# EFFECT OF METALOSATE® IRON APPLICATIONS ON PEAR UNDER BELGIAN CONDITIONS

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## Introduction and Aims

Iron deficiency doesn't occur very much in Belgium, but when it happens, it isn't always easy to solve. The standard method is an application through the soil. This application is very dependent on the weather and the pH. Therefore, it is interesting to compare this method with the foliar application of Metalosate® Iron.

## Experimental Design

Different treatments have been applied on 5-year-old Conference [aka Bartlett] Pear on Quince Adams [root stock]. We did one soil application in March, and this application was immediately followed by water in order to reduce the degradation by sunlight. We started with the foliar application after bloom and we sprayed every 2 weeks. Because of the extremely high temperatures in June and July, we treated less during this period. In August, the weather conditions were too bad and we decided to stop the treatments.

The treatments in the experiment have 4 replications. The trial is located at the Experimental Garden, on a parcel where the leaf analyses showed that the iron values were at the bottom line of the optimal values.

**Table 1**
**Treatment Program**

| Treatment | Dose | Date | Total Dose of Iron/Season |
|---|---|---|---|
| 1. Fe-EDTA foliar application | 7 x 1.00 kg/Ha (7 x 0.89 lbs./acre) | 9 May, 24 May, 7 June, 22 June, 7 July, 27 July, 10 Aug | 0.88 kg/Ha (0.79 lbs./acre) |
| 2. Fe-EDDHA soil application | 1 x 15.00 kg/Ha (1 x 13.38 lbs./acre) | 29 March | 0.90 kg/Ha (0.80 lbs./acre) |
| 3. Control | - | - | - |
| 4. Metalosate® Iron foliar application | 7 x 1.30 L/Ha (7 x 1.16 lbs/acre | 9 May, 24 May, 7 June, 22 June, 7 July, 27 July, 10 Aug | 0.44 kg/Ha (0.39 lbs./acre) |
| 5. Metalosate® Iron foliar application +Fe-EDDHA soil application | 7 x 0.80 L/Ha (7 x 10.96 fl. oz./acre) 1 x 15.00 kg/Ha (1 x 13.38 lbs./acre) | 9 May, 24 May, 7 June, 22 June, 7 July, 27 July, 10 Aug 29 March | 0.27 kg/Ha (0.24 lbs./acre) 0.90 kg/Ha (0.80 lbs./acre) |

**Effect of Metalosate® Iron Applications on Pear under Belgian Conditions**

## Results

### *Production 2006*

At harvest, the yield and the size was measured. In the following table these results are summarized. Conference was picked on 11 September.

**Table 2**
**Yield and Size of Pears**

| Treatment | kg/Tree | Number of Pears | Average Fruit Weight (g) |
|---|---|---|---|
| 1. Fe-EDTA foliar application | 21.5 $^{a}$ | 156 $^{a}$ | 139 $^{b}$ |
| 2. Fe-EDDHA soil application | 17.4 $^{b}$ | 110 $^{b}$ | 161 $^{a}$ |
| 3. Control | 20.7 $^{ab}$ | 139 $^{ab}$ | 157 $^{ab}$ |
| 4. Metalosate® Iron foliar application | 26.7 $^{a}$ | 205 $^{a}$ | 131 $^{b}$ |
| 5. Metalosate® Iron foliar application Fe- + EDDHA soil application | 23.2 $^{a}$ | 179 $^{a}$ | 137 $^{b}$ |

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Figure 1 shows the histogram of the fruit size.

