INFLUENCE OF FOLIAR APPLICATION OF FERTILIZATION AND FRUIT THINNING ON FRUIT PRODUCTION AND QUALITY

INFLUENŢA APLICĂRII FERTILIZĂRII FOLIARE ŞI RĂRIRII FRUCTELOR ASUPRA PRODUCŢIEI DE FRUCTE ŞI CALITĂŢII LOR

BALAN V., VĂMĂŞESCU S.
State Agrarian University of Moldova,
Chisinau, Republic of Moldova

Abstract. *He studied the quantity and quality of fruit of apple varieties Golden Delicious and Idared, grafted on M26, between growth and fructification, according to foliar fertilization and fruit thinning. Trees were led by slink spill. To slow chemical product used Bioprzerzedzacz SL 060 and the leaf nitrogen fertilization was used as Urea with 46% and Poly-Feed. Average harvest in the 2008-2009 years was 19,9-26,8 t / ha for the variety Golden Delicious and 16,3-25,9 t / ha in variety Idared. Fruit quality indices have been subject to variety, the production method of thinning of fruit and foliar fertilizer application.*

Key words: apple, foliar fertilizer, chemical thinning, hand thinning, harvest.

Rezumat. *S-a studiat cantitatea şi calitatea fructelor de măr de soiurile Golden Delicious şi Idared, altoite pe M26, în perioada de creştere şi rodire, în funcţie de fertilizarea foliară şi rărirea fructelor. Pomi au fost conduşi după fusul subţire .Pentru rărirea chimică s-a folosit produsul Bioprzerzedzacz 060 SL, iar pentru fertilizarea foliară azotul a fost utilizat sub formă de Uree cu 46% şi Poly - Feed. Recolta medie în anii 2008-2009 a constituit 19,9-26,8 t/ha la soiul Golden Delicious şi 16,3-25,9 t/ha la soiul Idared. Indici de calitate a fructelor au fost condiţionaţi de soi, nivelul producţiei, metoda de rărire a fructelor şi aplicarea îngrăşămintelor foliare.*

Cuvinte cheie: măr, îngrăşăminte foliare, rărit chimic, rărit manual, recolta.

INTRODUCTION

In determining the intensity of thinning reproductive organs must ensure a reserve of flowers to prevent any losses caused by late spring frosts. Fruit thinning is performed to increase the capacity of recovery of the remaining fruit trees and reduce the tendency to enter the frequency of fructification (V. Balan et. al., 2001; M. Stop 2004). Thinning fruit in developing only a single fruit per inflorescence reduces competition among fruits (competition for light, nutrients and water), allowing each individual fruit to obtain the desired size, large fruit (I. Grosu, 2005; A. Peşteanu, 2007, V., Balan, R., Şaganian, 2008). Developing too many fruits generates small fruits and poor quality. In the U.S., growers try to obtain only one fruit for every two inflorescences (FG Dennis, 2000; M. Iancu, O., Găgeanu, 2007). Getting a large production of fruit and competitive largely depends on the

variety of biological features and the technology applied. Foliar fertilization, chemical and manual thinning of fruit have a significant contribution to maintaining the physiological balance between growth and fructification and increase the quantity and quality of fruit (V. Balan, 2009).

MATERIAL AND METHOD

Planting of trees was established in spring 2003 with a one year trees in SA "Zubreşti" district Străşeni. The trees of Golden Delicious and Idared varieties grafted on rootstock M 26 were planted at 4x2 m distance and led by Slim manage. Clayey soil carbonate mold, maintaining the estate worked. Variants are located every 32 trees in random variation. To enhance the quality of the fruit in mining technology in bearing apple orchards were held following (table 1). For slow chemical product Bioprzerzedzacz 060 SL was used in concentration 0.075%, the fruit of the flower center had a diameter of 10-12 mm, and manual thinning was conducted after the fall of physiological, when fruits have reached 16-18 mm in diameter. Chemical and manual thinning of fruit has been applied to the background application of foliar fertilization and for operating conventional technology intensive apple orchards.

Table 1

Type of the mineral fertilizers, concentration and performance of the foliar treatments

variant	Fruit thinning method	Period performance treatments and foliar nutrients concentration,%				
		When 75% of the flowers have fallen, $(NH2)_2$ CO	When the fruits have a diameter of 10-12 mm, $(NH2)_2$ CO	When the fruits have a diameter of 25-30 mm, $(NH2)_2$ CO	When fruits are ripe stage, Poly-Feed	With 4 weeks before harvest, $CaCl_2$
V1	Control - no thinning	Water	Water	Water	Water	Water
V2	Control - no thinning	0,5	0,8	1,1	0,1	0,6
V3	Chemical thinning	Water	Water	Water	Water	Water
V4	Chemical thinning	0,5	0,8	1,1	0,1	0,6
V5	Chemical + hand thinning	Water	Water	Water	Water	Water
V6	Chemical + hand thinning	0,5	0,8	1,1	0,1	0,6
V7	Hand thinning	Water	Water	Water	Water	Water
V8	Hand thinning	0,5	0,8	1,1	0,1	0,6

For leaf nitrogen fertilization was used as Urea with 46% active substance, consuming 1000 liter per hectare in that concentration (tab1). The first treatment was applied after flowering (75% of the flowers have fallen) in a dose of 0.5%, second - when fruit were 10-12 mm in diameter in a concentration of 0.8% and the third - when fruits were diameter of 25-30 mm. In treatment 4, during ripen stage fruit, Poly-Feed

product to use a dose of 0.1% having constituted the report 19:19:19 NPK nutrients and micronutrients 6 (Fe, B, Mn, Zn, Cu, Mo).

