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Biodiversity Profile Of Avian Fauna In An Agro-Ecosystem Of Faisalabad

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ABSTRACT

The study of avian fauna in their roosting sites might be important to determine their roost status in any habitat. For the present study, the three DBH categories provided the ample opportunities for Rose-Ringed Parakeet, House Sparrow, House Crow and Roseus Starling. The average of the roost composition was recorded to the value (17±1.68), (34±0.64), (21±0.64), (83±0.52), (28±1.58) and (7±0.052) respectively as their DBH for birds which were present. Cumulatively, the number of birds might be augmented in the wake of suitable roosting and reversely to decline their population when roost become limited. Whenever, roosts are functioned with all roosts of birds with the predilection and sustainability. It is important to find out such methods which can control and minimize and to do away with the sustainability with the roosting.

Keywords: Avian Fauna; Roosting Sites; Rose-Ringed Parakeet; House Sparrow; House Crow; Roseus Starling; Roost Composition; Diameter At Breast Height (DBH); Bird Population; Roost Habitat; Urban Birds.

INTRODUCTION

One of integral part of biological framework is biodiversity, which is important for the measurement of variation in species and their numbers. There are many ideas such as variability between and inside of species, geographic and ecological zones, heredity, biological system and species variety. Biodiversity of freshwater give basic natural advantages as availability of water for drinking, fisheries, sustenance manufacturing, social purposes, and transportation (Bartkowski *et al.*, 2015). Subsequently, for wellbeing and welfare of the people, a security of this unbelievable diversity ought to be guaranteed (Corvalan *et al.*, 2005).

Advance and adverse, both kind of influence can be expected because of the cooperation between species which are wild, exist in agroecosystem and trees of agroecosystem. Avian species are the main species with quills, which have a place within the Phylum Chordata. This beautiful creature of nature is able to fly even towards poles of earth, also can jump inside the profundities of oceans more than 250m and able to survive in outrageous environment on earth, including the coldest and the hottest places (Peisley *et al.*, 2015). These cooperations may lessen, enhance

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or damage yield of crops (Borkhataria *et al*., 2012; Klosterman *et al*., 2013).

Avian species eat organic products, beats, seeds, grasses and little insects generally. They can likewise feed on arthropods and rodents by catching from fields of growing crops. Avian species are the critical piece of an agroecosystem to keep up the biological harmony. The avian species are companions of cultivators who trust that birds can eat up huge quantities of damaging insects, and additionally their eggs and hatchlings, which fills in as a pest control operator of insect nuisances in Pakistan (Hiron *et al*., 2015).

Furthermore, according to Matinez *et al*., (2016) these birds play a vital role in ecosystem sustainability in both natural and controlled conditions, they additionally screen changes in quality of living habitat, they hold the considerable capacity of working as the biological community of seed disperser, environmental organizer and this was supported Anderson *et al*., 2016, predators by Lavabre *et al*., (2016).

Avian species consolidated the cultivators; they play a crucial role in the control of insect which can damage crops in the agroecosystem. Interference of birds in fields as insect controller helps the farmers to manage damage of crops without the use of chemical insecticides and pest sprays. The avian populace is influenced by the pernicious impacts of pest sprays and the decrease of its typical prey protected regions are normally considered as crucial for the long time safety and protection of biodiversity. In reality secured zone adequacy for long period of time, in this regard genuinely dubious in nature (Guitart, 2012).

Disastrously, the across the board utilization of pesticides has disturbed the agroecosystems because many non-targeted species also get harmed and the reason is those chemicals which are in use. Many organisms which are beneficial instead of damage are also disturbed (BAP, 2015). However one of a kind shading stripes and modification in the conduct of avian species gives us an unmistakable visual sign, we have magnetized towards their natural beauty and every sort of their normal living habitat. Those areas which have an abundant variety of bird species lead us towards the environmental significance of their natural territory (Skorka, 2016).

One of the most well-known creatures of this planet is birds. They always stand out among others because of their unique beauty and their different varieties prompts a wealth of life and magnificence. Aside from this, avian species have constantly gained interest of humans with their characteristically delightful plumage, pleasant melodies, and aesthetic conduct. Other than this, birds are important for some more point of views; that is, they are a most sensitive pointer of contamination and furthermore considered as extraordinary good in control crop damage by insects or pests.

It is clear and obvious that a legitimate and deliberate biodiversity preservation strategy is exceptionally fundamental for the change, upkeep, and maintainability of any protected territory. A typical human instinct is that on the off chance that they can profit monetarily from a business that relies on upon adjacent regular assets of secured territories, and after that they should make a quick move to economically oversee and save those living spaces.

Avian species are an amazing category of taxonomy, to use as a sample of contextual investigation to investigate this issue. They are a prominent part of most agrarian lands and can possibly give various benefits to biological systems including provisioning advantages (e.g. sustenance from diversion meat and down for articles of

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clothing) and control natural ecosystem balance, for example, fertilization, control of pests biologically, dumping of squander and seed dispersal (Foundation for ecological security, 2010). Throughout the most recent century, in spite of thinking about biodiversity significance, human stress on biodiversity expanded hugely. In Pakistan, improvement organizers disregarded the significance of biodiversity of secured ranges and their part in human life.

As urban areas develop and grow, urbanization replaces local habitats with new man-made frameworks where normal and anthropogenic segments associate. Fledgling communities behave to this ecological variety in many ways. The loss in habitation, annihilation, and deterioration are the significant dangers to avian species diversity and abundance. However, there are various avian species that survive effectively in the urban grid. Therefore, It is not possible that urban areas will be considered as lost habitats for animals. But instead they are emerging as new territories, with the legitimate management, can possibly bolster diverse bird species. The greater part of the prior research coordinated towards deciding the habitat needs of different birds by keeping their focus on natural habitat, while urban environments have been generally disregarded. However, currently focus on urban avifauna research and protection endeavors for avian species are raising (Parsons *et al*., 2006).

Additionally, agribusiness is viewed as a noteworthy ecological risk bringing about the annihilation of natural environments, and additionally extending the spatial degree of agribusiness will probably bring about more prominent loss of biodiversity. In this manner, better administration of existing farming is fundamental. This administration ought to be guided at expanding production to meet increasing sustenance requirement with negligible disturbance to the working of natural ecosystems. Creating administration systems that reduce cultivation costs caused by animals while exploiting the advantages of natural benefits given by wildlife (which could likewise advance species conservation) is a vital stride in moving towards farming feasibility.

Faisalabad is located in the North Eastern piece of Pakistan covers a zone of 5856 Sq. km. This locality has an extraordinary atmosphere with the greatest temperature in summer, which is almost fifty centigrade and in cold season it is almost minus one degree centigrade while normal precipitation ranged around two thousand mili meters or seventy nine inches to keep the dirt extremely fruitful. Out of the aggregate territory of 14, 43,703 sections of land of the area, 11, 50,042 sections of land are flooded through canals. It is important to review the different variety of bird species in the Faisalabad agroecosystem with a specific end goal is to record the species of birds with respect to different trees in agroecosystem.

CHAPTER 2
REVIEW OF LITERATURE

To measure biodiversity of birds from deciduous forest of Italy Enrico *et al*. (2008) used guild parameters. They selected plots around radius of 50 m and collected data of birds by using point count method. They began count of birds by checking presence and absence of species. Results were formulated by using Shannon-Weiner index.

A detailed research has led at University of Agriculture Faisalabad by Beg and Qureshi in 1980 on the grounds that the significant part of the institutional land is

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utilized for yield development in crops. Educational institutes, private structures and roadsides are described by the existence of various plants. The reason is a heterogeneous environment with a very much articulated edge effect. As edge effect support faunal diversity, the avifauna of the university is in like manner rich and diverse. An aggregate of 66 types of birds was recorded from which 40 were inhabitants and 6 summers and 20 winter visitors.

Joshi *et al*. (2012) considered a region of India which is known as Nainatal and they directed estimation of bird species in height zones. Avifauna density was 7.74, 3.6 was species variation (3.68) and increment at high height had seen. Muscicapidae appeared as the most prevailing family with 47 species. An investigation of fledgling groups along the elevational zone of woods environments uncovered that high beta assorted birds species in elevated zones (0.58 high, 0.38 mid and 0.48 low height zone) demonstrating the more prominent variety in species arrangement among the rise zone. In high and low timberland habitats birds communities were observed and their high value observed in timberland habitats.

Bibi *et al*. (2013) decided to collect data about number of birds in wildlife sanctuary of Taunsa Barrage and close-by three towns. They likewise analyze their reliance on variety of birds at Taunsa Barrage. For review they utilized two methods; direct statistics and point count strategy. They collected information about 171 avian species with different species. It is concluded that general public contribution in the empirical use of natural resources in wildlife sanctuaries will provide robustness for biodiversity conservation in the learning area.

Begam *et al*. (2016) conducted survey in Baluchistan drift to record the appropriation, status and current patterns in the number of inhabitants in waterfront birds. Add up to 133 species were watched. Escalated farming practices are real dangers to avifauna are living space destruction, loss of natural surroundings because of land recovery, chasing, and some other anthropogenic exercises. Lately, the number of birds have been declining on the coast.

While applying compost for development in agroecosystem care is essential. Midwinter populace count by utilizing above techniques for study and investigation was completed. Hydrological investigation of surface completed of Uchali Lake and uncovered that Horticulture rehearses by utilizing manure cause harming of water source and exasperate differences of species. The populace tally of birds at Uchalli Lake was done for two back to back years i.e. 2010 and 2011 by Arshad et al., 2014. Avian species changed both in numbers and differing qualities. An aggregate of eleven birds went by the Uchalli Lake in 2010 with their aggregate numbers computed up to 1,139 though, a noticeable contrast was found in the year 2011 as the quantity of species rose to 34 and their aggregate numbers achieving up to 18,606.

Bhinder *et al*., (2015) have uncovered that one-year customary perception of Bajwat wetland of region Sialkot, Pakistan demonstrated that there are 110 avian species having a place with 73 genera, 39 families, and 15 orders. Passeriformes has a most noteworthy number of species. Control of contamination and environment pulverization is needful. Bajwat, a globally critical wetland is situated in Sialkot region of Pakistan. Amid one year concentrate, the zone was frequently visited with supporting materials, for example, camera, and binocular reference books. Among non-Passeriformes Anatidae family has a most extreme number of species. A large

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portion of the occupant birds was observed to be normal or plenteous while the greater part of the mid-year guests was uncommon and rare. This is the primary report of the avifauna of the zone demonstrating the lavishness of biodiversity.

A study was led by Akhtar and Pathan *et al*. (2014) to investigate the avian fauna of Swat Valley and to discover the real dangers to the avian fauna of the valley. In this review add up to, 138 species were recorded having a place with 13 orders and 48 families. The order Passeriformes were recorded much in number that was 31 species. The fauna was much rich with roosting because of the greenery of the territory and furthermore because of inadequate feeding and poor environment accessibility assumes a vital part in the difference and dispersion of the avian fauna of the range. The verdure of the review territory was rich and because of the thick vegetation, the review region was bearing rich avian fauna. As the greenery of the review zone was thick the Quails and Gray Partridge were found in substantial numbers as there were many spots of safe houses for their rearing and different exercises.

According to Raza *et al*. (2015) the review zone was a composite of the terrestrial ecosystem system, flooded manor alongside wetland zone. Thus this unpredictable biological system gives characteristic living space, sustenance accessibility, and reasonable conditions; consequently, it supports remarkably different populace of birds. The avifauna was a mix of both occupant and transient bird species. Amid visits add up to, 2085 bird species having a place with 52 species covering 46 genera, 30 families, and 12 orders were seen from the area. The watched avifauna was speaking to a blend of avian groups found in freshwater and earthly living space.

Passeriformes was the most predominant spoken to by 29 species having a place with 17 families, trailed by Charadriiformes, which was spoken to by 3 species having a place with 2 families. The review region gives a lot of nourishment assets particularly insects, scavengers, little invertebrates, arthropods, grains, seeds, leafy foods material of people, which bolsters a large portion of the Passeriformes species like Common Myna, Swallow, and House Sparrow.

The field research was done by Sangode *et al*. (2015) in the early morning and night hours to gauge the current biodiversity of avifauna in and around the grounds of Government Science College Durg, city harbors the wide assortment of avifauna. Varieties in sustenance accessibility in various seasons influenced the avifaunal differing qualities in the review range. This area has 30 avian species and 14 orders.

