Model study to investigate the toxic interaction between glyphosate containing herbicide AMEGA and copper sulphate on pheasant embryos

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Introduction

The chemical plant protecting process is one of the most important polluting activities in the agricultural production. Sprayed pesticides and other xenobiotics, e.g. heavy metals, due to the agricultural activities during the plant protecting processes, can contaminate the ecosystem of a given habitat simultaneously. Therefore, the chemical load can occur as a complex problem, so the combined toxic effect, i.e. toxic interaction of at least two substances can expected and the components can modify the effect of each other. Recently, the examination of the combination of heavy metals and other chemicals gained significant ground in both avian (Fejes et al., 2001; Kertész, 2001) and mammalian (Institóris et al., 2001; Pecze et al., 2001) toxicology research studies. Furthermore, the interaction effects are examined not only in the field of ecotoxicology, but also in all other areas that deal with health care and chemical safety issues (Oskarsson, 1983; Danielsson et al., 1984; Speijers and Speijers, 2004).

Materials and methods

Pheasant eggs with good fertile potential (Szarvasi Vad-ker Kft., Hungary) were used in the experiment. The eggs based on their size and weight were divided into four homogenous groups (55 eggs in each), and were incubated in Ragus type table incubator (Vienna, Austria) ensuring the required temperature (37–38ºC), the relative humidity (65–70%) and the daily rotation.

The eggs were dipped into the saline solution or emulsion of the test materials for 30 minutes on the first day of incubation. During the single and simultaneous administration copper sulphate (Reanal-Ker Ltd., Budapest) with a concentration of 0.01% and 2% of Amega glyphosate containing herbicide (Nufarm Hungary Ltd., 360 g/l) corresponding to that used in plant protection practice were applied. The control group was treated with avian physiological saline solution (NaCl 0.75%). All eggs and embryos were examined and processed on day 21 of incubation. During the processing rate of embryo mortality, body mass of embryos and type of developmental anomalies were registered.

Results and discussion

The average body weight of the embryos was significantly lower as compared to the control group in single administration of copper sulphate and Amega groups. The single and simultaneous administration of the test items increased the mortality of embryos as compared to the control.

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Developmental abnormalities were sporadically observed due to the single and concomitant administration. The results of the individual teratogenicity studies on copper sulphate in pheasant are in accordance with results of toxicity studies in other species. Depending on the dose, copper has embryotoxic potential and may cause developmental anomalies (Ferm, 1974; Várnagy and Budai, 1995).

Conclusions

Based on the results, there are presumably addition-type toxic interaction between copper sulphate and Amega herbicide that highly reduce the viability of the embryos.

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