International Journal of Rural Development, Environment and Health Research
[Vol-7, Issue-3, May-Jun, 2023]
Issue DOI: https://dx.doi.org/10.22161/ijreh.7.3
Article DOI: https://dx.doi.org/10.22161/ijreh.7.3.1
ISSN: 2456-8678 ©2023 IJREH Journal

Response of Smriti Van's animals to dietary modification and significance of fruit tree afforestation

Tejaswini Jaajpera, Priya Bharti

Dept. of Environmental Sciences, Banaras Hindu University, India

Received: 10 Apr 2023; Received in revised form: 08 May 2023; Accepted: 18 May 2023; Available online: 25 May 2023

Abstract— *The eating habits of the wildlife living in and around Smriti Van in Jaipur were observed for 15 days in order to determine how they would react when their daily conventional bird feed was changed to include a variety of fruits with varying juice contents. This information was used to further discuss the significance of fruit trees in defending wildlife against the effects of climate change, the environment, and the advantages of fruit tree afforestation. During India's hot month of July, four locations were marked for observation and checked for residue after 30, 60, and 90 minutes. At the end of the experiment, it was discovered that visiting animals preferred high-moisture content foods containing fruits, with the highest mean consumption value of 19.05 after 90 minutes. Animals preferred strawberries, with a mean consumption value of 19.7, followed by pomegranates and maize, with mean consumption values of 19.4 and 19.3, respectively, with an increase in the number of incoming species and amount consumed.*

Keywords— **Fruit tree afforestation, climate change, food preferences, Smriti van, Jaipur**

I. INTRODUCTION

Animals and humans are left with fewer resources due to anthropogenic activities like urbanisation and deforestation, and climate change is making it even harder for us. As a result, we are dealing with more frequent heat wave events, an increase in average temperature, fewer nutrient-rich food sources, degraded soil, micronutrient malnutrition, scarce food supplies, and pollution. Fruit tree planting and afforestation could be the answers to all of the issues we are currently experiencing. Fruit tree aforestation covers the planting of fruit trees in parks, by the side of the road, in cities, and at institutions. By eating fruits, animals can keep their body temperature and water requirements low. Increased biodiversity benefits from increased richness in the tree layer. Fruit plantations will increase the diversity of birds. Food shortages and even starvation are being caused by climate change in many places, but this can be avoided by planting fruit trees. Landscapes with a higher proportion of fruit orchards had higher functional and phylogenetic diversity, while landscapes with a higher proportion of degraded natural forest patches had lower functional and phylogenetic diversity (Jathilake Manjari et al. 2021).

Fruit tree plantation impacts soil community structure by increasing tree richness. Since the litter is the main source of soil organic matter, the plant species can greatly affect the quality of the litter. Micronutrient levels in the soil will increase and a good quality of humus will be formed. The more organic matter is in the soil, the more you prevent the soil from leaching and it maintains the soil structure. When it rains, the organic matter swells and retains more water in the soil, which irrigates the soil within. Because of improved soil spaces, nutrients, and moisture, the soil biota becomes rich, which leads to an increase in the population of

insects and worms, which in turn leads to an increase in the population of birds. Healthy soil is a carbon sink. An increased amount of soil organic matter helps sequester more carbon. Healthy soil nourishes and protects vegetal and animal biodiversity, creating healthy ecosystems that are more resilient to climate change. Many studies have found that native species mixtures recover soil biodiversity faster than monoculture practises (Wu et al. 2021).

Another key benefit of planting fruit trees in cities and colonies is that it will decrease dependency on bottled water and juice, which consequently prevents plastic pollution by reducing demand for plastic packaging. To achieve ecological goals, such as water and soil conservation and sand prevention, artificial afforestation has been widely implemented worldwide and can significantly increase carbon storage by absorbing atmospheric carbon dioxide and thus decreasing radiative forcing to cool the Earth (Zomer et al. 2006).

