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Promotion and conservation of native flora and fauna in newly established agro-biodiversity park in Acharya NG Ranga Agricultural University, Hyderabad

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ABSTRACT

Deccan plateau region in India is unique because of its varied geography and great diversity in its natural ecosystem that is immensely rich in agricultural diversity including wild plant biodiversity and various farms of faunal diversity. The Deccan plateau region of Hyderabad in particular is highly overexploited by several anthropogenic activities resulting in loss of life supporting resources, biodiversity gene pool and nature's self-sustaining and ameliorating capabilities. First of its kind in India, the Acharya NG Ranga Agricultural University, Hyderabad established the agro-biodiversity park in August 2008 over an area of 150 acres in the university campus. The park site is naturally spread with hillocks, boulders, undulated terrain with sloppy lands covered with natural jungle scrub with native herbs, shrubs, climbers and tree species. In the park a natural water tank is spread over 75 acres including surrounding wet ecosystem. The main aim of agro-biodiversity park is to preserve, conserve and maintain the rich flora and fauna present in Deccan plateau region of Hyderabad. At initial stage, with minimum disturbance, the exotic species such as *Parthenium hysterophorous*, *Lantana camara* and *Prosopis juliflora*, already present in the vicinity, were removed as these are considered dangerous invasive alien species, which adversely affect the native biodiversity and prevent forest regeneration. After removing these alien species, several block plantations of teak and mahuva dominated plant community with 70 per cent of teak and mahuva and remaining 30 per cent with forest mixed tree species were developed. In addition, separate generic blocks were also developed viz palm garden, medicinal tree garden and mixed forest tree garden. Besides these, a *Ficus* species diversity block was also developed. As a part of other activities, water ponds and water bodies were also created as a source of water for all resident and migratory bio-creatures for promotion of faunal genetic resources. In all, 24 species of insects, 5 of fish, 8 of reptiles were recorded in the park. Out of 120 species of butterflies present in Andhra Pradesh, 56 were recorded in the park. The species of birds have increased from 35 to 162 within two years.

Keywords: Biodiversity, agro-biodiversity, flora, fauna, conservation, preservation

INTRODUCTION

Biodiversity is the key that sustains agricultural production and productivity. It would be very difficult for a nation like India to achieve the global target of conservation valuable plant species in situ, unless management efforts were taken to incorporate community conserved biodiversity and agricultural landscapes.

Conservation of diversity on-farm and in situ in forests and protected areas is likely to backup food and agricultural security options of the future. Year 2010 was declared as 'International Year of Biodiversity'. One of the 2010 biodiversity targets at global level was to achieve significant reduction in the current rate of loss of biodiversity. The loss of diversity is alarming across known species groups. Knowledge and information is limited about the distributional pattern and conservation status of the threatened tree species of India facing climatic change with predictions indicating around 10 per cent of all tree species of India would be lost in the near future (Anil Kumar et al 2010). Approximately, 600 tree species in India are threatened with extinction, a sizable percentage being located in South India. Deccan plateau region is one of the richest diversity hot spots in India and is highly overexploited by several anthropogenic activities resulting in loss of life supporting resources, biodiversity, gene pool and nature's self-sustaining and ameliorative capabilities. Keeping in view of facts with appropriate presumptions pertaining to devastating effects resulting in degeneration of natural resources, the Acharya NG Ranga Agricultural University has has taken the lead to promote and conserve the native flora and faunal diversity at its newly established agro-biodiversity park at Hyderabad in 2008.

METHODOLOGY

The Acharya NG Ranga Agricultural University, Hyderabad is the first agricultural university in India that initiated the establishment of agro-biodiversity park in August 2008 over an area of 150 acres with natural ecosystem. The site selected for agro-biodiversity park was originally under jungle scrub, hillocks, rock structures, water bodies, undulating rocky terrain with different topography lands covered with various natural grown tree species, shrubs, herbs, creepers and grass species. Out of 150 acres, 50 per cent area was under natural water tank. At initial stage with minimum disturbance, the exotic species such as *Parthenium hysterophorous*, *Lantana camara* and *Prosopis juliflora* already present in the vicinity were removed and these were considered as dangerous invasive alien species, whose presence adversely affects the native biodiversity and prevent forest regeneration (Muniappan and Viraktamath 1993). The existing natural flora included tree species like babul, butea, neem, sissoo, pongamia, *Prosopis* spp, jamun, *Ficus* spp, *Acacia* spp, *Albizia lebbek*, *Cassia* spp, Custard apple and various species of shrubs and grasses were not disturbed. The existing fauna in the area comprised of peacocks, rabbits, wild boars, foxes, different species of snakes, lizards, mongoose, chameleons, birds and other

wild animals. Depending upon topography, soil profiles were dug. Initial surface and sub-surface soils and water samples from different locations of tank were collected and analyzed for various parameters by following standard methods (AOAC 1980). Baseline data, land use cover and aerial view maps of agro-biodiversity were collected with the assistance of sub centre of Salim Ali Centre for Ornithology (SACON), Hyderabad.

