

Comment

Comment on "Effects of 60 Hz Electromagnetic Fields on Early Growth in Three Plant Species and a Replication of Previous Results" by Mark S. Davies

W.C. Parkinson

Department of Physics, University of Michigan, Ann Arbor, Michigan 48109

In a recent paper Davies [1996] offers data that indicate that 60 Hz EMF tuned to the calcium resonance enhances the growth of *Raphanus sativus*, and appear to replicate the results of Smith et al. [1993]. The purpose of this note is to comment both on his data and on his conclusions.

First, this is a surprisingly "noisy" experiment. The ratio of the standard deviations of the mean to the means is large, varying up to 1.52. The mean values of the ratio together with their standard deviations for the ten parameters in each of runs RE1, RE2, and RE3 are 0.55 ± 0.42 , 0.33 ± 0.08 , and 0.42 ± 0.28 for the exposed plants and 0.37 ± 0.10 , 0.39 ± 0.13 , and 0.39 ± 0.15 for the control.

Secondly, there is a large variation in the magnitude of the data between runs RE1, RE2, and RE3. He suggests the variation is due to seasonality, there being some 11 °C temperature difference between the runs. Unfortunately he does not give the temperature for each run but it should be noted that the ratio of the means of RE1/RE2, Feb/May, varies from 5.86–0.74, and for RE1/RE3, Feb/Nov, varies from 0.68–3.46. With four exceptions the means in RE1, begun in February, are larger than the means in RE2, begun in May. Likewise, 13 of the 20 means in RE3, begun in November, are larger than in RE2.

Third, I am unable, using his U-values in the Mann-Whitney test, to obtain *P*-values greater than 0.05. In Mann-Whitney for his sample size *U* must

have a value less than 133 for RE1 and RE2, and less than 181 for RE3 to obtain a *P*-value > 0.05.

Fourth, in RE2 seven of the ten parameters have control values larger than the exposed values. In analysing his data (using the two-tailed *t*-test for lack of sufficient data to do a non-parametric test) six of the ten parameters in RE1 have *P*-values less than 0.02, while for RE2 only two of the ten have values less than 0.02, and RE3 five of the ten parameters have *P*-values less than 0.02.

In view of the "noisy" experiment, the fact that for eight of the parameters the control value is larger than the exposed and that less than half of the *P*-values show a significant difference at the 0.02 confidence level, I would not consider the results reported in Davies' paper to "concisely demonstrate an emf-effect."

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REFERENCES

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- Smith SD, McLeod BR, Liboff AR (1993): Effects of CR-tuned 60 Hz Magnetic Fields on Sprouting and Early Growth of *Raphanus sativus*. *Bioelectrochem Bioenerg* 32:67–76.