

The study of the effect of Parquet Herbicide on the Physiology of Breeding in Rats**Mahmood Najafiyan, Vahid Hamayatkah, Mohammad Farzam, Hossin Kargar***Department Of Chimistry Islamic Azad University , Jahrom Brunch , Jahrom, Iran**Department Of Biology Islamic Azad University, Jahrom Brunch, Jahrom, Iran**Department Of Biology Islamic Azad University, Jahrom Brunch, Jahrom, Iran**Department Of Biology Islamic Azad University , Jahrom Brunch , Jahrom, Iran*

Mahmood Najafiyan, Vahid Hamayatkah, Mohammad Farzam, Hossin Kargar: The study of the effect of Parquet Herbicide on the Physiology of Breeding in Rats

ABSTRACT

Introduction: Paraquate can be regarded as a herbicide with Gramaxon as its commercial name. Paraquate is a herbicide with the liquid formulation and dark green color which is used as a general, contact and high consumption toxicant in non-agricultural lands, road sides, under fallow areas and gardens in order have effective control of all yearlong broadleaved and needle leaved weeds. Gramaxon has a high level toxicity and is absorbed through skin. **Materials and methodology:** 50 matured rats of the Vistar race were provided and cleaved in five groups of ten, including Witness, Control, Experimental 1, Experimental 2 and Experimental 3. Their average weight was 200 ± 15 grams and their age was two months and a half. The toxicant Paraquate was injected to the rats using the method of intraperitoneally by an insulin syringe daily with the doses of 1, 2 and 4 mg/Kg of their weight for fourteen days and hormonal changes of FSH, LH, estrogen and progesterone were checked by ELISA test. **Results:** The results of the hormone evaluation show that LH hormone and FSH hormone caused a significant change in all Experimental group in comparison to Control group and estrogen hormone did not experience any meaningful changes in any Experimental group. Progesterone hormone showed a meaningful decrease in Experimental 1 group in comparison to Control group ($p < 0.05$) and had a meaningful increase in Experimental 2 group, but no meaningful changes was observed in Experimental 3 group. **Conclusion:** The results of the current study shows that Paraquate could have side effects on transpiration of sexual hormones of female rat and Ovogenesis process by producing free radicals.

Key words: Paraquate, FCH, Estrogen, progesterone, Rat**Introduction**

Paraquate is one the herbicides of Bi-Pridilume group [1]. Paraquate as a very powerful herbicide have a huge amount of consumption and production all around the world because of its unique characteristics. Its chemical formula is N,N' Paraquate – dimethyl 4,4 di-pridine is used as a herbicide in major and causes intensive pulmonary hurt in mammals. This herbicide is very toxicant for human and animals specially with the dilatory toxicity mechanism and this poisoning relates to the oxidation and revival mitochondrial and microsomal [4]. The toxicity mechanism of Paraquate usually relates to the production of anion super oxide.

These radicals are very toxicant and synthesize sorely with macromolecules and this toxin can produce a lot of active kind of oxygen such as hydrogen peroxide and superoxide anion as well. Those two free radicals are considered as two major

toxicants. The produced particles by that toxin cause serious hurts in different organs [5,6]. Paraquate is considered as a powerful toxicant synthesis which affects the growth of amphibians. In human, Paraquate After absorption through food aggregates in all important organs of the body specially in lung (more than ten times of plasma) as the selected organ because of high distribution volume, so that in the intensive toxicity cases death will occur because of lung (ادم) and phytroze (فيروز) [7]. Paraquate and its mechanism in the breeding system of male rats has caused a decrease in the weight of the male breeding organs (testicle, Epididymis, prostate and seminal and the number of sperms, cell division (meiosis and mitosis) , and Spermatogonia cells decrease as well [17].

Studies on bacteria, rat and human shows that Paraquate does not have mutagenic and carcinogenic effects but it weakens the immunity system and endometriosis. Paraquate causes decrease in the

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quantity of sexual cells among Bul/B Syrian rats and the wrinkle of sexual cells is considerable [3]. In this study, the effect of the Paraquate herbicide in different doses on eugene process and the hormonal axis of gonadal pituitary in mature female rat will be put under investigation.