Cities are urbanising and modernising at a faster rate than ever before, and green space is shrinking, making cities more vulnerable to heatwaves. When there is no cooling, urban heat island phenomena dominate.Trees and other plants help cool the environment, making vegetation a simple and effective way to reduce urban heat islands. Trees and vegetation lower surface and air temperatures by providing shade and through evapotranspiration. Researchers have found that planting deciduous trees or vines to the west is typically most effective for cooling a building.(https://www.epa.gov/ -Accessed on August 20, 2022)

Larinde and Ogunniyan reported that among urban tree planters in the city of Portharcourt 40.7% planted for Aesthetic/beautification, Shade (28.0%), Microclimate (11.3%) and Windbreaks (20.0%). Results revealed high concentration of Mango trees (91) as Edible fruit trees in the study area, mango is easily propagated from seeds and planted in most home gardens for its' economic, nutritional and environmental amelioration values. Cost estimates for afforestation are lower than for other carbon removal technologies such as bioenergy with carbon capture and storage and by an order of magnitude lower than for direct air capture (Smith et al. 2015). Afforestation is considered to be most effective in the tropical zone because the combined effect of carbon sequestration and albedo will result into net cooling.

It is estimated over two billion people—more than one-in-three—suffer from micronutrient deficiencies globally (FAO, 2013). Fruits are rich sources of antioxidants, vitamins, and minerals. Many fruits like citrus contain bioactive compounds such as vitamin C, carotenoids, flavonoids, vitamin B complex, and minerals, which are highly beneficial to human health and help in curing many diseases. Problems of malnutrition and food crises can be resolved. Health issues like obesity, high blood pressure, elevated cholesterol, and diabetes are becoming very common due to heavily processed food. Fruits are rich in nutrients and keep you energetic. 50% of our plates should consist of fruits and vegetables. Our bodies require fibres, and fruits are a natural source of fibres. Fruit trees alongside would be a blessing in developing countries like India, where some people can't afford one meal a day and many are malnourished. Fruit trees beautify the surroundings more and will be able to release happy hormones and lower stress in people. The happiness index of cities will change, and more efficiency in work can be observed. The health and happiness of a nation are directly related to economic prosperity.

To study how animals around us would react to fruit tree afforestation, we chose Smriti Van, Jaipur, Rajasthan. In Jaipur's summer and winter, this area exhibits an urban cooling effect and functions as a heat sink (Yousef et al. 2022). It is home to a wide variety of plants, birds, and mammals. On one extreme, there are xerophytes, while on the other, there is aquatic vegetation. These plants include rohira, kadam, and bahera (*Terminalia belerica*), which are often found in damp areas, as well as desert-adapted plants like khejari (*Prosopis cineraria*) and kadam. The Smriti Van also has a section with 68 different plant species from all across the nation (https://www.jaipurstuff.com/kulish-smriti-van-a-tranquil-journey-in-natures-lap/ -accessed on August 5, 2022), but there are very few fruit trees; we could only see jamun trees. Smriti Van is also visited by birds and mammals like the five-striped tree squirrels (*Funambulus pennanti*), red-wattled lapwings (*Vanellus indicus*), old world sparrows (*Passeridae*), mongoose (*Herpestidae*) and many more. Visitors to this park provide low moisture content foods such as pearl millet (*Pennisetum glaucum*), jawar (*Sorghum*), makka *(Zea mays*), rice *(Oryza sativa*), rice flakes, and occasionally

urad dal (*Vigna mungo*) or moong (*Vigna radiate*) to the park's resident animals throughout the year. Hence, for this study, we chose to present food of varying moisture content, including fresh fruits, seeds, and nuts. All observed species exhibit herbivore and omnivore food habits, and their behaviour was observed in their natural habitat.

II. MATERIALS AND METHODS-

Study Area-

With elevations ranging from 280 metres in the south to 530 metres in the north-east, Smriti Van (26.8736° N, 75.8120° E) is an expanded area of Jhalana Reserve Forest. The tropical dry deciduous forest that makes up JRF is distinctive. By the Köppen-Geiger climate classification, the climate of this area is classified as Semi-Arid Hot Steppe Climate (Bsh) by the Köppen–Geiger climate classifification (Sharma et al, 2013). Within the confines of the city, Smriti Van spans 108 acres. the centre of the city is about 5 kilometres away from city centre. Its beginnings can be traced back to 1981, when floods completely covered the region and valleys were created. By adding trees, this place afterwards flourished as a memento. Then, this site was modified by Vedic scholar Sh. Kapoor Chand Kulish. Later, as part of its "green Rajasthan" initiative, the Rajasthani government seized custody of the area and had a biodiversity forest created there. On October 8, 2005, the Park's foundation was laid. Only birds, insects, and reptiles were formerly known to inhabit the Kulish Smiriti Van in Jaipur. The public was given access to the restricted woodland area in December 2007 not long after it was established.