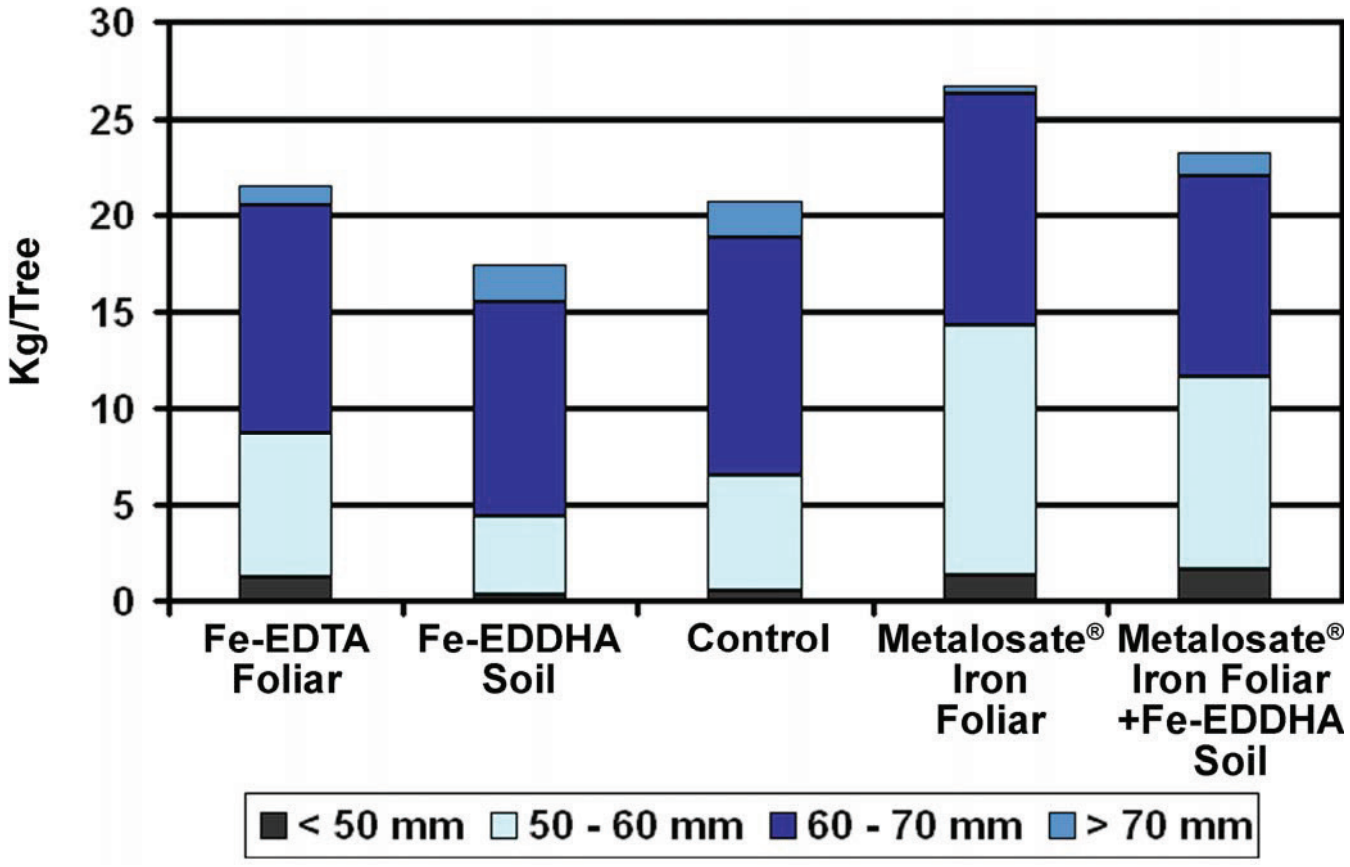


**Figure 1. Size of Conference Pear**

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### *Leaf and Fruit Analyses*

**Iron Level in the Leaves.** One week after each iron application, a leaf sample was analysed to follow the evolution. The next figure shows this evolution. The optimal value of iron is between 60 and 150 ppm.

