

The production and use of pesticides have increased dramatically in recent decades around the world. Pesticides are a broad group of chemicals that have benefits for humans but also strong and harmful effects on nontarget organisms. Poultry may be exposed to pesticides derived from feed containing residues. Usually, the source of the residues is the legal use of pesticides such as fungicides, insecticides, or herbicides in the production of crops used in the preparation of feed. The European Union has strictly regulated the use of these compounds, setting maximum residue levels (MRLs) for pesticides in these matrices. However, poultry feed, which is composed of a large number of grain ingredients, can finally contain high levels of pesticide residues.

Therefore, the main goal of the proposed project is to assess the impact of three popular substances belonging to the above groups: tebuconazole, imidacloprid, and glyphosate, and their combinations in the MRLs in each cereal presented in chicken feed, on the quality of rooster semen and their fertility.

Reports from the Regional Experimental Station of the Institute of Plant Protection – NRI in Białystok clearly indicate the increasing trend of presence of the tested pesticide residues in cereals. These are not only the cases where the MRLs are exceeded, but we must be aware that pesticides are increasingly identified in samples tested at the permitted levels. Therefore, an extremely important question that we should ask is how long and in what amounts these pesticide-containing products, even at acceptable levels, can be eaten by chicken? How can pesticides (mono and multicomponent residues) with MRL values affect the fertility of roosters consuming this feed? The proposed experiments will try to find answers to these questions, focusing on substances that are present in popular plant protection products used in cereal crops.

In this project, four research tasks are planned. In the first task, we will monitor the levels of pesticides in commercial chicken feed in Poland and France, and also in the semen and blood of chickens from several Polish and French farms. In the next tasks, the roosters will be fed with appropriate food with the substances tested in the MRLs in each cereal. During this time, a thorough analysis of their semen quality, artificial insemination to check the fertility of the roosters and the influence of the tested substances on steroidogenesis, apoptosis, and the antioxidant system in the testicles of the roosters will be examined. The project also involves *in vitro* experiments in which the substances studied will be added directly to semen to investigate the mechanism of action of pesticides in sperm.

Justifying the pioneering nature of the proposed project, we would like to emphasize that there is a gap in studies concerning the effect of low doses of pesticides, but in many cereals eaten by poultry, on their fertility. Our results may raise interest in reformulating the current MRLs for specific pesticides in feed grains and can start the debate about the quality of poultry feed.

The confirmation of the real problem, which we want to explore, as becoming more frequent occurrence of pesticide residues in feed for chickens, is recent studies, where was found that poultry manure can accumulate high residues of e.g. glyphosate, decreasing plant growth and reproduction. These results show that pesticide residues go through the digestive process of birds and, more importantly, remain in the manure for a long time. A similar scenario may also include other substances and their mixes, which we want to examine in the proposed project.