

biological effects in it. The magnitude of the effect depends on the distance between the object and the object and on the symmetry of location of the object relatively the environment non-biological subject.

Conclusions. All these facts have to be taken into attention during the treatment in combined magnetic field tuned to the cyclotron frequency of the ion investigation.

REGULATION OF BIOLOGICAL PROCESSES AND DECREASING OF CONCENTRATION OF BIOLOGICALLY ACTIVE COMPOUNDS BY MEANS OF WEAK COMBINED MAGNETIC FIELD

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Introduction. In our previous works, we investigated the biological effects in various combinations of magnetic fields (static and combined ones). The object of investigation was the gravitropic reaction of roots. Usually roots exhibit positive gravitropism and grow in the direction of the gravitational vector, while shoots respond negatively and grow opposite to the gravitational vector. We were the first who demonstrated that the application of a weak combined magnetic field (CMF) with the alternative component tuned to the formal cyclotron frequency of calcium ions to static component of CMF can change root gravitropism from a positive direction to negative one. CMF is comprised of a permanent magnetic field and a collinear to it alternating magnetic field.

Purpose. In this work to prove that Ca^{2+} ions play an important role in the gravitropic reaction we changed the concentration of Ca^{2+} ions in the water solution

for roots germination in a wide region. For this purpose, we germinated cress in the water solution of calcium chloride with concentration from 0 μM up to 3000 μM .

The other part of the work is devoted to the problem of activation of organic compounds by CMF.

Materials and methods. As in all our previous experiments, all measurements were fulfilled in artificial SMF and CMF. The fields mentioned above were created in μ -metal shield artificially by solenoids. Using of μ -metal shield is necessary to decrease essentially SMF and CMF magnetic noises and to obtain well reproducible magnetic characteristics of the magnetic fields. The magnitude of SMF drift does not increase 150-1000nT after 24 hours, 0.6-200nT after 1 hour and depended on the magnitude of SMF created in the shield. This fact allows us to obtain well reproducible biological results.

Results and discussion

Ca²⁺ results

Ca²⁺ is one of most biologically active ions. So the GTR of cress had to depend on its concentration. We studied the GTR dependence of cress on Ca²⁺ concentration both for SMF and CMF with alternative component tuned to the cyclotron frequency of Ca²⁺ ions. It was shown that GTR not only changed its sign in CMF but also essentially expanded in CMF.

This fact means that the region of activation of Ca²⁺ ions is expanded and its action we can see at smaller concentration of Ca²⁺.

NPA- ions results

We showed that the effect of the 5 hours previous action of NPA shows no difference between the samples in SMF and CMF, alternative component of which is adjusted to Ca²⁺ ion cyclotron frequency. This result shows that the previous 5 hour processing in NPA solution put an end to effects observed before (positive gravitropism in SMF and negative gravitropism in CMF, alternative component of which is adjusted to Ca²⁺ ion cyclotron frequency). 1, 2 and 3 hour previous germination in NPA did not change GTR both in SMF and CMF. It was positive in SMF and negative in CMF. On the contrary the samples germinated during 30 min in

NPA of the same concentration (1 nM) in SMF did not show any changes of GTR, while in CMF, alternative component of which is adjusted to NPA^- ion cyclotron frequency, showed the disappearance of any GTR (positive or negative). GTR both in SMF and CMF, alternative component of which is adjusted to H^+ ion cyclotron frequency, after 30 minutes germination in NPA is positive and did not differ in CMF and SMF.

Conclusions

1. Thus, summarizing results of this work and the previous work, it is possible to draw a conclusion that by means of CMF, alternative component of which is tuned to cyclotron frequency of biologically active ion, it is possible to activate action of biologically active compounds irrespective of, whether this compound enters into the investigated cell of biological object or it is brought from the outside. It is important only, whether this compound participates in the given biological process (in our case in gravitropic reaction).

2. By means of CMF with the frequency that has been tuned to cyclotron frequency of biologically active ion, it is possible to reduce essentially (by some orders) a dose of biologically active compound brought from the outside, for example, medicines or in our case of fertilizer.

3. The CMF action on biologically active ions (alternative component of CMF is tuned to cyclotron frequency of biologically active ions) is similar to addition of small dose of these ions.

4. The obtained results can find practical application in pharmacy, medicine and agriculture. By means of CMF it is possible to reduce operating doses of biologically active substances essentially.