The Behavior of Potato Mid-Early Varieties Concerning Production when Treatments with Unconventional Products Are Performed (2013-2014)

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ABSTRACT

The potato is a plant which has great importance for human nutrition, animal feed and industrial processing. Mid early potato varieties studied (Amelia, Robusta, Christian, Dacia, Impala and Roclas) reacted differently to the application of treatments with conventional and unconventional products. As is clear from the data obtained, the application of both conventional and unconventional treatments, the varieties taken into study, reacted differently to the application of the same treatments. We conclude that this is due to the effects of remineralization, rebalancing and regenerating of the metabolic processes of plants, nutrient content of main products, secondary products and trace elements acting on the plant cells, even in relatively unfavorable climatic conditions for potato culture.

Keywords: potato, mid-early varieties, unconventional products, production.

INTRODUCTION

The potato is a plant which has great importance for human nutrition, animal feed and industrial processing [Ştefan, 2005]. Rightly considered the ‘second bread’ of the world, the potato is one of the nicer food [Mogârzan et al., 2004]. Today, with the population explosion, potato, along with several other plants is hope for mankind ensuring adequate food supplies, competing with the most important food: cereals, meat, fruit.

This paper aims to identify and quantify the behavioral aspects of semi late potato varieties in terms of production, the application of unconventional treatments with products.

MATERIALS AND METHOD

To achieve its designed objectives polifactorial experience, type 2 x 6 x 6 in three repetitions, to identify the conduct semi late potato varieties in production facilities, the application of treatments with products where FACTOR - the experimental years 2013 or 2014; Factor B - semi late potato varieties: Robusta, Amelia, Christian, Dacia, Impala, Roclas; Factor C - unconventional products: Bordeaux mixture, Bionat, Biostar, Glutaxim, Terra Sorb Foliar, Maxiroot

In the experiments conducted at the Research and Development Station Jucu, in addition to application behavior varieties produced conventional and unconventional treatments, was pursued the behavior variety of different earliness groups in specific climatic conditions of the area in terms of production. To determine the production of potato were set three stages:

I. In the first stage, the main activity was the collection, this activity is carried out during the
potato harvesting optimum and suitable climatic conditions. Two weeks before harvest, it was taken an action preceding the harvest namely creeping destruction, with the main role to step up the tubers. Actual harvest was done manually on each variation and repetition in part, to avoid production losses and damage to tubers.

II. The second step consisted in counting tubers on each variant (to determine the average weight of a tuber for each variety), their calibration in 3 fractions (high, middle tiers, small) and weighing tubers from each.

III. A third phase focused on the preparation of a database with the results you get in phase II. After the creation of the database, the results obtained after weighing (kg) per variant and repetition were reported in part per hectare. For reporting data obtained per hectare was used „simple rule of three“ following formula:

\[
\frac{Q_{\text{var}}}{S_{\text{var}}} = \frac{X}{10000 \text{ m}^2}
\]

\[
Q_{\text{var}} - \text{the weight of each variant tubers}
\]

\[
S_{\text{var}} - \text{variable surface}
\]

Results were statistically interpreted and formed the basis of determining the effectiveness of treatment products applied on conventional and unconventional production and the attack in the varieties studied.

**Productivity of mid early potato varieties in experimental years**

In these experiments, we used six mid early potato varieties, namely Amelia, Robusta Christian, Dacia, Impala and Roclas. Next, to assess the behavior of these varieties in terms of production, the application of foliar greenhouse phytoprotective against major pathogens. The experimental results obtained on the production are shown in Table 1.

