

# EFFECT OF NAPHTHALENEACETIC ACID (NAA) ON PREHARVEST DROP OF GALA MUST APPLE VARIETY

## EFFECTUL ACIDULUI ALFANAFTILACETIC (ANA) ASUPRA CĂDERII PREMATURE A FRUCTELOR DIN SOIUL DE MĂR GALA MUST

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**Abstract.** *The experimental plot is placed in the orchard “Dacfruct” Ltd. founded in 2006. The study subject of the experience was Gala Must apple variety grafted on M 9. The trees were trained as slender spindles. The distance of plantation is 3.5 x 1.2 m. The research was conducted during the period of 2013 year. The aim of this study was to evaluate the effectiveness of grower regulator Obsthormon 24a in reducing fruit drop of apple trees. The tested agents were NAA, which was sprayed in one time in preharvest period. During the research, it was studied the quantity of dropped fruits under the trees and percentage of total fruit yield. It was established that, one treatment with Obsthormon 24a in dose of 300 ml/ha have a significant effect on fruit drop and there quality.*

**Key words:** *fruit drop, quality, NAA, preharvest spray*

**Rezumat.** *Livada experimental a fost fondată în anul 2006 în întreprinderea SRL „Dacfruct”. Ca obiect de studiu în experiment a fost soiul Gala Must altoit pe portaltoiul M9. Pomii au fost conduși ca fus subțire ameliorat. Distanța de plantare 3,5x1,2 m. Cercetările s-au efectuat pe parcursul anului 2013. Scopul acestor cercetări au fost de a evalua eficacitatea regulatorului de creștere Obsthormon 24a la prevenirea căderii fructelor din coroană. Ingredientul activ a fost ANA, care s-a pulverizat o singură dată înainte de perioada de recoltare. În perioada cercetărilor s-a investigat cantitatea de fructe căzute sub pom și ponderea lor la recolta de fructe. S-a stabilit că un tratament cu Obsthormon 24a în doza de 300 ml/ha are un efect pozitiv asupra căderii premature a fructelor și calității lor.*

**Cuvinte cheie:** *căderea fructelor, calitate, ANA, tratare înainte de recoltare*

### INTRODUCTION

Preharvest fruit drop can reduce production of apple cultivars in commercial orchards by as much as 30% (Babuc et al., 2013; Cimpoieș, 2012; Marini et al., 1993; Yuan and Carbaugh, 2007).

Application of synthetic auxins reduced preharvest fruit drop of apples (Marini et al., 1993). Naphthaleneacetic acid (NAA) is an auxin-type growth regulator that primarily is used to reduce preharvest drop. NAA does not strengthen up the fruit attachment, but only prevents further loosening from the fruit stem (Kvikliene et al., 2010; Schupp and Greene, 2004; Yuan and Li, 2008).

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One application of naphthalene acidic acid (NAA) may delay apple fruit drop for 10 to 14 days after treatment, and repeated applications of NAA delay fruit abscission more than single applications (Marini et al., 1993).

The aim of this study was to assess the effects of Obsthormon 24a (NAA) on the Gala Must variety used during the preharvest period, on fruit drop.

## MATERIAL AND METHOD

The researches were made during the period of 2013 year in the apple superintensive orchard founded in autumn 2006 at the company "Dacfruct" Ltd. with "knip boom" type apple trees crown formation.

The study object of experience was Gala Must apple tree variety grafted on weak vigor M9 rootstock. The crown was conducted on ameliorated thin spindle system. Distance of plantation is 3.5 x 1.2 m.

The chemical growth regulator used was Obsthormon 24a, containing 84 g/l active ingredient NAA, the preparation by the „L. Gobbi Ltd.“ producer from Italy. To optimize the fruit dropping of the apple trees were experimented the following variants:

V<sub>1</sub> - Control variant- without chemical treatments;

V<sub>2</sub> - Obsthormon 24a - 300 ml/ha;

V<sub>3</sub> - Obsthormon 24a - 375 ml/ha.

On experimental section in accordance with the experiences scheme in the second and in the third variants were made a single treatment (09/15/13) with a dose of 300 ml/ha and 375 ml/ha.

Fruit drop was evaluated one time, in harvest period. Dropping fruit was expressed as percentage of total fruit yield.

Firmness was measured with a penetrometer (FT- 327) with 11 mm diameter probe. Soluble solids content was measured with a refractometer.

## RESULTS AND DISCUSSIONS

The apple orchard frequently in the fall before harvest register prematurely fruit dropping. To exclude this phenomenon or decrease of dropped fruits is advisable to treat the trees with NAA 1-3 weeks before harvest. Of these preparations widespread in the European Community have become Hergon L, Obsthormon 24a etc.

