Review on Agriculture and Rural Development 2014. vol. 3 (1) ISSN 2063-4803

THE EFFECT OF THE LIQUID FERTILISER ON THE EMBRYOGENESIS OF PHEASANTS

ANDRÁS PALKOVICS

Department of Horticulture, Kecskemét College
Erdei Ferenc tér 1-3., 6000 Kecskemét, Hungary
palkovicsflora@t-online.hu

ABSTRACT
The human being pollutes the environment knowingly to improve in the quality for himself and for his domestic animals and cultivated plants. Use of modern fertiliser and its technology was part and parcel of the last one hundred years in the agricultural revolution. Quality problems of the environment constitute a violent contest to the individual interests, that's why the environment scientists have attacked that for years, to use the fertilisers. The aim of this study was to answer for these disputed questions, studying the toxic effect of liquid fertiliser on wild bird reproduction.
Birds were treated with blow-pipe per os, one part off eggs were injected through the air cap, another part were treated in bath tub. The birds were examined according to the following view points: time of the decease, production and fertility of the eggs. From eggs I conclude viability of embryos, malformations and I measured the body weight. Finally I can conclude that to use the fertiliser is not a very toxic agricultural method.

INTRODUCTION

Nowadays one of the greatest problems of mankind is the alarming pollution of the environment, the denaturation of the most exposed areas because of the increasing industrialisation, and the increased rate of vehicles and the chemicals used in agriculture.
The problems of the pollution of the environment are known to the public due to some works published in Hungarian that summarise the topic. During the modern production process of mankind numerous artificially produced and not natural chemicals get into the environment, and all over the world elements and chemicals spread that either could not have been found or existed only in traces in the biosphere. These unnatural substances do not fit into the normal metabolism of the living organisms, and even show toxic effects by disturbing the metabolism, therefore their accumulation gravely endangers the biosphere and mankind.
MINYEJEV (1988) claims that the study of the effects of the fertilisers and other chemicals on the environment and especially on the quality of agricultural products needs the complex research work of the experts of several related scientific areas such as agronomists, agrochemists, experts of the melioration, chemists, stock breeders, veterinarians, workers of the sanitary-epidemiological service, food-hygienists etc.

MATERIAL AND METHOD

Material

Eggs of the Shaver Starcross 288 layer hybrid were used in the test. The Damisol NPK fertiliser with 1:2:1 ingredient proportion is distributed by the Damisol Kft., Albertirsa. The fertiliser contains 100 g/l active ingredient. (25 g N, 50 g P_2O_5 and 25 g K_2O per litre) In practice the 1% solution is used. It can be applied in every field and horticultural culture in 5-15 l/ha quantity to promote intensive development. In case of winter cereals and

alfalfa the date of application is the same as the laying period of the birds that usually nest there. This may present a threat to the eggs of the birds that nest on the ground.

Method

The eggs were carried to the field 48 hours before the beginning of the test and after 24 hours of resting the experimental groups were formed and preparations for the test began.
From the fertiliser 10%, 1% and 0.1% solutions were prepared with lukewarm tap water.
Besides employing an untreated control group we also used a control group that was treated with tap water. The solution was applied to the eggs by two means (injected and sprayed). Thus 9 groups were created in total.
The control group contained 160 eggs, and each of the other groups contained 55 eggs. (600 eggs were used in total.) The eggs were marked with a pencil then were treated. When injecting, the eggs were bored above the air chamber with a pin, then 0.1 ml from the solutions were applied into the egg with a tuberculin syringe. The hole was sealed with histological paraffin.
In contrast with our first test where the eggs were bathed, this time the field conditions were modelled by the spraying of the eggs. The eggs were sprayed from a 30 cm distance with the solutions of different concentrations, using the dose applied in practice. The injection modelled the effects that occur when the agent surely gets into the egg, while spraying modelled the normal conditions.
After the treatment the eggs were rested for another 24 hours then were placed into the Eggstar 600 automatic incubator of the Bábolnai Ipari Kft. and were incubated for 10 days. The temperature of the incubation was 37.8 ºC (0.1 ºC), the humidity was 50-54%. The incubator automatically turned the eggs in every 2 hours by 45 grades.
The test lasted for the 10. day of the incubation. Each day 60 eggs were opened, 5 from each group, and 10 from the controls. Between the 1-4. days slides were created to examine abnormal development. The eggs were opened above the air chamber, the membranes were removed and the redundant egg-white was drawn by a syringe. A filter-paper was placed on the tread, the membrana vitellina was cut around and the embryo stuck to the filter-paper was put into a 38 ºC bird physiology (0.75% concentration) solution. The embryo was swam down from the paper and mounted on a slide. The slide was dyed and fixed with a 0.1% osmium-tetraoxide paint then glycerine-gelatine was dropped on the slide before covering it. The development stage of the embryos of the control group was examined under microscope and all embryos were compared to these controls. (To determine the differences in the development the Lille-scale was used as described by HAMILTON (1952).) The determination of the embryo mortality in the different treatment groups took place every day during the opening of the eggs.
On the 5-10. day the embryos were inadequate for making slides because of their increased size, therefore the effect of the treatments were determined after the wet and dry weight and the body organisation of the embryos. The embryos were removed from the egg, were deprived of the membranes then the development and the malformations were examined under microscope when the embryos were placed on a hollow slide. The abnormally developed embryos were placed into 4% formalin and the jars were marked individually. From the normally developed embryos the wetness was sponged up and they were placed into jars. Electrical scales of UWE NJW 150 type and a thousandth gram precision was used to determine the wet weight, then the embryos were placed into a vacuum exsiccator and were dried on 105 C till body balance. The dry weight was measured and the water content determined from the difference between the wet and dry weight. During the test a detailed record was made.

