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Species composition and diversity of natural regenerated tree species

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Abstract
In this present study, we examined the species composition and natural diversity according to family wise, of tree species of different sites of semi-arid zone of Agra (U.P.). fabaceae family emerged as a dominant family was determined by identifying with all respected sites (Taj Nature Walk, Shajahan Garden, Paliwal Park, Company Garden and Mau Forest). In this study maximum family composition were found at site 2 Shajahan Garden (26%). We figured out the minimum number of tree species belong to rhamnaceae, capparaceae and bignoniaceae and minimum number of tree species belong to fabaceae family. During this study thirteen families and total twenty-five tree species were found at all recognized sites. Throughout the time of research period, we investigated the percentage of the natural regeneration was 20% fabaceae.

Keywords: natural regeneration, tree species, family, semi-arid zone

1. Introduction
Regeneration is the key feature of the forest dynamics, progress and restoration of degraded forest land. It depend on number of seedling, sapling and their distribution pattern in region. The population of structure of a species in a forest can occupy its regeneration behaviour. Regeneration Status of species can be predicted by the age structure of their population.
Forest regeneration is the process by which new tree seedlings become established after forest trees have been harvested or have died from fire, insects, or disease. Regeneration is key to sustainable forestry and can be accomplished through two basic approaches:

- Natural regeneration, which occurs when new seedlings or sprouts are produced by trees left on or near the site
- Artificial regeneration, more commonly known as tree planting

Natural regeneration can successfully occur only if a sufficient amount of "growing space" is available for seed germination and subsequent growth of seedlings. Canopy trees strongly determine the understory light regime and tend to reduce the growing space for the recruitment of young trees into the canopy layer, thus consolidating their dominance.
An introduced, alien, exotic, non-indigenous, or non-native species, or simply an introduction, is a species living outside its native distributional range, which has arrived there by human activity, either deliberate or accidental. Non-native species can have various effects on the local ecosystem. Introduced species that have a negative effect on a local ecosystem are also known as invasive species. Not all non-native species are considered invasive. Some have no negative effect and can, in fact, be beneficial as an alternative to pesticides in agriculture for example. In some instances the potential for being beneficial or detrimental in the long run remains unknown. A list of introduced species is given in a separate article. (Carlton James T. 2002) [2].
The nativity denotes first record/origin of the species (Samant *et al*., 1998b) [4] and endemism denotes the restricted distribution of a species in a particular biogeographic province or a single Island or mountain top or even in a single rock outcrop. The naturalness (nativity) and uniqueness (endemism) of the plant diversity of any biogeographic province denotes the high conservation value of the area. These two attributes help in tracing the evolution. These two attributes play an important role in assessing the conservation value of any habitat, community and ecosystem for making a strategy and action plan for conservation.

2. Method
The study had been done in different site (ie. Taj Nature Walk, Shajahan Garden, Paliwal Park, Company Garden and Mau Forest) according to family diversity wise. The present work was carried out semi-arid area in Agra District. Analysis of the selected different sites was carried out in year of 2014 Months wiz. (april, may, june & july 2014). by using quadrates method. The quadrates were laid out randomly for tree species throughout the selected sites. The primary information such as local name, ecological condition of occurrence, status, growth, habitat condition etc. for each species, was collected. The nativity of the species was identified following (Anonymous 1883-1970 and Samant *et al.,* 1998a) [1, 5]. Endemism of the species was identified based on distribution of the species (Dhar and Samant 1993) [3]. A complete information establish and submitted in the form of herbarium and visual method, in department, govt. forest S.L.S. Dr. B. R. A. University Agra. All specimens identified and examined by different sources like as, university forestry department, Govt. forest division some from old literature.

3. Results and Discussion
Site 1: At site Taj Nature Walk maximum tree species (23% each) belong to moraceae and fabaceae which followed by

(14%) meliacea respectively but minimum percentage (8% each) tree species which occurred under following families – leguminose, bignoniaceae, rutaceae, and moringaceae.