Methodology and Instruments:

This is an experimental research which has been done in a laboratory. All of the moral basis of behaving with animals have been considered in this research. Fifty female mature rats of Vistar race with the weight of 200 ± 15 grams and the age of two months and half were provided by the Razi Center of Research on Vaccine and Serum Production in Shiraz. Rats were in Animals House of Jahrom Azad University under vitro circumstances of 21 ± 2 centigrade degree with twelve hours of light and twelve hours of darkness periods for two weeks. Rats were fed by standard food - pellete - and were free in eating food and drinking water. Their cage was disinfected three times a week by 70% alcohol. The Paraquate herbicide was provided by herbicide company. The injection was done intraperitoneally daily for fourteen days. Paraquate could be solved in physiology serum. By doing calculations, the needed doses of toxin were provided in physiology serum.

The fatal dose of Paraquate was defined equal to eight milligrams per one kilogram of the weight of the rat. The minimum, average and maximum doses were selected for injection. Rats were randomly divided into five ten-rat groups including the following:

Control group: A group which kept normally (receiving no treatments)

Control group: A group which received the physiology serum intraperitoneally.

Experimental group1: A group which received 1 mg/Kg the body weight of Paraquate.

Experimental group2: A group which received 2 mg/Kg the body weight of Paraquate.

Experimental group3: A group which received 4 mg/Kg the body weight of Paraquate.

The injective doses of Paraquate were injected intraperitoneally in 0.5 ml at 9.00 a.m. every day. After the end of the test period, the rats of all groups were anatomized and venesected after anesthesia with ether and after serum isolation the density of LH, FSH, estrogen and progesterone hormones was measured according to the ELISA in the laboratory of Jahrom University of Medical Science. ANOVA method of analysis was used for comparing the treatments and then Toki test was used for multiple comparisons among different groups. ($p < 0.05$) was considered as the level of significance in this study. SPSS software 15th edition was used for analyzing the data and doing statistical analysis.

Data Analysis:

The obtained results are the conclusion of using statistical methods on data. As illustrated in diagram 1, the amount of LH hormone does not show any meaningful changes in any Experimental groups in comparison to the Control group, but according to diagram 2 the amount of FSH hormone shows a meaningful change in all of the experimental groups in comparison to the Control group ($p < 0.05$). As diagram 3 indicates, no significant change was observed for the amount of estrogen in any Experimental group. Based on the diagram 4, the amount of progesterone has had a meaningful decrease in Experimental group 1, a meaningful increase in Experimental group 2 but no significant change in Experimental group 3 in comparison to Control group ($p < 0.05$).