Food presented for the study-

High moisture content- Pomegranate, Mango, Apple, Papaya, Strawberries Plum, Pears, and Guava.

low moisture content- Pumpkin seeds, Watermelon seeds, Groundnuts(with shell), Raw maize, Peas, and Moong Dal.

Locations-

1. Location 1- Urban colony
2. Location 2- Butterfly valley
3. Location 3- Trek trail A
4. Location 4- Trek trail B

Methodology-

From July 12th, 2022 to July 26th, 2022, 20 pieces of each fruit, nut, and seed were spread distinctively to the locations mentioned above at a distance of 10 meters from the conventional dry food provided by visitors, and after intervals of 30 minutes, 60 minutes, and 90 minutes, the number of left over chunks were counted. The species visited was also observed. Locations 1 and 2 were observed during the morning hours, whereas Locations 3, and 4 were observed during the evening hours on every day.

III. RESULT AND DISCUSSION

- **LOCATION- 1 (URBAN – GANDHI NAGAR COLONY)**

Table 1 – Consumption of hydrated fruits: amounts were presented in numbers form and fruits used were - Pomegranate, Mango, Apple, Strawberries, Plum, Papaya, Pears, and Guava.

TOTAL AMOUNT SERVED – 120 PIECES

DAY	AMOUNT CONSUMED		
	30 MINUTES	60 MINUTES	90 MINUTES
1	51	94	115
2	76	99	119
3	67	94	105
4	70	100	120
5	80	99	116
6	66	86	111
7	79	103	114
8	78	106	120
9	25	48	68
10	75	108	117
11	68	98	117
12	105	119	120
13	107	118	120
14	74	109	120
15	103	118	120

Table 2: Dried food consumption:The amounts were given in numbers, and the food used was: Pumpkin seeds, Watermelon seeds, Groundnuts, Raw Maize, Peas, and Moong Dal.

TOTAL AMOUNT SERVED – 120 PIECES

DAY	AMOUNT CONSUMED		
	30 MINUTES	60 MINUTES	90 MINUTES
1	55	78	82
2	70	90	91
3	60	86	91
4	68	82	106
5	69	95	96
6	58	92	92
7	78	94	94
8	83	92	102
9	87	99	108
10	91	97	97
11	108	117	117
12	92	111	114
13	95	105	105
14	95	105	107
15	90	105	109

From tables 1 and 2: It was discovered that birds and squirrels preferred eating high-moisture content food over low-moisture food in the Gandhi Nagar Colony, a neighbourhood close to Smriti Van, an urban area. During the first few days, Myna (*Acridotheres tristis*), the Jungle Babbler (*Turdoides striata*), and a squirrel(*Sciuridae*) were seen visiting the most. After day eight, dogs started arriving at the designated location, followed by parrots (*Psittaciformes*), peacocks (*Pavo cristatus*), and peahen later during the last few days, resulting in a higher amount of consumption. A sharp decrease was also observed in Location 1 due to rain, whereas other locations did not show much decline due to the shade provided by trees in the Smriti Van area. To determine whether the behaviour toward the food varied according to location, we chose four locations,

with location 1 being in an urban area and locations 2, 3, and 4 being within Smriti Van. However, it was observed that these animals preferred consuming fruits over their traditional diet, even in urban areas.

- **LOCATION- 2 (BUTTERFLY VALLEY – SMRITI VAN)**

Table 3- shows the consumption of hydrated fruits in numerical form, with the fruits used being pomegranates, mangos, pears, papaya, strawberries, and plums.

TOTAL AMOUNT SERVED – 120 PIECES

DAY	AMOUNT CONSUMED		
	30 MINUTES	60 MINUTES	90 MINUTES
1	53	78	93
2	39	82	111
3	65	86	99
4	95	106	118
5	83	110	112

6	87	104	113
7	110	114	114
8	106	117	120
9	45	75	82
10	97	118	119
11	110	120	120
12	110	119	119
13	114	120	120
14	106	116	120
15	120	120	120

Table 4 - Consumption of dried food: the amounts were given in numerical form, and the good used was - Pumpkin seeds, Watermelon seeds, Groundnuts, Raw Maize, Peas, and Moong Dal.

