yield, mean fruit weight, average fruit diameter, the number of first class fruits. It was established that, the spray with Geramid-New in dose 1.5 l/ha when 80% of the petals have fallen + 2-3 days, or Cerone 480SL in dose 0.3 l/ha at 10 - 20 days after full flowering have a significant effect on yield and fruits quality.*
Keywords: *apple, thinning, ANA, Ethephon, yield.*

Rezumat. *Cercetările s-au efectuat în livada întreprinderii „Codru-ST" fondată în anul 2009 cu pomi cu coroană formată după metoda „knip boom". Obiectul cercetărilor a fost soiul Idared altoit pe portaltoiul M9. Distanța de plantare 3,5 x 1,2 m. Cercetările s-au efectuat pe parcursul anului 2012. Regulatorii de creştere utilizați au fost pe bază de NAD (Geramid-New) și Ethephon (Cerone 480SL), care au fost testați în diferite perioade de rărire. În perioada cercetărilor s-au analizat recolta, greutatea şi diametrul mediu a fructelor, precum şi ponderea fructelor de calitatea I. S-a stabilit, că tratarea cu Geramid-New în doza 1,5 l/ha când 80% din petale au căzut + 2-3 zile, ori Cerone 480SL în doza 0,3 l/ha la 10 – 20 zile după înflorirea completă au influențat asupra producției și calității fructelor.*
Cuvinte cheie: *măr, rărire, ANA, Ethephon, producție.*

INTRODUCTION

Achieving high quantities of qualitative fruits can only be done by using appropriate modern technologies applied in accordance with natural conditions, economic, land sector-specific basis (Babuc V. *et al.,* 2013; Cimpoieş Gh., 2012).

Determining the fruit load is the technological operation that specifically determines the cargo of fruits to get a big production as constant year after year and high quality (Babuc *et al.,* 2013; Cimpoieş, 2012; Pesteanu, 2013, Stopar, 2000; Robinson *et al.,* 1998).

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Some apple varieties are linking abundant large amounts of fruits that are small and of poor quality. As a result, it gains widespread phenomenon of alternating the fruiting trees (Babuc *et al.,* 2013). To adjust the load with fruit trees is necessary to act on fruiting branches, fruit buds, flowers and fruit (Cimpoieş, 2012; Pesteanu, 2014,).

Using fruit chemical thinning with various active ingredients based on NAD, ANA, BA and Ethephon allow developing broader strategy for standardization of fruit load in different varieties (Basak, 2004; Greene, 1993; Robinson *et al.,* 1998; Stopar, 2000).

Ethephon is a harmless regulator, it has a wider range of use, and it increases the average weight of the apples by 10% and improves fruit bud differentiation (Stopar, 2000; Pfammatter *et al.,* 2000; Widmer *et al.,* 2008).

The optimal treatment period starts from the opening of 20% of flowers until the ovaries have a diameter of 22 mm (Pfammatter *et al.,* 2000).

NAD induces early mild thinning, which starts the differentiation process among the flower clusters. This paves the way for a second later treatment, with NAA and BA, which normally hits the weakened fruits, leaving 1 or 2 undisturbed fruitlets per cluster (Greene, 2002; Pesteanu, 2013; Tromp, 2000).

MATERIAL AND METHOD

The researches were made during the period of 2012 year in the apple orchard founded near the village Radeni from district Străşeni in the autumn of 2009 at the "Codru-ST" Ltd., with trees of a „knip boom" canopy type.

The study object of experience was Idared apple tree variety grafted on M9 rootstock. The trees were trained as slender spindles. Distance of plantation is 3.5 x 1.2 m.

The chemical growth regulators used was Geramid – New, (44.8 g/l NAD), the preparation by the „L. Gobbi Ltd.", Italy and Cerone 480SL (480 g/l Ethephon), the preparation by the „BAYER Crops Science AG", Germany.

To optimize the fruit load of the apple trees were experimented the following variants:

V_1 - Control variant- without chemical treatments;

V_2 - Geramid-New – 1.5 l/ha;

V_3 - Cerone 480SL – 0.3 l/ha;

V_4 - Cerone 480SL – 0.4 l/ha.

In variant two, the treatment with Geramid-New was done when 80% of petals were fallen + 2-3 days (05/05/12) and the third and fourth variants were spray with Cerone 480SL 10 to 20 days after full flowering (15/05/1215).