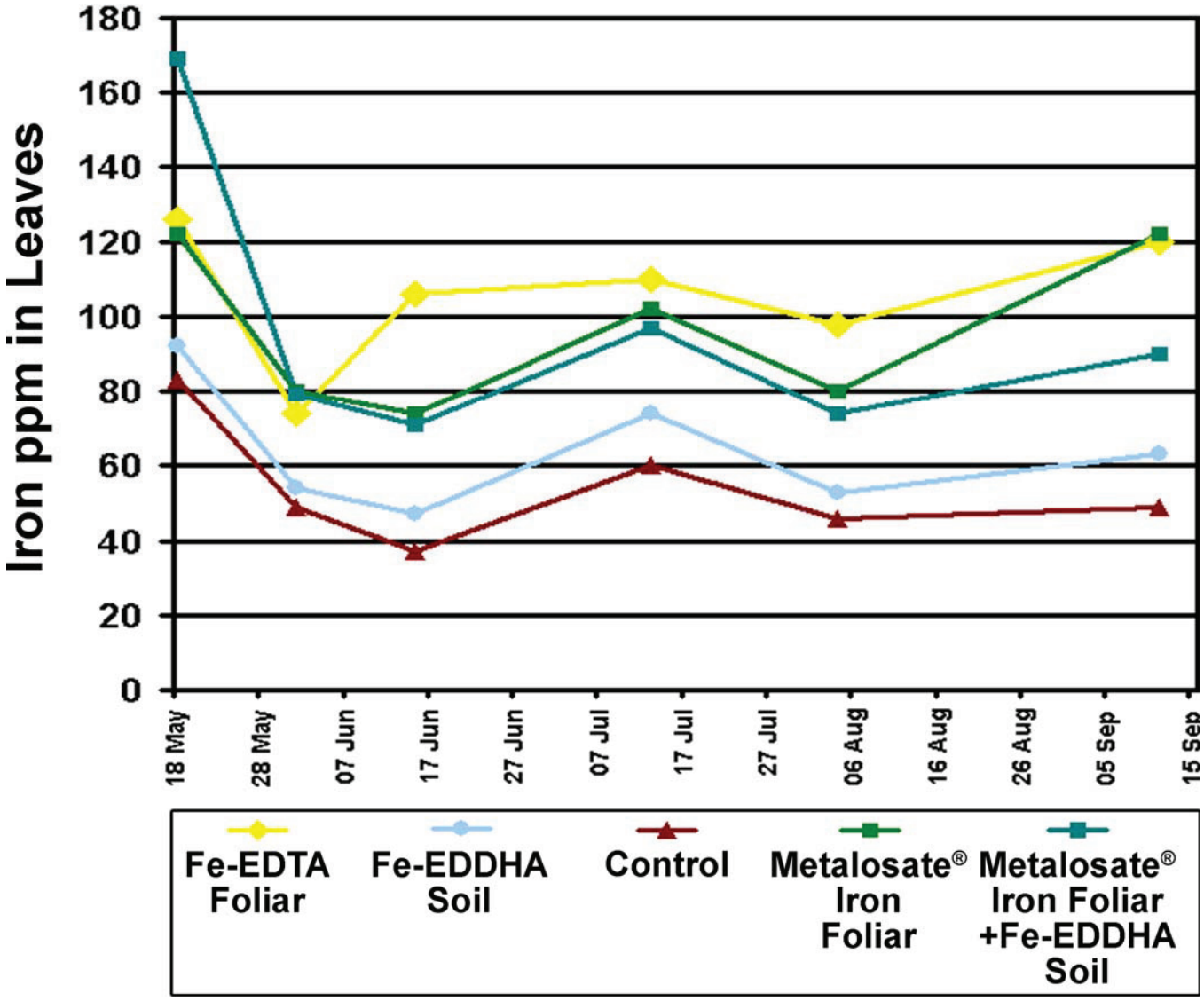


**Figure 2. Evolution of Iron in the Leaves During the Growing Season**

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At harvest, a sample of the old leaves on the one-year old shoot was analysed.