TOTAL AMOUNT SERVED – 120 PIECES

DAY	AMOUNT CONSUMED		
	30 MINUTES	60 MINUTES	90 MINUTES
1	52	67	83
2	34	69	76
3	52	102	113
4	48	75	111
5	64	97	107
6	74	104	116
7	54	70	93
8	32	63	99
9	11	32	54
10	91	104	119
11	68	108	117
12	83	93	118
13	90	118	120
14	79	114	120

From tables 3 and 4 – It was seen that birds and squirrels preferred eating high moisture content foods over low moisture content foods. Beginning with Mynas (*Acridotheres tristis*), squirrels, and Jungle babblers (*Turdoides striata*), other species including spotted doves (*Spilopelia chinensis*), red-wattled hapwigs (*Vanellus indicus*), parrots (*Psittaciformes*), and peacocks (*Pavo cristatus*), were also observed after day four. After day 10, mongoose also began to arrive at the marked location, which led to a sharp increase in consumption being noticed.

- **LOCATION- 3 (TREK TRAIL A- SMRITI VAN)**

Table 5 shows the consumption of hydrated fruits in numerical form. The fruits used were pomegranates, guavas, apples, pears, strawberries, and plums.

TOTAL AMOUNT SERVED – 120 PIECES

DAY	AMOUNT CONSUMED		
	30 MINUTES	60 MINUTES	90 MINUTES
1	55	84	105
2	72	95	113
3	54	102	114

4	90	109	116
5	99	118	120
6	98	116	118
7	85	110	118
8	65	110	113
9	87	117	120
10	107	117	118
11	88	111	117
12	83	98	117
13	95	106	119
14	113	118	119
15	109	109	118

Table 6 - Consumption of dried food: the amounts were given in numerical form, and the good used was - Pumpkin seeds, Watermelon seeds, Groundnuts, Raw Maize, Peas, and Moong Dal.

DAY	AMOUNT CONSUMED		
	30 MINUTES	60 MINUTES	90 MINUTES
1	36	75	95
2	52	82	95
3	68	110	116
4	61	89	110
5	62	83	102
6	70	108	116
7	71	91	105
8	56	99	113
9	57	73	102
10	77	98	112
11	71	101	116
12	83	107	118
13	90	103	116
14	88	113	115
15	86	111	116

Tables 5 and 6- show animals at Trek Trail A-Smriti van showed that they preferred high moisture content food to low moisture content food. The highest diversity of wildlife was seen here, including grey francolins (*Francolinus pondicerianus*) , jungle babblers (*Turdoides striata*), peacocks (*Pavo cristatus*), peahens, parrots (*Psittaciformes*), mynas (*Acridotheres tristis*) , cuckoos (*Cuculidae*), red wattled hapwigs (*Vanellus indicus*), five stripped squirrels (*F. pennantii*) , three stripped squirrels (Lariscus insignis), spotted doves (*Spilopelia chinensis*), mongooses (*Herpestidae*), common house sparrows (*Passer domesticus*), and common lapwing(*Vanellinae*).

LOCATION- 4 (TREK TRAIL B – SMRITI VAN)

Table 7 – Consumption of hydrated fruits: amounts were presented in numbers form and fruits used were - Pomegranate, Mango, pears, Papaya, Strawberries, and Plum.

TOTAL AMOUNT SERVED – 120 PIECES

DAY	AMOUNT CONSUMED		
	30 MINUTES	60 MINUTES	90 MINUTES
1	47	72	90
2	53	93	96
3	61	93	97
4	57	83	94
5	57	83	92
6	74	95	100
7	66	93	100
8	72	98	99
9	61	99	105
10	90	97	97
11	90	97	112
12	107	117	117
13	90	108	111
14	97	111	112
15	92	111	115

Table 8 - Consumption of dried food: the amounts were given in numerical form, and the good used was - Pumpkin seeds, Watermelon seeds, Groundnuts, Raw Maize, Peas, and Moong Dal.

DAY	AMOUNT CONSUMED		
	30 MINUTES	60 MINUTES	90 MINUTES
1	63	84	116
2	68	99	119
3	71	104	118
4	98	107	113
5	93	106	112
6	104	115	116
7	81	105	112
8	105	116	119
9	100	107	118
10	102	112	117
11	111	119	120
12	107	119	119
13	107	117	119
14	103	107	117
15	104	117	118

Tables 7 and 8: Animals at Trek Trail B-Smriti also demonstrated a preference for high-moisture food over low-moisture food consumption. Numerous species, including the Grey francolins (*Francolinus pondicerianus*) , jungle babblers (*Turdoides striata*), peacocks (*Pavo cristatus*), peahens, parrots (*Psittaciformes*), mynas (*Acridotheres tristis*) , cuckoos (*Cuculidae*), red wattled hapwigs (*Vanellus indicus*), five stripped squirrels (*F. pennantii*), spotted doves (*Spilopelia chinensis*), mongooses (*Herpestidae*), common house sparrows (*Passer domesticus*), and common lapwing(*Vanellinae*) were also spotted here.

