

Impact of tourism on floral diversity of Naag Tibba



Introduction:

Naag Tibba is a pilgrimage site and a prime tourist place located at the elevation of 3000 M from sea level. It is situated 120 Km from state capital Dehradun and 75 Km from Musoorie. It is a famous tourism visiting site. Every year several tourist and pilgrims visit there. According to locals in peak season approximate 300 people visit their on daily basis. To reach out Nag Tibba 8 Km long trek starts from the nearby village. This Trek passes through dense forest of Quercus and Rhododendron plants.

Due to the excessive tourists visit to this place it may affect negatively to surrounding environment. Nearby human population, flora, and fauna, suffers if the tourism becomes unreliable and unsustainable.

Tourism is typically viewed as a helping aspect to boost economy. The tourism opens economical oppurtunities to locals surrounding that area and provides livelihood to local people of the state.

Pickering and Hill (2007) have reviewed studies on the impact of recreation and tourism on plant biodiversity and vegetation in protected areas in Australia, and found out that vegetation was being crushed, sheared off and uprooted as a result of the nature-based tourism activities. Pickering and Hill further contend that those impacts result in changes to the vegetation including loss of height, biomass, reproductive structures (flowers, fruit, etc.), reduction in cover, increased litter, damage to seedlings and change in species composition. These activities will also lead to changes to the hydrology of the site, soil conditions including nutrients and erosion, as well as the introduction of weeds and pathogen. Tourism can also contribute to the severity of the pathogen's impact by increasing the stress on plants within areas already infected (Buckley et al., 2004).

It is understandable that human involvement with environment tend to use the resources, if it can't help to make them grow at least they can be saved from future damages by use of intelligent human behavior. Study of tourism environment is about understanding the cause and effect rule and to imply theories to protect the environmental loss due to mass tourism. It is also significant that Tourism should place along with the higher quality of environment and environment shall get benefit from it not the damage. No doubt every human action has its own pros and cons and fragility of nature resources must not be seriously harm by it. Tourism is without a doubt among the world's highest profitable industries (whether on the cost of environment) and relationship between tourism and environment can get equilibrate if financial profits gets used for the conservation programs or environmental sustainability.

Tourism is typically viewed as a helping aspect to boost economy. The tourism opens economical oppurtunities to locals surrounding that area and provides livelihood to local people of the state. Over the past few decades tourism increases its boundary upto international level. There is no debate on the fact that tourism provides sufficient money to the locals by providing employment as well as attracts foregien money to government's revenue, national income and

foreign exchange earning. Due to the excessive tourists visit to any tourist place it effect negatively to surrounding environment, it can have lamentable outcomes on the climate. At the point when tourism dynamic crosses the boundaries of legal and ethical barriers to earn more profit, it can prompt massive degradation of climate nearby. Nearby human population, flora, and fauna, suffers due to such unreliable and unsustainable tourism. In some ways tourism impacts environment adversely.

Tourism can have several negative impacts in case of pollution. It increases the noise pollution because of the tourist entertainment like unwanted yelling by the tourists to entertain themselves and loud music. Which shrink the realized niche of animals present in surrounding. Tourism can also increase the air pollution by the transportation of travelers.

The term biodiversity or biological diversity refers to the total numbers of individuals and different types of living organisms in the ecosystem (Butler, 2006). This includes the terrestrial rainforests, the freshwater lakes, the river systems, the coral reefs, the marine ecosystems and the alpine ecosystem. The loss of biodiversity among other things; threatens our food supplies, interferes with essential ecological functions, reduces the productivity of ecosystems, and destabilizes and exposes the vulnerability of the ecosystems to natural disasters such as floods, droughts, hurricanes etc. (UNEP, 2014).

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On the other hand, Newsome et al. (2002), Phillips and Newsome (2002), and Smith and Newsome (2002) posit that the recreation and tourism activities result in root damage to trees by tethered horses or holes dug by humans or other waste, trees cut for firewood and/or vandalism of vegetation at sites, and wildflowers and epiphytes harvested. According to Kelly et al. (2003) tourism is a threat for 20.8% of the plant taxa in Australia. A more recent study by Ballantyne and Pickering (2013), report that tourism and recreation threatened 42% of the plant species in Europe. The Canary Island and mainland Spain had the greatest diversity of species listed as threatened by tourism and recreation. Liddle (1997) discovered that trampling is by far the most widely studied impact of tourism and recreation on plants. Trampling can reduce biomass, cover, fecundity and survival of individual plant species and sometimes can lead to local ext inaction of susceptible species. The spread of weed seeds which was carried on tourist vehicles and clothing can threaten the flora species and ecosystem (Wace, 1977; Barker