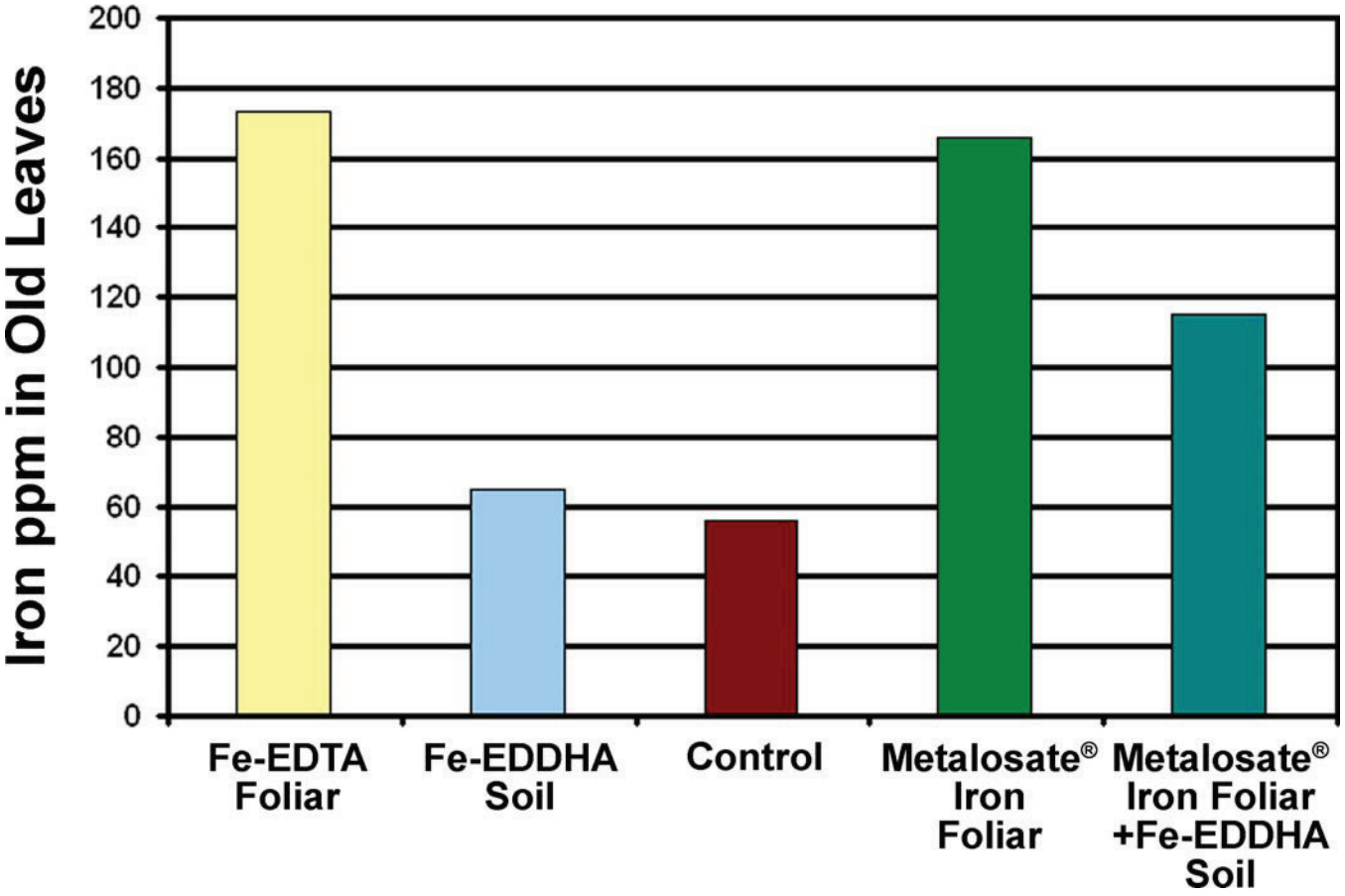


**Figure 3. Leaf Iron Content of the Old Leaves on the One-Year Old Shoot**

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**Leaf Analyses (General).** Figure 4 gives the results of the leaf analysis of all treatments at harvest. We give the evolution of the value of nitrogen (between 2.0 and 3.0%).

