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To Study the effect of herbicide on reproductive hormone of Male Albino Rat

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ABSTRACT

The effect of herbicide glyphosate on reproductive hormone of male Albino rat. The animals were exposed on acute exposure of the glyphosate for the present study. The Testosterone, FSH, and LH hormone level get decline with respect to normal. The main reason for the negative effect of these hormones on the testes' histological structure which is damaged due to glyphosate and consequently affects the Leydig or interstitial cells' number and function. So, it is concluded that herbicide glyphosate either in low or high concentration have very toxic effect on reproductive hormones.

Keywords: Glyphosate, Reproductive hormones, LH, FSH, Testosterone.

INTRODUCTION

Biochemical activities are generally studied per compound in cellular research, although mammalian cells are exposed daily to mixtures of xenobiotics and plant compounds. However, medicinal plant extracts may be claimed to prevent or cure chemical intoxications, but few of these are tested for their mechanisms of actions or cellular impacts.

The intensive use of glyphosate has resulted in increasing environmental and plant residues. Glyphosate is quite resistant to degradation due to the inert C-P linkage in the molecule (Chekan *et al.,* 2016). Nevertheless, it is broken down in dead plant material and soil by various microorganisms (Mamy *et al.,* 2016), the first decomposition product often is aminomethyl phosphonic acid, AMPA (Singh and Singh, 2016; Zhang et al., 2015b). However, decomposition of glyphosate takes place in living plants as well as in soils (Arregui *et al.,* 2004), so that both glyphosate and AMPA residues can be found in plant products.

Due to the large scale and intensive use of glyphosate and its accumulation in the environment and edible products, several major concerns have arisen in recent years about harmful side effects of glyphosate and AMPA for soil and water quality, and plant, animal and human health. Based on recent reports on potential chronic side effects of glyphosate (Battaglin *et al.,* 2014; Séralini

et al., 2014), the World Health Organization reclassified the herbicide glyphosate as probably carcinogenic to humans in 2015 (Bai and Ogbourne, 2016; EFSA, 2015; Guyton *et al.,* 2015; IARC, 2015).

The herbicide glyphosate, N-(phosphonomethyl) glycine, is a biocide with a broad-spectrum activity that was introduced for weed control in agricultural production fields in 1974 (Benbrook, 2016). One of them is Roundup (R), the most widely used herbicide worldwide, the residues of which are common in surface waters (IFEN: Report on pesticides in waters 2003-2004). These residues also enter the food chain (Takahashi *et al.* 2001), even though genetically modified edible plants (Spiroux *et al.* 2009). R is made up from a mixture of an isopropyl amine salt of glyphosate (G), quantitatively a minor compound, and various specific adjuvants depending on the formulation (Williams *et al.,* 2000).

Water environment and other herbicides are fat-soluble herbicides that are stored in living organisms by a process known as biological cations that cause them to remain in the food chain for a long time (Warsi, 2015). Herbicide particles can not only stay where they are applied but can also spread in other non-target areas through factors such as soil, wind, and water. Thus, it damages microorganisms by making toxic effects on different environments. This paper mainly focus on the comparative study of the effect of 15 days treatment and 30 days treatment on various parameters of glyphosate based herbicide roundup.

MATERIALS & METHOD

Experimental Design

The toxicity study of glyphosate was done for obtaining LD_{50}. The sub lethal dose of glyphosate was determined by studing the different research paper and the experimentation. Adult Male Albino wistar rats about age 2-3 weeks and 250-300gm body weight and Acclimatize for about 15 days and the experimental setup formed in three different groups.

- Group I control having 4 rats was given normal food and water in standard condition.
- Group II Experimental set having 4 rats was given oral dose of glyphosate 500mg per kg of body weight for 15 days along with normal food and water.
- Group III Experimental set having 4 rats was given oral dose of glyphosate 500mg per kg of body weight for 30 days along with normal food and water.

After 15 days the animal was sacrificed and blood samples were collected and the hormone testing were done by the laboratory from "New Tech Microbiology Lab Joint Venture with General Diagnostics "as well as confirm the readings by replicating thrice the experiment.