The effects on the fruit set, the yield, fruit quality at harvest and subsequent blooming were recorded and evaluated according to the following measurements: the number of inflorescences and the number of fruitlets on each tree; the fruit yield produced by each tree, and, for 1 ha orchard of apples; weight of 1 apple; the share of fruits (in %) in size classes based on their diameter from 50 mm to 85 mm with the intervals of 5 mm and relative effectiveness of treatments.

RESULTS AND DISCUSSIONS

Our investigation demonstrates that the growth regulators as product for chemical thinning of fruit have an essential influence.

If, in the control, where it has not been practiced fruit thinning, the difference between the total number of inflorescences and productive ones was not registered properly, constituted 115 and 111 pcs/tree (tab. 1).

In order not to overload the trees of Idared variety with fruits, it is necessary to carry the standardization on load of fruit through various methods of thinning, either manually or with chemical growth regulators.

Table 1

The number of total inflorescences (TIN), formed (FIN) in the crown of the variety Idared apple trees and fruit weight in a inflorescence

Experience variants	TIN, pcs/tree	FIN, pcs/tree	The share of fruits in an inflorescence, %			
			1 pc.	2 pcs.	3 pcs.	>4 pcs.
Control, without treatment	115	111	73.0	19.8	3.6	3.6
Geramid - New, 1.5 l/ha	120	59	81.2	15.4	3.4	-
Cerone 480SL, 0.3 l/ha	116	53	78.6	21.4	-	-
Cerone 480SL, 0.4 l/ha	113	23	60.9	30.4	8.7	-

The research demonstrates that treatment with growth regulators Geramid - New and Cerone 480SL linked to fewer inflorescences in the trees crown (tab. 1).

When treating with growth regulator Geramid - New dose 1.5 l/ha, the number of inflorescences was 59 pcs/tree and decreased by 88.1% compared to the control variant.

When using Cerone 480SL dose 0.3 l/ha, the number of inflorescences was 53 pcs/tree, and when the dose increased up to 0.4 l/ha the key index in the study declined to about 23 pcs/tree, or a decrease of 382.6% compared to the control variant.

The study on fruit weight in an inflorescence shows that in the variant without treatment on 3.6% of inflorescences there were four fruits, three fruits on 3.6%, on 19.8% two fruits and on 73.0% one fruit.

A more rational location of fruit in inflorescence was recorded when treating with Geramid - New in dose of 1.5 l/h and Cerone 480SL in dose of 0.3 l/ha, where 78.6-81.2% of fruits have one blossom, 15.4-21.4% formed by 2 fruits and in 3.4% of inflorescences was obtained 3 fruits.

When treating with the growth regulator Cerone 480SL in dose of 0.4 l/ha, we noticed that the share of inflorescences with one fruit decreases, but those with two or three fruits increases.

After the studied index, it was determined that treatments with Geramid - New in dose 1.5 l/ha and Cerone 480SL in dose of 0.3 l/ha had a positive effect on the number of related inflorescences and the placement of fruits in the trees crown.

The conducted research demonstrates that treating the trees with the growth regulators influences on the number of the fruits in the trees crown which is different according to used dosage.

The largest amount of fruit (tab. 2) was obtained in the control variant - 153 pcs/tree, then in decreasing order is placed version Geramid - New in dose 1,5 l/ha with 71 pcs/tree. When using growth regulator Cerone 480SL dose 0.3 l/ha, the amount of fruits was 57 pcs/tree, and when the dose of Cerone 480SL was 0,4 l/ha the given index decreased from to 34 pcs/tree .

The study on the number of fruit per 100 inflorescences shows regularity similar to that described above properly constituted 133, 59, 49 and 30 pcs.

Table 2

The influence of growth regulators on yield and fruit quality parameters in the trees crown on Idared apple variety

Experience variants	Number of fruits, pcs.		Quantity of fruits		Average weight, g	Average diameter, mm
	tree	100 infl.	kg/tree	t/ha		
Control, without treatment	153	133	13.20	31.41	86.3	60.9
Geramid - New, 1.5 l/ha	71	59	12.90	30.70	181.7	77.6
Cerone 480SL, 0.3 l/ha	57	49	11.57	27.53	206.6	79.8
Cerone 480SL, 0.4 l/ha	34	30	7.83	18.63	230.1	85.1
LSD 5%	3,08	-	0.58	1.38	2.61	-

Since the largest number of fruits per tree and on 100 inflorescences was recorded in the control variant, respectively and higher production from a tree and a surface unit was obtained in the given variant. The productivity of a tree was 13.20 kg and 31.43 t/ha per unit surface. An insignificant reduction, demonstrated statistically, was registered in the variant Geramid - New in dose 1.5 l/ha, where fruit production was respectively 12.90 kg/tree and 30.70 t/ha.