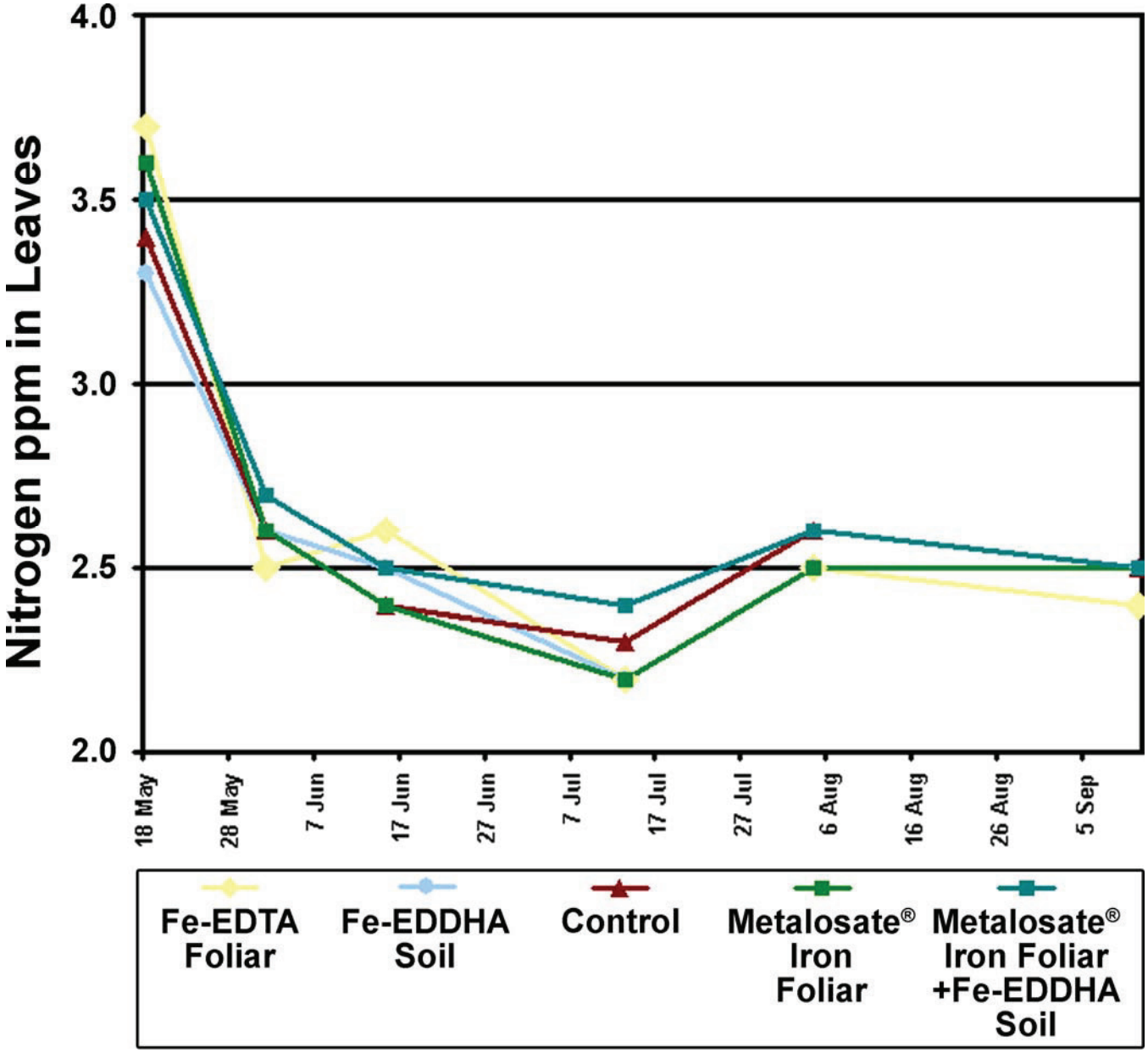


**Figure 4. Evolution of the Leaf Analysis of Nitrogen**

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The leaves were measured with a Hydro N-Tester™. This apparatus measures the chlorophyll content, which should be an indication for the value of nitrogen in the leaf.

