

**Biotic Potential Effects of Pesticide Cypermethrin on *Mus Musculus* (Linnaeus, 1758)****Rayan Das**

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**Abstract :**

*Cypermethrin is generally safe for both people and animals when used as directed on the label since it has minimal toxicity to mammals. It might have negative effects on health and the environment. This study intends to contribute to our knowledge of the possible dangers of pesticide exposure in wildlife populations by methodically evaluating these reproductive parameters in order to offer thorough insights into the effects of different doses of cypermethrin on the reproductive physiology of mice, *Mus musculus* (L.). As the concentration increased, the number of females conceived decreases. This study also suggested that the concentration of the substance played a role in female breeding success. As the concentration increased, fertility appeared to decrease. It also suggested that the gestation period in an organism was influenced by the concentration of Cypermethrin. As the concentration increases, the gestation period lengthens. Cypermethrin's effects on the oestrus cycle may accumulate over time, exacerbating reproductive dysfunction with prolonged or repeated exposure.*

**Keywords:** *Cypermethrin, Wildlife Populations, Metabolic, Wildlife Populations, High Concentration.***Introduction:**

The estruses cycle is strictly regulated by hormones such as progesterone and oestrogen. Changes to their concentrations have the potential to impact different stages of life. Synthetic hormones have several beneficial applications, but they also carry the risk of ovarian, breast, and prostate malignancies (Bohlke et al. 1998). Meat contains hormone residues, which may cause a variety of health problems in humans, such as hormonal imbalance, developmental delays, infertility, and perhaps cancers of the colon, breast, or prostate (Ganmaa and Sato, 2005). Another part of the body that infections might target is the reproductive system. Pests such as rodents, insects, mites, and ticks may be controlled using this synthetic pyrethroid pesticide, which finds extensive usage in public health, residential areas, and agriculture. The effect is paralysis and death brought on by interference with the target species' neurological systems. Cypermethrin is generally safe for both people and animals when used as directed on the label since it has minimal toxicity to mammals. On the other hand, others worry that it might have negative effects on health and the environment, especially in aquatic environments, and that it could even affect hormones. According to Das et al. (2016), cypermethrin reduces female reproductive activity in rats by interfering with the oestrous cycle and ovarian biomarkers via increased oxidative stress. This study intends to contribute to our knowledge of the possible dangers of pesticide exposure in wildlife populations by methodically evaluating these reproductive

parameters in order to offer thorough insights into the effects of cypermethrin on the reproductive physiology of mice, *Mus musculus* (L.).

