

# First Experiences with the Use of Chitin to Control Club-root (*Plasmodiophora brassicae*)



NEW! AGRO BIOSOL becomes BIOSOL

**Club-root on broccoli roots: assessment value 4 (see below).  
(photographs W. E. Heller, ACW Wädenswil)**

**The ACW trials produced encouraging results regarding the control of club-root. The use of the chitin-nitrogen fertilizer Biosol reduced the infestation on the trial areas considerably. The researchers will continue the trial in Wädenswil for the next four years.**

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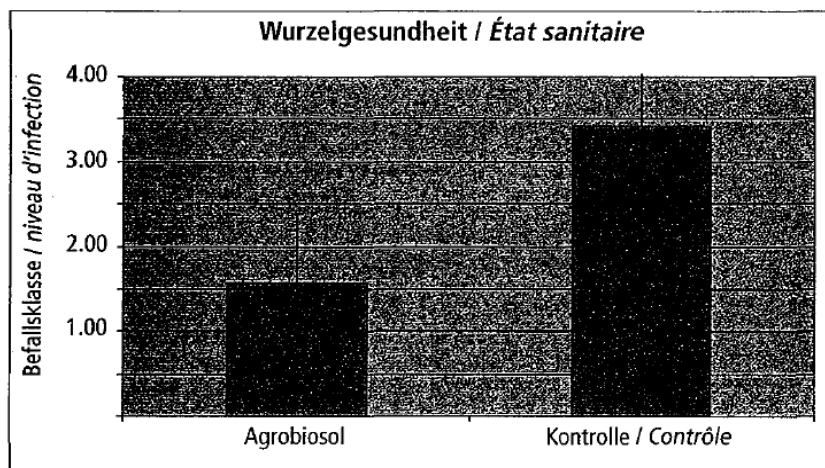
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The pathogen *Plasmodiophora brassicae* causes one of the major plant diseases of crucifers worldwide: club-root. Many vegetable growing areas in Switzerland are also infested, even the ACW experimental farm «Sandhof» in Wädenswil. There is a high infection pressure on plots, on which no crucifers had been grown for 10 years, even after such a long time. This was shown by a planting trial carried out with rucola in 2006. Unfortunately, we have no promising direct chemical agents at our disposal for the control of this parasite. The resting spores can only be destroyed by steaming. In view of the current energy prices, most farmers cannot afford to steam field plots, therefore we searched for a biological approach to control this persistent plant disease.

## **Chitin as a Possible Control Agent**

Why should chitin be effective against club-root? Although the pathogen systematically belongs to the so-called parasitic slime moulds, its cell walls consist of chitin to a large extent. Chitin is one of the most frequently occurring natural substances together with cellulose. The cell walls of

higher fungi and the exoskeletons of arthropods mainly consist of chitin. The natural substance chitin can be degraded in any biologically active soil by fungi and bacteria, i.e., the necessary microflora is available. We now ask ourselves the question, whether the chitin-degrading microflora can be stimulated to greater population and increased activity by an intensive application of chitin. In many coastal regions, fertilizers containing nitrogen, in the form of chitin, from crab shells has been used for a long time. In Switzerland, Agrobiosol is offered as chitin-nitrogen fertilizer. This is dried material and the residue of the biological manufacture of antibiotics from penicillium fungi.



Wurzelgesundheit      root health  
 Befallsklasse        infestation level  
 Kontrolle             control

**Average evaluation of the root health of 168 plants each from the Agrobiosol and control plots (0=no infestation; 1=slight infestation, 2=considerable infestation, 3=heavy infestation, 4=very heavy infestation).**

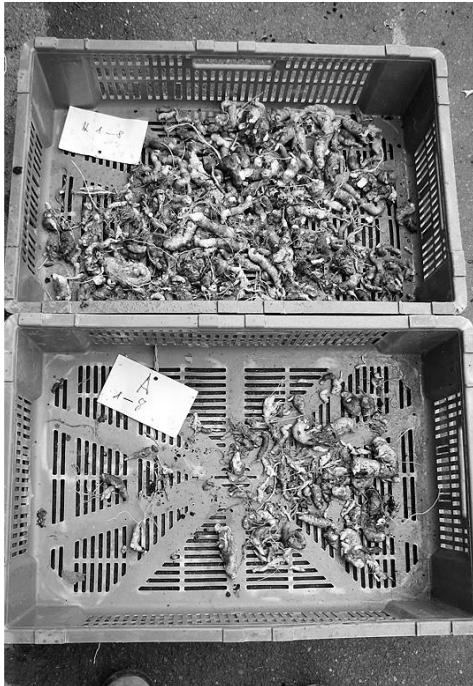
### The Pot Experiment Showed Very Good Results

A first success, was achieved in trials carried out by planting cauliflower in pots containing soil that was infested with club-root. The infestation was considerably reduced by applying large doses of Agrobiosol. Unfortunately, results from pot experiments cannot be applied to field conditions without reservation, therefore we carried out the appropriate trials this year at the «Sandhof» farm.

### Field Trial at the Sandhof Farm

Since we cannot work with excessive Agrobiosol-N applications in the field, the application which suppressed the club-root in the pot experiment, we opted for the long-term effect of ecologically acceptable chitin-N applications. Over a period of four years, plots 25 and 26 were not planted with crucifers, however vigorous weed control was applied. On plot 25, the cultures sweet corn, celery, lettuce, chard, and the intercrop oat were fertilized exclusively with Agrobiosol-N. On plot 26, N-fertilization of the same crop rotation was carried out with mineral fertilizers. In mid June 2007, broccoli of the variety Ironman was planted for the first time on both plots, to test the reduction of the infection pressure of club-root. At the end of September, 168 plants, in eight different blocks of those plots, were dug out as completely as possible in two rounds. The plant roots were washed, the infestation with club-root was evaluated, and the clubs were cut off and weighed. When digging up the plants, there was clearly reduced infestation of club-root found on the Agrobiosol plot. The results of the root assessment of the plants from both plots are shown in the graph.

The clubs were collected and weighed to indicate the infection pressure. A total of 6997 g of clubs were found in the 168 control plants. On the Biosol plot, only 1300 g were found with the same number of plants, which corresponds to a reduction of the club production of 81.4 percent. In addition, the clubs of the plants from the control plot were heavier and partly already brittle and rotten, whereas the few clubs of the plants from the Agrobiosol plot were smaller and mainly intact.



Clubs collected from 48 plants of the Agrobiosol plot (below) and 48 plants of the control plot (above).

## Conclusions and Outlook

The trial clearly showed that it is not sufficient to merely stop growing crucifers, for a period of four years, to noticeably reduce the infection pressure of club-root. Additional accompanying measures are required, such as N-fertilization with Agrobiosol for example. The trials showed that the plots treated with Agrobiosol for a period of four years had a considerably lower infection pressure of club-root. Therefore it is possible to reduce the infestation of plants with this disease by means of the soil microflora for a specific site. The fact that the N-fertilizer effect of Agrobiosol does not correspond to the analytically detectable nitrogen content can be disregarded. It can be assumed that at least part of the «missing» nitrogen was used for the building and activity of a *Plasmodiophora*-suppressing soil microflora.

The trial is continuing for four more years. This is to determine, whether the infection pressure of the club-root pathogen is further reduced during this period. We will also examine, if the use of less rapidly degrading types of chitin, such as crab shells, has a different effect on the reduction of the club-root pathogen than the more readily degradable cell wall chitin of *Penicillium* fungi.