RESULT AND DISCUSSION

Mean level of reproductive hormone (Testosterone, FSH and LH) measured in the blood of the rats exposed to Roundup of glyphosate after 15 days is presented in Table 1. Testosterone, FSH and LH levels were decreased statistically significant ($p < 0.05$) in the glyphosate exposed rats compared to the control. When we compare the Testosterone normal values of group I (control) shows that the consequently decline in secretion of reproductive hormones Testosterone, follicular stimulating hormone (FSH) and luteinizing hormone (LH). Statistically the values of Testosterone, Follicular Stimulating Hormone (FSH) and Luteinizing hormone (LH) where done manually.

Lower the level of testosterone in exposed rats might be gives to the adverse impact of glyphosate in the Roundup consumed on the histological structure of their testes (my further studies) and subsequently affects the Leydig or interstitial cells by the number and function, meanwhile the secretions of testosterone get decrease (Zitzmann, 2008).

The serum level of testosterone, F.S.H and L.H. is decline may be due to disruption of gonadal tissues (Wang *et al.,* 2009). Treatement of glyphosate decreased average daily feed intake significantly, and at 500 mg per kg of the body weight of seminal vesicle gland and coagulating gland, the total sperm count diminished noticeably (as per my further Studies). As to testosterone, estradiol and progesterone levels, and oxidative stress (OS) constraints, as per in testis presented no difference at all doses of glyphosate related to that in control group (Dai *et al.,* 2016).

Table 1: reproductive hormonal level of Albino rat

Treatment	Testosterone	FSH	LH
Control	622.75 ± 0.14*	10.40 ± 0.46	6.43 ± 0.98
Herbicide 15 days	163.75 ± 0.28	1.74 ± 0.79*	1.48 ± 0.10*
Herbicide 30 days	159.75 ± 0.12*	1.25 ± 0.35	1.24 ± 0.80*

*Significant value at P≤0.05

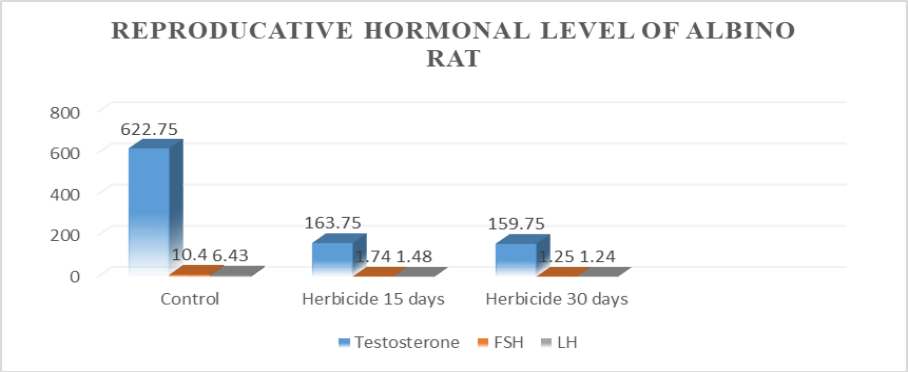

Figure 1: reproductive hormonal level of Albino rat

Histopathologically, severe deteriorating testicular architectural lesions were seen in the Roundup treated rats. Roundup may interfere with spermatogenesis hormonal activity and may leads to infertility in male gonad (Folarin *et al.*,2017).

The effects of exposure to Glyphosate/ Glyphosate Based Herbicides (Roundup) on the hypothalamic–pituitary–gonadal (HPG) axis in both males and females in terms of endocrine interruption, cell capability, and propagation. Most of the main controllers of the reproductive axis (GPR54, GnRH, LH, FSH, estradiol, testosterone) are changed at all levels of the Hypothylamus -pituitary gonadal (HPG) axis (hypothalamus, pituitary, ovaries, testis, placenta, uterus) by exposure to Glyphosate Based Herbicides.

CONCLUSION

The present work indicates that glyphosate-based herbicide caused alterations in the reproductive hormone of Albino Rat. The altered level and low content of Testosterone, F.S.H and L.H reflects a change in the rate of synthesis and degradation of different hormones lowered working capacity of male gamete during reproduction under the impact of accumulation of glyphosate leading to an alteration in function indicating the vulnerability of the organ.

Conflicts of interest: The authors stated that no conflicts of interest.

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