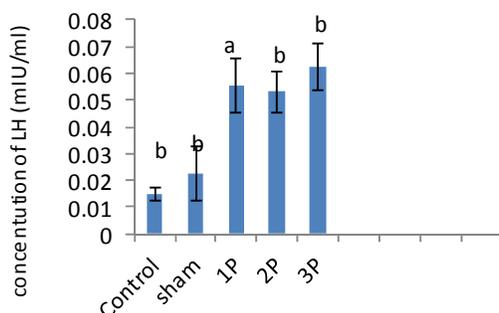


Diagram. 1: The effect of Paraquate herbicide on density of LH hormone

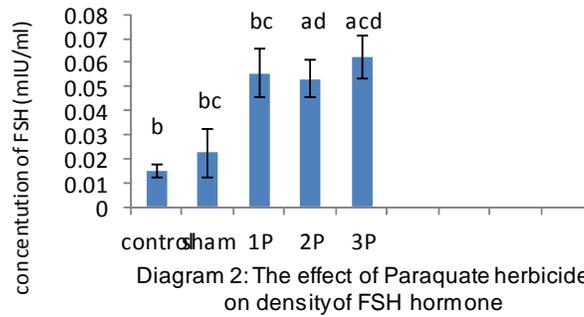


Diagram. 2: The effect of Paraquate herbicide on density of FSH hormone

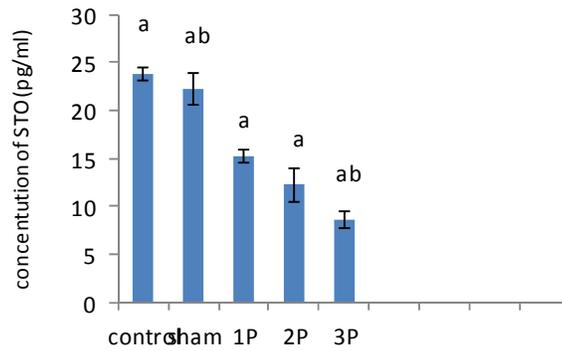


Diagram. 3: The effect of Paraquate herbicide on density of estrogen hormone

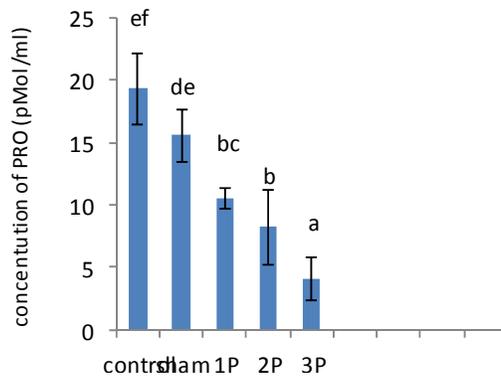


Diagram. 4: The effect of Paraquate herbicide on density of progesterone hormone

Results And Discussion

With an increase in population in our world today, it is not possible to provide food without scientific and progressive agriculture. In this modern agriculture, man should make use of toxins for extermination, herbicides and different kinds of chemical dung as well. Although all of those dung and toxins serve to human, it causes some problems in some ways. One of those toxins is Paraquate whose biochemical parameters and mechanisms have not been recognized yet.

The serum level of sexual hormones was known as very useful in evaluation of the fertility of human and animals [18]. In general, a considerable decrease in density of sexual hormones in fertility activities leads to fertility disorders in people who expose to chemical substances [19]. In these studies, being exposed to chemical substances causes the anagram of ovary structure and considerable changes in progesterone and level of estrogen in rats which was proved in previous experiements. In addition, some results have been reported in some researches done by Uboh and colleagues in which the decrease of progesterone and level of estrogen of serum is

because of damage in ovary. Normally in fertility and ovulation, estrogen and progesterone are under the effect of hypophysis which produces FSH and LH[20].

Studies indicate that oxidative stress plays an important role in pathogens of different disease such as cancer, diabetes, vascular and heart disease, Parkinson, Schizophrenia, Atherosclerosis, pulmonary disease and Cataract[8]. Oxidative stress is because of free radicals and mitochondria are known as the basic production place for free radicals [9]. mitochondria are the target goals for Paraquate toxin in organic and herbal tissues. In addition, lipid peroxidation leads to an increase of the harmful effects such as an increase in the rigidity of membrane, osmotic fragility, a decrease of intra-cell substances and fluidity of membrane [11]. Paraquate leads to a decrease in glutathione and glucose Phosphate dehydrogenase while the superoxide glutathione and glutathione peroxidase Catalase and superoxide increase which can prove the effect on antioxidant system of rats.

The studies have shown some effects of Paraquate such as histopathologic changes in rats [12] and testicle and ovary atrophy in them up to now [13]. In addition, they, by studying the effect of Paraquate on different generations of a specific kind of birds in a specific period, concluded that Paraquate can cause decrease of fertility, decrease of the weights of ovary and tubal. The breed chicks has got disorders as well [14]. In other studies which have been done on the effect of Paraquate and Glifusate on testicle and ovary of amphibian, they stated that Paraquate has caused the inhibition of Beta estradiol and in conclusion has created a kind of disorder which could be because of the effect of the reactives of oxygen or active oxygen [15].

Generally, in the damaged ovary, the level of estrogen and progesterone hormones, with the high and considerable production level of the produced LH and FSH is gonadal with the negative feedback of the mechanism of the Pituitary.

So, this result could be stated that if the ovary tissue hurts, it will get disorder in transpiration of estrogen and progesterone hormones which that disorder could be seen in the form of decrease or increase so that the meaningful decrease of progesterone hormone in Experimental group1 is logical in comparison to Control group. In the current research the amount of the progesterone density has increased in Experimental group 1 and decreased in Experimental groups 2 and 3 as well, but these changes have not been meaningful in comparison to Control group.

At first it might seem that the changes in LH and FSH hormones which is because of GnRH causes an increase in the FSH of the blood serum, but as it does not have any effect in the LH of the blood serum it could not be effective in increasing the GnRH. The density of FSH has shown a meaningful increase in

all Experimental groups in comparison to Control group ($p < 0.05$), which according to the researches of Hemayatkhah Jahromi and the colleagues in 2008, there has been an decrease in the density of this hormone in mature male rats. The results of this research are in opposite to what we have concluded in this research which could be because of the produced free radicals and lipid peroxidation leading the tissue changes and result in disorder of hormones transpiration. More importantly, gender might play a role in making this difference.

Conclusion:

According to the current research, we can conclude that the herbicide of the Paraquate type probably can have destructive effects on breeding physiology of the female rat.