### **Materials and Method:**

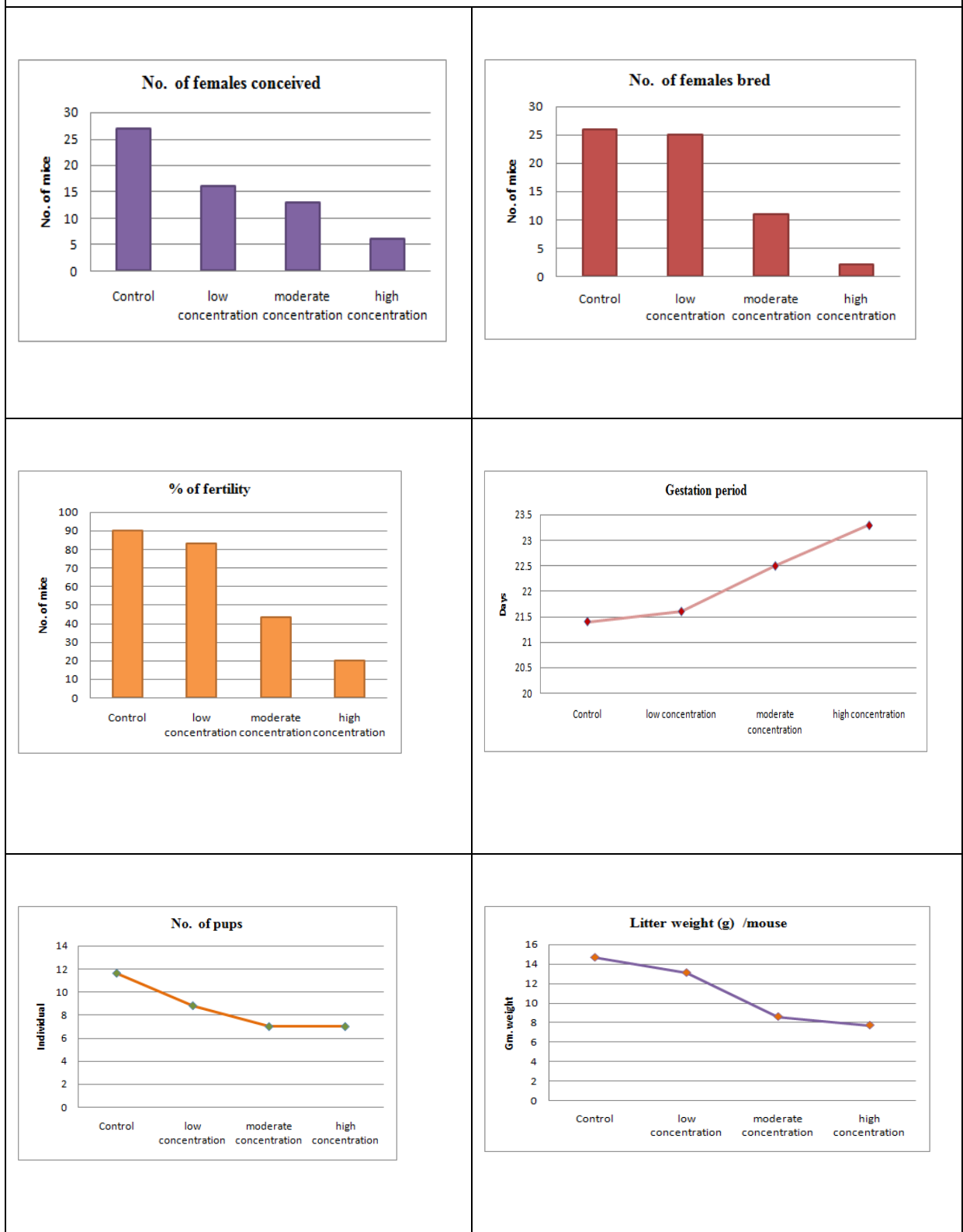
*Mus musculus* has played a vital role in advancing our understanding of human biology and disease. A total of 60 mature female and 10 male mice, with an average weight of 30-35 g, were acquired and kept in cages with five animals per cage for this research. During the course of the trial, the animals were fed regular mouse chow pellets and given access to unlimited water. Divided animals into control groups (no exposure) and exposure groups receiving individual or combined doses of the chosen markers. Every day during the experiment, a vaginal smear of every mouse in every group were taken and examined under a light microscope. Based on the data collected from each mouse, the mean number of oestrus cycles per month for each experimental group were calculated. To achieve the necessary concentrations of 1.38, 2.76, and 5.52 mg/kg body weight (bw), or 1/476th, 1/238th, and 1/119th of the LD50 value of the aqueous suspension of CYP, respectively, an emulsifiable concentrate of CYP (10%) were bought and diluted in distilled water. In addition, the doses were modified based on the mice's body weight during the trial. Collected blood samples from mice following appropriate animal handling protocols and euthanasia methods.