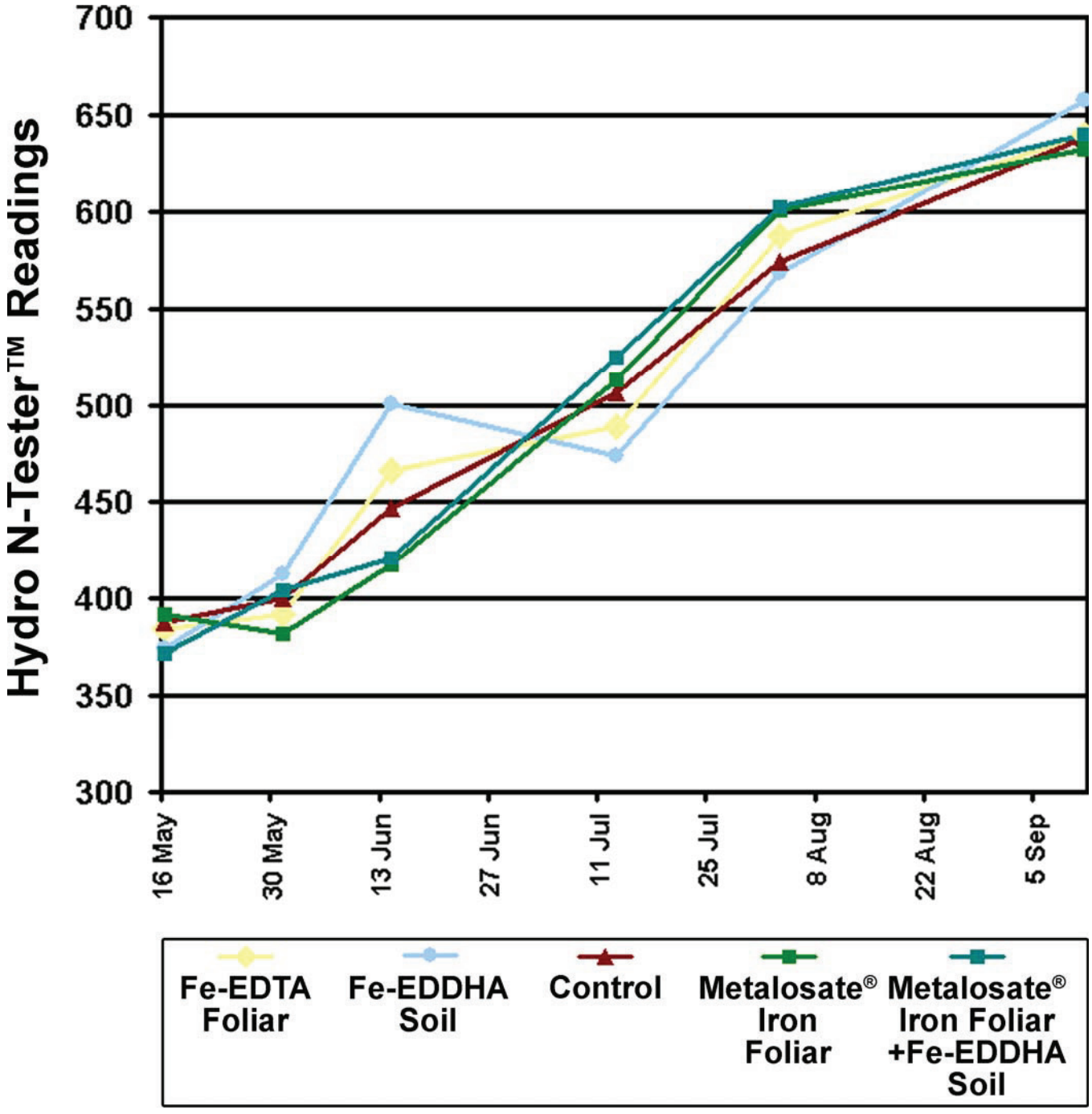


**Figure 5. Evolution of the Hydro N-Tester™ Results**

## Effect of Metalosate® Iron Applications on Pear under Belgian Conditions

We evaluated the correlation between the Hydro N-Tester™ value, and the value of nitrogen and magnesium in the leaves.

**Table 3**
**Correlation between the Hydro N-Tester™ Value, and the Value of Nitrogen and Magnesium in the Leaves**

| Correlation | Hydro N-Tester™ | N | Mg |
|---|---|---|---|
| Hydro N-Tester™ | 1 | | |
| N | -0.51 | 1 | |
| Mg | 0.82 | -0.41 | 1 |

In the next table, the results of the leaf analyses of all treatments at harvest are summarized.

**Table 4**
**Mineral Content of Leaves**

| Treatment | % | | | | ppm | |
|---|---|---|---|---|---|---|
| | N | P | K | Mg | Mn | Fe |
| 1. Fe-EDTA foliar application | 2.2 | 0.12 | 0.54 | 0.36 | 147 | 173 |
| 2. Fe-EDDHA soil application | 2.2 | 0.12 | 0.57 | 0.33 | 146 | 65 |
| 3. Control | 2.2 | 0.11 | 0.50 | 0.40 | 162 | 56 |
| 4. Metalosate® Iron foliar application | 2.3 | 0.12 | 0.45 | 0.36 | 177 | 166 |
| 5. Metalosate® Iron foliar application + Fe-EDDHA soil application | 2.3 | 0.11 | 0.38 | 0.39 | 171 | 115 |
| **Optimal Values** | **2.0-3.0** | **0.15-0.5** | **1.25-2.25** | **0.25-0.5** | **30-100** | **60-150** |

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**Fruit Analyses.** At harvest, the mineral content of the fruits was also examined.

**Table 5**
**Mineral Content of Fruits**

| Treatment | ppm | | | | | | |
|---|---|---|---|---|---|---|---|
| | N | P | K | Ca | Mg | Mn | Fe |
| 1. Fe-EDTA foliar application | 60.3 | 12.8 | 115 | 5.8 | 5.9 | 0.07 | 0.16 |
| 2. Fe-EDDHA soil application | 50.9 | 13.4 | 135 | 5.7 | 6.0 | 0.07 | 0.19 |
| 3. Control | 55.3 | 12.4 | 115 | 5.1 | 5.4 | 0.07 | 0.15 |
| 4. Metalosate® Iron foliar application | 53.6 | 12.0 | 110 | 5.2 | 5.2 | 0.07 | 0.16 |
| 5. Metalosate® Iron foliar application + Fe-EDDHA soil application | 55.0 | 11.9 | 113 | 5.2 | 5.5 | 0.07 | 0.16 |
| **Optimal Values** | **65-80** | **>10** | **120-160** | **6-10** | **6-10** | **0.09-0.15** | **>0.10** |

