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Sarus crane, biodiversity and pesticides: A review

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Abstract

The Sarus crane, *Grus antigone* is a monogamous, non-migratory and world's tallest flying bird. Its abundance is positively associated with percentage of wetlands on the landscape, and negatively with the percentage of area under rice cultivation. Biodiversity or biological diversity refers to the variety of life on Earth, comprising millions of plants, animals, microorganisms and the genes they contain. It simply means the existence of a wide variety of plant and animal species in their natural environments or the diversity of plant and animal life in a particular habitat. Pesticides are biologically toxic substances used by humans to kill pests to increase the yield of many crops and to control the spread of insects. In present discussion, authors are trying to discuss the effects of pesticides on sarus cranes and biodiversity.

Keywords: Sarus crane, biodiversity, wetland, pesticides, conservation

Introduction

The Indian Sarus crane, *Grus antigone antigone* is the largest of the crane species found in India (Archibald *et al.*, 2003) ^[1] and prefers to inhabit close to human association. Besides the sarus crane, house sparrow and common myna are also associated with human habitation (Balwan and Saba, 2020) ^[4]. The sarus crane is now listed as globally threatened *i.e.* vulnerable bird species (BirdLife International, 2016; IUCN Red List, 2023) ^[6, 10], as its population is decreasing. However, Verma and Prakash (2017a, 2019, 2023) ^[25, 28, 32] and Prakash and Verma (2019) ^[18] reported an increase in its population in Kaushambi district of Uttar Pradesh. The Sarus crane pairs are popular as eternal symbol of unconditional love, devotion and good fortune with high degree of marital fidelity as they pair for lifelong (Prakash and Verma, 2016; Verma and Prakash, 2017b) ^[17, 26].

Biodiversity is the 'foundation of human life' (Verma and Prakash, 2020a) ^[29]. There are varied definitions of the term 'biodiversity'. According to Gaston and Spicer (2004) ^[9], it is 'variation of life at all levels of biological organization'. Biodiversity is necessary for the survival of entire biota including humans (Kumar, 2018) ^[13]. The system of abiotic and biotic components together constitutes an ecosystem. In order to maintain this system with widespread biodiversity, an ecological balance is needed (Ashok, 2017) ^[2].

Pesticides are biologically toxic substances used by humans to kill pests to increase the yield of many crops and to control the spread of insects. The use of pesticides has caused serious environmental and health risks to living beings including fishes that in turn disturbs the biodiversity and sustainable development (Prakash and Verma, 2014; Chaudhary *et al.*, 2021) ^[16, 8]. The pesticides can alter habitat structures, making them inhospitable for certain species (Verma and Prakash, 2018) ^[27]. Aquatic ecosystems, in particular, are vulnerable, with runoff from agricultural fields carrying pesticides into rivers and lakes, affecting fish, amphibians, other organisms and farmers (Zhou *et al.*, 2002; Wafa *et al.*, 2013; Prakash and Verma, 2020) ^[35, 33, 19].

Interrelationship between Sarus crane and Biodiversity

The living world has rich diversity of animals, plants and microbial life that appear to be well adapted according to the environment. It simply means the existence of a wide variety of plant and animal species in their natural environments or the diversity of plant and animal life in a particular habitat. A variety of animals refer to various animal species including birds such as Sarus cranes. The sarus crane is 'State Bird of Uttar Pradesh' and shows strong correlation with agriculture (Ashok, 2018) ^[3]. The biodiversity is being depleted by the loss and deterioration of habitats, unprecedented climatic changes, diseases, indiscriminate

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anthropogenic activities such as electronic wastes, cultivation shifting, poaching, pollution and so on (Kumar, 2021; Verma and Prakash, 2020b; Prakash and Verma, 2022; Singh *et al.*, 2023) [14, 30, 20, 22]. Since the human beings are deriving all the benefits from biodiversity hence they should take proper care for the preservation of biodiversity in all its forms and good health as well as safety for the future generation.

Effects of Pesticides on Sarus cranes and Biodiversity

Pesticides are chemicals used in agriculture, forestry and public health to manage pests. In the agricultural sector alone, pesticides play a pivotal role in ensuring food security by protecting crops from insects, weeds, and diseases. They can have short-term toxic effects on directly exposed organisms, and long-term effects can result from changes to habitats and the food chain. Excess use of pesticides may lead to the destruction of biodiversity. The pesticides can disturb the natural habitat of many birds, aquatic organisms and other organisms (Bhakar *et al.*, 2023; Rani *et al.*, 2024) [5, 21].

Sarus cranes live close to human habitation and depend on food grains as their primary food source. They prefer to choose specific plants in making nests (Verma and Prakash, 2016) [24] and show specific nesting behavior (Verma and Prakash, 2021) [31]. However, pesticides used in fields pose a major threat to the birds by either killing them or affecting their calcium metabolism and making the shells of their eggs very fragile. It interferes with supply of calcium that is essential for eggshell formation. If the eggshell is thin, it will be crushed as soon as the mother sits on it for hatching and will definitely reduce the population of Sarus cranes (Mahendiran *et al.*, 2020) [15].

India's population is increasing day by day and in order to meet its nutritional requirement, the rate of agricultural production is continued to increase. However, today's agriculture generally aims to produce large quantities of food, against the lowest economic costs, in the short term. These short-term goals often lead to conflict with the conservation and management of biodiversity and other long-term ecosystem services (Srivastava *et al.*, 2019) [23]. However, agriculture is the unavoidable contributor to biodiversity loss with multidimensional effects (Kumar, 2017a; Chandrakumara *et al.*, 2023) [11, 7]. Everyone should follow the concept of development and sustainability with environmental ethics (Yadav, 2016; Kumar, 2017b) [34, 12].

Conclusion

This varied diversity must have to be maintained in order to mutual survival and existence of living beings. Conserving biodiversity does mean the proper management of the biosphere by human beings in such a way that it gives maximum benefits for the present generation and also develops its potential so as to meet the needs of the future generations. The best way to conserve biodiversity is to save habitats and ecosystems rather than trying to save a single species. The conservation of biological diversity has now become a global concern. There are basically two main approaches of biodiversity conservation namely, in-situ conservation (within habitat) and ex-situ conservation (outside habitat).

Currently, in most of the cases unsustainable development is occurring. Irresponsible planning and environmental degradation through over exploitation of resources, generation of wastes and pollutants are the major reasons. Such practices are not sustainable in the long term. The true sustainable

development is the optimum use of natural resources with high degree of reusability, minimum wastage, least generation of toxic byproducts and maximum productivity. The sustainable development has multi-dimensional concept incorporating the interactions among society, economy and environment. In order to achieve the sustainable development, each and every one should obey the effective environmental ethics, minimize the harmful anthropogenic activities, promote inclusive education and development and care for earth, environment and biodiversity.

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