The statistical evaluation was made by computer. The mean wet and dry weight was determined for each day and group, the rate between fertile and infertile eggs, the dates and rate of embryo deaths, the incidence and types of abnormal development. The effect of the treatment on the wet and dry weight and the water content of the embryos were analysed by variance analysis.

RESULTS

Rate of embryo mortality

The toxic effect affecting the embryo may manifest as necrosis, depressed functional capacity, malformation or depressed growth (VÁRNAGY, 1985). First we would like to show the effects of NPK solutions of different concentration on the embryo mortality. The injection treatment which showed the effect of the amount of the chemical that surely gets into the embryo increased the rate of dead embryos to a greater extent than the spraying treatment. The greatest embryo mortality was observed at the injection of NPK of 1% and 10%, respectively (20-22%). This is seven times more as in the case of the controls. When spraying the fertiliser, a smaller amount of the agent got into the egg thus embryo mortality was also lower. In the eggs sprayed with different concentrations of fertiliser the rate of embryos did not increase significantly compared to the controls (the increase was only 1.85%). This means that the Damisol NPK fluid fertiliser presumably is not harmful to the viability of the eggs of birds that nest on the ground when applied according to the instructions. It is interesting that in the case of small concentration (0.1%) NPK solution, the embryo mortality was higher in the spraying treatment than at injection in contrast with the other groups.

Date of embryo mortality

At the control group the death of the embryos occurred at the 3., 4., 5., and 6. day, respectively. The rate of embryo mortality was the highest on the third day. At the groups injected with tap water also the third day proved to be the most dangerous. This date is critical in the development of the embryo since at this time it switches from the cytotypic developmental stage to the organotypic developmental stage. After the forming of the endoderm and entoderm the differentiation of the various tissues and organs begins. When using injection treatment with 0.1% solution embryos died on the 4. day, while spraying caused embryo mortality on the first and second day. By injecting a 1% solution embryo mortality spreads evenly on six days, and by injecting 10% solution the time of embryo mortality extends to seven days. We can see that by increasing the concentration – provided the agent gets into the egg – mortality is observable on more days. In the groups treated with spraying the few embryo deaths occurred at completely different dates. This is presumably due to the different permeability of the shell and the semipermeable membranes, which caused that the solutions of different quantity reached the embryo by different speed.

Types of developmental anomalies

In our tested groups 13 types of developmental anomalies could be separated. Some of them manifests as the complete or partial absence of the yolk venation, some as the dwarfness and deformity of the body and some anomalies affect the eyes, the brain and the somites. The most frequent anomaly were the poor yolk venation (25.9% of the abnormally developed embryos), the small body (17.2%) and the open cavity (12%). The rate of the spontaneous deformities was 12% compared to the total malformations, based on the

controls. The rate of the different types of anomalies was high in the groups treated with injection of 1% and 10% solution. Since several anomalies could be observed on one embryo, the rate of the anomalies in the groups is not the same as the rate of the abnormally developed embryos.

Effect of the agent on the growth of the embryo

The body weight of the embryos was measured up from the 4. day, for their size and weight enabled to study the effect of the fertiliser on the growth only from this date. As compared to the body weight of the untreated control on the 10. day, the mean wet weight on the 10. day differed significantly only in the groups injected with 10% solution. The weight of these embryos was only one-tenth the weight of the controls. Similarly, only in the group injected with 10% solution showed difference in the dry weight compared to the controls (the weight was also very low). In the other treatment groups no significant difference was observed in the mean wet and dry weight or in the water content.

Examining the 4-10. day as a whole we can say that during the examined period the wet weight became 30 times larger, the dry weight increased 40-fold and the water content increased 30-fold in the control group. In the groups injected with 0.1% NPK solution significant difference was observed in the dry weight.

By examining the rate of growth we found that the increase of the body weight is the highest between the 4. and 5. day and the 5. and 6. day in all of the groups. So the rate of growth was not affected by the NPK fertiliser.

CONCLUSIONS

The human use of modern fertilisers and its technology was part and parcel of the last one hundred years in the agricultural revolution. The aim of this study was to answer for these disputed questions, studying the toxic effect of liquid fertilisers on wild bird reproduction. From eggs I concluded the viability of embryos, malformations and I measured the body weight. Finally I can conclude that to use the fertilisers is not a very toxic agricultural method.

REFERENCES

HAMILTON, H.L. (1952): Lille's Development of the Chick. Holt, Rinehart and Winston, New York.

MINYEJEV, V.G. (1988): Agrokémia és környezetvédelem. Biológiai környezetünk védelme sorozat. Mg Kiadó Bp. p. 173

VÁRNAGY L. (1985): A peszticidek teratológiai hatása. in A biológia aktuális problémái 32. Medicina Könyvkiadó Bp. pp. 9-35