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Habitat Destruction of Wild Rice Germplasm and Their Impact on Future Crop Improvement

Anjan Kumar Sinha

Department of Botany, Raghunathpur College, Raghunathpur, Purulia-723133

Email- anjansinha06@gmail.com

Abstract:**Whole eastern region including West Bengal of India is a home land of a large number of wild rice species. Among the 24 wild rice species two wild rice species i.e. *Oryza rufipogon* and *O.nivara* has been found abundantly in various districts of West Bengal like Bankura, Purulia, Bardhaman and Birbhum etc. Habitat of the wild rice varieties has been declining very fast. Extensive survey has been conducted in the district of Bankura and Purulia of West Bengal and found various patches of wild rice population. Due to the biotic and abiotic stress factor and anthropogenic activities these wild rice germplasm resources have been rapidly declining from their natural habitat. Present investigation shows the periodical decline of a wild rice population from the seasonal pond near the Jaychandi foothills of Purulia district of West Bengal. Data from three consecutive years from 2023-2025 is clearly indicating that the wild rice population is declining from their natural habitat very fast and proper conservation strategies should be adopted urgently or we may lose these valuable genetic resources from this region in near future.**

Keywords:*Wild rice, West Bengal, destruction, germplasm, conservation.*

*Corresponding author: A. K. Sinha

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1. Introduction

From morphology to the genetic configuration Wild rice is closely related to the cultivated rice. Due to natural selection cultivated rice had evolved from the wild rice varieties. Eastern part of India is a home land of a large number of wild rice species population.Among the 24 wild rice species two wild rice species i.e. *Oryza rufipogon* and *O.nivara* has been found abundantly in Eastern part of India (Sing, 2013). Wild rice germplasm resources consist of diverse genetic diversity into their gene pool (Samal, 2018). Most of the wild rice germplasm have excellent adaptability towards the various abiotic and biotic stress conditions. These genetic resources will play a pivotal role in future crop improvement as the climate is gradually

changing (Brar, 2003). Due to present climatic conditions, change of natural environmental conditions, change in crop structure and land management practice, overpopulation and urbanization, wild rice germplasm resources have been declining very fast day by day from their natural habitat (Sinha, 2024). Several workers had been working on collection, conservation, characterization and documentation of wild rice diversity of Eastern India and pointed out the gradual erosion of wild rice diversity from their natural habitat (Patra et.al 2008) (Lu & Sharma, 2003). Present work investigated the destruction of wild rice habitat of Jaychandi foot hills of Purulia district of West Bengal due to the extension of urbanization and changing of land use pattern during the last three years (from 2023-2025).

2. Review of literature

Rice is a staple food for more than half of the world population. Among the total 26 species of genus *Oryza* only two species (*Oryza sativa* & *Oryza glaberrima*) are cultivated, i.e. used for rice consumption and other 24 species belong to wild species. Rich number of phenotypic and genotypic diversity have been reported among the cultivated and wild species of *Oryza* and more than 120000 different accessions are reported so far (Das *et. al*, 2023). Collection, conservation and characterization of wild rice accession have been conducted by several national and international levels. International Rice Research Station (IRRI) conserved 4645 wild rice accessions in their gene bank (http://irgcis.irri.org//), Indian National Bureau of Plant Genetic Resources (NBPGR) conserved 307 different accessions of *Oryza rufipogon*, and 726 different accessions of *Oryza nivera* species in their gene bank in the year 2018 (Source: http://www.nbpgr.ernet.in:8080/PGRPortal/). So many workers have been working on morphological and genetic variation found among the different accessions of wild rice species. Sing *et al* (2018), Khus (1990), Vaughan (1994), Suh (1997), Vaughan (2003), Mishra (2016), Brar (2003), Sanchez (2023), etc. have been worked on morphological and molecular characterization of wild rice varieties, resistant potentiality of wild species against the various biotic and abiotic stress, and utilization of wild and weedy species in crop improvement works. Wild rice varieties have been possessing high levels of genetic variation in their gene pool and these genes are responsible for drought, cold, submerged and pest and pathogen resistance of the wild rice varieties. Several initiatives have been taken to identify these genes and utilization of these genes in the crop improvement programme. Various workers like Sing, 2018; Sweeney, 2006; Ashikari,2005; Ren et.al, 2005; Takano-Kai et.al 2009; Chen et al., 2008; Baba et al. 1993; Xu et al. 2006; Amante-Bordeos, 1992; Devanna et.al, 2014 etc. have worked on identification of different gene locus of *Oryza rufipogon* and *O.nivara* species for salt tolerant, bacterial blight resistant and other

stress resistantpotentiality.

3. Results and discussion

Study area of wild rice population

Plate 1. Flowering population of Wild rice species in the month of September-October in the year- 2023. The whole water body had been covered with the wild rice species.

Plate 2. Population of wild rice species in the month of September-October in the Year-2024. The whole water body affected by the grazing and other anthropogenic activities. The population of wild rice specie had been decreased drastically.