Harisha (2016) in another study uncovered that an aggregate of 46 species having a place with 16 families and 8 orders are present in Khondaji Lake, India. Among them, the Charadriiformes was found to rule the rundown by 5 families with 14 species taken after by Ciconiiformes by 3 families with 13 species. The research likewise uncovered that the lake is a powerless wetland harboring a lot of inhabitants and also couple of transient birds, of the aggregate wetland birds recorded, 91% were least concerned (LC) and 9% were close debilitated; near threatened (NT) species, which incorporates, Black-headed Ibis (*Threskiornis melanocephalus*), Darter (*Anhinga melanogaster*), Black-followed Godwit (*limosa*) and River Tern (*Sterna aurantia*) have an ensured status under the timetable IV of Indian Wildlife Protection Act, 1972.

Rais *et al*. (2011) recorded thickness and relative plenitude of avifauna. They have observed eighty six aggregate of birds from this area. The lake, in general, delineates an alarmingly regrettable environmental condition which is apparent from the 39.32

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% diminishment in the range of lake inside a limited ability to focus seven years. Unregulated tourism, arrive infringement; are significant dangers to this water tributaries. Unfortunately this lake might disturbed and notwithstanding a changing situation.

William *et al*. (2014) conducted a range of surveys in Tehsil Sambrial, District Sialkot, and Punjab, Pakistan from April 2012 to September 2013. Their collection of birds was as; 35 species having a place with 12 orders 27 families. Additionally, twenty eight species were resident and two of them were summer reproducer and remaining were visitors. A couple of species were recorded amid monsoon season when a large portion of the species will relocate for roosting, nesting and reproducing. Area under consideration has diverse habitat as agriculture land. House Sparrows, Parakeet, House Crows, Starling were conspicuous birds of the review zone which are able to embrace the variation in habitat of Tehsil Sambrial. Human effects, for example, Installation of mechanical units, cutting of trees, utilization of bug sprays in agrarian practices are significant dangers to avian groups.

Altaf *et al*. 2013 has done collection of data from May 2009 to September 2009 about distribution, habitat and diversity of birds. They use to do their data collection during early hours of morning and evening during the interval of 6 months. Area of research was Head Khanki at River Chenab. This is situated 32°24’07 of North and also 73°58’39 of east with the height of 219 M.

The absence of logical research with respect to the shorebirds is a noteworthy imperative in the global collaboration for the protection of shorebirds in Pakistan. Descriptive reviews were completed for, as far back as a quarter century. Birds roosting were noted and status was ascertained. An aggregate of 57 types of shorebirds has been recorded from Pakistan by Ghalib *et al*. (2009).

Haresh and Acharya 2015 examined the abundance and diversity of wetland birds in Gujarat. In western side of Ahmedabad, Gujrat, India, Gota lake is placed in which vast flocks of wetland birds was moving. Wetland birds distribute us with some of nature’s greatest pleasing wonders. Wetland birds are brilliant indicators of diversity and water quality. They have noted diverse thirty species belonging to five orders and eleven families. Due to industrial progress increases in Gujarat birds under hazard in future.

Kler *et al.* (2015) studied the two main components determining bird community are Habitat structure and complexity. For conservation efforts and research city avifauna is attractive increasingly suitable goals. To describe the dispersal of many common bird classes they classify habitat of birds in 6 different towns of Punjab. Investigation has discovered the occurrence of 15 avian species in Balachaur towns and 25 with maximum 17 in Begowal. In urban areas House Crow and Blue Rock Pigeon were the richest species. During the survey active roosts of 7 bird species were detected in study zones. In regions that are at highest hazard from expansion monitoring and better-targeted research is needed.

Muzamdar and Kumar (2014) examined that grasses, dry plant matter including dry grass and paper small and pieces of wires in 50 urban nests (71.42%) the birds used for nest creation. In rural nests fragments of wires and paper were not found. Birds select natural material for example twigs and grass throughout nest building. Due to absence of available o grasses, twigs birds use fragments of wire and paper to made

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nests in urban environments. Deficiency of accessibility of material used to make nest urban purple sunbirds took ominously extra period to build nests.

Gregor *et al*. (2011) examined in tropical areas the influence of expansion on avian communities. They determined that whole bird mass upsurges with urbanization. Wang *et al*. (2009) studied the retorts of the Chinese Bulbul (*Pycnonotus sinensis*) to urbanization by evaluating nest arrangement and existing nesting resources at five land-use classes such as farmlands, urban parks riparians, mountains, street trees strips of increasing progress in Hangzhou, China. They found nesting materials used by Chinese Bulbuls changed expressively through land-use classes, and it amplified knowingly with urbanization.

Shahabuddin *et al.*, 2016 conducted an experiment to examine the *Alectoris chukar* habitat and population utilization in Totalai game reserve in 2013 and 2014 in summer and autumn. Early in the morning and at evening experiment was planned. The most important danger to the surviving wild life including *Alectoris chukar* was devastation of territory by cutting of grass, mudslides, invasion and expansion. In areas where water is available, birds were seen from the bottom to tall elevation basins during the summer, autumn and spring. Grasses initiate growing and juicy diet was extant after the major autumn hails previously occupied sites full with birds and birds inhabit water less sites.

Pandrani *et al.*, 2005 studied midwinter water bird during the month of January. During the migratory period near four thousand water birds habit the zone on two wetland of Jiwani. . In August or September birds frequently reach and leave these areas in April. Sand plovers and ringed plover were too present in Summer. In Gwadar town due to growing instabilities as an outcome of the evolving actions bird population is declining in freshwater wetlands. Due to absence of organization, trouble and famine water bird population has decreased in Pakistan wetlands.

Aynalem and Bekele, 2008 was carried out study in the southern tip of Lake Tana, Bahir. This study tells the relative abundance, species composition and bird distribution of riverine habitat and wetlands at Infranz, Lake Tana, Ethiopia. 129 bird species were exposed in which 21 Palaearctic migrants and two worldwide endangered. During the dry seasons and wet season species composition of birds was not expressively changed but in habitats there were an important alteration. Highest evenness and species diversity were found in Yiganda wetland. The key pressures to the existence of birds are extension of irrigation and pastures structures.

Koli, 2014 conducted a study to examine the birds diversity and communities of birds. As a bio indicator birds are most sensitive to ecological variations. In the Todgarh-Raoli Wildlife Sanctuary, Rajasthan, India research was passed out to discover the variety and position of avifauna. 142 types of birds fitting to 18 orders 45 families were noted.

Tripathi *et al.*, 2015 examined the diversity of bird's specie at Chuhiya Forest during the research period conditions of weather of Chuhiya forest were renowned. Great figure of bird species at Chuhiya Forest and surrounding areas documented the diverse surroundings and birds cover different places. Passeriformes species were present in great number. To save the ecosystem in good condition and preserve the diversity of species in this area, the difficulties should be managed to take direct achievement.

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Li *et al.*, 2016 explained that for protecting bird diversity Buffer Zone of nature reserve is habitually unnoticed. When Li studied the diversity of birds in Buffer Zone of Yancheng reserve there were number of families was twenty six and orders were thirteen. Similarly, After their study they observed fifty species from that area. Those birds which were highly abundant showed in orders such as Passeriformes, Charadriiformes and Ciconiiformes. Now different species of birds are protected, such as Crowned and Grey cranes in the northern buffer zone. Consequently the surroundings were correspondingly significant for conservation of birds and should be assumed to provide the equal shelter. The territories are incessantly altering due to effect of anthropogenic activities and natural forces. Then, we annually check the diversity of birds.

CHAPTER 3
MATERIALS AND METHODS

This study regarding the biodiversity profile of diversified avian fauna comprising Rose ringed parakeet, House Sparrow, House Crow and Rosling Starling was conducted for a period of 3 months in an enlarged agricultural farmland of Faisalabad. Unquestionably, the entire central Punjab comprises productive agro-ecosystem and majority of the agricultural practices are extended in this province.

Availability of tall and old trees in the presence of canal irrigated system of three main irrigation canals viz Jhang branch, Gogera branch, Rakh branch possess sufficiently large water tributaries which are exclusively used for the irrigation purpose.

In this province occurrence of old and tall tree viz *Salmelia melabarica*, *Termenalia arjuna*, *Ciderella toona*, *Delbergia sisso* and variety of others are always pivotal in the establishment of avian biodiversity and also providing them with the suitable environment for roosts. Due to this reason, there is hardly any dearth of food limitation and as such, the birds keep on fostering. Many of them over last several decades have acquired the status of considered pests to bring about economic losses.

This study clearly emphasized on determining the biodiversity profile of the four birds to estimate their relative abundance in the crop land ecosystem. For this, impact of some trees was critically evaluated with to view to establish the sustainable roosts of three birds species.

Observation were made consecutively for three months and the data of each month for the four birds has been aggregated into a single table implication of statistical design ANOVA and Tukyes comparison test was made for the interpretation of the results and discussion.

CHAPTER 4
RESULTS AND DISSCUSSION

Studies on the biodiversity profile of avian species for three months that from March to May in this period tree species like *Salmalia malabarica*, *Delbergia sisoo*, Eucalyptus and some others were categorized into three categories based on their diameter at breast height and categorized according to less than fifty centimeters, between fifty to seventy cm and above seventy centimeter. The occurrence of bird roosts for four species *P.krameri*, *C.splendons*, *P.dometicus*, and *S.roseus* were also

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determined. *Salmalia* was represented fifteen times which fell into the category of fifty to seventy centimeters DBH.

It may be important to determine that trees *Timeserminallia arjuna, Cedrella toona,* while *Salmalia malabarica*, Eucalyptus, popular and *Momordicha charantia* were present in fifty to seventy centimeters. While *Delbergia sissoo* and *Eugena cuminii* were only presented in greater than seventy centimeters. The Rose-Ringed parakeet was represented 33 times among all the trees and similarly *Corvus splendons, Passer domesticus* and *Sturnus roseus* only occur 28, 16, and 7 time. The average bird roosts were clearly augmented in the *Salmalia malabarica* to the maximum, while to the minimum it was 1.50 for *Eugena cuminii* and *Momordica Charantia*. The statistical representation indicated that strong interaction might be possible with the trees and birds. Table 1-30 provides similar values, but with several deviation, it may be perhaps important that occurrence of bird roosts were mostly were present with tree species evenly distributed under all three categorization. The similarities and dissimilarities also depend on the variation among the roosting sites which might be considered attributes to the differential pattern of trees within the same roosts.

Rose-Ringed Parakeet and *Corvus splendons* along with house sparrow remained as most of the predominant birds while Roseus Starling might be considered less frequent. It remains important to know all the three DBH (less than fifty. Between fifty to seventy, above seventy) were carefully checked and monitored in their respective roosting sites (Check figures and tables for details)

Table 4.1: Observations for the variety of four species of birds and average of their roosts on trees, within the diameter of >50 to <70 (cm) is gathered in one table and data is for 3 days (03-01-2017 to 03-03-2017) during the first week of March (2016)

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C.splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica		15		10	5	3	0	4.50
Dalbergia sissoo			10	7	2	1	1	2.75
Eucalyptus		7		3	4	3	1	2.75
Terminalia arjuna	7			5	4	4	2	3.75
Cedrella toona	10			3	5	1	0	2.25
Eugenia cumini			11	4	2	0	0	1.50

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Popular poplar		**5**		**1**	**4**	**2**	**1**	**2.00**
Momordicha charantia		**7**		**0**	**2**	**2**	**2**	**1.50**
Total	**17**	**34**	**21**	**33**	**28**	**16**	**7**	**1.17**
SE	**17±1.6**	**34±0.6**	**21±0.6**	**33±0.52**	**28±1.68**	**16±1.21**	**7±0.52**	**1.17±0.13**

Table 4.1.1: Analysis of variance between trees and occurrence of bird roosts

SOV	**DF**	**SS**	**MS**	**F-Value**	**P-Value**
Trees	7	31.50	4.500	1.35	0.039
Occurrence of bird roosts	3	51.75	17.250	5.16	0.008
Error		21	70.25	3.345	
Total		31	153.50		

Table 4.1.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

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Occurrence of Bird roosts	N	Mean	Grouping
P. krameri	8	4.125	A
C. splendens	8	3.500	A
P. dom	8	2.000	A B
S. roseus	8	0.875	B

