

The effects of microwaves on trees and other plants

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Plants and electromagnetic fields

In several germination laboratory experiments, placing seeds into a static magnetic field has been shown to increase the speed and the number of germination's. In growth experiments, it has been proven that the exposed plants develop larger longitude and weight (Martínez *et al.*, 2003). In a study realized under a high power line between Austria and the Czech Republic, the effect on wheat and corn crops was assessed. The results indicated a 7% reduction in the production of wheat in the fields next to the electric line during the 5 years that lasted the investigation (Soya *et al.*, 2003). A stimulating effect on the growth and development of plants subjected to static magnetic fields is usually corroborated, whereas inhibitory action can occur in the case of variable magnetic fields (Martínez *et al.*, 2003).

Effects in calcium balance in meristem cells of pea roots subjected to magnetic fields were observed (Belyavskaya, 2001). Another study realized with microwaves also showed a long term drop in calcium and sulfur levels in leaves of beech trees directly related with the power of the broadcast radiation (Schmutz *et al.*, 1996). In animal cells the same thing has been proven : microwaves can affect the intercellular communication which can affect the functioning of the calcium channels (Dutta *et al.*, 1989).

30 years ago two Canadian investigators observed a deterioration that was unpredictable on plants subjected to microwaves (Tanner & Romero-Sierra, 1974). More recently other authors have notified cytogenetical changes (micronuclei, interchromosomal bridges and chromosomal fragments) induced in wheat exposed to a source of microwaves. They concluded that those effects are not thermal (Pavel *et al.*, 1998). An Ukrainian investigator also observed alterations in condensed chromatin distribution of meristem cells exposed to low magnetic fields (Belyavskaya, 2001).

Will that occur with trees ?

In the area that received the radiation of Skrunđa Radio Location Station (Latvia), the radial growth of pine trees (*Pinus sylvestris*) decreased. This did not happen beyond the area of incidence of the electromagnetic waves. A negative statistically significant correlation was also proven between the relative additional increment of the trees and the intensity of the electromagnetic field, and it was confirmed that the beginning of this decrease in growth coincided with the start of radar operation. The effects of many other environmental and anthropogenic factors were evaluated, but no significant effects on the tree growth were observed (Balodis *et al.*, 1996). In a study, carried out at the same time, on the cellular ultra-structure of needles of irradiated pines, the following was observed : an acceleration of the production of resin, a promotion of the senescence of the trees and a decrease in seeds germination from pines most exposed to the electromagnetic fields (Selga & Selga, 1996).

The trees near to a antenna located in a forest of Michigan have grown very quickly since the mast was installed in 1986. Forestry researchers attribute the extra growth to the electromagnetic fields around the antenna. It seems that each species react in a different way. They did not seem to affect the northern red oaks (*Quercus rubra*), neither the paper birches (*Betula papyrifera*), but red pines near the antenna grew taller than red pines at

the distant site, while aspen (*Populus tremuloides*) and red maples (*Acer rubrum*) grew thicker than their counterparts further off (Kiernan, 1995). These observations suggest that the electromagnetic fields have a subtle influence on the forest.

In Ouruhia (New Zealand), the trees have been dying where the main beams were directed to, in places that received the waves of a powerful radio antenna. They seemed to be most vulnerable when they had their roots in water or when they were near the river. In the points with higher levels of electromagnetic radiation the trees were affected or they were dead ([http://canterbury.cyberplace.org.nz/ouruhia /](http://canterbury.cyberplace.org.nz/ouruhia/)).

In the frontier along the former border between the FRG and the GDR, numerous radar's were placed for espionage mission during the cold war. The areas with the damaged forest almost always coincided with the surface swept by the microwaves. Immediately after the spying installations, that were working during 2 or 3 decades, have been powered down, a notorious recovery of the forest took place. In those areas conventional contamination didn't exist. In Canada the radar's also had devastating effects in the near forests (Volkrodt, 1991).

In Switzerland the trees located near a great transmitter grew in such a way that it seemed that they escaped from the waves (Hans-U. Jakob., not published data), this curious observation it is also described by the Dr. Hertel (1991).

It is important to point out that the radiations that were investigated in these studies were pulsed microwave radiation, with characteristic very similar to the modern communication systems (telephony without cables).

Possible explanations

The trees are particularly sensitive and react to environmental changes (Balodis, 1996). Some European scientists are convinced that acid rain is not the sole cause of this new type of forest damage that has desolated big areas in Germany, Switzerland and Austria, and that there are other additional culprits, among them the electromagnetic fields of microwaves. Humanity has known electromagnetic waves for over a century, but they have not been used extensively in technical applications until World War II. Over the last thirty years, transmission density has doubled every four years, and the electromagnetic contamination has gone up around 100 times. We have now entered the microwave era where we are dealing with minuscule dimensions (Volkrodt, 1988). Our environment is polluted with much waste in the form of dangerous electromagnetic radiation's (Volkrodt, 1991). Today trees and other biological systems are being subjected to dangerous higher microwave radiation's, several billion times higher than naturally occurring, which interfere with living information systems and cause slow but relentless effects on the living matter.