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References

1. Qaazi Khosravi, M., Sh. Maqsood, M. Sotoodeh, B. Shakiba, A.M. Karkani, P. Aazar, & Esmaeeli, 2004. The effect of Captoril in prohibition of the pulmonary fibrose created by Paraquate, studying the role of nitric oxide, Pharmacology training group (Poorsina).
2. Mirshekari, B., 2003. 1st edition). Weeds and their management. Azad University of Tabriz publication, pp: 291-293.
3. Hemayatkhoh Jahromi, V., K. Parivar, A. Bahaoddini, F. Kafilzadeh, 2008. Studying the effect of Paraquate herbicide on histologic changes of testicle, fertility, (the process of spermatogenes and the hormonal axis of gonadal Pituitary in the mice of the Balb/C race, *the Magazine of biology of Iran*, 21(3): 527-535.
4. Lambert, C.E., S.C. Bondy, 1989. The effects of MPTP, MPP+ and paraquat on mitochondrial potential and oxidative stress. *Life Science*, 44(18): 1277-84.
5. Taylor, N.L., D.A. Day, A.H. Millar, 2002. Environmental stress causes oxidative damage to plant mitochondria leading to inhibition of glycine decarboxylase. *J Bio chem.*, 277(45): 42663.
6. Farrington, J.A., M. Ebert, Land E.J., Fletcher K. Bipyridylum, 1973. salts and related compounds.v. pulse radiolysis studies of the reaction of paraquat radical with oxygen. Implication for the mode of action of bipyridyl herbicides. *Biochim Biophys acta*, 314(3): 372-81.

7. Crouch, E., 1999. Pathobiology of pulmonary fibrosis. *Am J Physiol*, 259: 159-84.
8. Scheffler, I.E., 2000. A century of mitochondrial research: achievements and perspectives. *Mitochondrion*, 1(1): 3-31.
9. Cadnes, E., K.J. Davies, 2000. Mitochondrial free radical generation, oxidative stress, and again. *Free radic boil med*, 29(3-4): 222-230.
10. Morán, J.M. and et al., 2010. Effect of paraquat exposure on nitric oxide-responsive genes in rat mesencephalic cells. *Nitric Oxide.*, 23(1): 51-9.
11. Aydin, S., I. Aral, N. Kilic, I. Bakan, F. Erman, 2004. The level of antioxidant enzymes, plasma vitamins C and Ecement plant workers. *Clin chim acta*, 341(1-2): 193-198.
12. Alex, B.H., 1996. The effect of paraquat on histopathologic changes of rats. *Biochem Physiol*, 80(3): 53-57.
13. Balford, A.U., 1991. Anderson A. Oncogenicity study of paraquat in rats. *Toxiol.*, 51(3): 61-67.
14. Cheryl, A.B., 1985. Effect of paraquat on reproduction and growth in northern bobwhite. *J wildlife manage*, 49(4): 1068- 1073.
15. Luana, Q., M. Ennio, M. Oretta, B. Massimo, 2009. effect of paraquat and glyphosate on steroidogenesis in gonads of frog *Rana esculenta* in vitro. *Pesticide biochemistry and physiology*, 93(2): 91-95.
16. Sanhita, R., S. Aanab, R. Amitabha, 2007. effect of paraquat on antioxidant system in rats. *Indian journal of experimental biology*, 45: 432- 438.
17. Anuar, M.D., 2007. Zain, the evaluation of the toxic effect of paraquat and its mechanism of action on reproductive system of male rats, master of science, p-um 1107.
18. Dixon, X.L., 1984. Assessment of chemicals affecting the male reproductive system. *Arch Toxicol*, 7: 118-127.
19. Bjore, C., C. Bornberg, R. Niger, 1993. A comparative study of chemically induced DNA damage in isolated human and rat testicular cells. *Rep Toxicol.*, 10: 509-519.
20. Zrally, Z., J. Bendova, D. Svecova, L. Faldicova, Z. Veznik, A. Zajikova, 1997. Effects of oral intake of nitrates on reproductive functions of bulls. *Veterinarna Medicina*, 42: 345-354.
21. Yarube, I.U., M. Abdel-Halim, M.E. Okasha, J.O. Ayo, K.V. Olurunshola, 2009. Antioxidant vitamins C and E alleviate the toxicity induced by chronic sodium nitrate administration on sperm count and serum testosterone level in wistar rats. *European Journal of Scientific Research*, 25: 35-41.