Figure 1: Graphical representation of birds roosts with respect to different trees with in range of (>50 to <70 cm) DBH

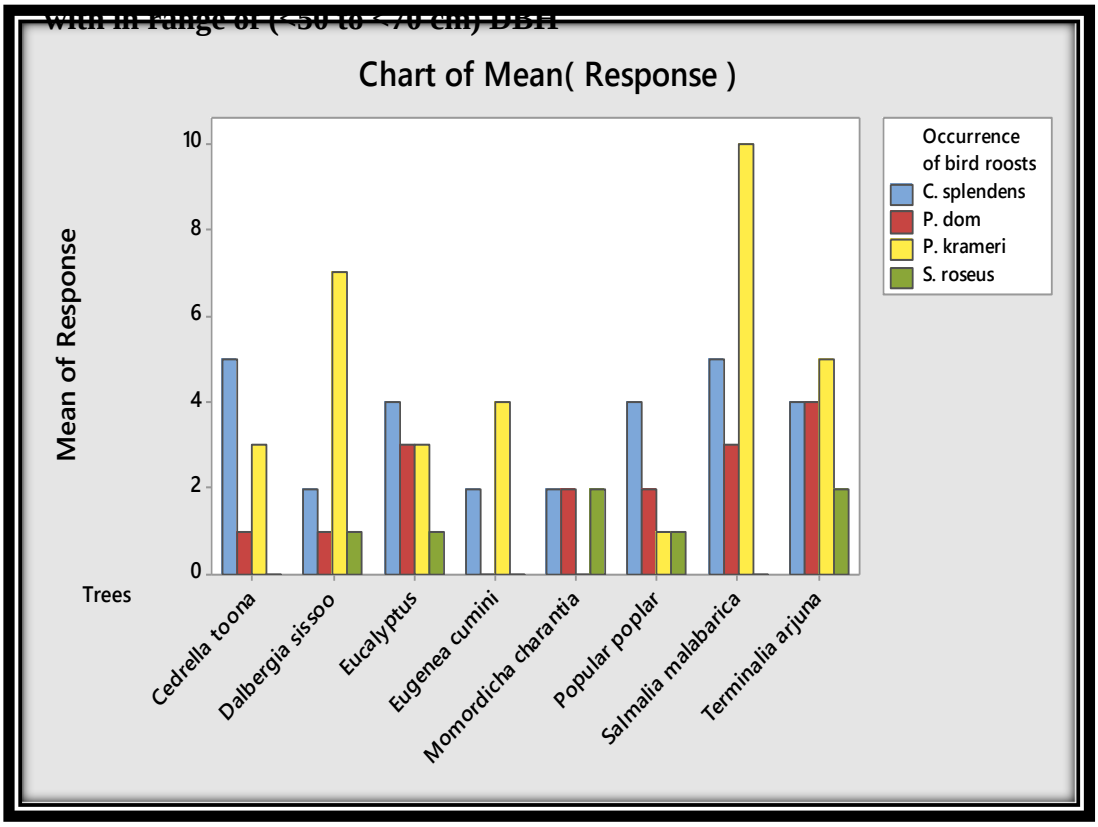


Table 4. 2: Estimated data for the diversity of avian fauna and average roosting of them on trees, within the diameter of >50 to <70 (cm) is collected and merged in one table and data is for 3 days (03-04 -2017 to 03-06-2017) during the first week of March (2017)

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C.splendens*	*P. domesticus*	*S. roseus*	

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Occurrence of bird roosts					N	Mean	Grouping	
Salmalia malabarica		**17**		**6**	**0**	**1**	**4**	**0.64**
Dalbergia sissoo			**9**	**8**	**6**	**0**	**2**	**2.44**
Eucalyptus		**5**		**0**	**3**	**3**	**1**	**1.44**
Terminalia arjuna	**8**			**5**	**9**	**5**	**3**	**2.75**
Cedrella toona		**4**		**3**	**5**	**1**	**0**	**2.25**
Eugenea cumini	**9**		**11**	**8**	**4**	**0**	**3**	**1.40**
Popular poplar		**9**		**1**	**0**	**2**	**1**	**0.44**
Momordicha charantia	**5**		**8**	**4**	**2**	**2**	**2**	**0.76**
Total	**13**	**35**	**28**	**35**	**29**	**14**	**13**	**1.26**
SE	**13±1.1**	**35±0.6**	**28±1.6**	**35±0.65**	**29±1.69**	**14±1.12**	**13±1.11**	**1.26±0.16**

Table 4.2.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	SS	MS	F-Value	P-Value
Trees	7	44.50	6.357	2.25	0.071
Occurrence of bird roosts	3	27.75	9.250	3.28	0.041
Error	21	59.25	2.821		
Total	31	131.50			

Table 4.2.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

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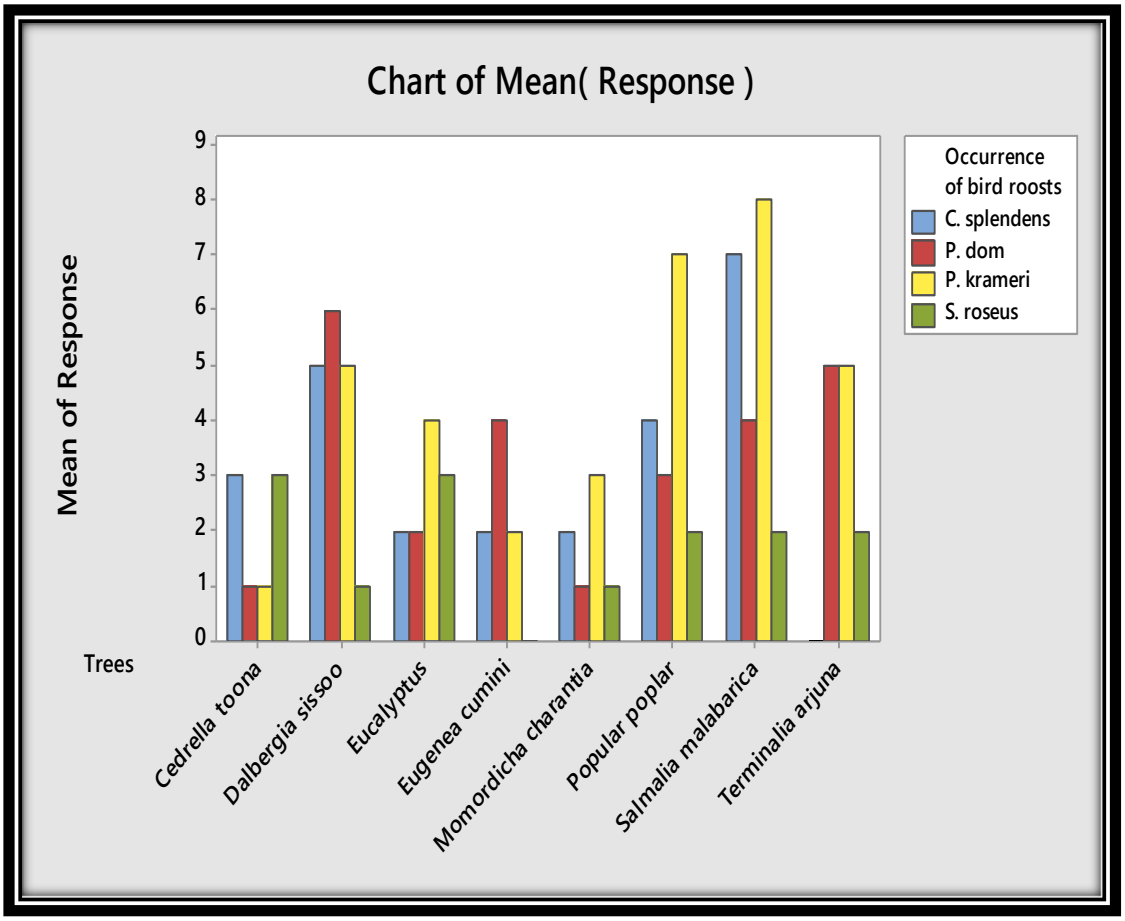
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P. krameri	8	4.375	A	
P. dom	8	3.250	A	B
C. splendens	8	3.125	A	B
S. roseus	8	1.750	B	

Figure 2: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.3 : For the diversity of four species of birds and average of their roosts on trees information is collected, within the diameter of >50 to <70 (cm) and



aggregated in in table below and data is for 4 days (03-07 -2017 to 03-10-2017) during the 2nd week of March (2017)

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C.splendens*	*P. dom.*	*S. roseus*	
Salmalia malabarica		17		6	0	1	4	0.64
Dalbergia			9	8	6	0	2	2.44

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sissoo								
Eucalyptus		**5**		**0**	**3**	**3**	**1**	**1.44**
Terminalia arjuna	**8**			**5**	**9**	**5**	**3**	**2.75**
Cedrella toona		**4**		**3**	**5**	**1**	**0**	**2.25**
Eugenea cumini	**9**		**11**	**8**	**4**	**0**	**3**	**1.40**
Popular poplar		**9**		**1**	**0**	**2**	**1**	**0.44**
Momordicha charantia	**5**		**8**	**4**	**2**	**2**	**2**	**0.76**
Total	**13**	**35**	**28**	**35**	**29**	**14**	**13**	**1.26**
SE	**13±1.1**	**35±0.65**	**28±1.6**	**35±0.65**	**29±1.69**	**14±1.12**	**13±1.11**	**1.26±0.16**

Table 4.3.1: Analysis of variance for Trees and occurrence of bird roosts

Source	**DF**	**SS**	**MS**	**F-Value**	**P-Value**
Trees	7	44.50	6.357	2.25	0.071
Occurrence of bird roosts	3	27.75	9.250	3.28	0.041
Error	21	59.25	2.821		
Total	31	131.50			

Table 4.3.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

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Occurrence of bird roosts	N	Mean	Grouping
P. krameri	8	4.375	A
C. splendens	8	3.625	A
S. roseus	8	2.000	A
P. dom	8	1.750	A

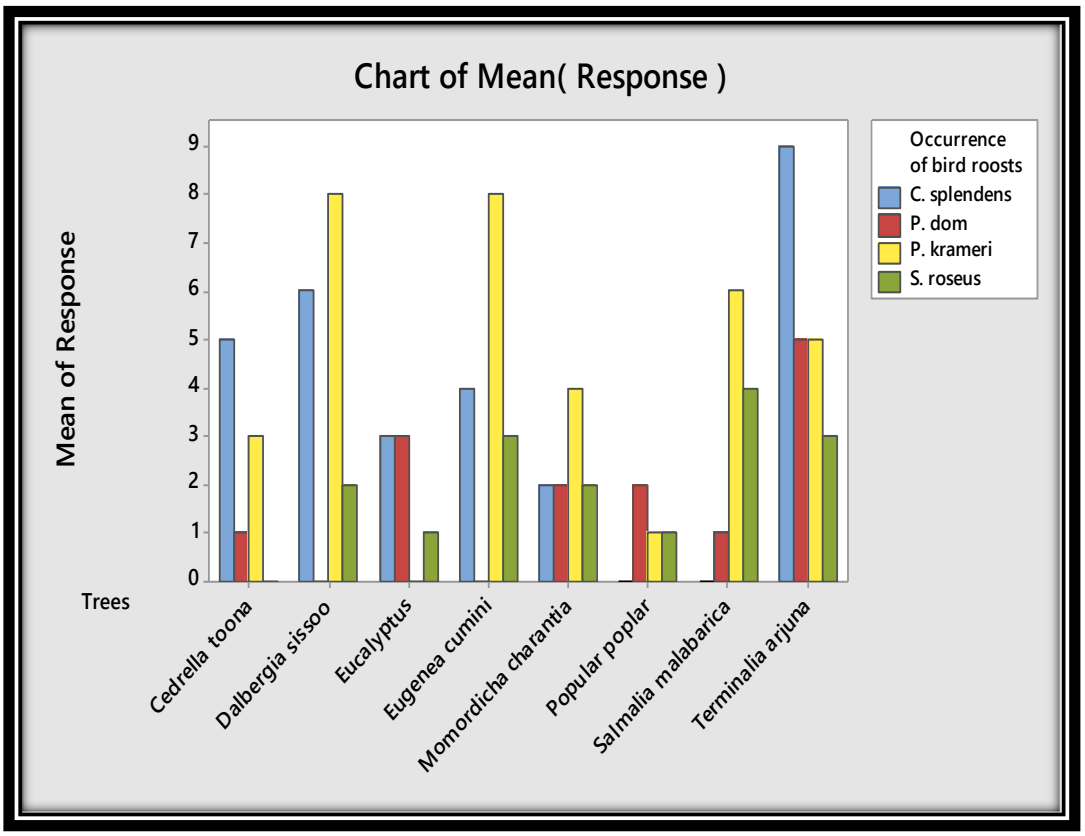


Figure 3: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.4: Approximate number of birds on selected tree species in observed, within the diameter of >50 to <70 (cm) breast height is collected and merged in one table and data is for 3 days (03-11 -2017 to 03-13-2017) during the 2nd week of March (2017)