Table 9: Food preferences of consumers observed during the 15 days of the present study

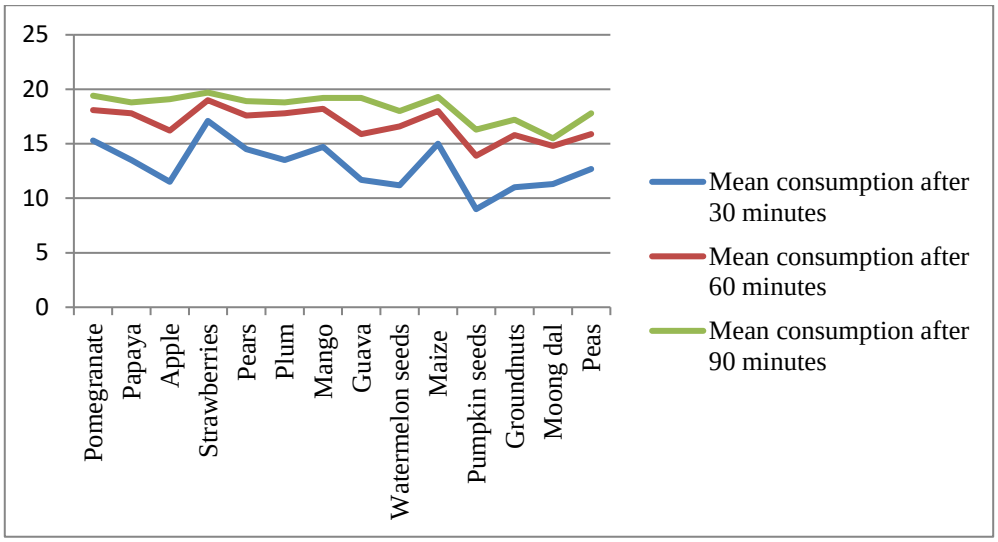

Table 9 -According to the data collected, animals preferred strawberries the most, with a mean consumption value of 19.7, followed by pomegranates and maize, with mean consumption values of 19.4 and 19.3 respectively. Fruits were preferred by animals over seeds, nuts, and grains. An exceptionally high mean consumption number was shown by maize more than the many fleshy fruits provided to the animals.

Table 10 shows the total mean consumption of high moisture content food and low moisture content food at 30-, 60-, and 90-minute intervals from July 12th to July 26th, 2022.

