

POTATOES (*Solanum tuberosum*)

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Potato is herbaceous perennial which belongs to the family *Solanaceae*. In the *Solanum* genus, there are over 150 species of tuber-bearing plants including potatoes. It is considered that potatoes originate from the Andes (Peru and Bolivia). Potatoes are among the most important plants that are used in feeding people and livestock. Potato is plant that grows 50-100 cm in height. Underground stem (stolon) is a continuation of overground stem. The end of stolon can easily thicken and shape of several tubers (up to twenty or sometimes even more) of different sizes and shapes. From South America, Spanish moved plant to Europe in the second half of 16 century. In the 17th and 18th century, potatoes spread to Europe and became the main agricultural cultivated plant in Ireland, Germany and the countries of Central Europe. Potatoes are one of the most important plants in human nutrition; potato tubers are very nutritious and easily digestible. Contain large amounts of vitamin C, various amino acids, proteins, tiamin and nicotinic acid.



Solanum tuberosum

Ecological conditions of growing potato

Potatoes are grown for tuber, which is used for human consumption, for feeding livestock and for industrial purposes. Potato is grown on very large areas in the world, in temperate climate. Potato culture may grow aslo up to an altitude of 1000 meters, in the Andes and even more. In the subtropical area potatoes are grown as winter crops. Potato requires good soil preparation and adequate fertilizer before planting. The best potatoes are grown on lighter, drained soils, but potato culture is not very demanding on the quality of the soil. Potatoes require good fertilization, especially if the soil is poorly fertile. Potato especiallyrequires increased potassium fertilizers (K_2O). Potatoes culture, which exhausted the soil because the tone of one potato tubers from the soil brought about 6 kg of potassium, 3.2 kg of nitrogen, 1.6 kg of phosphorus (P_2O_5), 0.4 kg magnesium (MGO) and over 30kg of calcium (CaO)



Figure 1. - The picture above shows the planting of potatoes in the conditions of peasant production of potatoes in the Croatian atea of Zagorje. Photo D. Dumancic

Potatoes require good fertilization, especially if the soil is of poor fertility. So successful cultivation of potatoes should be well prepared regarding soil and fertilizers, especially organic fertilizers (stable mature manure, compost, green manure), which, among other things, significantly improve the fertility, texture and soil structure. To fertilization with organic manure usually certain amounts of mineral fertilizers are added, which are not required if the potato is sprayed 5-6 times with **HERBAGREEN®**. Previous experience has shown that **HERBAGREEN®** can fully compensate for fertilization with mineral fertilizers, especially where fertilization was performed with the necessary quantities of manure.

Potato culture is attacked by many diseases (bacteria, fungi, and viruses), parasites and pests. It has been recorded more than 200 kinds of diseases that attack the plant during vegetation period. Just to mention potato rootworm (*Leptinotarsa decemlineata*) whose larvae equally as well as adult insects can completely destroy the potato leaf, and thus the whole plant.

Economic importance and geographical distribution of potato crop

Potato is important because cultures grown on very large areas of many countries on all continents (over 150 countries). Worldwide production of potatoes in 2007 amounted to 333.5 million tons produced on 18.8 million hectares. On average, produce 17:23 tonnes per hectare. Potato occupies fifth place in the world by volume manufacture (after sugar cane, corn, rice and wheat.)

The world's biggest potato producers are China (64.8 Mt), Russia (36.8Mt), India (28.6 Mt), USA (20.4Mt) and Ukraine (19.0 Mt). Productions of these countries represent half of world production



Figure 2. - The picture is taken in full bloom development of potato plants. Treated plants with **HERBAGREEN® are strong and resistant to disease owing to the influence of **HERBAGREEN®** that increases the immunity of plants for all types of infections. Also, treated plants are more resistant to attacks by various pests and especially to attack of potato beetle. This photo was taken after the third treatment with herbagreeno.**

HERBAGREEN®

impact on the quality and yield of potatoes

Numerous experiments in different countries of the world confirm the very positive impact of **HERBAGREEN®** on the overall growth, development and production of potatoes. All experiments conducted so far confirm the excellent results achieved with **HERBAGREEN®**. Experiments so far carried out in a number of countries, and here we outline only the most important, Croatia, France, Russia, Turkey, Macedonia, Serbia, Germany, Spain and many others. All results so far obtained can be briefly summarized as follows:

- After the first treatment a young potato plant gets very dark green leaves, which proves that the intensity of photosynthesis in the plant is strongly increased (because of CO_2 from the calcite - CaCO_3 which is in the inter cellular area decomposed to $\text{CaO} + \text{CO}_2$). The chloroplasts become very active and create sufficient chlorophyll for the vital processes.
- Regular repeated spraying of **HERBAGREEN®** intensifies the biological processes so that the plant becomes very vital and very resistant to all biotic and abiotic stress;
- The treated plants showed an increased resistance to important diseases of potatoes, significantly reducing the number of preventive and protective treatment with chemicals;
- Regular treatment with **HERBAGREEN®**, resulted in strong resistance of plants against attacks by Colorado potato beetle and other parasites;
- One of the most important impact of regular treatment of potato with **HERBAGREEN®** is the increase of the yield by 20-30% compared with untreated potatoes on the same plot;
- It also intensified the flowering of potatoes, increased the number of flowers, the blossoms are larger with intensive colour and open at the same time. Flowers of treated plants give larger fruits in which seeds of potato became ripe with increased germination power.
- Treated potato contains a greater percentage of dry matter (15-20%)

- Matured potatoes have uniform shape, uniform colour, and the surface of them is smooth and bright. Treated potato plants give the same size, same shape and healthy appearance;
- Potato treated has improved the taste because it contains higher amounts of protein, amino acids, vitamin C and other important ingredients for human nutrition.



Treated with **HERBAGREEN®** (3 X)

Untreated

Figure 3. - In the picture above we can see the potato treated three times and no treated potato tubers, the differences are large. Treated potato is given higher size and similar shape. Tuber colour was lighter. As these tubers of potatoes vary according to size, color and form, even bigger is the difference by taste and nutritive value. Treated potato tubers contain 20% more dry matter than untreated tubers. (Photo Ž. Horvat) resulting in a longer shelf life.



Figure 4. - In the picture above (taken in Chuvashiya, Russia, 2008), we can see two different rows of potatoes. Right row is treated only once with **HERBAGREEN®**, while the left row is not treated. As you can clearly see a row of treated potatoes is in full development and flowering. In treated row we did not find any Colorado potato beetle, so that the plants had no damage or diseases. In contrast, an untreated row potato was completely destroyed by an attack of Colorado potato beetle.
(Photo D. Dumančić)

Conclusion

Potatoes certainly belong to the crops that have so far provided amazingly good results after using the **HERBAGREEN®**. Results were particularly good where spraying of plants was performed more frequently (once a week or once every ten days). In many other potato fields application of **HERBAGREEN®** led to even more favourable results than those we have above stated in regard to increased production and in terms of quality of potatoes, as well as for potato resistance to unfavourable conditions, the emergence of diseases and pests and the emergence of unfavourable environmental conditions and disturbances (drought, cold, excessive heat, large humidity, etc.).