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica		16		5	1	3	0	0.50
Dalbergia			8	7	4	1	1	1.60

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Occurrence of bird roosts	N	Mean	Grouping			
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Eucalyptus	**7**	**6**	**4**	**3**	**1**	**2.00**
Terminalia arjuna	**7**	**5**	**4**	**4**	**2**	**2.14**
Cedrella toona	**14**	**3**	**1**	**1**	**0**	**0.28**
Eugenea cumini	**6**	**4**	**2**	**0**	**7**	**2.16**
Popular poplar	**6**	**4**	**4**	**2**	**1**	**1.80**
Momordicha charantia	**7**	**0**	**2**	**1**	**2**	**0.71**
Total	**21**	**36**	**14**	**34**	**22**	**15**	**14**	**1.19**
±SE	**21±0.64**	**36±0.66**	**14±1.12**	**34±0.64**	**22±0.66**	**15±1.13**	**14±1.12**	**1.19±0.14**

Table 4.4.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	SS	MS	F-Value	P-Value
Trees	7	26.97	3.853	1.22	0.336
Occurrence of bird roosts	3	31.84	10.615	3.36	0.038
Error	21	66.41	3.162		
Total	31	125.22			

Table 4.4.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

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P. krameri	8	4.250	A	
C. splendens	8	2.750	A	B
P. dom	8	1.875	A	B
S. roseus	8	1.750	B	

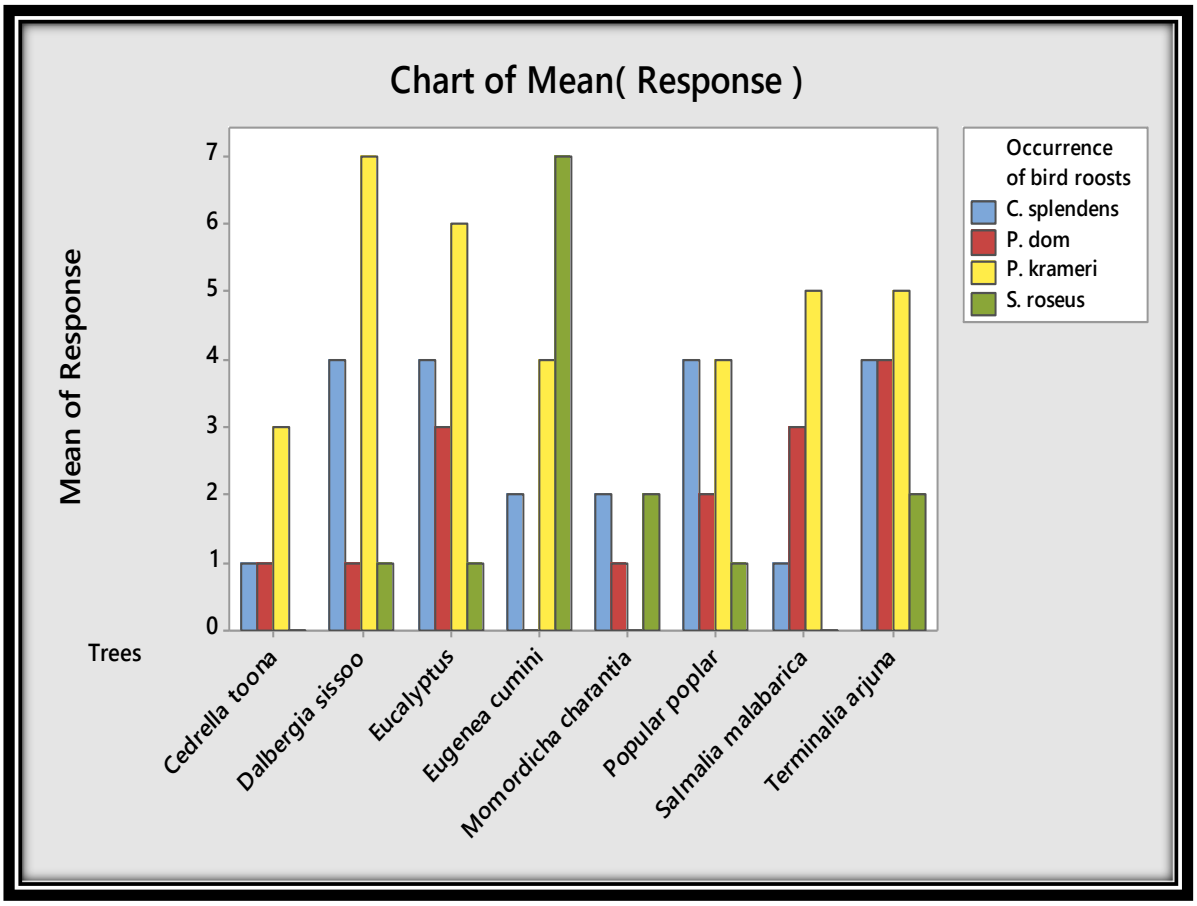


Figure 4: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.5: Information is computed in this table regarding bird roosts and tree variety and gathered in table from the 2nd week of March (03-14-2017 to 03-17-2017) and observed value is enclosed in range of <50 to <70 (cm).

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica	**8**			**2**	**5**	**3**	**0**	**1.25**

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Dalbergia sissoo		**11**		**3**	**2**	**1**	**4**	**0.90**
Eucalyptus	**4**			**3**	**0**	**3**	**1**	**1.14**
Terminalia arjuna			**9**	**8**	**4**	**4**	**2**	**2.00**
Cedrella toona		**12**		**3**	**6**	**1**	**0**	**0.83**
Eugenea cumini			**4**	**4**	**2**	**0**	**2**	**2.00**
Popular poplar		**5**		**1**	**4**	**2**	**1**	**1.60**
Momordicha charantia	**2**	**7**		**6**	**2**	**2**	**2**	**1.20**
Total	**12**	**36**	**21**	**30**	**24**	**16**	**12**	**1.20**
±SE	**12±1.10**	**36±0.66**	**21±0.64**	**30±0.42**	**24±1.13**	**16±1.21**	**12±1.10**	**1.20±0.15**

Table 4.5.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Trees	7	20.97	2.996	0.96	0.483
Occurrence of bird roosts	3	25.34	8.448	2.71	0.071
Error	21	65.41	3.115		
Total	31	111.72			

Table 4.5.1: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

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Occurrence of bird roosts	N	Mean	Grouping
P. krameri	8	3.750	A
C. splendens	8	3.125	A
P. dom	8	2.000	A
S. roseus	8	1.500	A

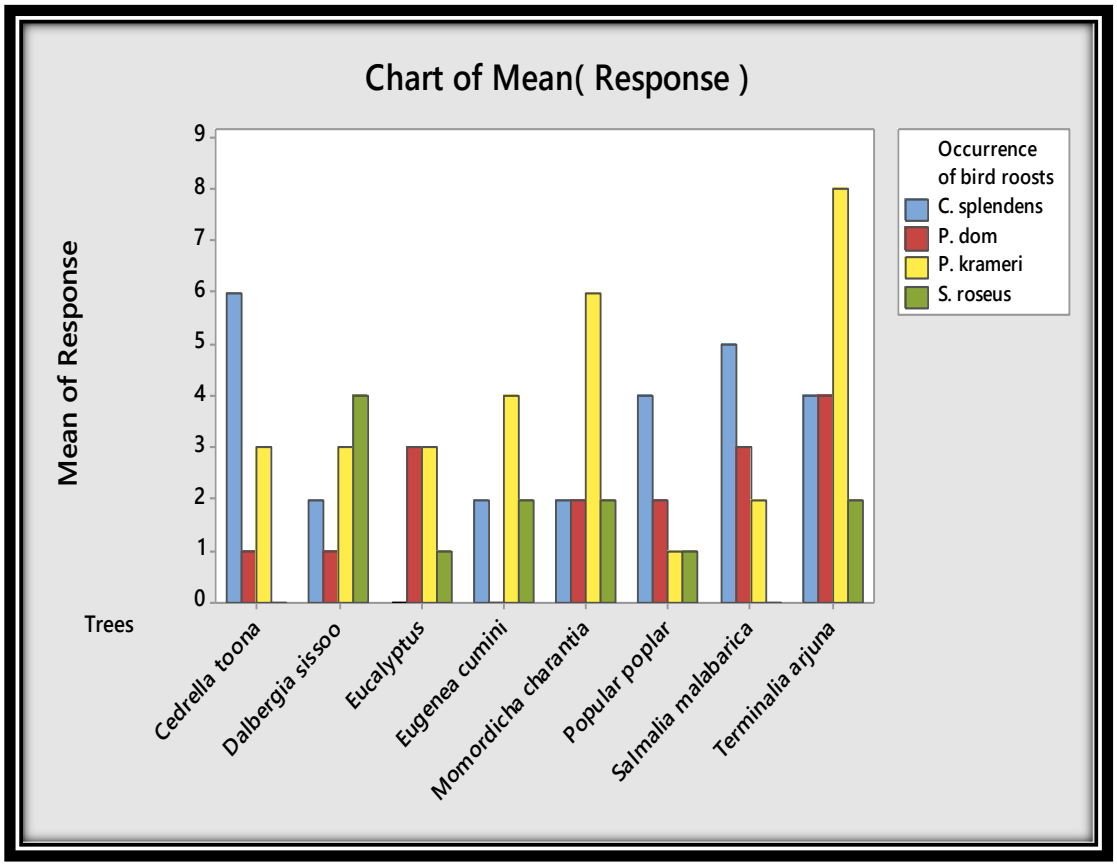


Figure 5: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.6: Information is valuated in table for the mean value of roosting of birds on eight tree species in 3 days (18- 03-2017 to 20-03-2017) during the 3rd week of March (2017)

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C.splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabaric		15		7	4	9	2	1.46

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Dalbergia sissoo			**8**	**7**	**2**	**1**	**1**	**1.37**
Eucalyptus		**7**		**3**	**3**	**3**	**1**	**1.42**
Terminalia arjuna		**9**		**11**	**1**	**0**	**2**	**1.55**
Cedrella toona	**5**			**0**	**2**	**1**	**0**	**1.66**
Eugenea cumini			**11**	**4**	**2**	**8**	**0**	**1.27**
Popular poplar		**5**		**1**	**4**	**2**	**1**	**1.60**
Momordicha charantia	**6**			**0**	**2**	**3**	**4**	**1.66**
Total	**12**	**36**	**18**	**33**	**22**	**15**	**9**	**1.18**
±SE	**12±1.10**	**36±0.66**	**18±1.69**	**33±0.52**	**22±0.66**	**15±1.13**	**9±0.54**	**1.18±0.13**

Table 4.6.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Trees	7	53.97	7.710	1.06	0.422
Occurrence of bird roosts	3	33.59	11.198	1.54	0.233
Error	21	152.66	7.269		
Total	31	240.22			

Table 4.6.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

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Occurrence of bird roosts	N	Mean	Grouping
P. krameri	8	4.125	A
P. dom	8	3.375	A
C. splendens	8	2.500	A
S. roseus	8	1.375	A

