

A new possibility of improving common bean tolerance to frosts

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Common bean has been one of the most important vegetable crops in Poland. In 2006, the total area of commercial bean domestic production was over 30, 000 hectares. It is a warm-season crop and therefore hardly tolerates both cold and freezing temperatures. Reportedly, early bean pods forced in April and May under unheated, plastic tunnels sell well and therefore get good wholesale market price. Their production, however is limited due to lack of cold tolerant cultivars. There is though another way to solve the problem: spray the plants with a compound to improve their tolerance to low temperatures.

The idea is not a new one. It brings us back to big losses in the Polish fruit orchards due to early spring frosts every 7-8 years, after which all fruit growers are asking us for immediate help in this problem. An idea is to develop a substance of any nature to protect fruit flowers or any part of plants from low temperature damages. The first research on this problem was carried out on fruit tree flowers, where the damages may result in complete loss of fruit harvest in a given year. The used there compounds: Asahi SL, Tytanit and Help were found in some way useful, but not always fully reliable. Then they were adopted to be used in bean production. The carried out by us trials in the previous years proved that they were effective (especially Help) to protect common bean seedlings in the field from frost damages. At this stage, however, we could not offer anything to improve the seed minimal germination temperature in case of cold soil. Moreover, seed company people and gardeners, when talking to us, had suggested to come up with something more environment friendly, not another chemical to spray on our food.

In these circumstances, we would like to pay your attention to a brand new biological-chemical compound, which in our preliminary 1-year long laboratory and field research trials gave very promising results. Its name is “Crop Natural Plant Antifreezer” (CNPA) developed and registered in Turkey. According to its developer, it contains bacteria of *Thiobacillus* subspecies (*T. ferroxidant*, *T. thioxidant* and *T. thioparus*) and over 50 various mineral compounds. It has been reported to protect various agricultural and horticultural plants (including fruit tree

flowers) from frost damages and harms. According to its producer and distributor, CNPA can be used for both open field and plastic covers crops.

In the first experiment run in the controlled conditions in the laboratory, we looked at its effect on minimal seed germination temperature. Seeds of one of the tested cultivars, when exposed to 8°C (considered to be the critical temperature for bean germination), when soaked with the 0.45% water solution of CNPA, after 9 days germinated in 47.7 % in comparison with the check seeds, which germinated in 22.5% (photo 1). In the other tested cultivar there was also a tendency to better germination when the compound was used.

The experiment was also repeated in the field. Identically soaked seeds of the same cultivars (with one new cultivar) were sown in the field on April 16, i.e. one month before recommended in Poland sowing time. The spring 2007 was cold and on April 21 the night air temperature in the field went down to -3oC and the following day – to -7oC. Moreover, on May 1 we recorded -4.5oC and the following night -3oC. That created excellent natural conditions to test the new compound. Out of pod snap bean cultivars tested, one had clearly better field emergences when the tested compound was used on seeds (photo 2). The other had generally poor field stand, but still those with CNPA had performed better, whereas in the third cultivar no differences were recorded.

We were also looking at number of pods set on an individual plant and final trade pod yield. The latter being important for professional bean growers. In all tested plants, we noticed a tendency to increase a number of pods set on an individual plants and a 20 % increase in fresh pod yields for all plants as a result of the CNPA antifreezing effect.

The preliminary research, although run on a research scale with small number of plants, gave us some idea whether the tested compound worked or not. In our opinion, if the further experiments confirm the 2007 year's results in the field (this time run on a bigger scale), CNPA has a chance eventually to become a useful tool to face low temperature problems in commercial common bean production in Poland.

Photo 1 a -b.

The 9-day old seedlings of the snap bean ‘Libra’ preliminary soaked in 0.45 % water solution of ‘Cropaid NPA’ (left with the green tissues Photo 1a) and the check ones (untreated Photo 1b)



Photo 2

The field with the “Libra” snap bean seeds treated with the compound (left with green seedlings) and the check ones (untreated) one month after sowing seeds

