

Fertilization with **TURF forte** improves plant health

TURF forte, an organic fertilizer is known to many forestry experts and farmers. The excellent fertilizer properties of **TURF forte** have been repeatedly verified by scientific papers. A special advantage is the slow nitrogen release from the dried fungal mycelium, which is the starting material for FRISOL F production. The slow release of nitrogen, which is mainly present in proteious form, prevents leaching and overdosage. The last two properties even permit the use of **TURF forte** in protected water collection areas and organic farming. When used over a period of several years, considerable improvements of the soil structure and soil biology will result combined with lasting, positive effects on forest cultures, ski slopes and agricultural crops.

Many users and some scientific studies gave rise to the impression that plants which are fertilized with **TURF forte** are not only better nourished and therefore stronger, but also healthier. Even an increased resistance to fungal diseases has been observed repeatedly. The occurrence of snow mould was considerably reduced in exposed areas of ski slopes which were fertilized with **TURF forte**. With regard to vine growing, an increased resistance of vines to most dangerous fungal diseases was statistically proved by Dr. Solar, University of Soil Sciences, Vienna, Austria during a field trial carried out over many years. Is it possible to prove and explain such conspicuous observations in scientific terms? Do we not usually observe the opposite, namely that good or too intensive nitrogen fertilization increases the susceptibility of cultures to fungal diseases? The secret seems to be in the composition and production of **TURF forte**.

In order to be able to prove and explain the assumed plant protective action of **TURF forte**, infections have to be produced in plants which were treated with **TURF forte** or are untreated under strictly controlled conditions. Such conditions for cultivation and infection are routinely available in the climate chambers and greenhouses of SANDOZ AGRO in its agrobiological research station in Witterswil, canton Solothurn, Switzerland. It was therefore practical to carry out the tests which are necessary for argumentation in a joint project. In Witterswil, a large collection of fungal pathogens is available which are normally used in the search for new fungicides due to their aggressiveness and economic importance.

Two of these pathogens were selected for the **TURF forte** - project, one of which is *Phytophthora infestans*, the pathogen causing late blight of potato. This noxious fungus, which also occurs on tomatoes, increasingly causes problems for potato farmers in recent years, as new strains occur which are resistant to the common fungicides. This is why *Phytophthora* is an important target organism for SANDOZ AGRO. *Plasmopara viticola*, the pathogen of the downy mildew of grapevine, was used as test object for diseases of vines.

The following is a brief description of the standardised trial procedure: an aqueous extract was prepared from the fungal mycelium which is the raw material for the production of FRISOL F using heat and pressure. This extract is clarified by simple filtration and contains polysaccharides (= multiple sugar) of different lengths and proteins as major components. The extract has the brown colour and typical odour of **TURF forte**.

When young potted plants are watered twice with this fungal extract, the strong fertilizer effect known from **TURF forte** can be seen already after a few days. The plants are larger, they have thicker stems, a larger leaf surface, and a dark-green healthy colour due to the

higher chlorophyll content. The gardeners in the greenhouse nicknamed these plants "Schwarzenegger-tomatoes". Too high a dosage causes phytotoxic reactions.

When the potted plants are watered twice with the **TURF forte** - extract, preferably seven and three days before infecting the plant massively with the pathogen *Phytophthora infestans*, the effect is highly positive. One week after the strong artificial infection, when leaves which are highly infected with the fungus already fall off the untreated control plants, the tomatoes which have been watered with mycelium extract still look very well and only show a few small infected spots. This experiment, which has been repeated many times, is the first irrevocable proof of the assumed plant protective action of **TURF forte**.

A second result came as a surprise: the protective action is still improved, if the tomato leaves are sprayed during the second treatment instead of watering the plants once again. The symptoms on the **TURF forte** plants are then reduced by 85 to 95 % as compared to the untreated and equally infected plants. The same observations were made with regard to the late blight of potato . In this case however, spraying twice, seven and three days before the first infestation, was more successful than the combined watering/spraying treatment. The same was applicable to young vine cuttings which were infected with *Plasmopara viticola*; two preventive spraying treatments with fungal extract made the plants 90 % resistant to fungal infection, because the **TURF forte** -extract does not actually kill the fungus. This was also proved by laboratory tests, as fungi can even grow on the extract.

These last observations help to explain the surprising phytosanitary effect of **TURF forte**. The fungus is not actually killed by the mycelium extract, but **TURF forte** improves the resistance of plants to the fungus attack. This is clearly a case of induced resistance. This phenomenon had been known to the scientists in Witterswil for a long time, and for many years they have searched for a natural trigger of this self-defence of cultivated plants. It is present to the aqueous extract of penicillium mycelium, which is processed to produce **TURF forte**.