ORIGINAL RESEARCH PAPER
Volume - 10 | Issue - 05 | May - 2021 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

AMPHIBIAN: FRIENDS OF FARMERS

Zoology

Newton Paul Assistant Professor, Department of Zoology, Isabella Thoburn College, Lucknow-226007, Uttar Pradesh, India.

ABSTRACT

Amphibians are vital for proper functioning of an ecosystem. Different genera of frogs and toads play a dual role as prey and predator in an ecosystem. The most important role is they act as a food for higher chordates like snakes, birds and mammals. Due to huge use of pesticides and chemical fertilizer in agriculture sector is one of the important cause of decline of amphibian population in the world. On medical point of view they are very significant in controlling the different genera of mosquitoes like *Anopheles, Aedes* and *Culex* which are responsible for malaria, yellow fever and dengue in human population. The rice field filled with water give opportunity to frogs to live in that in return they control insect and pest of rice crops.

KEYWORDS

amphibian, pesticide, fertilizer, prey and farmer

INTRODUCTION

India is an agricultural country in the world, it export large amount of rice, wheat, cereal and vegetables in different country of the world. Agriculture lands have suitable condition for the development of both arthropods and amphibians. Different species of pest and insect thrive well in that habitat. Farmer uses several insecticides to manage pest and insect population from crops damage. But farmer in the greed of good production forget the importance of natural hunter (frogs) in management of pest and insect in the agricultural field. Therefore due to extensive use of chemical fertilizers and insecticide is one of the responsible factors for decline in amphibian's population.

IUCN (2017) reveals that about 32% of amphibian species are threatened or extinct (Stuart et al., 2004; McCoy and Peralta, 2018). Amphibian are bless with great power of sensitivity where they thrive. Presence of amphibian in an ecosystem can predict accuracy of environmental factors both biotic and abiotic. As they live in both aquatic and terrestrial habitat they are considered as thermometers of that environment. On the basis of survival amphibian are well equipped with their wide range of morphology and physiological adaptation according to habitat. They can live under unfavourable conditions like drought and winter for long time. Earthworms are well known as friends of farmer as they help in regulation and facilitating air ventilation and soil quality in agricultural land. In the same way, amphibians are also making burrow for air passage and maintain soil chemical composition by regular digging process in an ecosystem.

Agricultural significance

Amphibians are the only vertebrate, that least harmful to human being. In Japan, frogs are considered as a symbol for good luck. As the amphibians are able live in the both aquatic and land habitat, they maintain energy flow and nutrient cycle in both. The continuous huge demand of food by large population of human being encourages the farmer to use variety of chemical fertilizer to produce large quantity of crops. The uses of fertilizer in the crop field enhance the productivity no doubt but also change the chemical composition of soil. The chemicals of fertilizer can increase or decrease the productive of water bodies by affecting micro flora and fauna. It can also cause some changes in the larval and adult stage of amphibians. Beside chemical fertilizer, farmer has used extensively pesticides, insecticide, fungicide and herbicides for large production of crop. The pesticide accumulate in amphibian by feeding contaminated food, absorption via gills and most important route is skin from where they respire.

Depending upon the nature of use, the pesticides are insecticides, fungicides, nematicides, rodenticides and biopesticides. Pesticides can be grouped into Organochlorides, Organophasphates, Organocarbamates and Pyrethroids. Organochlorides are an insecticide includes DDT (dichloro, diphenyl trichloroethane), Lindane, Aldrin, Thiodan and Mirex. Organophasphates includes Malathion, Parathion and Fenitrothion. Organocarbamates includes Aldicarb, *Carbofuran and* Propoxur. Pyrethrins are obtained naturally form chrysanthemum flowers. Pyrethrins are used to control insect and pest population. Pyrethroids have been extensively used agriculture sector to the population of aphids, beetles, bugs, leafhoppers, thrips and many others. The common pyrethroids frequently used in India are Permethrin, Decamethrin, Cypermethrin and *Fenvalerate.* The fungicides are used to remove the infection of fungus in crops. The common fungicides are categorised in Inorganic fungicides which include Bordeaux mixture, Mixtue, sulphur, mercuric chloride and Organic fungicides which include dithane, oxanthiins and mercury compounds. Pesticides are used throughout the world by the farmers. The annual use of pesticides in India is 40millions kg per year (Birge et al., 2000; Pandya, 2018). Pesticide has both acute and chronic effect on amphibian population. Chemicals cause adversely affect through delayed metamorphosis, increased predation, reduced size, reproductive complication, deformities, and suppression of immune systems lead to destruction of amphibian population (Christin et al., 2013).

Molly et.al. (2019) suggested the use of native Luzon wart frog in controlling pest of rice crop and improving its production without use of any pesticides in Los Baños, Philippines in two rainy seasons (2015 and 2017). The growling grass frog (*Litoria raniformis*) native to south-eastern Australia was reported within an agricultural area. But their population decrease due to use of metolachlor herbicide, and low pH in the rice bays of northern farms (Hyne et al., 2009). Khatiwada et al., (2016) reported 13 species of frogs in rice paddies which consume large population of rice pest especially during dry seasons and also find frogs significance for farmers. Frogs belong to order anura have significantly consumed different species of rice pest belongs to the order coleoptera, lepidoptera, orthoptera, homoptera and Hemiptera. Sathe and Patil (2014) reported different species of toad *Bufo* feed variety of pest and insect like paddy pests, grass hoppers, moths, bugs, beetles, jassids, cicadas, caterpillars, borers, in Kolhapur region of Indian state of Maharashtra state in India.