Figure 6: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

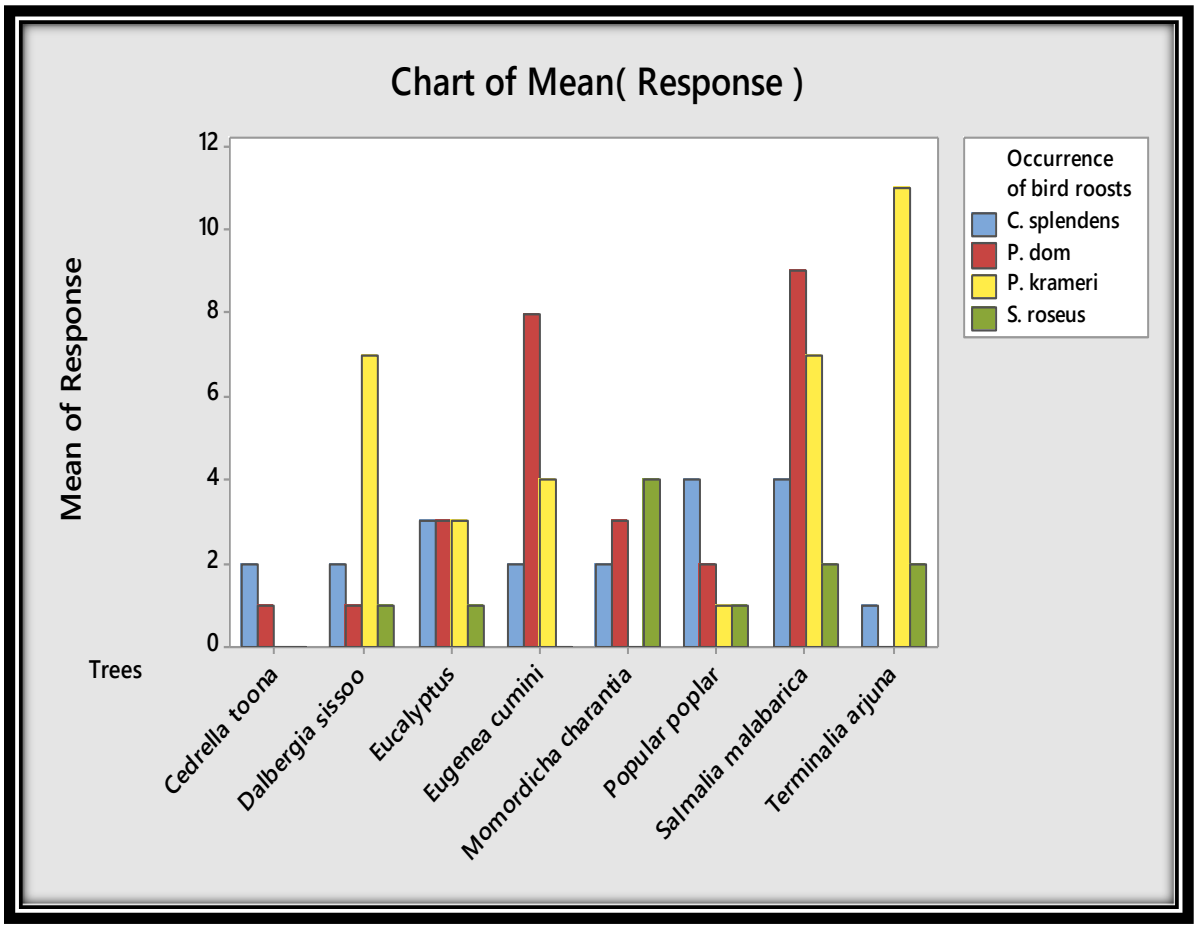


Table 4.7: Values are ascertained for diversity among birds within range of breast height <50 to <70 (cm) on different variety of trees from the (03-21-2017 to 03-24-2017) during the 3rd week of March

Trees	Trees categorization (DBH values) and tree	Occurrence of bird roosts (numbers)	Average bird

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	numbers						roosts	
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. rosseus*	
Salmalia malabarica		**8**	**4**	**1**	**5**	**3**	**0**	**0.80**
Dalbergia sissoo	**2**		**2**	**7**	**2**	**1**	**1**	**2.75**
Eucalyptus		**4**		**3**	**0**	**3**	**1**	**1.75**
Terminalia arjuna			**9**	**5**	**4**	**4**	**2**	**1.66**
Cedrella toona	**10**			**3**	**5**	**1**	**4**	**1.13**
Eugenea cumini		**17**		**8**	**2**	**0**	**1**	**0.64**
Popular poplar	**4**			**1**	**4**	**2**	**1**	**2.00**
Momordicha charantia		**10**		**0**	**2**	**2**	**4**	**1.50**
Total	**16**	**39**	**15**	**33**	**28**	**16**	**7**	**1.12**
±SE	**16±1.21**	**39±0.69**	**15±1.13**	**33±0.52**	**28±1.68**	**16±1.21**	**7±0.52**	**1.12±0.09**

Table 4.7.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	SS	MS	F-Value	P-Value
Trees	7	13.38	1.911	0.42	0.881
Occurrence of bird roosts	3	16.38	5.458	1.19	0.337
Error	21	96.13	4.577		
Total	31	125.88			

Table 4.7.1: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

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Occurrence of bird roosts	N	Mean	Grouping
P. krameri	8	3.50	A
C. splendens	8	3.00	A
P. dom	8	2.00	A
S. roseus	8	1.75	A

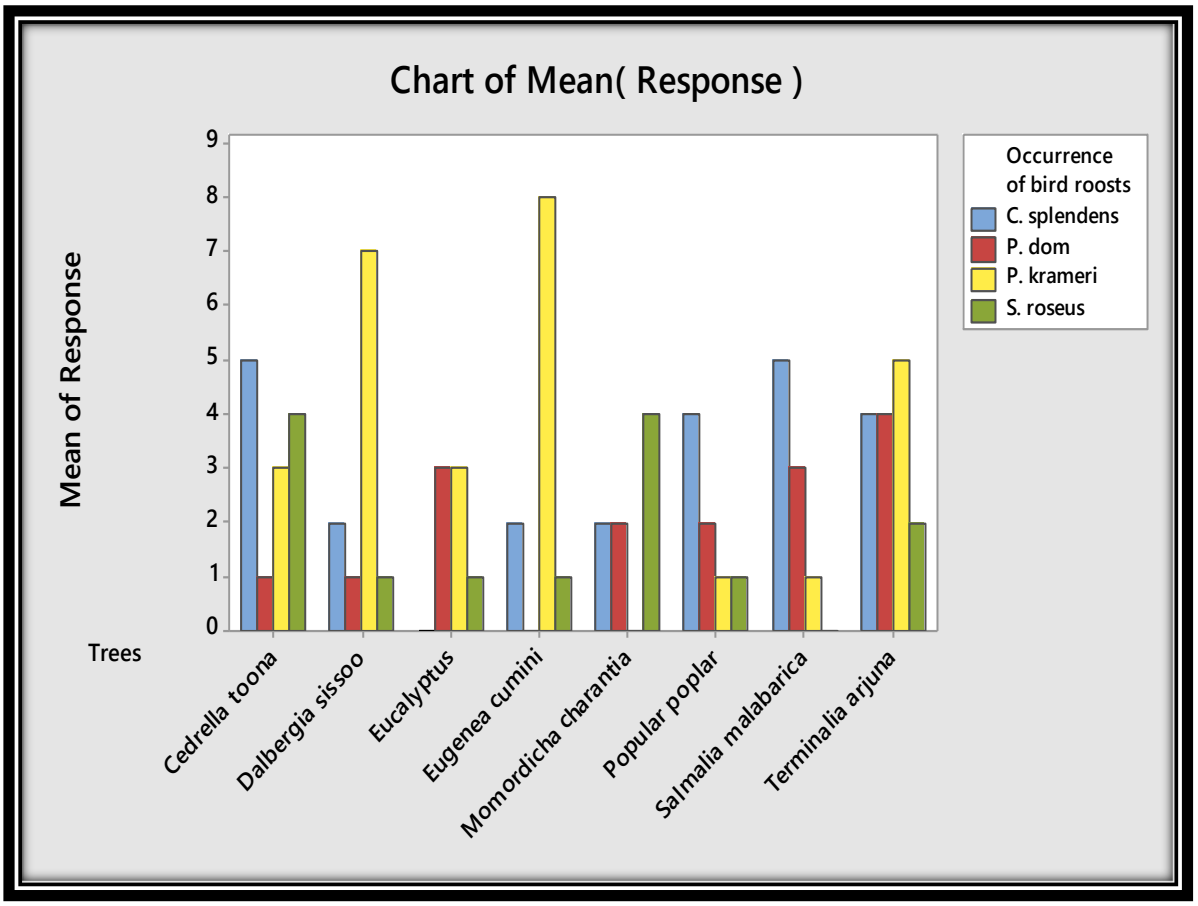


Figure 7: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.8: Observations for the variety of four species of birds and average of their roosts on trees, within the diameter of >50 to <70 (cm) is gathered in one table and data is for four days (03-25-2017 to 03-28-2017) during the first week of March (2016)

Trees	Trees categorization (DBH values) and	Occurrence of bird roosts (numbers)	Average bird

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Occurrence of bird roosts	N	Mean	Grouping

	tree numbers							roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica	**6**			**10**	**5**	**3**	**0**	**3.00**
Dalbergia sissoo		**10**		**2**	**2**	**1**	**1**	**0.60**
Eucalyptus		**7**		**3**	**4**	**3**	**4**	**2.00**
Terminalia arjuna		**6**	**3**	**5**	**4**	**4**	**2**	**1.60**
Cedrella toona	**4**			**5**	**5**	**1**	**0**	**2.75**
Eugenea cumini		**5**	**2**	**4**	**2**	**5**	**4**	**2.14**
Popular poplar			**3**	**1**	**4**	**2**	**1**	**2.60**
Momordicha charantia	**1**	**7**		**0**	**2**	**2**	**2**	**0.75**
Total	**11**	**35**	**8**	**25**	**28**	**21**	**14**	**1.62**
±SE	**11±0.09**	**35±0.65**	**8±0.53**	**25±1.53**	**28±1.68**	**21±0.64**	**14±1.12**	**1.62±0.18**

Table 4.8.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	SS	MS	F-Value	P-Value
Trees	7	36.47	5.210	1.47	0.231
Occurrence of bird roosts	3	19.84	6.615	1.87	0.166
Error	21	74.41	3.543		
Total	31	130.72			

Table 4.8.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

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P. krameri	8	3.750	A
C. splendens	8	3.500	A
P. dom	8	2.625	A
S. roseus	8	1.750	A

Figure 8: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

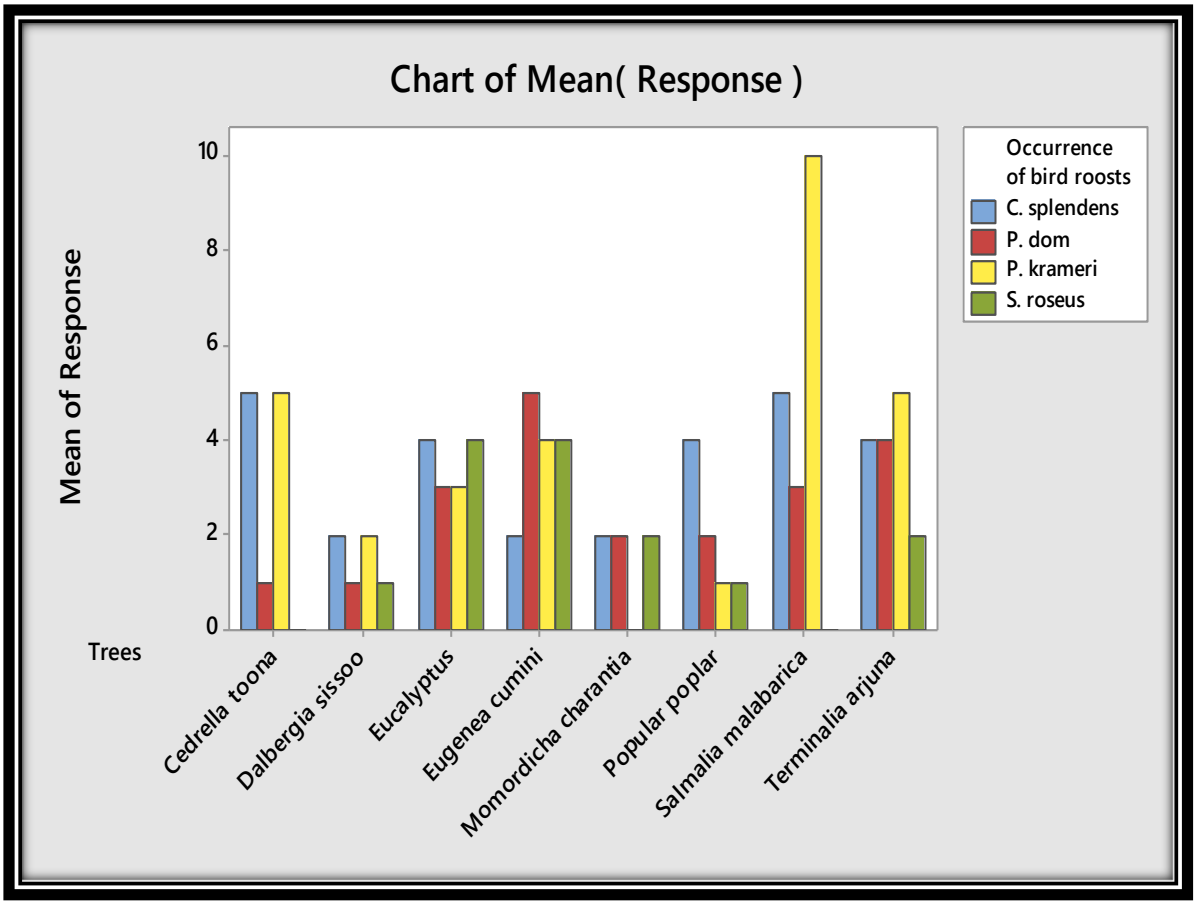


Table 4.9: Observation were made for average bird roosting and highest roosting shown by *C.splendens* during second last week of March on the specie of tree named as *Cedrella toona*