The data in Table 1 it appears that, following the application of foliar treatments, the yields obtained in 2013, 3 of the 6 varieties under study are higher than the yields obtained in 2014. In 2013 there were positive registered significant differences compared to control (Robusta variety) variety Dacia positive and significant differences in the varieties Amelia and Christian. In 2014, there were negative significant differences from the control varieties and Impala Dacia and a significantly negative difference unica variety. Amelia and Christian varieties were not

<table>
<thead>
<tr>
<th>R1</th>
<th>R2</th>
<th>R3</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S2</td>
<td>S3</td>
</tr>
<tr>
<td>S4</td>
<td>S5</td>
<td>S6</td>
</tr>
</tbody>
</table>

27 m length of experience (6 varieties x 2 rows x 0.75 m between rows x 3 repetitions)
12 m Width experience (6 treatments x 2 m between treatments)
Total area 324 m²

**Fig. 1** Experimental scheme
The Behavior of Potato Mid-Early Varieties Concerning Production

The influence of some conventional and unconventional treatments applied on mid early potato varieties upon production

As seen in Table 1, the yields recorded in two experimental years were different. Climatic data recorded Research Station Jucu, underline the fact that during the potato growing season, rainfall records were distributed unevenly, while temperatures have exceeded the annual average. In Table 2 shows the yields obtained during experiments and the average yields obtained, the

<table>
<thead>
<tr>
<th>Year</th>
<th>Variety</th>
<th>Production (t/ha) 2013</th>
<th>Difference</th>
<th>Duncan Test</th>
<th>Production (t/ha) 2014</th>
<th>Difference</th>
<th>Duncan Test</th>
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<tbody>
<tr>
<td>2013</td>
<td>Robusta</td>
<td>16.36</td>
<td>0.00</td>
<td>Mt.</td>
<td>21.89</td>
<td>0.00</td>
<td>Mt.</td>
</tr>
<tr>
<td></td>
<td>Amelia</td>
<td>18.60</td>
<td>2.23</td>
<td>*</td>
<td>21.96</td>
<td>0.07</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Christian</td>
<td>18.55</td>
<td>2.19</td>
<td>*</td>
<td>22.46</td>
<td>0.58</td>
<td>-</td>
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<tr>
<td></td>
<td>Dacia</td>
<td>20.09</td>
<td>3.73</td>
<td>***</td>
<td>16.96</td>
<td>-4.93</td>
<td>000</td>
</tr>
<tr>
<td></td>
<td>Impala</td>
<td>17.07</td>
<td>0.71</td>
<td>-</td>
<td>17.61</td>
<td>-4.28</td>
<td>000</td>
</tr>
<tr>
<td></td>
<td>Roclas</td>
<td>15.76</td>
<td>-0.60</td>
<td>-</td>
<td>19.39</td>
<td>-2.50</td>
<td>0</td>
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<tr>
<td></td>
<td></td>
<td>DL (p 5%)</td>
<td>1.30</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>DL (p 1%)</td>
<td>1.77</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DL (p 0.1%)</td>
<td>2.39</td>
<td></td>
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</tr>
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</table>

The main features of mid-early varieties taken in the study

<table>
<thead>
<tr>
<th>Nr. crt.</th>
<th>Issues on the main features</th>
<th>Robusta</th>
<th>Amelia</th>
<th>Christian</th>
<th>Dacia</th>
<th>Impala</th>
<th>Roclas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Maturity</td>
<td>Mid-early</td>
<td>Mid-early</td>
<td>Mid-early</td>
<td>Mid-early</td>
<td>Mid-early</td>
<td>Mid-early</td>
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<tr>
<td>2</td>
<td>Productive potential</td>
<td>52.4 t/ha</td>
<td>70.6 t/ha</td>
<td>70.6 t/ha</td>
<td>95.6 t/ha</td>
<td>Ridicată High</td>
<td>65.9 t/ha</td>
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<tr>
<td>3</td>
<td>Resistance to common scab (Synchitrium endobioticum)</td>
<td>Resistant</td>
<td>Resistant</td>
<td>Resistant</td>
<td>Resistant</td>
<td>Resistant</td>
<td>Resistant</td>
</tr>
<tr>
<td>4</td>
<td>Tuber shape</td>
<td>Roundly</td>
<td>Roundly egg-shaped</td>
<td>Egg-shaped</td>
<td>Roundly egg-shaped</td>
<td>Long egg-shaped</td>
<td>Egg-shaped</td>
</tr>
<tr>
<td>5</td>
<td>Bark color</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Yellow</td>
</tr>
<tr>
<td>6</td>
<td>Core color</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Yellow</td>
</tr>
<tr>
<td>7</td>
<td>Resistance to Potato Leafroll Virus (PLRV)</td>
<td>Resistant</td>
<td>Resistant</td>
<td>Sensitive</td>
<td>Resistant</td>
<td>Susceptible to twisting</td>
<td>Resistant</td>
</tr>
<tr>
<td>8</td>
<td>Resistance to Potato Virus Y (PVY)</td>
<td>Resistant</td>
<td>Very resistant</td>
<td>Middle resistant</td>
<td>Very resistant</td>
<td>Good resistance</td>
<td>Middle resistant</td>
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<tr>
<td>9</td>
<td>Resistance to Late Blight (Phytophthora infestans)</td>
<td>Middle resistant</td>
<td>East sensitive</td>
<td>East sensitive</td>
<td>Sensitive on leaf</td>
<td>Susceptible on leaf</td>
<td>Middle resistant</td>
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</table>