Four weeks before harvesting the fruit, to use calcium chloride concentration of 0.6% in the treatment 5.

Investigations of foliar fertilization and the normalization of a load of fruit from apple or methods of research conducted through field and laboratory stationary Golden Delicious, Idared varieties, grafted on M26 rootstock.

Establishing harvest is done for each tree separately, weighing the production of the 32 trees and making the arithmetic mean. Average weight of fruit is determined by weighing the balance of a sample of 100 apples, which represents both shape and degree of maturity. Soluble solids is determined using the device GAZ-20, titrated acidity - by neutralizing an aqueous extract of fruit volume with a solution of NaOH - 0.1 N in the presence of phenolphthalein as indicator and expressed as percents malice acid-dominant (E. P. Şirocov, 1985).

RESULTS AND DISCUSSIONS

Stimulation fructification or removal of part of the yield (Standardization) is a necessary and required surgery to obtain quality fruits especially the apple, pear and peach. (I. Grosu, 2005; Gheorghe Petre et. Al. 2007; V. Balan, R. Şaganian, 2008)

Manual fruit thinning is not possible due to labor intensive and slow chemical means is already common practice in intensive fruit plantations (table 2). During growth and fruit-bearing trees and Workloads foliar fertilization of fruit load had a significant influence on average fruit weight and productivity and insignificant on the number of fruit per tree. Thus, in 2008, the number of fruit per tree, for example, the tree of the variety Golden Delicious in version control was 162-165 fruit/tree, whereas this indicator was 133-135 fruit/tree the version with chemical thinning, of 136-138 fruit/tree in versions with chemical thinning and maintenance manual of 134-135 fruit/tree in the version with a slow hand. This difference is explained by the application of hand thinning of fruit. The average mass of fruit was significantly influenced by foliar fertilization and fruit thinning method.

In 2008, for example, the tree of the variety Golden Delicious, in version control, average fruit weight was 98-109 g, while the trees of the same variety, but the versions with the application of thinning the fruit, the value of this index up 120-150 g for chemical thinning, 133-139 g - chemical thinning and revision of textbooks and 135-136 g - hand thinning. The variety Idared, compared to the control, the variations of chemical thinning (V3, V4) and chemical thinning and manual revision (V5, V6) recorded increases in fruit weight from 100 g to 140-172 g in 2008 and from 102 g to 144-173 g in 2009.

Regardless of the method of thinning the fruit, average fruit weight is increased in variants foliar fertilization application. Thus, the overall mass of the variety Golden Delicious fruit, for example, the variant with chemical thinning without using mineral fertilizers (V3) was 150 g and the version where they applied foliar fertilization (V4) this index was 120 g. The average mass of fruit, the variations with chemical thinning and maintenance manual (V6) and manual

thinning (V8) with foliar fertilization was higher by 3.5% compared with variants (V5, V7) without foliar fertilization.

In 2009, the Golden Delicious variety average fruit weight was from 89 g (V1) up to 125 g (V4) exceeding witness in ferilizare leaf variants with 19.9 %. Fruit weight was higher compared Idared variety Golden Delicious variety. If, for example, the tree of the variety Idared to variants which applied a slow manual (V7, V8) The average fruit weight was 178-180 g (2008 year) and 188-197 g (2009 year), when the trees of Golden Delicious variety - was 135-136 g (2008 year) and 137-140 g (2009 year).

Table 2

Fruit production by variety and fruit thinning on foliar fertilizer application background (Rootstock M 26, 4x2 m planting distance, SA Zubreşti, 2008-2009)

Variant	Number of fruits at the tree		The average mass 1 fruit, g		Yield t/ha	
	2008 year	2009 year	2008 year	2009 year	2008 year	2009 year
Golden Delicious variety						
V1	165	180	98	89	20,2	**20,0**
V2	162	150	109	111	22,0	**20,7**
V3	133	144	150	156	25,2	**26,8**
V4	135	138	120	125	19,9	**22,5**
V5	136	142	139	143	24,0	**25,9**
V6	138	145	133	138	22,5	**24,5**
V7	135	148	135	140	22,8	**25,9**
V8	134	148	136	137	22,8	**25,4**
DL 95%	3,55	3,40	4,83	5,84	1,36	**1,21**
Idared variety						
V1	175	128	100	102	21,9	**16,3**
V2	150	100	137	143	25,6	**17,8**
V3	143	95	140	156	22,5	**17,1**
V4	120	93	150	144	25,9	**18,1**
V5	100	77	172	173	23,6	**16,1**
V6	110	80	165	167	20,6	**17,3**
V7	111	82	179	188	24,8	**19,3**
V8	100	85	180	197	22,5	**20,9**
DL 95%	**4,45**	**4,76**	**6,31**	**3,36**	**1,28**	**0,76**