Site 2: At site Shajahan Garden maximum tree species (21.25%) belong to fabaceae which followed by (14% each) meliaceae, apocynaceae and moraceae respectively but minimum percentage (7.25% each) tree species which occurred under following families moraceae, putanjaceae, sapotaceae, rhamnaceae, ulmaceae and moringaceae.

Site 3: At site Paliwal Park maximum tree species (44.50%) belong to fabaceae which followed by (22.50%) meliaceae, respectively but minimum percentage (11% each) tree species which occurred under following families - moraceae, apocynaceae, and moringaceae.

Site 4: At site Company Garden maximum tree species (37%) belong to fabaceae which followed by (15%) meliaceae but minimum percentage (8% each) apocynaceae, leguminose, eubharbiaceae, rhamnaceae and capressaceae.

Site 5: At site Mau Forest maximum tree species (43%) belong to fabaceae but minimum percentage (14.25% each) tree species which occurred under following families - meliaceae, ulmaceae, leguminose and myrtaceae.

Table 1: Diversity of natural regenerated tree species at different sites

Natural Regeneration	
Family	**Plant species**
Fabaceae	*Pongamia pinneta* (p glabra) *Saraca indica* (S osaca) *Cassia fistula* (Pt.) *Prosopis juliflora* (p. chinensis) *kigelia pinnata* (Jacq.) Dc
Rutaceae	*Aegle marmelos* (L.)
Meliaceae	*Melia azedarach (B)* *Ailanthus excelsa (*p) *Azadirachta indica* (Sl)
Leguminosae	*Cassia siemea* (Qg.)
Eubharbiaceae	*Ricinus communis* (L.)
	Hiterophragma adenophyllum
Myrtaceae	*Syzygium cumini* (L.)
Moraceae	*Ficus religiosa* (L.) *Ficus bengalensis* (L.) *Ficus infactoria* (F. lacer) *Morus alba* (Qg.)
Apocynaceae	*Nerium indicm* (Mill.) *Thevitia parwiana* (Pers.)
Sapotaceae	*Mimusopes elengi* (L.)
Ulmaceae	*Holptelea integrifolia* (ROXB)
Moringaceae	*Moringa olefiera* (Lam.)
Bignoniaceae	*Tecoma undulata* (D.Don)
	Zizyphus mouritiana (Lam.)
Capparaceae	*Cappris aphylla* (Forssk.)

4. Conclusion

In natural regeneration, total twenty-five type of tree species which belong to thirteen families were recorded at all sites in which maximum (20%) of tree species belong to fabaceae which followed by (16%) moraceae respectively.

In this present study maximum number of tree species belong to fabaceae family and minimum number of tree species belong to other families (leguminosae, eubharbiaceae, rutaceae, myrtaceae, lamiaceae, sapotaceae, ulmaceae, moringaceae, rhamnaceae, capparaceae and bignoniaceae).

Composition of Natural Regenerated tree species (At different sites)

Maximum family composition (26%) were recorded at site 2 (Shajahan garden) followed by (23%) site 1 (Taj nature walk) and (23%) site 4 (Company garden) respectively while minimum family composition (14%) occurred at site 3 (Paliwal park) and site 5 (Mau forest).

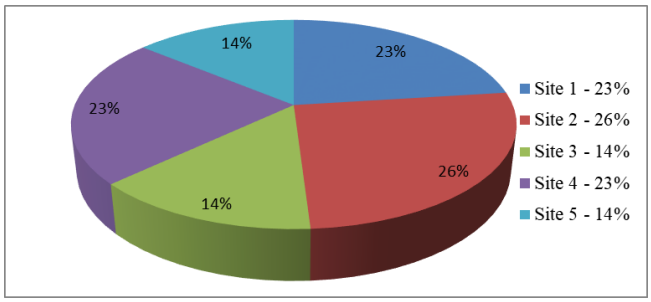

Fig 1: Family Composition of Natural Regenerated tree species at different site

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