Trees	Trees categorization (DBH values) and tree numbers	Occurrence of bird roosts (numbers)	Average bird roosts

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Occurrence of bird roosts	N	Mean	Grouping

	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica	**4**			**2**	**2**	**3**	**0**	**1.75**
Dalbergia sissoo		**10**		**7**	**2**	**1**	**1**	**1.10**
Eucalyptus	**3**		**2**	**3**	**4**	**3**	**1**	**1.42**
Terminalia arjuna		**5**		**6**	**5**	**4**	**2**	**3.20**
Cedrella toona	**8**			**3**	**5**	**1**	**5**	**1.75**
Eugenea cumini		**9**		**0**	**2**	**0**	**0**	**0.22**
Popular poplar			**6**	**1**	**4**	**2**	**1**	**1.33**
Momordicha charantia	**4**			**2**	**4**	**1**	**2**	**2.25**
Total	**19**	**25**	**8**	**25**	**29**	**17**	**12**	**1.59**
±SE	**19±1.70**	**25±1.53**	**8±0.53**	**25±1.53**	**29±1.69**	**17±1.68**	**12±1.10**	**1.59±0.89**

Table 4.9.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	SS	MS	F-Value	P-Value
Trees	7	36.22	5.174	2.33	0.063
Occurrence of bird roosts	3	21.09	7.031	3.16	0.046
Error	21	46.66	2.222		
Total	31	103.97			

Table 4.9.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

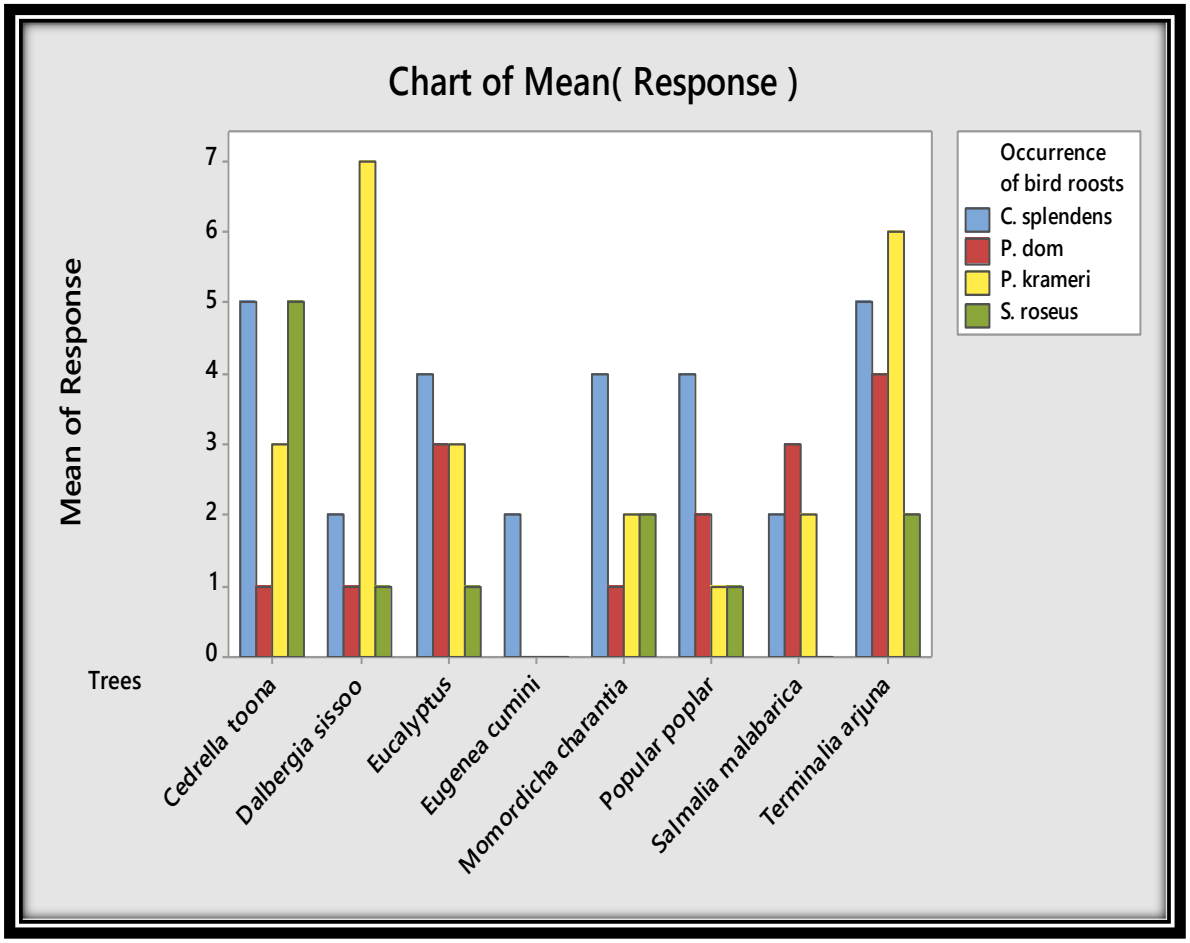
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C. splendens	8	3.500	A
P. krameri	8	3.000	A
P. dom	8	1.875	A
S. roseus	8	1.500	A

Figure 9: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH



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Occurrence of bird roosts **N** **Mean** **Grouping**

Table 4.10: Mean roost value of birds is 1.26 about variety of bird species in the range of DBH value of less than fifty to above seventy on eight trees. Peak of birds roosting is seen in diameter of 50 to 70 (cm)

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. kramer i*	*C .splende ns*	*P. domestic us*	*S. roseus*	
Salmalia malabarica	**9**			**10**	**5**	**3**	**0**	**2.00**
Dalbergia sissoo		**7**	**2**	**7**	**2**	**1**	**1**	**1.22**
Eucalyptus	**6**			**3**	**4**	**3**	**1**	**2.00**
Terminalia arjuna	**4**			**5**	**4**	**4**	**2**	**2.75**
Cedrella toona		**8**	**3**	**3**	**5**	**1**	**0**	**0.81**
Eugenea cumini			**2**	**4**	**2**	**0**	**0**	**3.00**
Popular poplar	**3**	**9**		**1**	**4**	**2**	**1**	**0.63**
Momordicha charantia		**7**	**4**	**0**	**2**	**2**	**4**	**0.72**
Total	**22**	**31**	**16**	**33**	**28**	**16**	**10**	**1.26**
±SE	**22±0.66**	**31±0.45**	**16±1.21**	**33±0.53**	**28±1.68**	**16±1.21**	**10±0.09**	**1.26±0.16**

Table 4.10.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	SS	MS	P-value	F-value
Trees	7	27.88	3.982	1.02	0.445
Occurrence of bird roosts	3	45.13	15.042	3.86	0.024
Error	21	81.87	3.899		
Total	31	154.87			

Table 4.10.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

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P. krameri	8	4.125	A	
C. splendens	8	3.500	A	B
P. dom	8	2.000	A	B
S. roseus	8	1.125		B

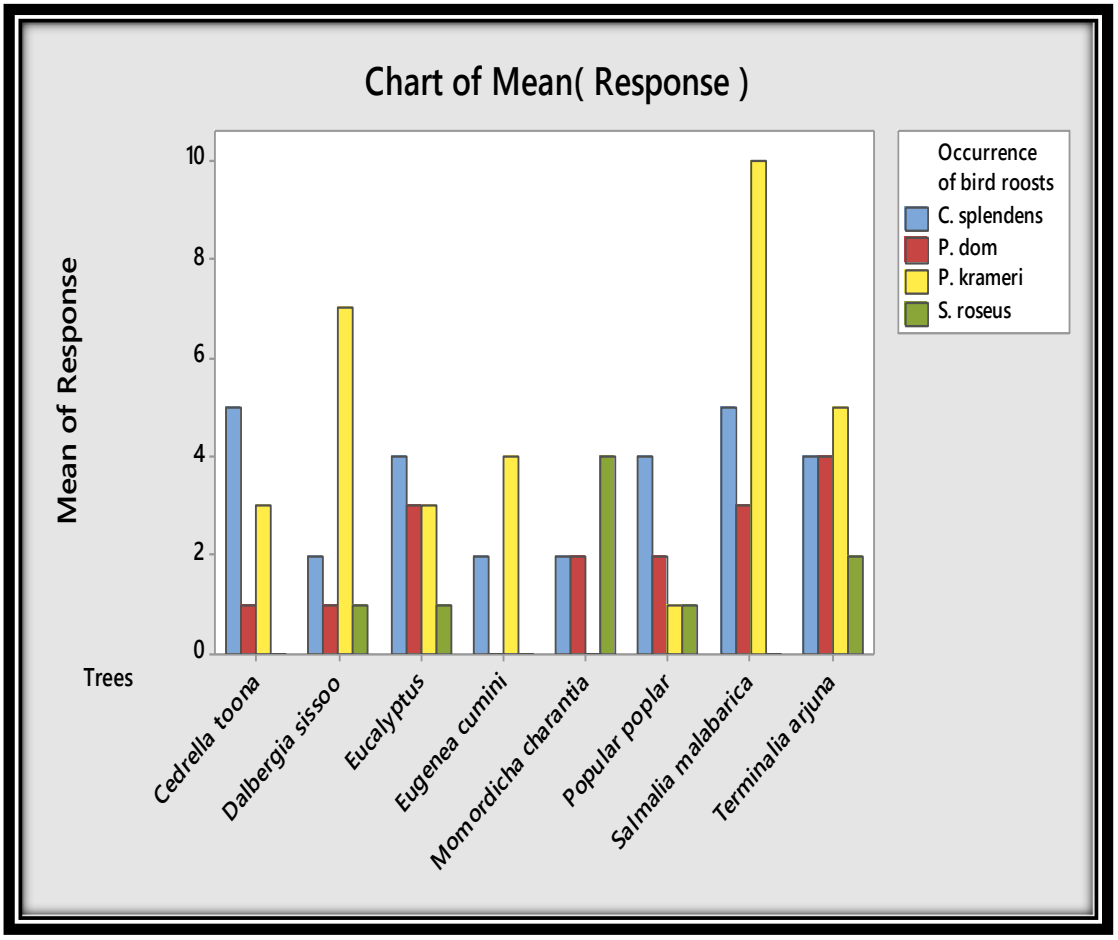


Figure 10: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.11: Collection of the data for variety of trees from the roost in first three days of April (2016) to estimate the (DBH) diameter at breast height has shown in table from the study sites and *P.krameri* is present in abundance.