## Effect of Metalosate® Iron Applications on Pear under Belgian Conditions

### *Fruit Quality*

**Harvest.** The percentage yellow pears was also determined.

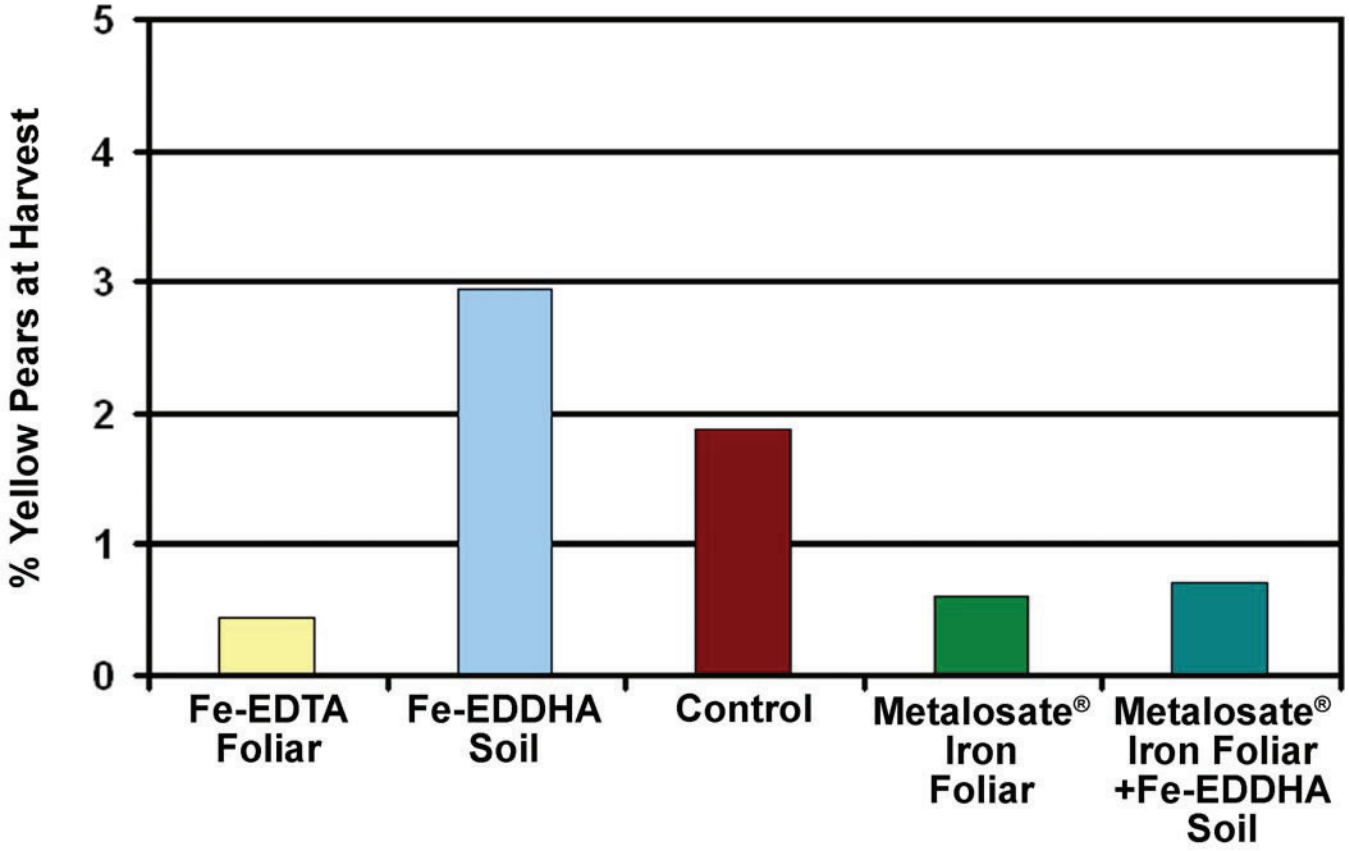


**Figure 6. Percentage Yellow Pears at Harvest**

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At harvest, the fruit quality was also determined by means of firmness, sugar content, and starch value.

**Table 6**
**Fruit Quality**

| Treatment | Firmness (kg/0.5 cm²) | Sugar content (° Brix) | Starch value (1-10) |
|---|---|---|---|
| 1. Fe-EDTA foliar application | 5.2 | 12.9 | 8.4 |
| 2. Fe-EDDHA soil application | 5.3 | 14.8 | 7.7 |
| 3. Control | 5.4 | 13.8 | 8.4 |
| 4. Metalosate® Iron foliar application | 5.4 | 13.0 | 8.8 |
| 5. Metalosate® Iron foliar application + Fe-EDDHA soil application | 5.4 | 13.2 | 8.4 |

## Effect of Metalosate® Iron Applications on Pear under Belgian Conditions

**After Storage.** From every treatment, a sample was stored in controlled atmosphere storage until February. After storage and after shelf life, the ground colour was determined. The following figure gives the evolution of the number of green pears.