& Wardlaw, 1995). Study by Whinam et al. (2005) found that equipment likely to contain weed seeds included day packs and the cuff and Velcro closures on jackets, although propagates were also found on walking boots. Other form of medium that can spread weed seeds or pathogen include footwear, tent pegs, trowels, horse hooves, bike tyres and other types of vehicles (Buckley et al., 2004). Casual and unpremeditated collecting of plants by tourists can also be a significant threat.

Tourism and Environment are interdependent:

Tourism is based on the environment; Tourism has and will always devour the natural resources. Tourism is the main factor carrying out the natural environment in both positive and negative aspect. Even simplest form of tourism like visiting a zoo consumes environmental resources such as animals, birds or plants. Such a kind simple form of tourism also renders constructive as well as unconstructive effects. The negative effect cases might be the capturing animals from their natural habitat and keeping them in a zoo, whereas positive aspect can be that by capturing the animals they are getting protected against hunters and other environmental conditions that can be critical to them. In various other smaller or greater impressions tourism has both negative and positive effects, but more important is to understand the actual destruction or refurbishments causing from tourism towards environment.

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Naag Tibba is a pilgrimage site and a prime tourist place located at the elevation of 3000 M from sea level. It is situated 120 Km from state capital Dehradun and 75 Km from Musoori. It is a famous tourism visiting site. Every year several tourist and pilgrims visit there. According to locals in peak season approximate 300 people visit their on daily basis. To reach out Nag Tibba 8 Km long trek starts from the nearby village. This Trek passes through dense forest of Quercus and Rhododendron plants.//

Methodology:

To assess the impact of tourism in medicinal plants following methods has been applied.

To analyze impact of tourism along the trek route several factors has been thoroughly checked which includes pollution, irregularities etc. during the trek we also noted the plants diversity and their rarity at that specific area.

Plant species found on the trek leading to Naag Tibba were assessed, counted and divided into three main categories rare, common, and abundant. Species were grouped under rare category has less than 100 plant individuals along the path; species were grouped under Common category has under 500 individual count. And species were grouped under abundant category has more than 500 plant individual count.

Results:

Plant diversity of Nag Tibba:

Nag tibba is rich in plant diversity. During our recent visits of July 2020 later June 2021 total 53 plant species recorded nearby the trekking path. Several plants are important for the forest ecology found there. Some of them are also important for their medicinal uses. Lady slipper's orchid is red listed plant is found during the trek. *Asparagus racemosus*, *Thalictrum foliosum*, *Xanthoxylum aromaticum*, *Rubia cordifolia*, *Trichosanthes tricuspidata*, *Potentilla lineata*, *Varleriana jatamansi*, *Viola pilosa*, and *Taraxacum officinale* are some of them.

S. No.	Plant name	Status
1	<i>Asparagus racemosus</i>	Common
2	<i>Thalictrum foliolosum</i>	Common
3	<i>Ficus palmata</i>	Common
4	<i>Ficus neramolis</i>	Common
5	<i>Triscosanthes triscupidata</i>	Rare
6	<i>Princepia utilis</i>	Common
7	<i>Juglans regia</i>	Common
8	<i>Xanthoxylum aromaticum</i>	Rare
9	<i>Ajuga brectosa</i>	Common
10	<i>Pyrus pashia</i>	Common
11	<i>Berberis aristata</i>	Common
12	<i>Rubia cordifolia</i>	Common
13	<i>Salvia mukerjeea</i>	Common
14	<i>Caragana versicolor</i>	Common
15	<i>Lotus corniculatus</i>	Common
16	<i>Potentilla lineata</i>	Rare
17	<i>Ainsliaea aptera</i>	Abundant
18	<i>Ainsliaea latifolia</i>	Abundant
19	<i>Cirsium verutum</i>	Common
20	<i>Viola pilosa</i>	Abundant