Tab.1. Productivity of mid early potato varieties in experimental years

<table>
<thead>
<tr>
<th>Year</th>
<th>Variety</th>
<th>Production (t/ha) 2013</th>
<th>Difference</th>
<th>Duncan Test</th>
<th>Production (t/ha) 2014</th>
<th>Difference</th>
<th>Duncan Test</th>
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<tr>
<td></td>
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<td>Mt.</td>
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<td>-</td>
</tr>
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<td>000</td>
</tr>
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<td>17.61</td>
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<td>-2.50</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DL (p 5%)</td>
<td>1.30</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>DL (p 1%)</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>DL (p 0.1%)</td>
<td>2.39</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

significantly different from control. Figure 2 shows that, compared to the average yields recorded in the two years The experimental, Robusta varieties, Amelia, Christian, Impala and unica experimental highlighted in 2014 while in 2013, only the variety Dacia s recorded higher yields than the average.

Production differences in the experimental years may be justified by the fact that rainfall records, especially during the growing season has been uneven, registering temperatures higher values from the annual average.
application of conventional and unconventional treatments. After analyzing the data in 2013, the variants that were applied to Terra Sorb Foliar products and Maxiroot, the differences were significantly negative. Other products have significant differences. The data presented in 2013, follows that any treatment applied to unconventional products have significant differences from the control positive. In 2014, the application of treatment products, bionic Biostar, Glutaxim, Terra Sorb Foliar and Maxiroot very significant differences were recorded negative. Average yields in the experimental years all varieties mid early in the study (Table 2), obtained by interpreting the results using Duncan test highlights that the application of treatment products Bionat, Glutaxim, Terra Sorb Foliar and Maxiroot were registered significant

Tab. 2. The influence of some conventional and unconventional products, applied on mid early varieties upon production

