# INFLUENCE OF FERTILIZATION AND CLIMATE ON APPLE FRUITS RIPENING UNDER AGROECOPEDOLOGICAL CONDITIONS OF "V. ADAMACHI" FARM, IAŞI

## INFLUENȚA FERTILIZĂRII ŞI A UNOR INDICI CLIMATICI ASUPRA GRADULUI DE MATURARE A FRUCTELOR LA MĂR, IN CONDITIILE AGROECOPEDOLOGICE ALE FERMEI „V. ADAMACHI", IAŞI

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***Abstract.*** *In the present study was monitored the level of apples maturity at harvest for two years consecutively. Experience was conducted in "V. Adamachi" Farm, Iasi, by application of mineral and foliar fertilizers in an apple trees orchard, Idared variety. The optimal time for fruit harvesting is determined by their destination. Assessing the level of starch hydrolysis through iodine test and fruit firmness, are two tests used to estimate the optimal timing of harvesting. Differences were observed between the fertilization variants through the level of fruit maturity during the two years of study. Lowest values were recorded for control variant and foliar application variants only. Apple fruits firmness at harvest was generally lower in 2011 compared to 2010, and so starch content, fact that rushed harvest time.*
**Key words:** fertilization, apple fruits, starch content, firmness

***Rezumat.*** *În lucrarea de față s-au făcut aprecieri asupra gradul de maturare a merelor în momentul recoltării, timp de doi ani consecutiv. Experiența desfăşurată în cadrul fermei didactice „V. Adamachi", Iaşi, a urmărit efectele aplicarii de îngrăşămintelor minerale şi foliare într-o livadă de măr soiul Idared. Momentul optim de recoltare a fructelor se stabileşte în funcție de destinația acestora. Aprecierea gradului de hidroliză al amidonului prin proba cu iod, precum şi determinarea fermității fructelor, sunt două teste utilizate în estimarea momentului optim de recoltare. S-au observat diferențe ale gradului de maturare atât între variantele de fertilizare cât şi între cei doi ani de studiu. Valorile cele mai scăzute s-au înregistrat la varianta martor şi la variantele fertilizate exclusiv foliar. Fermitatea fructelor cât şi conținutul în amidon la recoltare, în anul 2011, au înregistrat valori mai ridicate, comparativ cu 2010, fapt ce a grăbit recoltarea acestora.*
**Cuvinte cheie:** fertilizare, măr, conținutul în amidon, fermitate

## INTRODUCTION

Idared variety is one of the most popular and commercially important apple cultivars in Romania. Idared fruits are harvested in the end of september, begining of october, and can be stored for 5 - 7 months in order to be placed on

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the market in spring time. To ensure maximum storability, fruits should be harvest when mature, but not fully ripped, otherwise physiological processes are underway fact which complicates long term storage (Ingle et al., 2000). Starch index for should be 6 or 7 according to the "European code for assessing the degree of starch hydrolysis". Starch estimates at harvest were not consistently affected by nitrogen, but tended to be lower in fruits from trees receiving the low rate of nitrogen (136g N/ tree) in august. The highest fruit firmness occured in fruit from trees receiving 136g N/tree in august (Drake, 2002). Knowing fruit firmness is very important; it enables us to determine harvest time, packing and transport, as well as quality and shelf life of apples (Beceanu, 2002).

## MATERIAL AND METHODS

Researches were carried out in Vasile Adamachi Farm, Iassy county,over two years. This study was conducted over one crop Idared variety apple trees, in a 4x4m spacing. Fertilizing treatments were randomised within one block; groups of three trees; in three replications. In the experience were studied 9 variants of fertilization with ground and foliar fertilizers, including the control:

V1 – control;
V2 – mineral fertilization - N60:P60:K60;
V3 - mineral fertilization - N90:P90:K90;
V4 - foliar fertilization - Pentakeep - G;
V5 – foliar fertilization - Cropmax ;
V6 - mineral fertilization N60P60K60 + Pentakeep-G;
V7 - mineral fertilization N90P90K90 + Pentakeep-G;
V8- mineral fertilization N60P60K60 + Cropmax ;
V9– mineral fertilization N90P90K90 + Cropmax;

NPK 15.15.15 was applied 1/3 in autumn and 2/3 in early spring. Foliar fertilizers (Cropmax and Pentakep-G) were applied three times, starting when the fruit was 5 mm in diameter, and every two weeks after.