RESULTS AND DISCUSSION

Soil data of agro-biodiversity park revealed that most of the soil type was red gravelly to sandy loams with shallow to medium deep soil. Black clay loamy deep soils were present near the water tank area. Soils were neutral to alkaline in reaction (6.54 to 8.69) and non-saline to medium saline in nature (0.06 to1.87 d|Sm^{-1}). Organic carbon content was low to high (0.45-1.2%). It was found to be very low to low in available N (125-326 kg ha^{-1}), medium to very high in P_2O_5 (34.6-130.2 kg ha^{-1}) and low to high in K_2O (233-782 kg ha^{-1}). It is well known that different plant species promote different groups of soil biota, and changes in below ground organisms enhance the rate of vegetation change. Therefore, the planting of different species in degraded soils might be used to promote soil biodiversity and function, thereby enhancing the rate of restoration (Chun Lin Long et al 2003).

The initial water samples from existing polluted tank were slightly to strongly acidic (pH 6.4 - 4.6), very low in EC (0.1 dSm^{-1}). Cl^- content was high that ranged from 2-.2 to 36.6 meq L^{-1}, whereas, CO_3^{--} were absent and HCO_3^- were very low in content (1.9 - 3.56 meq L^{-1}). Mg content was more as compared to Ca.

The main aim of the agro-biodiversity park was to preserve and conserve and promote the native flora and fauna through ex situ conservation of the species by fulfilling the following objectives:

- To establish 15-20 biotic communities including wild relative field crops as a repository that flourished in the Deccan plateau in the past,
- To restore and develop the existing dry land and wet land habitat to preserve and conserve the genetic resources of both flora and fauna,
- To create a field gene bank for the threatened land races and wild genetic resources of cereals, millets, pulses, oilseed and fiber crops,
- To create different habitat types which will provide material for resident and migratory birds, mammals, reptiles, amphibians, insects etc,
- To promote and create awareness on nature conservation through education,

- To promote scientific research for preserving the keystone species of ecosystem importance, and
- To promote ecotourism which will act as a cultural and aesthetic centre for urban dwellers.

Besides, different plant community dominated blocks were developed such as teak, mahuva, palm, medicinal tree garden, mixed forest tree blocks as genetic diversity. *Ficus* block as species diversity and natural jungle scrub was maintained for comparison in agro-biodiversity park. All the plantation was taken up during monsoon season and the survival was more than 90 per cent. Watering and care was taken during first summer season to protect the young plants against water stress problem as suggested by Kona et al (2009).

Teak dominated plant community block (2040 plants planted in 5.2 acres)

In this block, plantation was done during the month of September 2008 with mixed plantation of different plant species with the objective of creation of natural habitat wherein plant species would have different forms, shapes, canopy structures, growth promoting the native flora and fauna in the locality. Teak was planted with a composition of 70 per cent in mixed plant community in the block. Hence, it is called as teak dominated plant community block.

Mahuva dominated plant community block (1355 plants planted in 3.4 acres)

Mahuva dominated with 70 per cent plant community block was also established in September 2008 with 30 per cent composition in mixed plant community.

Ficus religiosa (Peepal), *Peltophorum ferrugineum* (Copper Pod tree), *Alstonia scholaris (*Sapta padi), *Millingtonia hortensis* (Indian cork tree), *Spathodia campanulata, Lagerstroemia flos-reginae* (Pride of India), *Bauhinia* spp (Camel foot tree), *Pongamia pinnata* (Karanj), *Tabebuia rosea, Azadirachta indica* (Neem), *Tamarindus indica* (Tamarind), *Syzygium cumini* (Jamun), *Emblica officinalis* (Amla), *Ferrunea elephanta* (Wood apple), *Tectona grandis* (Teak) and *Madhuca latifolia* (Mahuva) were planted in these blocks.

Ficus garden block (27 species planted in 1 acre)

In this block, different species of genus *Ficus* were planted during September 2009 to denote genetic diversity in the species. *F pandurata, F benjamina blackiana* (*Ficus* black), *F prestige, F regenald, F wasteland, F benghalensis, F religiosa, F glomerata, F benghalensis* (variegated), *F noda, F hispida, F benjamina* (Golden king), *F iceland, F pumila, F mysorensis, F elastica*

(variegated), *F dammaropsis* (Ficus round high land), *F bushking, F triangle, F milenusi, F religiosa* (Prop root), *F drooping, F avoa gold, F long leaf, F tussila, F mexicana and F plurocarpa* were planted in this block.

Medicinal tree garden block (29 species planted in 1.5 acres)

In this block about 29 tree species (*Adathoda vasica, Thespesia populnea, Syzygium cumini* (Jamun), *Ceiba pentandra, Acacia sinuata* (Shikakai), *Erythrina indica, Cassia alata* (Ring worm tree), *Aegle marmelos* (Bael), *Simarouba glauca* (Paradise tree), *Plumbago jailana, Asparagus racemosus* (Sathavari), *Alstonia venenata, Commiphora wightii* (Goggul), *Terminalia bellerica, Holarrhena antidysenterica, Adenanthera povonia, Cassia glauca, Sterculia urens* (Gum karaya), *Pongamia pinnata* (Karanj), *Butea monosperma* (Flame of the forest), *Azadirachta indica* (Neem), *Emblica officinalis* (Amla), *Cassia fistula, Haemophyllum canophyllum*, *Tabebuia avalanda, Cassia siamea*, *Sterculia foetida, Dalbergia latifolia* (Rose wood) and *Madhuca latifolia* (Mahuva) which have medicinal value were planted to establish a medicinal tree garden in agri-biodiversity park in September 2009.