21	Daphnea paparacea	Common
22	Cotoneaster microphyllus	Common
23	Fragaria nubicola	Common
24	Pyrecantha crenulata	Common
25	Prunus cerasoides	Common
26	Vibrunum continifolium	Common
27	Galium avutum	Common
28	Varleriana jatamansi	Abundant
29	Taraxacum officinale	Common
30	Rhododendron arboreum	Abundant
31	Androsace sarmulosa	Common
32	Primula denticulata	Abundant
33	Aeschynanthus parvifolia	Common
34	Scutellaria scandens	Common
35	Quercus leucotrichophora	Abundant
36	Quercus semicarpifolia	Abundant
37	Quercus floribunda	Abundant
38	Punica granatum	Common
39	Lindigofera heterantha	Common
40	Mahonia nepalensis	Rare
41	Arisaema tortuosum	Abundant
42	Mentha arvensis	Rare
43	Trifolium	Abundant
44	Roscoea alpina	Common
45	Roscoea purpurea	Abundant
46	Anemone vitifolia	Abundant
47	Geranium wallichianum	Common
48	Polygonum	Common
49	Habenaria benthamii	Rare
50	Swertia spp.	Rare
51	Cypripedium cordigerum	Rare
52	Curcuma sp.	Common
53	Sobaria tomentosa	Common

























Fig. *Asparagus racemosus*, *Tricosanthes triscupidata*, *Salvia mukerjeea*, *Princepia utilis*, *Xanthoxylum aramaticum*, *Juglans regia*, *Ajuga brectosa*, *Aeschynanthus parvifolia*, *Berberis aristata*, *Punica granatum*, *Rubia cordifolia*, *Mahoonia nepalensis*, *Arisaema tortuosum*, *Ficus palmata*, *Viola pilosa*, *Roscoea alpina*, *Roscoea purpurea*, *Rhododendron arboreum*, *Hebenaria benthamii*, *Quercus semicarpifolia*, *Cypripedium cordigerum*, *Potentilla sp.*

Effect of tourism on biodiversity

Plant biodiversity is very important for the locals and as well as scientific community. Plant diversity of forest not only provides fuel wood and fodder to the locals it also helps to maintain the ecological balance.

Several key factors which may affect the diversity of that specific area have been reported.

1. Lack of permanent trail
2. Pollution
3. Using multiple trek
4. Dustbin setup
5. Proper surveillance

1. Lack of permanent trail:

During the trek to Naag Tibba reported that no permanent trail has been setup to trek that pilgrim area. Due to lake of permanent trek multiples route has been used to trek which may affect the floral diversity of the area by trampling of flora from multiple path.





Fig. No permanent route.

2. **Pollution:** Pollution is a major factor which affects environment. During the trek of Naag Tibba we have seen several such non disposable waste nearby the route. Awareness of 3S (Reduce, Reuse and recycle) method of reducing the plastic waste can help to save the environment of this tourist area.





Pic: Plastic waste along the trek

3. **Using multiple paths:** During the field visits several cases of using multiple paths to reach Nag Tibba has been reported. Using multiple paths can harm the floral diversity of forest as well surrounding area of treks.
4. **Grassland encroachment to establish Nonpermanent stay:** For night stay tourists and pilgrims using grassland for install their tent which can harm the grassland vegetation and also create chances to land sliding and soil runoff during rainy season.





Fig. marks on grassland to establish tent for night stay.

Conclusion:

Trekking and pilgrim site Nag Tibba is in immense anthropogenic pressure. To reduce this pressure Govt organizations should try to take some concrete steps.

1. **Garbage control:** Along the treks there is no dustbins has seen to dispose the waste tourists carry themselves which create more amount of waste along the trek. Establishing dustbins also aware visitors not to throw garbage on the forest area.
2. **Proper surveillance:** Along with the forest department employees local peoples have also take interests to save their environment by which we can deal with this issue properly and save the surrounding area of this tourist place.
3. **Setup the permanent trail:** Govt. organizations should set up the permanent trails to reach Nag Tibba which reduces the unnecessary trampling floral vegetation. Using permanent trails can help to protect the surrounding environment from unnecessary trampling.
4. **Environment awareness:** To aware trekkers and pilgrims govt. must do something to creat awareness among tourists.
5. **As a pilgrimage site trek route ristricted to temple site only. Trek from Sri Naag raj mandir to top of the Naag Tibba hill must be closed for night camping and if possible it must be closed for any tourist activity untill proper management not established to manage tourism.**
6. Eco development commities may be established and the management of this tourist place will be done with the help of locals so that the tourism will be converted into sucessful eco tourism model.

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