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia	5	4		8	5	3	0	1.77

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Occurrence of bird roosts	N			Mean			Grouping
malabarica							
Dalbergia sissoo	**9**	**10**	**7**	**1**	**1**	**2**	**0.58**
Eucalyptus	**9**		**6**	**4**	**3**	**4**	**1.88**
Terminalia arjuna	**4**		**5**	**2**	**4**	**2**	**3.25**
Cedrella toona	**4**		**3**	**5**	**3**	**0**	**2.75**
Eugenea cumini		**8**	**3**	**1**	**4**	**3**	**1.37**
Popular poplar	**5**		**1**	**4**	**2**	**1**	**1.60**
Momordicha charantia	**3**	**7**	**4**	**2**	**0**	**2**	**0.80**
Total	**12**	**36**	**18**	**37**	**24**	**20**	**14**	**1.43**
±SE	**12±1.10**	**36±0.66**	**18±1.69**	**37±0.65**	**24±1.13**	**20±0.63**	**14±1.11**	**1.43±0.34**

Table 4.11.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	SS	MS	F-Value	P-Value
Trees	7	19.22	2.746	0.87	0.545
Occurrence of bird roosts	3	35.59	11.865	3.77	0.026
Error	21	66.16	3.150		
Total	31	120.97			

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P. krameri	8	4.625	A	
C. splendens	8	3.000	A	B
P. dom	8	2.500	A	B
S. roseus	8	1.750		B

Table 4.11.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

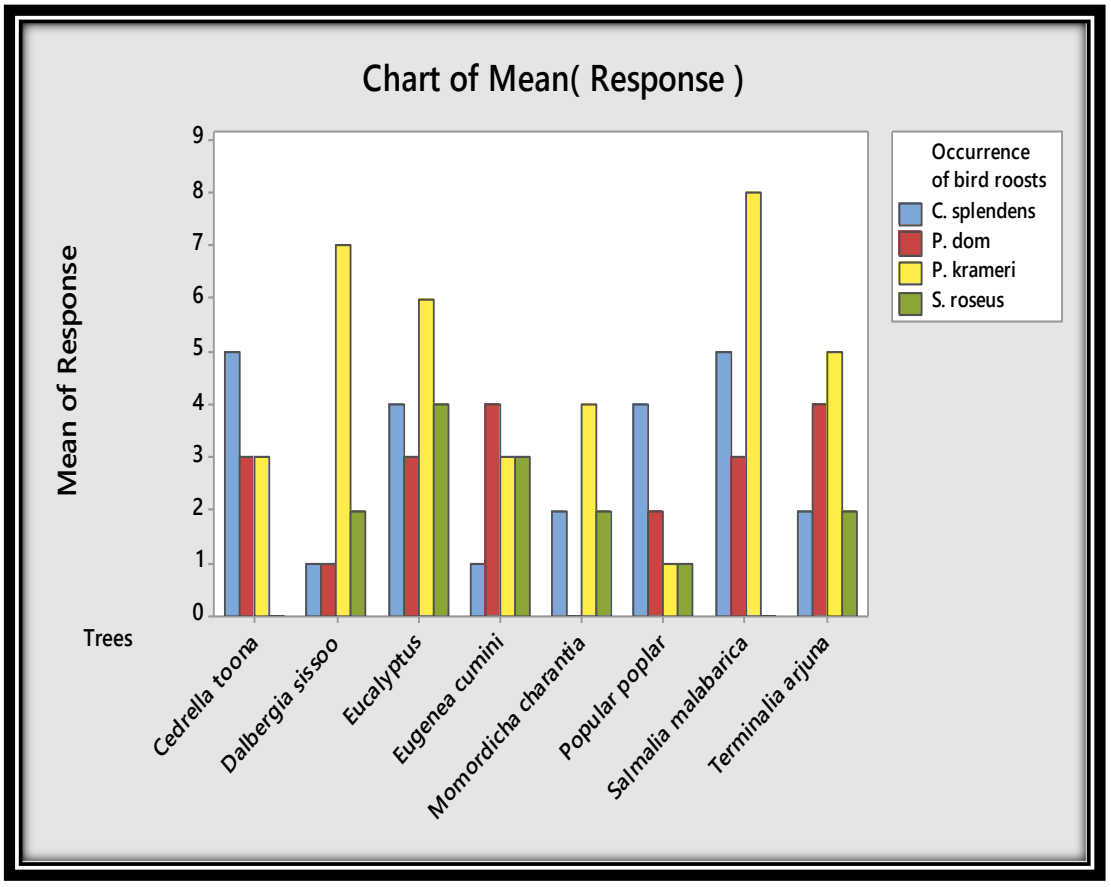


Figure 11: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.12: Birds roosting has been observed and highest number of was seen at DBH of 50 to 70 (cm) and *p.krameri* has shown high diversity during the second three day of initial week of April (2017)

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Occurrence of bird roosts **N** **Mean** **Grouping**

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. kramer i*	*C. splende ns*	*P. domestic us*	*S. roseus*	
Salmalia malabarica	**4**		**9**	**7**	**5**	**3**	**0**	**1.15**
Dalbergia sissoo		**14**	**2**	**7**	**2**	**1**	**1**	**0.68**
Eucalyptus	**6**			**5**	**3**	**3**	**1**	**2.00**
Terminalia arjuna		**11**		**5**	**4**	**3**	**2**	**1.27**
Cedrella toona	**8**		**3**	**4**	**7**	**1**	**7**	**1.72**
Eugenea cumini	**2**		**3**	**4**	**2**	**0**	**2**	**1.60**
Popular poplar		**9**		**3**	**4**	**2**	**1**	**1.11**
Momordicha charantia	**10**		**7**	**0**	**2**	**0**	**4**	**0.35**
Total	**30**	**34**	**24**	**35**	**28**	**13**	**18**	**1.07**
±SE	**30±1.70**	**34±0.64**	**24±1.13**	**35±0.65**	**28±1.67**	**13±1.11**	**18±1.69**	**1.07±0.06**

Table 4.12.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	SS	MS	F-Value	P-Value
Trees	7	29.72	4.246	1.18	0.354
Occurrence of bird roosts	3	37.84	12.615	3.51	0.033
Error	21	75.41	3.591		
Total	31	142.97			

Table 4.12.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

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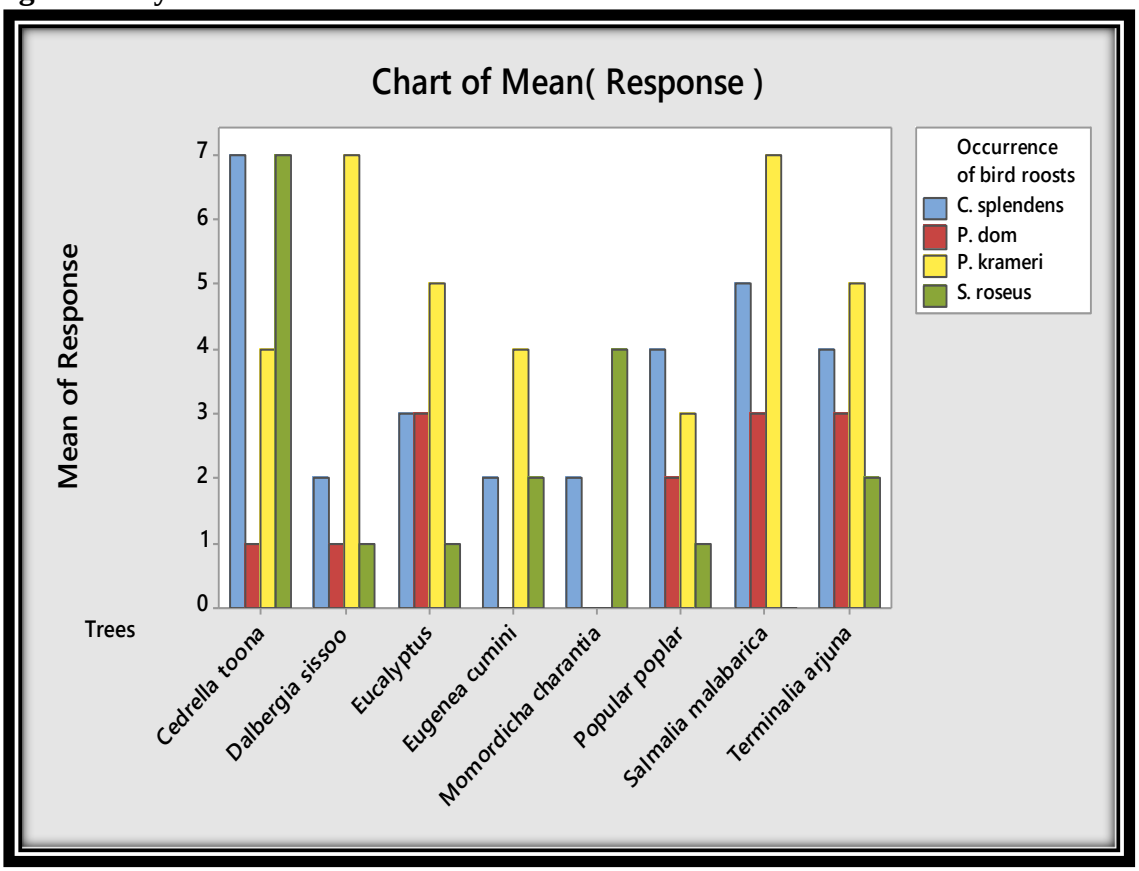
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P. krameri	8	4.375	A	
C. splendens	8	3.625	A	B
S. roseus	8	2.250	A	B
P. dom	8	1.625	B	

Figure 12: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.13: Observation were recorded during the 2nd week of April for the different birds and valuated in below table by keeping in consideration DBH value. Number of birds was more than others on *Salmalia malabarica* have seen during these days.



Trees	Trees categorization (DBH values) and tree numbers	Occurrence of bird roosts (numbers)	Average bird roosts

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	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C .splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica			**8**	**10**	**5**	**3**	**0**	**4.50**
Dalbergia sissoo		**11**		**4**	**2**	**1**	**8**	**2.75**
Eucalyptus	**4**			**3**	**6**	**3**	**1**	**2.75**
Terminalia arjuna		**9**		**5**	**4**	**2**	**2**	**3.75**
Cedrella toona			**5**	**3**	**5**	**7**	**0**	**2.25**
Eugenea cumini	**9**			**4**	**3**	**0**	**0**	**1.50**
Popular poplar		**7**		**1**	**4**	**2**	**6**	**2.00**
Momordicha charantia			**3**	**8**	**2**	**2**	**2**	**1.50**
Total	**13**	**27**	**16**	**35**	**31**	**20**	**19**	**1.87**
±SE	**13±1.11**	**27±1.57**	**16±1.21**	**35±0.65**	**31±0.50**	**20±1.73**	**19±1.70**	**1.87±0.37**

Table 4.13.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Trees	7	17.00	2.429	0.34	0.928
Occurrence of bird roosts	3	31.25	10.417	1.45	0.258
Error	21	151.25	7.202		
Total	31	199.5			

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Occurrence of bird roosts	N	Mean	Grouping
P. krameri	8	4.750	A
C. splendens	8	3.875	A
P. dom	8	2.500	A
S. roseus	8	2.375	A