Palm garden block (22 species planted in 1 acre)

In this block about 22 species of palms (*Caryota urens* (Fishtail Palm), *Roystonea regia* (Royal Palm), *Licuala grandis* (Ruffled fan Palm), *Ptycho sperma* (Areca Palm), *Phoenix sylvestris* (Sugar date Palm), *Dypsis decaryi* (Triangle Palm), *Phoenix roebelenii* (Date Palm), *Dictyosperma album* (Kentia Palm) were planted to establish as a model for genetic diversity of palm species during November 2009. Some of the palms like sugar date palms and date palms have been reported to withstand hardy dry conditions (Maarten van ginkel 2010).

Mixed Forest tree block

About 6000 tree saplings viz *F religiosa, F benghalensis, F mollis, Terminalia arjuna, Madhuca longifolia, Syzygium cumini, Tamarindus indica, Sterculia foetida, Terminalia catappa*, *Hordwikia binata*, *Terminalia tomentosa* and *Anthocephalus cadamba* (large crown species) and *Emblica officinalis*, *Cassia fistula, Bauhinia racemosa*, *Mimusops elengi, Santalum album, Putranjiva roxburghi, Swietenia mahagony, Millingtonia hortensis, Dalbergia latifolia, Dendrocalamus strictus* and *Ferronia elebphantum* (small and medium crown species) were

planted in 10 acres in July 2010. As these were planted in monsoon, almost all plants survived.

Proposed activities

- Preservation, conservation and maintenance of traditional varieties and land races of cereals, millets, pulses and oil seeds
- Development of butterfly garden
- Development of range lands and grass lands
- Development of water ponds and water bodies
- Development of wetland ecosystem

As a part of other activities, water ponds and water bodies were also created as a source of water for all resident and migratory bio-creatures for promotion of faunal genetic resources. In all, 24 species of insects, 5 of fish and 8 of reptiles were recorded. Out of 120 species present in the state, 56 were recorded in the park. The species of birds have increased from 35 to 162 within a span of two years in this park (Vasudeva Rao and Parasharya 2009). Besides, various species of insects belonging to Dictyoptera (5), Hemiptera (4), Hymenoptera (2) and Coleoptera (13), 10 species of dragonflies and damselflies, 56 species of butterflies belonging to Nymphalidae (23), Lycaenidae (5), Pieridae (9), Hesperiidae (5) and Papilionidae (14), 5 species of fish from Osteoglossiformes (1), Cypriniformes (3) and Siluriformes (1), 3 species of (amphibians frog, toads etc) and 8 species of reptiles (snakes, lizards, chameleon etc) were present.

Expected outcome of the agro-biodiversity park

- The park may nurture a variety of ornamental plants, medicinal and aromatic plants, aquatic plants, orchids, palm groves, bamboo groves, mixed forest trees etc,
- As a heritage garden it will enhance the joy of aesthetic exploration and education as much as academic study,
- The park is expected to attract a host of insect species, birds and other wild creatures,
- The park will act as a tool of informative herbarium for the students, visitors, researchers etc,
- It will act as research resource for colleges and research institutes, and
- It will help in promotion of ecotourism.

CONCLUSION

Establishing agro-biodiversity park in Acharya NG Ranga Agricultural University, Hyderabad will promote and conserve the flora and faunal diversity of Deccan plateau of Hyderabad region that flourished in the past. In addition, it is also

expected to improve the micro-climate, environment, vegetation and soil biota as well as carbon sequestration. The park will also create awareness and promote scientific research education and finally encourage ecotourism in the future.

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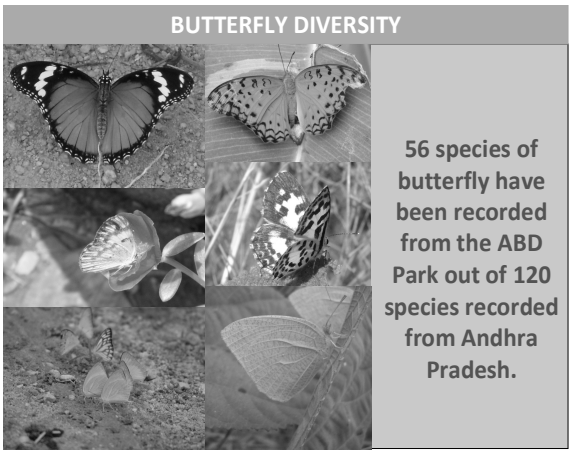

Fig1. Butterfly diversity in Agro-biodiversity park and its surroundings

Fig 2. Insect diversity in Agro-biodiversity park and its surroundings

Fig 3. Bird diversity in Agro-biodiversity park and its surroundings