<table>
<thead>
<tr>
<th>Year</th>
<th>Treatment</th>
<th>2013 Production (t/ha)</th>
<th>Difference</th>
<th>Significance</th>
<th>2014 Production (t/ha)</th>
<th>Difference</th>
<th>Significance</th>
<th>Average 2013-2014 Production (t/ha)</th>
<th>Difference</th>
<th>Significance</th>
</tr>
</thead>
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<tr>
<td></td>
<td>Bordeaux mixture</td>
<td>19.33</td>
<td>0.00</td>
<td>Mt. EFG</td>
<td>22.29</td>
<td>0.00</td>
<td>Mt. I</td>
<td>20.81</td>
<td>0.00</td>
<td>Mt. EF</td>
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<tr>
<td></td>
<td>Bionat</td>
<td>18.43</td>
<td>-0.90</td>
<td>DEFG</td>
<td>18.49</td>
<td>-3.81</td>
<td>000 DEFG</td>
<td>18.46</td>
<td>-2.35</td>
<td>000 CD</td>
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<tr>
<td></td>
<td>Biostar</td>
<td>18.58</td>
<td>-0.75</td>
<td>DEFG</td>
<td>18.80</td>
<td>-3.49</td>
<td>000 DEFG</td>
<td>18.69</td>
<td>-2.12</td>
<td>000 CD</td>
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<td>Glutaxim</td>
<td>18.88</td>
<td>-0.45</td>
<td>DEFG</td>
<td>14.47</td>
<td>-7.82</td>
<td>000 A</td>
<td>16.67</td>
<td>-4.14</td>
<td>000 AB</td>
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<tr>
<td></td>
<td>Terra Sorb Foliar</td>
<td>16.98</td>
<td>-2.36</td>
<td>BCDE</td>
<td>16.76</td>
<td>-5.53</td>
<td>000 BCD</td>
<td>16.87</td>
<td>-3.94</td>
<td>000 AB</td>
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<td>Maxiroot</td>
<td>16.88</td>
<td>-2.45</td>
<td>0 BCD</td>
<td>16.88</td>
<td>-5.42</td>
<td>000 BCD</td>
<td>16.88</td>
<td>-3.93</td>
<td>000 AB</td>
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<td>DL (p 5%)</td>
<td>1.95</td>
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<td>DL (p 5%)</td>
<td>1.38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DL (p 1%)</td>
<td>2.57</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DL (p 1%)</td>
<td>1.82</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DL (p 0.1%)</td>
<td>3.29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DL (p 0.1%)</td>
<td>2.33</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 2. Productivity of mid early potato varieties compared with the years average
The Behavior of Potato Mid-Early Varieties Concerning Production

CONCLUSIONS

Mid early potato varieties studied (Amelia, Robusta, Christian, Dacia, Impala and Roclas) reacted differently to the application of conventional and unconventional treatments with products.

Table 3 presents the yields obtained from the 6 mid early varieties studied, the two experimental years, the application of treatment. Further data will be analyzed each year experimental basis, and the average yields obtained in the two experimental years.

Analyzing the data in Table 3, after applying treatments with conventional and unconventional products in 2013, it is noted that, mid early varieties studied behaved very differently in terms of production.

Variety Amelia, when applying unconventional treatments Biostar product, recorded a production increase higher compared to control (Bordeaux mixture), the differences being very significant positive significant positive respectively compared to the control.

If Robusta variety in 2013, tratmentele applied unconventional products did not influence the productivity of the variety, the differences are insignificant compared to the control.

Compared to the varieties mentioned, the Christian variety treatments, reacted negatively in terms of output. The only treatment that has positively influenced unconventional production is the Bionat, in which case the difference was recorded significant positive compared to the control. When applying treatments with other products, the differences were not significant compared to the control.

Dacia mid early potato variety, among the six studied, was the only one who reacted very negatively to the unconventional application of treatment products.

Impala reacted negatively semi-early variety, in terms of production, the application of unconventional treatments Bionat product. Where the other treatments with unconventional products, the differences were insignificant in 2013 compared trainer.

As shown in Table 3, obtained by interpreting reultatelor using multiple comparison test (Test Duncan), mid early variety Roclas reacted positively to the application of treatment product unconventional Glutaxim, the differences are distinct significantly positive or significantly positive compared with its trainer. When applying other products, the differences were not significant compared to the control.

The data in Table 3 we can say that in 2013, applying unconventional treatments Bionat and Glutaxim products have positively impacted production potential of varieties. This can be justified by the fact that 2013, in terms of climate was unfavorable with temperatures higher than the annual average and the uneven distribution of rainfall, especially during the potato vegetation. Nutrients contained unconventional products, in conjunction with the precocity group they belong to varieties sudiu taken have had a positive influence on production rather unfavorable climatic conditions for potato cultivation.

In experimental year 2014 mid early varieties behaved differently from the 2013 application treatments. Products of unconventional stands Biostar, increases production of the variety Amelia registered variant treated with this product is distinctly significant positive compared to the control, while the product unconventional Bionat had a negative influence on production, the difference recorded being significantly negative from the witness.

If Robusta variety is remarkable unconventional Atonik product, the differences being very significant positive resect positive significantly distinct from the witness.

Variety Christian reacted very well to the application of unconventional treatments Bionat and Biostar products, production increases very significantly positive compared with its treatment has been applied to the product Bordeaux mixture (control).

