



Effects of Radiation on Insects in Hanumangarh District of Rajasthan (India)

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Abstract: Rajasthan is the largest state of India. Hanumangarh is a district of Rajasthan located in the extreme north of the state, covering a geographical area of about 12,645 km. sq. It is situated on the bank of Ghaggar River (Ancient Saraswati River). An energy come from source and travels at speed of light through space is refer to as Radiation. Radiation cause very harmful effects on living organisms. Insects are the unique Arthropods, found everywhere on earth's ecosystems. In Animal kingdom insects are belonging from class Insecta of Arthropoda phylum. The present study provides special information about the effect of radiation on insects. Due to high radiation in environment insect's physiology, morphology, reproductive organs, lifespan, pheromone production, behavior, feeding and flight, etc. are affected.

Keywords: Radiation, Insects, Hanumangarh district, Rajasthan.

Introduction: Rajasthan is the largest state of India. Hanumangarh district is situated at extreme north of Rajasthan. Energy come from source and travels at speed of light through space is refers to as Radiation. The effects of ionizing radiation over insects are study in the 'Radio entomology' branch of science. Radiation can induce biological effect in insect cells in the form of α - Particles, β -Particles, γ - Particles, Neutrons, X-rays, and etc. radioactive effects of higher Linear. Energy Transfer (LET) like α -particles and neutrons are more effective to inducing biological effects. Radiation effects on cellular level to the insects and cause very serious problem in behavior and health of Insects. This research provides special information that how the insects are affected by different types of radiations in Hanumangarh district of Rajasthan.

Aim of the study:

1. To investigate the current status of insects due to radiation in Hanumangarh district of Rajasthan.
2. To evaluate the effect of different types of rays on insects.
3. To enhance public awareness and knowledge about radiation effect on insects.

Study area: Rajasthan, the largest state of India cover 10.4% of India geographical area and situated at 28°41'N 75°3' E. Hanumangarh is a district of the Indian state of Rajasthan. This district is located at extreme north of Rajasthan with an area of 12,645 km. sq. Hanumangarh is situated in desert area and this area has a water canal irrigation system. There is very low rainfall during monsoon season. For this paper Sangariya, Bhadra, Nohar, Pilibanga, Rawatsar areas of Hanumangarh district were selected for the study of effect of radiation on insects.

Methods and Materials: The study was undertaken monthly for a period of 6 month from February 2021 to August 2021. The insect fauna from terrestrial environment was collected by using insect net. For nocturnal insect light trap was used. In this research paper hand picking, direct observation, survey method and many other procedure were also followed by researchers. For insect collection sweep net, hand lens, microscope, container, insect rearing cages, ethyl alcohol for temporary storage, etc. are used.

Result and Discussion:

- 1. Effect on Reproductive organs -** Due to high radiation exposure, insect's organs are sterile so that the number of insects are reduces due to lack of matting.

UV content of the light was responsible for most of the sterilizing effect because they penetrate poorly and may adversely affect matting. Since many insects species are attracted to UV light.

Sterilization occurs through induction of dominates lethal mutation in gene by ionizing radiation. Insects could be earlier diapauses by radiation.

It was suggested that these rays merited further attention as a method of inducing sterility and diapauses of field population of insects.

- 2. Reduction in Life span-** High dose of ionizing radiation reduces the lifespan of adult male and female insects.
- 3. Change in Pheromone Production-** Radiation might be cause change in pheromones production. In Caribbean fruit fly, 50, 70 and 100Gy doses of radiation reduce pheromone production in mature male flies. Less than 50Gy did not cause a change in pheromone production.

- 4. Damage to the Gut of insects-** Mid-gut regenerative cell is very sensitive to radiation damage. For example- exposure of 30Gy radiation on boll weevil cause extensive damage to the regenerative cell of mid-gut and weevils die in a week.
- 5. Development of Abnormalities-** UV-C radiation decreased the body mass of insects and the adult emergence rate. In *Tribolium*, hind wing and elytra morphology were altered by UV-C radiation.
- 6. Effect on Chromosomes-** Damage in chromosome and chromosome breakage may be caused by ionizing radiation. Due to which strain of same species are adapted for diverse environment.
- 7. Effect on Size and Weight-** Large and long lived adult with higher moisture content of some insect species may be more sensitive by radiation as compare to small and short lived adults.
- 8. Nutrition Reduction-** Starvation may increase by radiation in insects so that nutrition is reduced.
- 9. Effect on insect Larvae and Pupa-** Generally adults are more radiosensitive than pupa and pupa are more radiosensitive than larva and egg. The percentage of larval and pupa mortality increased significantly with the increase of used doses as compare with the control.
- 10. Effect of 5G Radiation and Wi-Fi on insect** – Because insects are the organism with high surface area to volume ratio so 5G radiations and Wi-Fi could be severely affected to insects. It declines insect population.
- 11. Effect of Radio-waves in insect** – Radio waves kills the destructive insects in field products.

Conclusion: Insects play important role in ecosystem maintenance. This research provides the special information about effect of radiation on insect. High radiation causes harmful effects on insects such as – lifespan, sterility, nutrition reduction, chromosomal breakage, decreases or increases body size, developmental abnormalities, pheromone production and damage in gut etc. High radiation reduced the lifespan of insects. It cause sterility in insects by which the number of insects population is decreased day by day. It causes mortality in insect's larva and pupa stage. Starvation may increase in insects by radiation effect. Thus this study provides a picture of insect affected by different type of rays.

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References:

1. Calkins, C. O., & Parker, A. G. (2005). Sterile insect quality. In *Sterile insect technique* (pp. 269-296). Springer, Dordrecht.
2. Proverbs, M. D. (1969). Induced sterilization and control of insects. *Annual review of entomology*, 14(1), 81-102.
3. DUCOFF, H. S. (1972). Causes of death in irradiated adult insects. *Biological Reviews*, 47(2), 211-238.
4. Cornwell, P. B., Crook, L. J., & Bull, J. O. (1957). Lethal and sterilizing effects of gamma radiation on insects infesting cereal commodities. *Nature*, 179(4561), 670-672.
5. Henson, W. R. (1958). The effects of radiation on the habitat temperatures of some poplar-inhabiting insects. *Canadian Journal of Zoology*, 36(4), 463-478.
6. Abdullah, M. (1961). Behavioural effects of temperature on insects.
7. Carpenter, J. E., Bloem, S., & Marec, F. (2005). Inherited sterility in insects. In *Sterile insect technique* (pp. 115-146). Springer, Dordrecht.
8. Cogburn, R. R. (1967). Infrared radiation effect on reproduction by three species of stored-product insects. *Journal of Economic Entomology*, 60(2), 548-550.
9. Hori, M., Shibuya, K., Sato, M., & Saito, Y. (2014). Lethal effects of short-wavelength visible light on insects. *Scientific reports*, 4(1), 1-6.