

The Effects of Electromagnetic Forces (EMF) on Plants

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A study was conducted to look at the impact of electromagnetic forces (EMF) from high voltage lines (HVL) on plants, and also soil contamination with heavy metals under HVL and around the pylons. This study was carried out in three different areas *viz.* impact on plant growth and development, plant protein and biochemical changes, and heavy metals contamination from the lines and pylons.

The effect of EMF on growth and mineral uptake of plants varied among crops and length of exposure. Growth can be enhanced or depressed depending on EMF strength and crops. The nutrient absorption and its accumulation in plant tissues seemed to be inconsistent. The effects of a prolonged exposure found to be attributed to some differences. The above considerations indicate the need for repeated studies over several life cycles to get better knowledge and understanding on the behaviour of plants grown under influence of EMF. This suggestion was made based on inconsistent results from our studies that had been conducted either at existing farms or under semi-controlled conditions. Further research on EMF effect on other crops as well is imperative so as to ensure the safety of the products under EMF influence.

As indicated from the results, the products from sample plants cultivated under HVL lines are safe to be consumed, although there was considerable potential depression or enhancement in element absorption upon longer exposure to EMF. Agriculture activities under HVL lines should be promoted as to utilize the available lands for food production as being urged by the government.

In the young oil palm plants, higher chlorophyll content was found in the leaves of plants grown nearest to the lines. This will enhance photosynthetic activity, which can lead to higher growth. However, the reverse was observed with the 7-year old palm where decreased chlorophyll, protein content and increase in peroxidase enzyme activity was observed which indicated that the plant was under stressful conditions.

In Chinese cabbage, plants found directly under the lines had increased chlorophyll content that will lead to higher photosynthetic activity, which eventually enhance growth.

Nevertheless, no alarming manipulations of the genetic materials from exposure to EMF were observed in the plant species studied except with peroxidase, an enzyme related to stress where an extra isozyme was observed in young oil palm. Since this enzyme is only related to stress, this observation is not worrisome.

High electric field (EF) pulsing of seeds was found to enhance subsequent growth of soybean and *Oncidium tuka* (orchid) plantlets grown using tissue culture technique. This aspect can be studied further to realise the potential of using simulated EF as a tool to increase productivity of economically important crops. Optimization of the dosage and exposure period needed to promote growth inevitably warrant refinement.

Metals contamination under pylon and erosion of Al from HVL due to rainfall at this point in time is negligible. The study area has low heavy metals concentration, except for Zn. Comparatively, extractable Zn concentration in soil under pylon is consistently high, but the concentrations are still within acceptable range according to certain standards. This is probably because of the initial washings of Zn by rain from pylons and insulator components (one time erosion). Although Zn concentrations under pylons were high,

there were no increase in Zn content in soil with increasing pylon age, therefore, we suspect very minimal ongoing erosion, if any, from pylons. Aluminium concentrations at control area for soil and plant were higher than that of under HVL area, therefore, it is quite remote to consider that there is erosion of HVL by rainwater. Further more, there was no increase in Al concentration under HVL compared to that of control with increasing age of HVL (7 to 35 years)

Acid rain with pH values equal to or less than 4 eroded more Al ions. Human activities around HVL that could potentially affect the pH of precipitation need to be overseen. HVL that passes through such areas need to be constantly monitored due to higher degree and rate of corrosion.

Reader Enquiry

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