If the first three varieties have reacted favorably to the application of conventional and unconventional treatments products, as shown in Table 3, Dacia varieties, Impala and Roclas reacted unfavorably applied to most products.
### Tab. 3. The behavior of potato mid-early varieties concerning production when treatments with unconventional products are performed

<table>
<thead>
<tr>
<th>Factor a (year)</th>
<th>Factor c (treatment)</th>
<th>Factor b (varieties)</th>
<th>Amelia</th>
<th>Robusta</th>
<th>Christian</th>
<th>Dacia</th>
<th>Impala</th>
<th>Roclas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Production (t/ha)</td>
<td>Difference</td>
<td>Semnificance</td>
<td>Production (t/ha)</td>
<td>Difference</td>
<td>Semnificance</td>
<td>Production (t/ha)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2013</td>
<td>2014</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bordeaux mixture</td>
<td></td>
<td></td>
<td>16.15</td>
<td>0.00</td>
<td>Mt. 18.03</td>
<td>0.00</td>
<td>Mt. 20.50</td>
<td>0.00</td>
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<td>Bionat</td>
<td>24.65</td>
<td>8.50 ***</td>
<td>15.07</td>
<td>-2.96</td>
<td>-</td>
<td>25.61</td>
<td>5.11</td>
<td>*</td>
</tr>
<tr>
<td>Biostar</td>
<td>15.46</td>
<td>-0.69</td>
<td>19.11</td>
<td>1.08</td>
<td>-</td>
<td>22.73</td>
<td>2.23</td>
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<tr>
<td>Glutaxim</td>
<td>21.96</td>
<td>5.81</td>
<td>13.04</td>
<td>-4.19</td>
<td>-</td>
<td>18.73</td>
<td>-1.77</td>
<td>-</td>
</tr>
<tr>
<td>Terra Sorb Foliar</td>
<td>20.76</td>
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<td>16.65</td>
<td>-1.38</td>
<td>-</td>
<td>18.88</td>
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</tr>
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<td>18.26</td>
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<td>-2.50</td>
<td>-</td>
<td>21.23</td>
<td>0.73</td>
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<td></td>
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<td>17.65</td>
<td>0.00</td>
<td>Mt. 18.29</td>
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<td>19.54</td>
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<td>-</td>
<td>18.52</td>
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<td>Terra Sorb Foliar</td>
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<td>18.78</td>
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<td>21.64</td>
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<td>4.78</td>
<td>4.78</td>
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<td>4.78</td>
<td>4.78</td>
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<td>DL (p 5%)</td>
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<td>DL (p 0.1%)</td>
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</table>
Variety Dacia reacted unfavorably to most unconventional applied products, recorded very significant differences from the control negative. If Impala variety, most treatments applied to unconventional products have negatively affected the productive potential of the variety, the differences being very significantly negative or significantly negative distinct from the control (Table 3).

Of the six varieties studied, Roclas variety is distinguished by the fact that he reacted negatively to the application of the 6 treatments.

As is clear from the data presented in Table 3 mid early varieties studied behaved differently in the two experimental years. If 2013 Amelia variety of unconventional react favorably after treatment bionic 2014 reacted unfavorably same variety. This can be justified perhaps by the fact that in two experimental years, the climatic conditions were different. In terms of rainfall, 2014 was rich, and in this case, probably applying unconventional Bionat product would not be appropriate. Dacia varieties and Impala reacted unfavorably to the application of treatment in two experimental years, with steadied that in 2014, the variety Impala reacted unfavorably to the application of most products.

We conclude that this is due to the effects of remineralization, rebalancing and regenerating metabolic processes of plants, nutrient content of products in primary, secondary and micronutrients that act on the plant cells, even in relatively unfavorable climatic conditions for potato cultivation. Besides the favorable effects These products help to intensify the process of photosynthesis, thereby hardening the synthesis corofil cells and other proteins (carbohydrate) cells and due to this reaction, accelerates metabolism of plants, which leads to increased root system so deep and the number of bristles absorbing, increasing the capacity of absorption of nutrients in the soil solution.

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