The conducted investigation, demonstrate that during treatment (15/08/2013) the amount of fruit in apple trees of Gala Must variety constituted 87 - 90 pcs (tab. 1). This amount of fruit in the trees crown is considered optimal to achieve consistent and quality productions annually. If, in the control variant, the total amount of fruit from the tree crown was 88 pcs, then in the variants where was used the growth regulator Obsthormon 24a, it ranged from 87 - 90 pcs/tree. A slight increase in the amount of fruit was recorded from variant 2, where planned treatment with Obsthormon 24a in dose of 300 ml/ha - 90 pcs/tree, compared to variant Obsthormon 24a in dose of 375 ml/ha - 87 pcs/tree.

This slight difference between variants in study, 3 pcs/tree, allowed us to mount the experiment for testing the growth regulator Obsthormon 24a to prevent premature fruit dropping in the autumn before harvest.

On the day of harvest (29.08.2013) was registered, the amount of fruit in the studied variants was 76 to 88 pcs. The small amount of fruit in the trees crown was recorded for control variant - no treatment, where the studied index was 76 pcs/tree.

In the variants treated with the growth regulator Obsthormon 24a the amount of fruit in the crown of trees was placed between 86-88 pcs. In the variant Obsthormon 24a in dose of 300 ml/ha the amount of fruit recorded maximal values 88 pcs/tree, and when the dose of treatment was 375 ml/ha - 86 pcs/tree. The difference between the amount of fruit in variant Obsthormon 24a in dose of 300 ml/ha and control variant without treatment was 8 pcs/tree, and between Obsthormon 24a in dose of 375 ml/ha and control variant - 10 pcs/tree.

*Table 1*

**The influence of growth regulator Obsthormon 24a on the quantity of fruits before and after treatment in the trees of the variety Gala Must, average fruit weight and diameter**

Variants	Quantity of fruits, pieces			The average weight, g	The average diameter, mm
	total per tree at treatment	on trees at harvest	dropped under the trees		
Control, without treatment	88	76	12	148.0	69.7
Obsthormon 24a, 300 ml/ha	90	88	2	148.5	70.8
Obsthormon 24a, 375 ml/ha	87	86	1	149.0	71.0

The most important index of apple plantation treatment with growth regulator to prevent fruit dropping is the amount of fruits on the ground. The conducted investigations show that in the control variant is recorded the largest amount of dropped fruit - 12 pcs/tree.

The treatments with growth regulator Obsthormon 24a essentially decreased premature fruit dropping before harvest. In the variant Obsthormon 24a dose 300 ml/ha the amount of dropped fruit was 2 pieces and in the variant Obsthormon 24a in dose of 375 ml/ha was only a fruit. So, treating trees with growth regulator Obsthormon 24a improved physiological processes taking place in plants didn't allow forming suber layer between stalk and fruit bearing formations and prevent premature fruit drop.

The use of growth regulators Obsthormon 24a influenced insignificantly and on the average fruit weight and diameter. If the average weight of fruits in the control variant was 148.0 g and diameter was 69.7 mm, in the variant of treatment Obsthormon 24a in dose of 300 ml/ha the studied indexes were respectively increased by 3.4% and 15.7% and in the variant Obsthormon 24a in dose of 375 ml/ha with 6.7% and 18.6%.

Studying the influence of the dose treatment on analyzed indicators, we noticed an essential difference between variant Obsthormon 24a in dose of 300 ml/ha and in dose of 375 ml/ha. In the variant Obsthormon 24a in dose of 300 ml/ha the amount of dropped fruits were 2 pcs/tree and in the variant Obsthormon 24a in dose of 375 ml/ha was 1 pcs/tree. The average diameter of the fruit weight was the same.

Fruit production is one of the major indexes to assess the technological elements that were conducted in apple plantation.

The data of table 2 shows that growth regulator Obsthormon 24a did not influence the production of fruit and was placed at the same level as in the control variant, without treatment. In the control variant, fruit production amounted to 29.76 t/ha, in the variant Obsthormon 24a in dose of 300 ml/ha – 30.33 t/ha and Obsthormon 24a in dose of 375 ml/ha - 29.62 t/ha.