Applying methods of fruit thinning has a direct impact on fruit production. Thus, the Golden Delicious variety in chemical thinning options (V3, V4), chemical thinning and maintenance manual (V5, V6), or manual thinning only increase production ranged between 12.8% and 24.8% in 2008 and 12.5% and 34.0% in 2009 compared to the control (V1) without any special intervention. The variety Idared fruit ranged between 20.6 and 25.9 t/ha in 2008 and 16.1 and 20.9 t/ha in 2009 year to provide high definition of quality fruit. Use of foliar fertilizers while chemical thinning of fruit or plant protection treatments also had an impact on fruit production. On the background of the application of 4 treatments with

foliar fertilizers containing nitrogen production growth in version control (V2) compared to the control (V1) with no special intervention was 8.1% higher in the variety Golden Delicious, and 14,4% in variety Idared.

Application of foliar fertilizers to variants chemical thinning, chemical thinning and manual or manual thinning but also helped increase production by 13.5% from the variety Golden Delicious and 12.7% in variety Idared. Obtain optimum fruit production and quality constant is determined by cultural and technical progress to date. The application of foliar fertilization, chemical and manual thinning of fruit is determined decisively both quantity and quality fruit production.

For a fair assessment of fruit quality was determined by weight, content of soluble solids, titrated acidity and firmness (table 3). Fruit quality indices have been conditioned by variety, the production method of fruit thinning and application of foliar fertilizers. Fruit firmness in comparison, in the framework of the same methods of fruit thinning, it is found that it ranged between 7.5 and 8.3 kg/cm^2 at the variety Golden Delicious and between 7.2 and 8.0 kg/cm^2 in variety Idared .

Table 3

Quality fruit indices thinning method based on the background of their foliar fertilizer application. (Rootstock M 26, 4x2 m planting distance, SA Zubreşti, 2008-2009).

Variant	Quality fruit indices					
	Firmness, Kg/cm^2		Titrated acidity,%		Soluble dry matter,%	
	2008 Year	2009 Year	2008 Year	2009 Year	2008 Year	2009 Year
Golden Delicious variety						
V1	**8,2**	**7,9**	**0,27**	**0,26**	**14,1**	14,3
V2	**9,3**	**7,8**	**0,34**	**0,33**	**14,6**	14,4
V3	**7,5**	**7,8**	**0,24**	**0,24**	**14,4**	15,6
V4	**8,1**	**7,8**	**0,32**	**0,33**	**13,9**	14,3
V5	**8,1**	**7,8**	**0,31**	**0,32**	**14,4**	14,3
V6	**8,3**	**7,9**	**0,32**	**0,29**	**14,3**	14,4
V7	**8,3**	**8,1**	**0,33**	**0,33**	**14,4**	14,4
V8	**8,1**	**7,9**	**0,31**	**0,34**	**14,2**	14,2
Idared variety						
V1	**8,0**	**7,7**	**0,6**	**0,5**	**14,0**	14,1
V2	**7,2**	**7,4**	**0,52**	**0,50**	**14,1**	14,7
V3	**7,3**	**7,2**	**0,47**	**0,47**	**13,5**	13,3
V4	**7,4**	**7,4**	**0,48**	**0,46**	**14,1**	14,5
V5	**7,3**	**7,4**	**0,47**	**0,46**	**14,2**	14,2
V6	**7,4**	**7,4**	**0,46**	**0,48**	**14,3**	14,5
V7	**7,5**	**7,5**	**0,45**	**0,43**	**14,2**	14,1
V8	7,3	7,4	0,47	0,48	14,1	14,1

Analyzing the values of soluble solids content and titratable acidity of fruit presented in Table 3 compared to the data presented in the literature (E, P, Şirocov,

1985, V. Balan et. al. 2001), we can state that they are mean those that are considered normal, without reaching the limits considered as symptoms of deficiency and varies from year to year in the framework of the variety, the fruit thinning method and application of foliar fertilization.

Regardless of the method of thinning titrated acidity content ranged between 0.26% and 0.34% in Golden Delicious variety and between 0.43% and 0.52% in variety Idared. Content of dry substances soluble variety Golden Delicious apples are from 13.9 to 14.7%. The study presented evidence that quality fruit of the varieties Golden Delicious and Idared least vary thinning methods applied in the experiment.

CONCLUSIONS

1. Application Workloads chemicals to harvest the apple varieties Golden Delicious and Idared causes slight reduction in production, together with improving the quality of fruit.

2. Average harvest in the years 2008-2009 was 19,9-26,8 t/ha for the variety Golden Delicious and 16,3-25,9 t/ha in variety Idared. To increase the quantity and competitiveness of the fruit, it is necessary to exploit technology intensive apple orchards practiced foliar fertilization with mineral fertilizers in 5 stages, chemical thinning of fruit product Bioprzerzedzacz 060 SL when fruit flower center has between 10 and 12 mm, supplemented with a slow hand, the fruit of the flower center reached 16-18 mm in diameter.

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