When treating the trees with regulator Cerone 480SL in dose 0.3 l/ha, the production declined to 11.57 kg fruit/tree, or a decrease of 3.17 t/ha compared to variant Geramid - New in dose 1.5 l/ha and 3.88 t/ha compared to the control.

The lowest production of fruits was recorded when using the growth regulator Cerone 480SL use in dose 0.4 l/ha, the harvest on a tree representing 7.83 kg and at a unit area 18.63 t.

The quality of the fruit to a great extent depends on the weight and the average diameter of the fruit. Our investigation shows that growth regulators Geramid - New and Cerone 480SL had an essential influence on quality of production.

If in the control variant, the average weight of a Idared fruit was 86.3 g, then in the variants where was made treatment with growth regulator, it was respectively Geramid - New in dose 1.5 l/ha - 181.7 g, with Cerone 480SL dose 0.3 l/ha - 206.6 g, and in the variant Cerone 480SL dose 0.4 l/ha - 230.1 g. The

average weight of the fruit is in direct correlation with the number of fruit remaining in the trees crown.

The average diameter of the fruits is an indicator that directly touches the weight average output obtained. The lowest average diameter was recorded in control variant - 60.9 mm, where trees were without thinning. Further, in increasing order where placed variants where we used of growth regulators such as, Geramid - New in dose 1.5 l/ha - 77.6 mm, Cerone 480SL dose version 0.3 l/ha - 79.8 mm and Cerone 480SL version dose 0.4 l/ha - 85.1 mm.

The obtained results demonstrate that the highest fruit production was recorded when we used chemical thinning with Geramid - New in dose 1.5 l/ha. In version Cerone 480SL dose treatment with 0.3 l/ha, the harvest of fruits decreased insignificantly, but the fruit quality is the highest.

The study was focused not only on knowing the diameter of fruits, but also the fruit division in diameter from 5 to 5mm in correlation with the experience variants (Tab. 3).

Table 3

The influence of growth regulators on fruit redistribution depending on their diameter on Idared apple variety

Experience variants	Fruit Share (%) depending on their diameter (mm)						
	55	56-60	61-65	66-70	71-75	76-80	81-85
Control, without treatment	12.3	34.7	42.3	10.7	-	-	-
Geramid - New, 1.5 l/ha	-	-	-	7.0	18.8	51.0	23.2
Cerone 480SL, 0.3 l/ha	-	-	-	1.3	11.8	36.7	50.2
Cerone 480SL, 0.4 l/ha	-	-	-	1.8	2.0	5.2	91.0

The obtained results demonstrate that inferior quality production was obtained in control variant. The largest share of fruits (12.3%) are less than 55 mm diameter, 34.7% with the diameter 56-60 mm, 42.3% with the diameter 61-65 mm and only 10.7% have a diameter of 65-70 mm. Therefore, in variant without thinning, the fruits of the first category were 10.7%.

The used of growth regulators influence on fruit quality. Practically, in all variants exhibited chemical thinning the obtained production assigns to category I and category of extra quality.

When treating with Geramid - New, the share of fruits with the diameter of 66-70 mm is 7.0%, 18.8% with the diameter of 71-75 mm, 51.0% with the diameter of 76-80 mm and 23.2% of fruits with the diameter of 81 mm or higher.

When treating with growth regulator Cerone 480SL in dose of 0.3 l/ha, we record an increase in fruit weight with 81-85 mm diameter (50.2%) and a decrease in the quantity of fruit which is attributable to 66-80 mm diameter (49.8%). When treating with Cerone 480SL in doses of 0.4 l/ha, the share of fruits with 66-70 mm diameter was 1.8%, with 71-80 mm diameter - 7.2%, and having a diameter

greater than 81 mm – 91.0%.

Therefore, convincing results about the fruit diameter were recorded in variants Geramid - New in dose 1.5 l/ha and Cerone 480SL dose 0.3 l/ha.

CONCLUSIONS

1. The effectiveness of growth regulators Geramid - New and Cerone 480SL in regulating the fruit cargo on Idared variety through chemical thinning influenced on productivity and fruits quality.

2. When using chemical thinning on Idared variety, higher fruit production and a higher quality were recorded when using the growth regulator Geramid-New in dose of 1.5 l/ha to 1000 l/ha solution when 80% of the petals have fallen further 2-3 days.

3. In case of unfavorable weather conditions during treatment with growth regulator Geramid-New, consider using Cerone 480SL dose 0.3 l/ha to 1500 l/ha solution at 10 to 20 days after full flowering.

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