Research into how EMFs affect insects

It is clear that flying insect populations are declining. The question is whether there is a link between this fact and the fastest-growing form of environmental pollution — electromagnetic fields (EMFs)?

Research summary

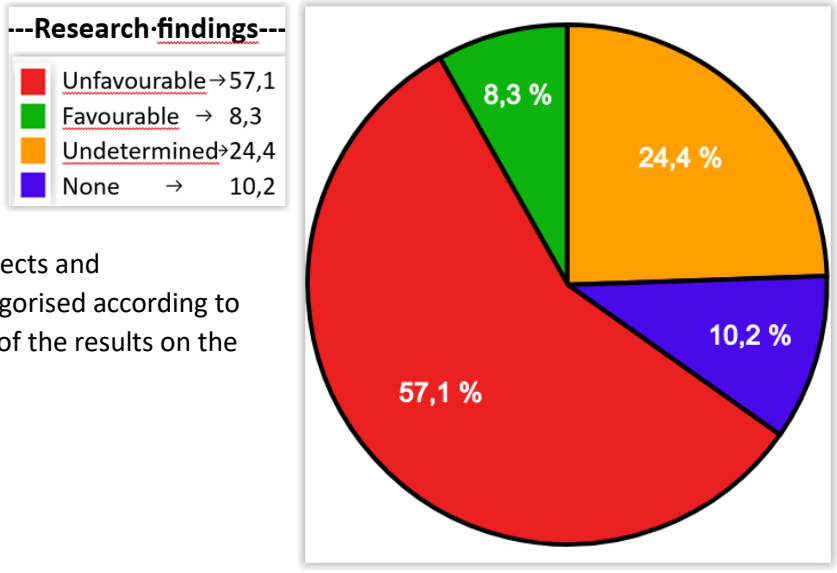
In 2023, a review was published summarising the results of 119 studies on insects and electromagnetic fields, i.e. radiation from wireless technology and electric and magnetic fields such as those from the electricity grid.

- The majority of the studies showed effects.
- These effects included impacts on reproductive capacity, development, metabolism, behaviour, orientation and memory. Oxidative stress and DNA damage were also found.
- Experiments with mobile phones found effects within 10 minutes of exposure, whilst field experiments near mobile phone masts typically found harmful effects after several weeks or months.
- Biological effects of electromagnetic fields have been clearly demonstrated in laboratories, but only partially in the field, meaning that the broader ecological consequences remain unknown.[1]

Radiation from wireless technology

Of the 119 studies reviewed, 36 had been conducted where the radiation intensity was less than one hundredth of the limit value for radiofrequency radiation. 31 of these showed adverse effects.

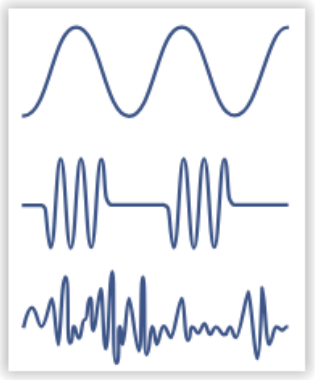
Changes in chromosomes have been observed in fruit flies at 4,800 microwatts per square metre from Wi-Fi[2]. The distance to a Wi-Fi router is then less than two metres.



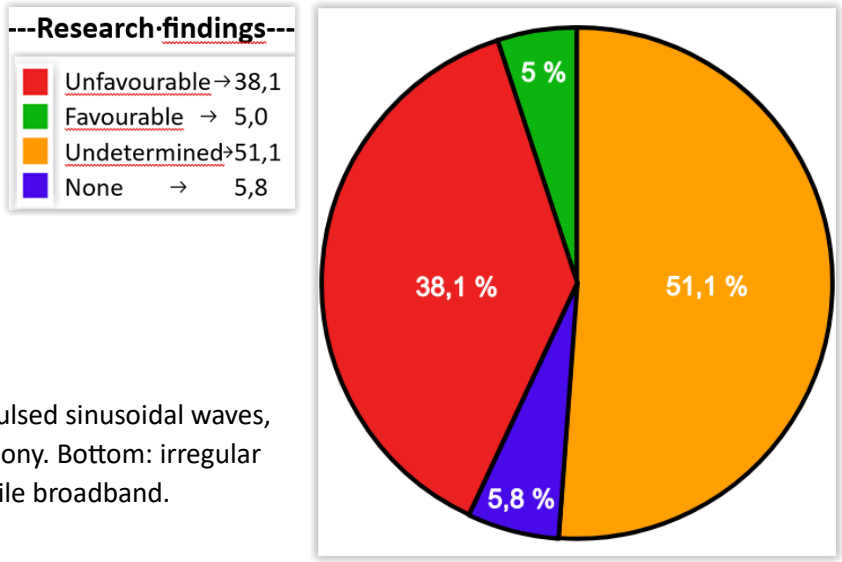
Results of studies involving insects and radiofrequency radiation, categorised according to the assessment of the impact of the results on the insects' lives.
Percentages.

Electric or magnetic fields from the mains supply

The researchers note that the lower proportion of adverse effects compared with radiation from wireless technology may be due to the fact that sinusoidal waves were often used in the experiments, rather than pulsed or irregularly varying field strengths such as those from wireless technology. Sinusoidal waves minimise the fields' impact on the surroundings.



Top: sinusoidal waves. Middle: pulsed sinusoidal waves, typical of 2G/GSM mobile telephony. Bottom: irregular waves, typical of 3G/4G/5G mobile broadband.



Results of experiments involving insects and electric or magnetic fields, categorised according to the assessment of the impact of the results on the insects' survival. Percentages.

A researcher's summary

The renowned researcher Alfonso Balmori writes:

"Insect biodiversity is under threat worldwide. Many studies have reported the severe decline in insect populations that has occurred over recent decades. The same is happening to the vital group of pollinators, which are crucial for the pollination of crops. The loss of insect diversity and abundance is expected to lead to cascading effects on food webs and ecosystem services. Many authors point out that the decline in insect numbers must primarily be attributed to agricultural practices and the use of pesticides. On the other hand, evidence of the effects of non-thermal microwave radiation on insects has been known for at least 50 years. [Non-thermal radiation does not cause heating – translator's note.] The review in this study shows that electromagnetic radiation should seriously be considered as a contributing factor behind the dramatic decline in insect populations, in synergy with intensified agriculture, pesticides, invasive species and climate change. The extent to which man-made electromagnetic radiation poses a significant threat to pollinating insects is both unclear and likely. For these reasons, and in view of the benefits it provides to nature and humanity, the precautionary principle should be applied before any new roll-out (e.g. 5G) is considered."[3]

Footnotes

1. Alain Thill, Marie-Claire Cammaerts & Alfonso Balmori, Biological effects of electromagnetic fields on insects: a systematic review and meta-analysis, Rev Environ Health 2024; 39(4): 853–869.
2. Ugo Cappucci, et al., WiFi-Related Radiofrequency Electromagnetic Fields Promote Transposable Element Dysregulation and Genomic Instability in Drosophila melanogaster, p. 3.
3. Alfonso Balmori, Electromagnetic radiation as an emerging driver factor for the decline of insects, Science of The Total Environment Volume 767, 1 May 2021, 144913.