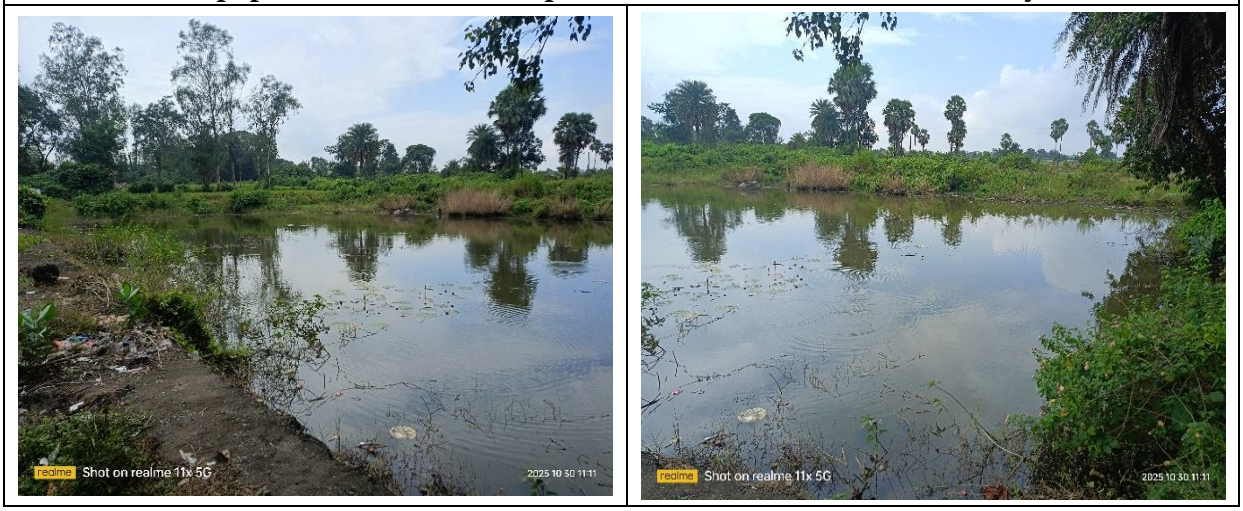

Plate 3. Picture of the same water body in the month of October-November, 2025. The population of the wild rice species has been washed out. Not a single population of the wild rice species has been found in the water body.

The study area of wild rice population is a seasonal pond near the Jaychandi foothills of Purulia district of West Bengal. A large population of *Oryza rufipogon* species has been observed in the seasonal pond up to the year 2023. The wild rice species had been grown abundantly from the month of July- August, set flowering during the September and completed their lifecycle in October-November. High shuttering characters of the panicle have been observed and mature seeds have fallen down into the water and shuttled down in the bottom of the water body. Plate no 1. Shows the wild rice population in the month of September-October,2023. The picture clearly shows the wild rice population totally covering the whole water body. Plate no-2 shows the same water body in the year of 2024. It was observed that the wild rice population has started declining due to grazing and anthropogenic activities. In Plate no.3 the picture is taken of the same water body in the growing season of year 2025 (in the month of October) and the picture clearly shows that the whole water body is devoid of any single Wild rice population. The whole population of the wild rice has vanished from their natural habitat due to anthropogenic activity.

Impact of wild rice destruction in sustainable agriculture

Cultivation and yield stability of present elite rice varieties are subjected to various parameter like biotic and abiotic stress, productivity and quality. For sustainable agriculture and yield consistency development of abiotic and biotic stress resistant rice varieties are very much necessary. As wild rice grown on various abiotic and biotic stress condition, they have developed resistant gene in their gene pool to protect against these stress conditions. These gene pool will be the future tool for the development of drought resistant, heat stress tolerant, submerged tolerant, virus, bacteria, pest and pathogen resistant rice varieties (Sinha, 2024). Previously a RNA virus (Grassy stunt virus) resistant gene had been found in a wild rice species i.e. in *Oryza nivara*which had been used for the development of virus-resistant hybrid rice varieties in Asiatic region (Khus, 1974). Another important aspect is development of high-quality nutritious rice with low glycaemic index. Several wild rice species possess genes responsible of production of low GI rice (Aavula, 2023). Breeding with these varieties may produce low GI elite rice varieties. These could be all possible if we preserved considerable number of wild rice germplasm in in-situ conditions. If we lose this wild germplasm, we not only loose the genetic diversity of wild rice population rather we lose the chance to sustain our agriculture in near future.

4. Conclusion

Habitat of the wild rice population of Bankura and Purulia district of West Bengal are under great threat due to various anthropogenic activities. Wild rice population grown on aquatic environment or wet land are more vulnerable as most of the water bodies are disappearing very fast due to drought or due to various developmental activities. Timely action should be adopted to prevent further loss of existing wild rice species of West Bengal. Development of awareness among the common people, students, and young generation about the importance of wild rice species for the future crop improvement and sustainable agriculture.

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