### **Results and discussion:**

Here are some potential effects found in this study:

1. **Disruption of Oestrus Cycle:** Cypermethrin exposure disrupted the normal hormonal regulation of the oestrus cycle in mice. This disruption led to irregularities in the timing and duration of the oestrus stages (proestrus, oestrus, metestrus, and dioestrus). Some mice exhibited prolonged or shortened oestrus cycles altogether.
2. **Changes in Hormone Levels:** Cypermethrin can interfere with the production and regulation of hormones involved in the oestrus cycle, such as oestrogen and progesterone. This disruption resulted in altered hormone levels, which in turn affected the timing and progression of the oestrus cycle stages.
3. **Fertility Issues:** Prolonged exposure to cypermethrin led to fertility problems in mice. Changes in the oestrus cycle affected the timing of ovulation and receptivity to mating, potentially reducing the likelihood of successful reproduction.
4. **Reproductive Toxicity:** Cypermethrin exposure had reproductive toxic effects on mice, including effects on the ovaries and uterus. This manifested as structural abnormalities, decreased ovarian follicle development, or changes in uterine morphology.
5. **Endocrine Disruption:** Cypermethrin is known to disrupt the endocrine system, which can have wide-ranging effects on reproductive function. It may interfere with the normal signalling pathways involved in the regulation of the oestrus cycle.
6. **Developmental Effects:** If cypermethrin exposure occurred during critical periods of reproductive development, such as during gestation or early postnatal life, it had long-lasting effects on the reproductive system of mice, including alterations in the oestrus cycle.

**Fig. 1. Effects of Cypermethrin on the fertility potential of the studied rodent**



The graph (Fig. 1) likely illustrates the effects of varying concentrations of a substance on female's biotic potential. As the concentration increased, the number of females conceived decreases. This graph suggested that the concentration of the substance played a role in female breeding success. The graph depicted the impact of different concentrations (low, moderate, and high) of a substance on mouse fertility. As the concentration increased, fertility appeared to decrease. It also suggested that the gestation period in an

organism was influenced by the concentration of Cypermethrin. As the concentration increases, the gestation period lengthens. In case of number of pups the **concentration categories** was as follows:

1. **Control:** Approximately 12 pups.
2. **Low Concentration:** Around 10 pups.
3. **Moderate Concentration:** Approximately 8 pups.
4. **High Concentration:** Roughly 6 pups.

As the concentration of cyperthrin increased, the number of pups decreased. There seemed to be a negative correlation between cyperthrin concentration and pup production. As we moved from the control group to the high concentration group, there wa a clear downward trend in litter weight. This suggested that higher concentrations of cypermethrin might lead to reduced litter weight in lab mice. Cypermethrin is an insecticide commonly used in agriculture and pest control. The observed decrease in litter weight could be due to various factors:

- **Toxicity:** Cypermethrin might directly affected the health of the mice, leading to weight loss.
- **Metabolic Changes:** Exposure to cypermethrin might alter metabolic processes, affecting weight.
- **Reproductive Effects:** Cypermethrin could impact reproduction, affecting litter size and weight.

These findings highlight the potential impact of cypermethrin on mammalian health. Researchers and pesticide users should be cautious about its use to minimize harm to animals and humans. Nasiadek et al. (2018) found that female rats exposed to subacute oral Cd exposure may experience long-term disruptions to their reproductive systems. Sengupta and Banerjee (2014) reported that metals, being reproductive poisons, could potentially cause hormonal changes that impact various aspects of reproductive health. Waseem et al. (2014) found that due to its toxicological effects on reproduction, lead exposure can result in infertility in female mice.

### **Conclusion:**

Exposure to cypermethrin led to significant disruptions in the normal oestrous cycle of female mice. This disruption was observed through alterations in the duration and frequency of oestrous phases, including proestrus, oestrus, metestrus, and dioestrus. Following cypermethrin exposure, immediate disruptions in the oestrus cycle, such as alterations in vaginal smear patterns or hormone levels, may occur. These acute effects provide initial insights into the pesticide's impact on reproductive function but may only represent transient changes. Cypermethrin's effects on the oestrus cycle may accumulate over time, exacerbating reproductive dysfunction with prolonged or repeated exposure. Assessing cumulative effects requires continuous monitoring and repeated exposure paradigms to capture dose-dependent responses and potential sensitization to cypermethrin toxicity.

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