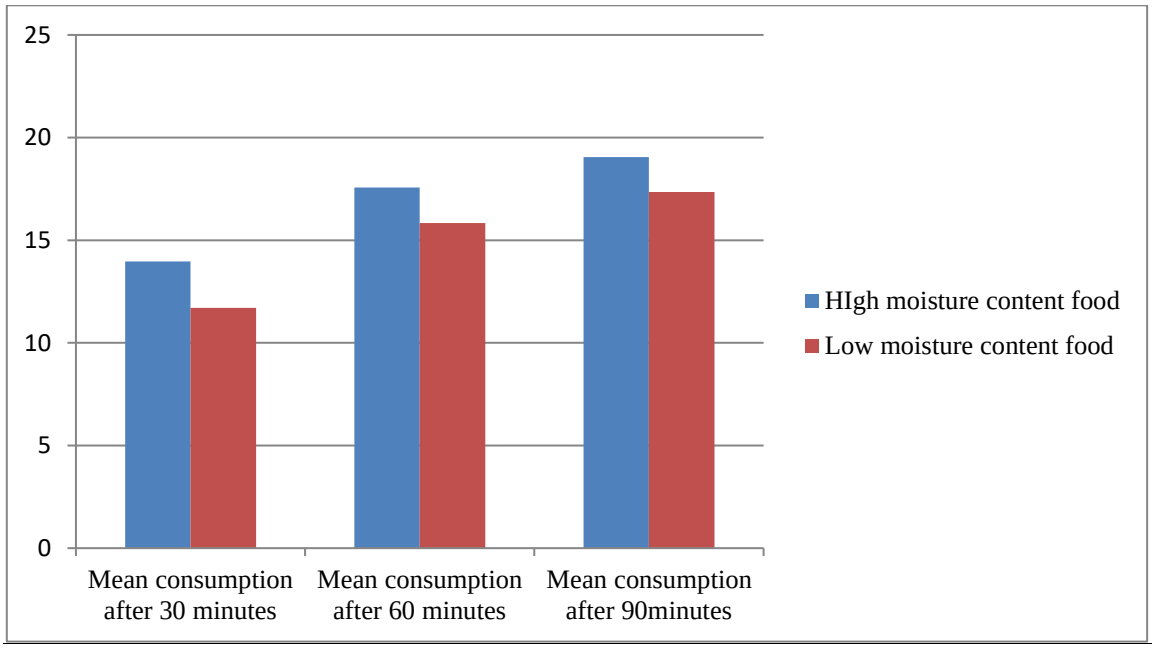

Table 10- It displays the total data from all 15 days of presenting fruits, seeds, nuts, and grain to the animals visiting Smriti van, as well as the marked location of Gandhi Nagar colony in Jaipur. The high mean consumption value of 19.05 shown by hydrated fruits presented demonstrates that if we plant more fruit trees in parks and other areas around us, the animals will appreciate the change.

IV. CONCLUSION

With all of the data gathered, we can conclude that promoting fruit tree afforestation will be appreciated by animals in both natural and urban habitats, allowing them to stay healthy and withstand our changing climate. More fruit trees will also benefit these animals during difficult times such as the COVID-19 Pandemic and floods, when food cannot be provided to them

artificially. It will also help to reduce species dominance in urban areas such as temples and traffic lights, where birds are artificially fed by humans, as their migration to urban areas will decrease if the resources are available in their natural habitat. The park, which is being closely observed for this study, is 0.44km in size, but it has a large impact on the surrounding region by keeping the air cool in the summer, filtering urban pollutants, increasing property value, increasing biodiversity, lessening the effects of sandstorms, decreasing energy needs, acting as a green muffler, and improving physical and mental health. Fruit tree plantations improve the whole ecosystem and can influence the climate if adopted in cities around the world.

ACKNOWLEDGEMENT

We wish to thank our supervisor Professor. Sunita Verma from IESD, BHU for her guidance and support during the study.

REFERENCES

[1] Jayathilake, H.M., Warren-Thomas, E., Nelson, L., Dolman, P., Bumrungsri, S., Juthong, W., Carrasco, L.R. and Edwards, D.P., 2021. Fruit trees and herbaceous plants increase functional and phylogenetic diversity of birds in smallholder rubber plantations. *Biological Conservation*, 257, p.109140.

[2] Wu, W., Kuang, L., Li, Y., He, L., Mou, Z., Wang, F., Zhang, J., Wang, J., Li, Z.A., Lambers, H. and Sardans, J., 2021. Faster recovery of soil biodiversity in native species mixture than in Eucalyptus monoculture after 60 years afforestation in tropical degraded coastal terraces. *Global Change Biology*, 27(20), pp.5329-5340.

[3] Keerthika, A. and Chavan, S.B., 2022. Oxygen production potential of trees in India. *CURRENT SCIENCE*, 122(7), p.850.

[4] Zomer, R., Trabucco, A., van Straaten, O. and Bossio, D., 2006. *Carbon, land and water: A global analysis of the hydrologic dimensions of climate change mitigation through afforestation/reforestation* (Vol. 101). IWMI.

[5] Yosef, R., Rakholia, S., Mehta, A., Bhatt, A. and Kumbhojkar, S., 2022. Land Surface Temperature Regulation Ecosystem Service: A Case Study of Jaipur, India, and the Urban Island of Jhalana Reserve Forest. *Forests*, 13(7), p.1101.

[6] Sharma, B.K.; Kulshreshtha, S.; Rahmani, A.R. (Eds.) *Faunal Heritage of Rajasthan, India: Conservation and Management of Vertebrates*,

[7] 1st ed.; Springer: Cham, Switzerland, 2013; ISBN1 978-3-319-01344-2, ISBN2 978-3-319-01345-9.

[8] Ayushi, 2019- (https://www.jaipurstuff.com/kulish-smriti-van-a-tranquil-journey-in-natures-lap/)

[9] Using trees and vegetation to reduce heat islands US EPA (https://www.epa.gov/)