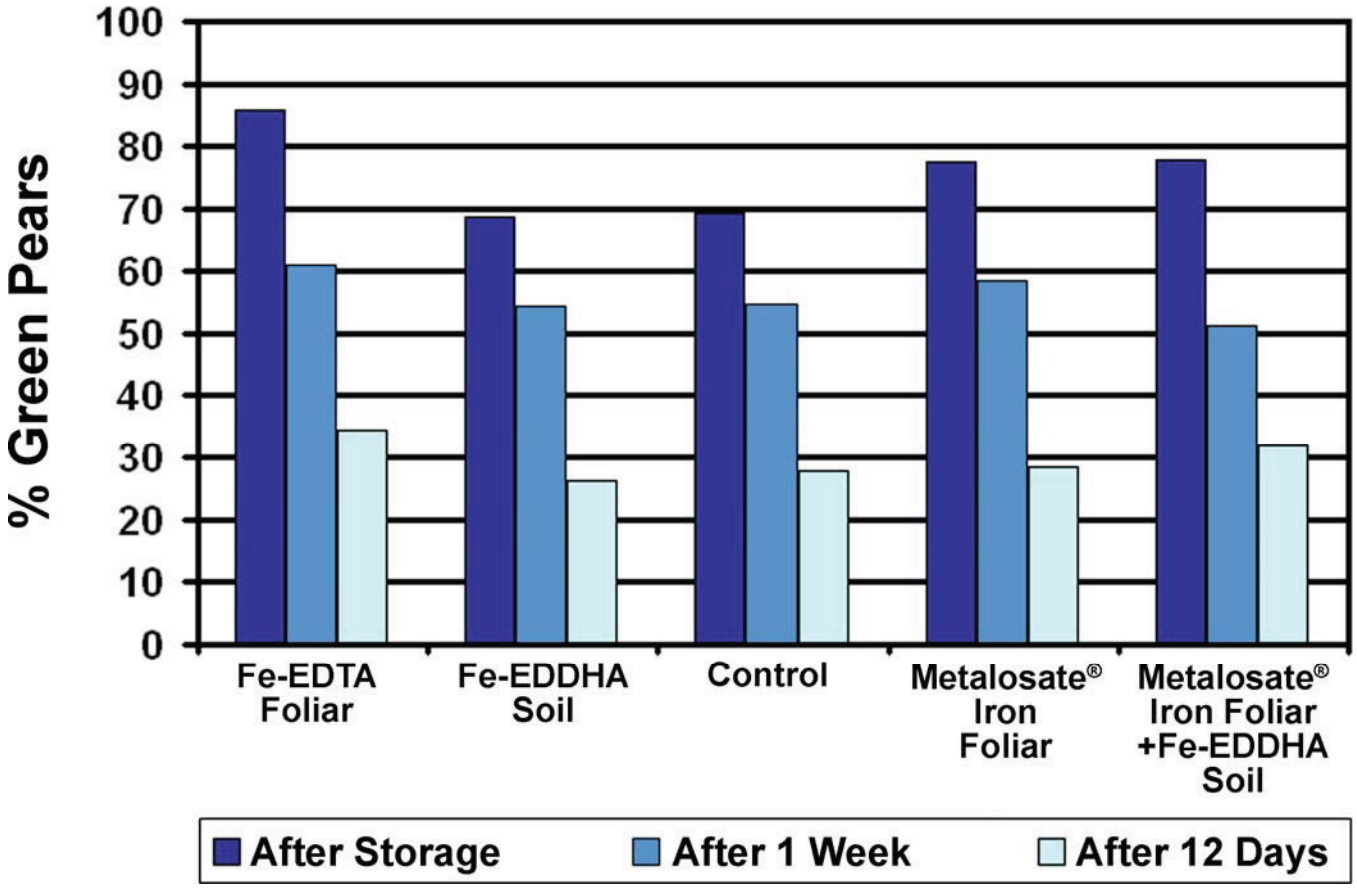


**Figure 7. Evolution of Green Pears after Storage**

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## Discussion

### *Leaves*

The evolution of the iron in the leaves varies between the different treatments. The highest level is found with the EDTA application. The two treatments with Metalosate® Iron show little difference. Only at the end of the season, there is an increase in the iron level at the basis of the 1-year-old branches, with a treatment of 0.8 L/Ha. The soil application has little effect.

All leaf samples have been measured with a Hydro N-Tester™. This value should be a measure for the photosynthesis and should give an idea of the nitrogen content in the leaves. In this trial there is no relation between both parameters. On the other hand, there is a correlation of 82% between the Hydro N-Tester™ value and the magnesium content.

### *Fruit*

The application of iron is done to promote greener fruits. At harvest, Treatment 2 (soil application) has the highest iron content in the fruits, but had the most yellow pears. The number was still negligible. Treatment 2 also had the highest sugar content and the smallest starch value at harvest.

After the harvest, Treatment 2 had again more yellow fruits. The best results were obtained by Treatment 1 (foliar application of EDTA). During shelf life, the number of green pears decreased so that the differences disappeared after one week.

## Conclusion

The foliar applications didn't give any increase of the iron content in the fruits. Only with a soil application in spring we can increase the iron content in the fruits. Only when there are deficiency symptoms on the leaves, foliar applications can be a solution.

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