In some regions where the air is clean, the floor that is under the trees remains acid in spite of the absence of chemical precipitation. Does some other process that can cause changes in the balance of ions exist?. The answer is positive, for example the electrolysis. This requires that in the soil exists an electric current which creates ion movements through the depositing of electrons on water soluble minerals suspended in solution. Wolfgang Volkrodt

investigated the damages caused by radar's on the German forests during many years, and he checked that the areas with high microwave levels exhibited serious forest damages. "The microwaves are certainly one of many harmful factors, but we don't know the extent of its magnitude (...) they cause the cellular membranes of trees to resonate and thereby interrupt the water circulation. The balance of electrically charged particles is also distorted... The short waves are those that cause the most damages to trees" (Volkrodt, 1988 & 1991).

It is possible that microwaves are received by the trees and finally converted into electric current that flows toward the ground. Already in 1987 the renowned forest biologist Professor Hüttermann (1987) made the following statement: "There can be no doubt that electromagnetic waves are received by trees and their needles. Although they are not optimal conductors, it can be demonstrated by means of simple experiments that the leaves absorb the waves by resonance and that this process causes the induction of a flow of electrically charged particles in the needles and leaves." Continuing with the Volkrodt theory (Volkrodt, 1991) the induced charge carriers finally migrate into the ground and the direct current that spreads from the roots into the soils causes a kind of electrolysis. And this leads to the soil acidification, repeatedly observed under the trees that exhibit this new type of damages. In the ground a change occurs in the ionic balance (acidification). It disturbs the mineral management of the affected trees and also retards the activity of soil organisms. However the comprehensive scientific evaluation would require long term studies since the fragmentary investigation it is insufficient. According to this author, the high compensatory payments to people and forest estates damaged by the influence of the microwaves, avoided that the investigations continued (Volkrodt, 1991).

According to the Swiss investigator Ulrich Hertel, there is a perfectly established proof of a causal chain of electrical smog – stunted growth – damage to soil – dying trees. Yet the official science ignores it. "The increasing contamination of our environment with technological poisons, as the radiation's, is specially pernicious. It exposes the environment to a constant stream of considerably higher and more dangerous frequency, and this virtually without a pause. The slow process of death has begun... There are always certain trees which, due to their location or their constitution, are less exposed to the damaging influences [of microwaves] or are able to put up more resistance than others. In the near forests to these radar's, the trees that grow on the hills and mountains are condemned, they are generally thin, lean or have withered tops. The most protected sector still has intact trees The microwaves act slowly on the soil, on plants and on water. Under their influence the structure of all organic components has to disintegrate... Today all life cycles in nature are being badly damaged by technological radiation's. The internal destruction of the soil also interferes with the growth of the young forest. The delicate feeder hair roots here are missing, the trees are standing in water and yet die of thirst. The destruction of the electrical potential differentiation, both in the water and in the tree, prevents the capillary's ability to pull the water upward in the circulation system from above. For this reason the flow of sap is slowed and gradually ceases completely. The tree begins to wither, from top down. Branches lose their needles and become thin. Trees grow transparent, their color also changes... Natural electromagnetic relationships form the basis of all cycles in nature. The construction and preservation of these relationships is only possible due to natural energy and their destruction takes place because of energy

emanating from the technological unnatural energy" (Hertel, 1991).

Nearer observations in space and time

For some years has a progressive deterioration on trees, especially near phone masts in cities, been observed. We still don't have systematized observations, but in Valladolid (Spain) trees located inside the main lobe (beam) show a sad and feeble aspect, possible delays in growth and, probably, a high susceptibility to illnesses and plagues. In places where we have measured higher radiation levels the trees show a more notorious deterioration. The trees don't grow above the height of the other ones and those that stand out have withered tops. We have observed that the white and black poplars (*Populus sp.*) and the willows (*Salix sp.*) are more sensitive, although we ignore if a special susceptibility of this family exists or if it can be due to their ecological characteristics that force them to always live near the water, and this favors the electric conductivity (see also <http://canterbury.cyberplace.org.nz/ouruhia/>). Other species as *Platanus sp.* and *Ligustrum japonicum*, have shown to be more resistant.

The necessity for prevention, monitoring and control

15 years ago Wolfgang Volkrodt wrote with ingeniousness: "But the future looks brighter. By the year 2100 communications transmissions will be achieved through a national network of modulated optic fiber conductor cables. After that the surfeit of microwave transmitters, in particular directional transmitters, will no longer be necessary" He wanted fervently that the damage to the environment with dangerous electromagnetic radiations of microwaves ceases, and at the same time made a warning on the urgency of giving up the use of this technology (Volkrodt, 1988). Their forecasts, although very deliberate, was very mistaken. Parallel to the optic fiber the expansion of wireless communications (GSM, DCS, UMTS, WLAN...) in the last years has been explosive.

In a less innocent way, this author already noticed the powerful interests of the industry and their intents to avoid that this would be investigated (Volkrodt, 1991). In other occasions the industry did finance studies to avoid publications (Hans-U. Jakob. unpublished data).

The bibliography revised in this article is disturbing. The logic shows us that the effects should have been foreseen before the unfolding... The electromagnetic fields are altering our world in a way that we still don't very much understand. The monitoring of the forest masses requires a special attention. If we consider what we know today, any installation near to forests, parks or gardens, should without any doubt value the impact of microwaves on the vegetable masses, keeping in mind that their effects on the health of people (Navarro *et al.*, 2003; Santini *et al.*, 2003) and on the fauna (Balmori, 2003), are much more dangerous than what the industry and the interests created around proclaim, without any scientific guarantee and in a false way.

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