Frogs and toads are natural predator of an ecosystem; they mainly feed on locusts, grasshoppers, mealworms, caterpillars of different insects. Amphibian genera frequently used surface waters in agricultural areas for breeding and reproduction (Knutson et.al. 2004). The hunting behaviour of frogs and toads protect the crops at both time during day (mainly morning) and night. They also feed a large number of caterpillars; belong to different genera to insects. Besides controlling pest population, they also act as scavengers by feeding on dead animals, accidently fall down on agricultural areas. Amphibian provides incredible service to farmer by removing huge notorious population of pest in agriculture field. It is reported that one toad consumed large quantity of pest in a seasons where as frogs feed rice paddy pest more that its body weight. Each year amphibian saves large money of farmer by protecting their crops from different species of pest and insect (Deuti and Goswami, 1995). Agricultural land may give suitable habitat to amphibian for movement, dispersal and also serve as a site for conservation of the different species (Youngquist and Boone, 2014; Hansen et al., 2019).

CONCLUSION

The continuously extensive use of pesticides on agricultural land decrease the soil properties by killing micro fauna and disturbing

detritivores decomposition. During rainy season the pesticides chemical mixed with rain water and reaches to different water bodies where they accumulate in different species of flora and fauna. Mainly aquatic fauna like fishes and amphibian are adversely affected by contamination of water with toxic chemicals. Pesticides directly absorbed in body through skin and gill and indirectly reach inside the body by feeding bio-accumulated flora and fauna with pesticides chemicals. The most hazardous effect of pesticides chemical in the amphibians mainly larval stages are mutagenic change through alternation at genetic level (DNA). More research is required in the field of pesticides effect and their adverse effect on decline of amphibian in agricultural areas. There is an urgent need to conserve amphibians' species by both government and farmer level and also mention frogs importance in pest management practices (Khatiwada et al., 2016). The author suggest that frogs are friends for farmer (FFF= frogs friends of farmer).

Acknowledgements

The author is grateful to the Principal Dr. (Mrs.) V. Prakash, Isabella Thoburn College, Lucknow, Uttar Pradesh, India for her continuous encouragement and guidance.

REFERENCES

1. Birge, W. J., Westerman, A. G. and Spromberg, J. A. (2000). Comparative toxicology and risk assessment of amphibians, In: Ecotoxicology of amphibians and reptiles. Sparling, D. W., Linder, G. and Bishop, C. A. Eds, SETAC, Pensacola, FL, 727.
2. Christin MS, Gendron AD, Brousseau P, Ménard L, Marcogliese DJ, Cyr D, Ruby S, Fournier M. (2003). Effects of agricultural pesticides on the immune system of Rana pipiens and on its resistance to parasitic infections. Environ. Tox. Chem. 22(5):1127-1133.
3. Deuti, K and Goswami, B.C.B. (1995). Amphibians of West Bengal Plains. Culcutta: WWF- India Publ., 53 p.
4. Hansen N. A., Scheele B. C., Driscoll D. A. and Lindenmayer D. B. (2019). Amphibians in agricultural landscapes: the habitat value of crop areas, linear plantings and remnant woodland patches. Animal Conservation 22: 72–82
5. Hyne R. V., Spolyarich N., Wilson S. P., Patra R. W., Byrne M., Gordon G., Francisco S.B., and Palmer C. G. (2009). Distribution of frogs in rice bays within an irrigated agricultural area: links to pesticide usage and farm practices. Environmental Toxicology and Chemistry, Vol. 28, No. 6, pp. 1255–1265
6. IUNC (2017). The IUCN Red List of Threatened Species. Available online at: http://www.iucnredlist.org/initiatives/amphibians/analysis.
7. Khatiwada J. R. , Ghimire S. , Khatiwada S. P. Khatiwada, Paudel B., Bischof R. , Jiang J., Haugaasen T. (2016). Frogs as potential biological control agents in the rice fields of Chitwan, Nepal. Agriculture, Ecosystems & Environment Vol. 230, pg 307-314
8. Knutson M.G., Richardson W.B., Reineke D.M., Gray B.R., Parmelee J.R. and Weick S.E. (2004). Agricultural ponds support amphibian populations. Ecol Appl 14:669–684.
9. McCoy K.A. and Peralta A.L. (2018). Pesticides Could Alter Amphibian Skin Microbiomes and the Effects of *Batrachochytrium dendrobatidis*. Front. Microbiol. 9:748. doi: 10.3389/fmicb.2018.00748
10. Molly E. S.G., Diaz M. I., Almazan M. L., Singleton G. R., Hadi B.A.R. and Propper C. R. (2019). Agriculture, Ecosystems & Environment. Vol. 279 pg 100-108. https://www.sciencedirect.com/science/article/pii/S0167880919300957
11. Pandya I. Y. (2018). Pesticides and Their Applications in Agriculture. Asian Journal of Applied Science and Technology Vol. 2, Is. 2, pg 894-900.
12. Sathe T. V. and Patil R.N. (2014). Diversity and Utility of Toads (Amphibia: Anura) in Biological insect pest control in Satara, India. Indian Journal of Applied Research. Vol.: 4, Is.: 6 pg. 526-527
13. Stuart S.N., Chanson J.S., Cox N.A., Young B.E., Rodrigues A.S., Fischman D.L., Waller R.W. (2004). Status and trends of amphibian declines and extinctions worldwide. Science 306, 1783–1786. doi: 10.1126/science.1103538
14. Youngquist, M.B. and Boone, M.D. (2014). Movement of amphibians through agricultural landscapes: the role of habitat on edge permeability. Biol. Cons. 175, 148.