The starch index was determined by using a 0.1N potassium iodine solution. Firmness [UP] is a measure of texture and it was measured with a penetrometer Stanhope Seta. These two indicators were determined immediately after harvesting apple fruit samples.

## RESULTS AND DISCUSSIONS

Sum of temperatures during the vegetation period in the two years of study, was approximately equal and recorded slight positive deviations from normal. Regarding the rainfall, in 2011 were recorded 353.2 mm during the growing season, as opposed to 2010 when rainfall recorded for the same period were in half.

The literature recommends a period about 165-170 days from blooming to harvesting for Idared variety, because it is suitable for long-term storage ( 5-7 months in cold storage). Due to slightly higher temperatures and more abundant rainfall in 2011, there was a more accelerated ripening of the fruits for Idared apple variety, compared to previous year.

It is noticed that in 2010, as well as in 2011, trees have blossomed in the same time, but harvest time was different; there was a gap of about two weeks between 2010 and 2011 (table 1).

*Table 1*

**Blooming and harvest time, Idared variety**

| Year | Blooming time | Harvest time | Number of days |
|---|---|---|---|
| 2010 | 25 aprilie | 10 octombrie | 168 |
| 2011 | 15 aprilie | 25 septembrie | 153 |

Compared with the control sample, we observed that, in 2010 a better firmness of apple fruits was obtained in V2 and V8 variants. A lower firmness was achieved for fertilization variants V4 and V9. Over the other variants of fertilization there isn't a significant deviation from the control (table 2).

In 2011 an improved firmness was observed in V2 and V5 compared to the control variant. A lower firmness was recorded in V4, V6 and V9. Firmness of fruits harvested in 2011 showed lower values than those from the previous year, values that shows a better firmness.

The hydrolysed starch for apple fruits harvested in 2011 was higher than that of fruits harvested in the previous year; so the amount of unhydrolyzed starch was lower. Compared with the sample control, we find that nearly all fertilization variants rushed starch hydrolysis resulting higher values for starch index.

*Table 2*

**Influența fertilizării asupra gradului de maturare al fructelor in 2011**

| Fertilization variants | | Starch index (0-10) | | Firmness [UP 1mm] | |
|---|---|---|---|---|---|
| | | 2010 | 2011 | 2010 | 2011 |
| V1 | control | 5.7 | 7.7 | 29.1 | 27.1 |
| V2 | N60:P60:K60 | 6.7 | 7.3 | 28.8 | 25.5 |
| V3 | N90:P90:K90 | 5.7 | 6.3 | 29.8 | 27.0 |
| V4 | Pentakeep - G | 6.3 | 5.3 | 30.6 | 34.1 |
| V5 | Cropmax | 6.3 | 8.3 | 29.0 | 26.3 |
| V6 | N60P60K60 + Pentakeep-G | 6.7 | 7.0 | 29.8 | 30.9 |
| V7 | N90P90K90 + Pentakeep-G | 6.3 | 7.3 | 29.2 | 27.1 |
| V8 | N60P60K60 + Cropmax | 5.7 | 8.3 | 28.7 | 27.1 |
| V9 | N90P90K90 + Cropmax | 5.7 | 8.7 | 32.5 | 32.5 |

Fruits harvested in 2011 showed various degrees of hydrolysed starch content, comparing control with variants of fertilization. It highlights the fertilization variants with Cropmax that favored the starch hydrolysis speed in apple fruits.

A correlation between fruit firmness and degree of starch hydrolysis in apple fruits shows for 2010 low fruit firmness for a low degree of starch hydrolysis, while in 2011 was registered an inversely increase of fruit firmness with a higher degree of starch hydrolysis. This is due to differences of precipitation recorded in the studied years, 2011 registered heavy rainfalls compared to 2010, fact that ensured better hydration of fruits and thereby increased fruit firmness.

## CONCLUSIONS

1. Compared with the control sample, nearly all fertilizations variants rushed starch hydrolysis, it is highlighted that fertilization variants with Cropmax led to higher values for starch index.

2. Apple fruits firmness values registered in the two-year study shows that in 2011 the fruits were harvested at a ripeness level more advanced compared to 2010, although the number of days from bloom to harvest was reduced.

3. A correlation between fruit firmness and starch hydrolysis in apple fruit for studied variants of fertilization reveals: in 2010, fruit firmness was lower at a low starch hydrolysis, while in 2011 fruit firmness was higher for a more pronounced starch hydrolysis, fact explained through the heavy rainfall in the second year of study.

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