*Table 2*

**The influence of Obsthormon 24a growth regulators on fruit production obtained from a unit area of the variety Gala Must at harvest t/ha**

Variants	Production, t/ha			The difference between the production left and control
	total	dropped under the tree	in the tree	
Control, without treatment	29.76	4.21	25.55	-
Obsthormon 24a, 300 ml/ha	30.33	0.78	29.55	+ 4.00
Obsthormon 24a, 375 ml/ha	29.62	0.36	29.26	+ 3.71
LSD 5%	1.21	-	1.18	-

It is obvious that the amount of total production, some fell on the ground until the harvest, and the other was collected from the crown of trees. The amount of production collected from the ground and from the crown of the tree is different and has been influenced by treatments with Obsthormon 24a whose active ingredient is naphthaleneacetic acid.

In the control variant, production collected from trees crown was 25.55 t/ha and harvested from the ground for industrialization 4.21 t/ha, or 16.48% of the qualitative one.

The treatment with growth regulator Obsthormon 24a positively influenced on maintaining maximum production in the crown of apple trees. When the treatment was with Obsthormon 24 in dose of 300 ml/ha production collected from crown was 29.55 t/ha and from the soil 0.78 t/ha, which constituted 2.64% of the share of quality. In the variant Obsthormon 24a in dose of 375 ml/ha lawfulness exposed to the previous variant is available, and the share of

production of poor quality picked from the ground was 1.23% compared to that harvested from crown.

The effectiveness of treatment with growth regulator Obsthormon 24a is demonstrated by the production difference collected in these variants and control variant. In variant treatment with growth regulator Obsthormon 24a in dose of 300 ml/ha, the difference between output collected from the crown in time variant and control variant was 4.0 t/ha and in the variant Obsthormon 24a in dose of 375 ml/ha - 3.71 t/ha.

The conducted investigations (tab. 3) demonstrates that fruit pulp firmness on Gala Must apple variety 15 days before harvest variants in the study was 8.3 to 8.4 kg/cm<sup>2</sup>.

At the time of harvest (15 days after treatment) Gala Must variety flesh firmness decreased to a value of 6.5 to 6.9 kg/cm<sup>2</sup>. The small farm has been in version control - 6.5 kg/cm<sup>2</sup>. When treating with growth regulator Obsthormon 24a, pulp firmness was 6.8 to 6.9 kg/cm<sup>2</sup> which demonstrates that treatments with product based on naphthaleneacetic acid inhibit physiological processes of formation of ethylene and increases fruit firmness.

*Table 3*

**The influence of growth regulators Obsthormon 24 on firmness and soluble solids content of fruits of Gala Must apple variety**

Variants	Firmness, kg/cm <sup>2</sup>			Soluble solids (% harvest)	
	at treatment	at harvest	dropped fruits	fruits of the tree	dropped fruits
Control, without treatment	8.3	6.5	5.6	13.2	14.9
Obsthormon 24a, 300 ml/ha	8.4	6.8	5.7	12.8	14.7
Obsthormon 24a, 375 ml/ha	8.4	6.9	5.6	12.8	14.9

Dropped fruits on the ground have a much lower firmness compared to the ones in the crown of the tree. The firmness of the fruit of the studied variants ranged from 5.6 - 5.7 kg/cm<sup>2</sup>. Therefore, the difference in firmness of dropped fruits on the ground and the ones in the tree crown that were collected were 0.9 - 1.3 kg/cm<sup>2</sup>.

The fruit soluble solids determine the optimal harvest time. As harvest time approaching, the intensity of accumulation of soluble dry substances is increased.

The obtained data demonstrates that the amount of fruit soluble dry substances of the tree, at Gala Must variety, in the study variants was 12.8 to 13.2%.

The highest value of the weight soluble dry substance was obtained in the control variant - 13.2%. When treating with growth regulator Obsthormon 24a, we notice a decline by 0.4% compared to the control variant where the studied

index is 12.8%. The latest number demonstrates that growth regulator Obsthormon 24a increased fruit firmness and decreased the amount of soluble solids.

Dropped fruits have a smaller firm and a high content of soluble solids, representing in the study variations from 14.7 to 14.9%. The amount of soluble solids demonstrates that fruit drop to the ground before maturation, and can only be used for industrialization.

Conducted investigations demonstrates that convincing results on quality index record the variant where was used the growth regulator Obsthormon 24a in dose 300 ml/ha.

## CONCLUSIONS

The treatments made with growth regulator Obsthormon 24a based of NAA (84 g/l) 15 days before harvesting decreased essentially the amount of dropped fruits.

The fruit firmness and soluble solids content recorded higher values in variants treated with Obsthormon 24a then in the control variant.

Based on the experimental results obtained, the growth regulator Obsthormon 24a can be included in the technological system to prevent premature fruit dropping before harvest ripening apple production to Gala Must variety in dose 300 ml/ha, applied by means of the spray by 15 days before harvest.

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