Table 4.13.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

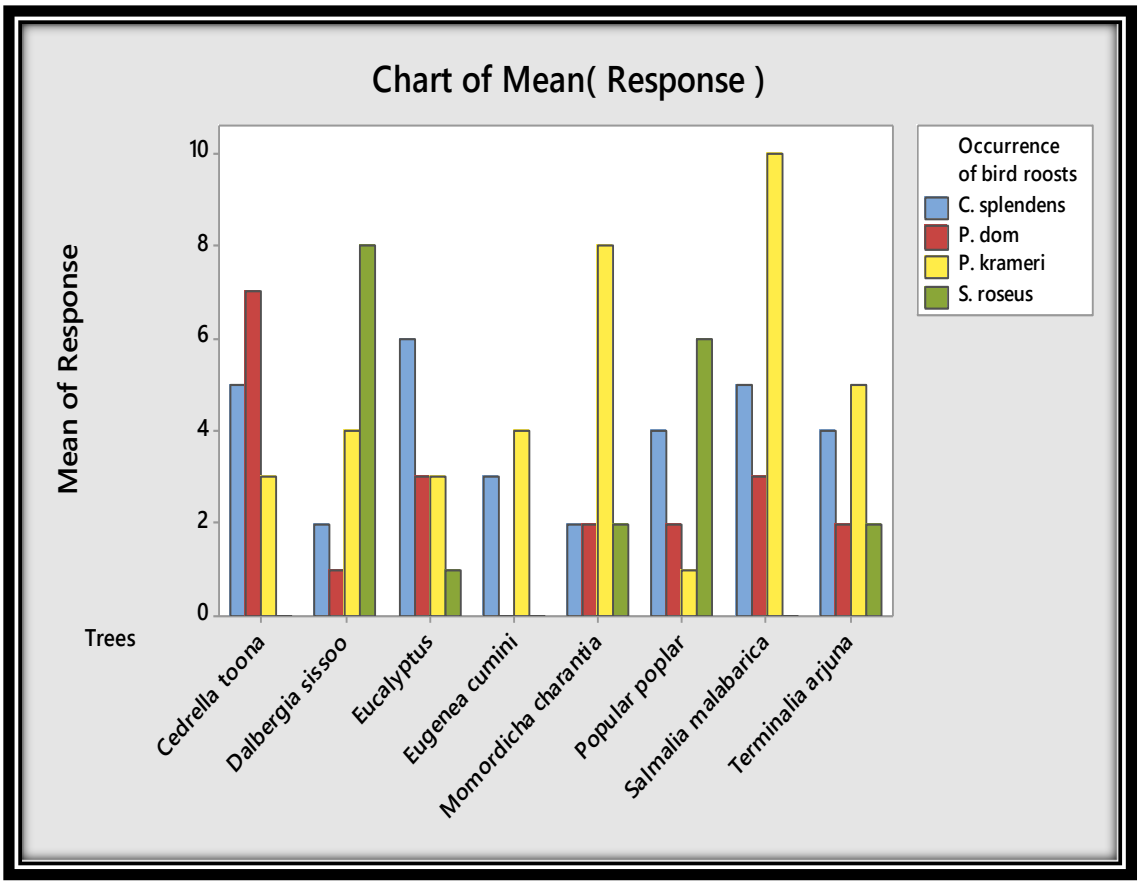


Figure 13: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.14: From collected data of last 4 days of second week (April) most of the species were found within breast height of 50 to 70 (cm) and mean value of computed average bird roost is 1.72

Trees	Trees categorization (DBH values) and tree	Occurrence of bird roosts (numbers)	Average

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	numbers							bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica		13	1	10	5	3	0	4.50
Dalbergia sissoo	2		6	7	2	4	1	2.75
Eucalyptus		11		3	7	3	1	2.75
Terminalia arjuna				5	4	4	2	3.75
Cedrella toona	4		3	3	3	1	5	2.25
Eugenea cumini		9		4	2	0	4	1.50
Popular poplar	10		1	6	4	2	1	2.00
Momordicha charantia		4		0	2	2	2	1.50
Total	16	37	11	38	29	19	16	1.72
±SE	16±1.21	37±0.67	11±1.10	38±0.67	29 ±1.69	19±1.70	16±1.21	1.72 ±0.49

Table 4.14.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	SS	MS	F-Value	P-Value
Trees	7	22.37	3.196	0.69	0.677
Occurrence of bird roosts	3	37.63	12.542	2.72	0.070
Error	21	96.87	4.613		
Total	31	156.87			

Table 4.14.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

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Occurrence of bird roosts	N	Mean	Grouping
P. krameri	8	4.750	A
C. splendens	8	3.625	A
P. dom	8	2.375	A
S. roseus	8	2.000	A

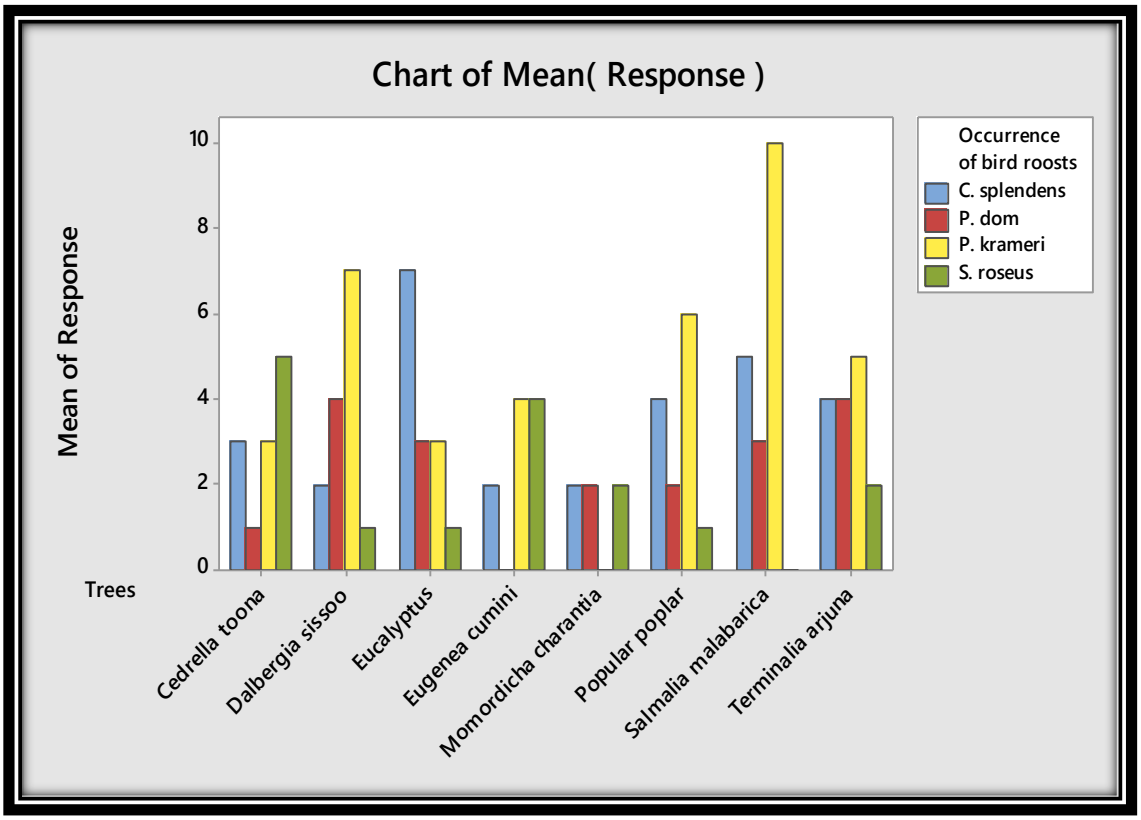


Figure 14: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.15: During the 3rd week of April in first 3 to 4 days following observation has been recorded and mean roosting value was calculated 1.48 for four species of birds and eight species of plants with in <50 to <70 (cm) diameter range of breast height.

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia		11		11	5	3	0	1.63

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malabarica								
Dalbergia sissoo			**6**	**7**	**2**	**1**	**1**	**1.83**
Eucalyptus		**8**		**3**	**4**	**3**	**1**	**1.37**
Terminalia arjuna	**7**			**5**	**5**	**4**	**5**	**2.71**
Cedrella toona	**4**		**4**	**3**	**5**	**1**	**0**	**1.12**
Eugenea cumini			**7**	**4**	**2**	**0**	**3**	**1.28**
Popular poplar		**4**	**4**	**1**	**4**	**6**	**1**	**1.50**
Momordicha charantia	**3**	**7**		**0**	**2**	**2**	**2**	**0.60**
Total	**14**	**29**	**21**	**33**	**29**	**20**	**13**	**1.48**
±SE	**14±1.12**	**29±1.69**	**21±0.64**	**33±0.65**	**29±1.69**	**20±0.56**	**13±1.10**	**1.48±0.18**

Table 4.15.1: Analysis of variance for Trees and occurrence of bird roosts

Table 4.15.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

Source	DF	SS	MS	F-Value	P-Value
Trees	7	38.50	5.500	1.08	0.409
Occurrence of bird roosts	3	32.75	10.917	2.15	0.125
Error	21	106.75	5.083		
Total	31	178.00			

Occurrence of bird roosts

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Occurrence of bird roosts	N	Mean	Grouping
P. krameri	8	4.250	A
C. splendens	8	3.625	A
P. dom	8	2.500	A
S. roseus	8	1.625	A

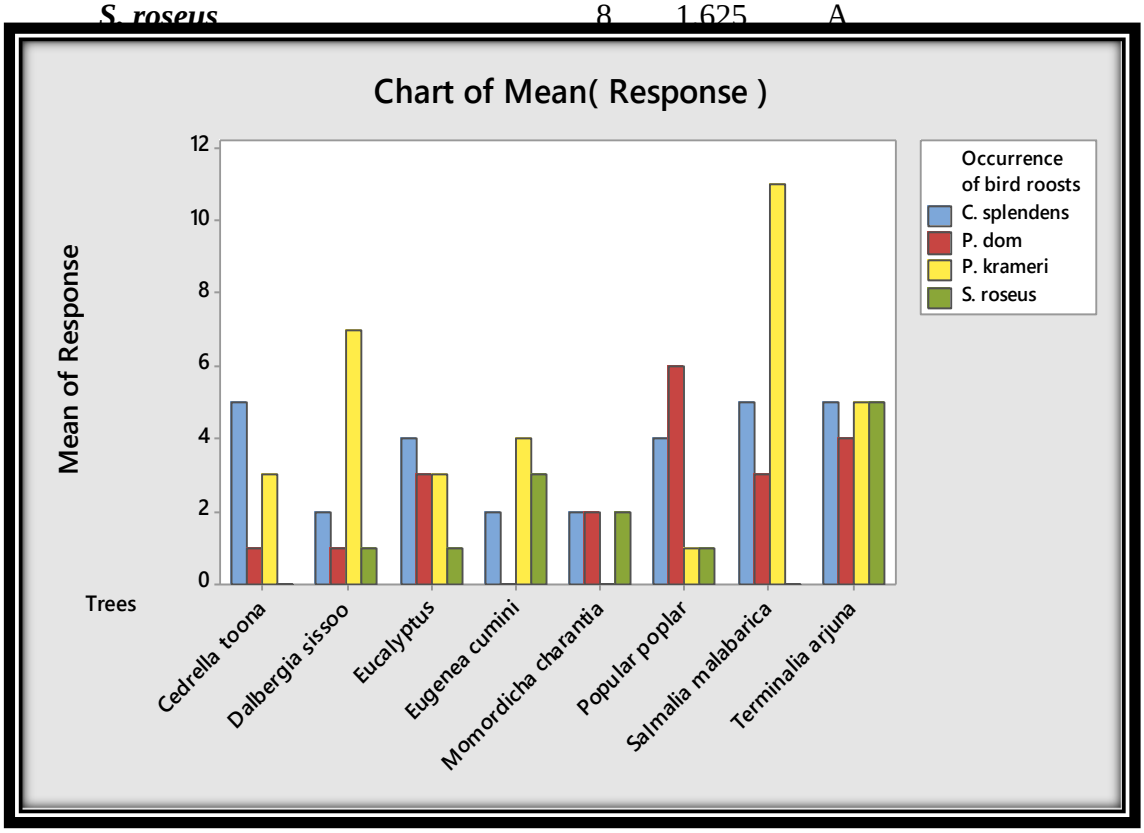


Figure 15: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.16: From collected data of last 4 days of second week (April) most of the species were found within breast height of 50 to 70 (cm) and mean value of computed average bird roost is 1.72

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
S\almalia malabarica		15		10	5	3	0	1.20

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Dalbergia sissoo			**10**	**7**	**2**	**1**	**2**	**1.20**
Eucalyptus		**7**		**3**	**4**	**3**	**1**	**1.57**
Terminalia arjuna	**7**			**5**	**5**	**4**	**2**	**2.28**
Cedrella toona	**10**			**12**	**5**	**4**	**0**	**2.10**
Eugenea cumini			**11**	**4**	**2**	**6**	**3**	**1.36**
Popular poplar	**7**			**1**	**1**	**2**	**1**	**0.71**
Momordicha charantia		**7**		**0**	**2**	**2**	**2**	**0.85**
Total	**24**	**29**	**21**	**43**	**26**	**25**	**11**	**1.41**
±SE	**24±1.69**	**29±1.69**	**21±0.64**	**43±1.68**	**26±1.16**	**25±1.15**	**11±0.09**	**1.41±0.21**

Table 4.16.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	SS	MS	F-Value	P-Value
Trees	7	38.50	5.500	1.08	0.409
Occurrence of bird roosts	3	32.75	10.917	2.15	0.125
Error	21	106.75	5.083		
Total	31	178.00			

Table 4.16.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

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Occurrence of bird roosts	N	Mean	Grouping
P. krameri	8	4.250	A
C. splendens	8	3.625	A
P. dom	8	2.500	A
S. roseus	8	1.625	A

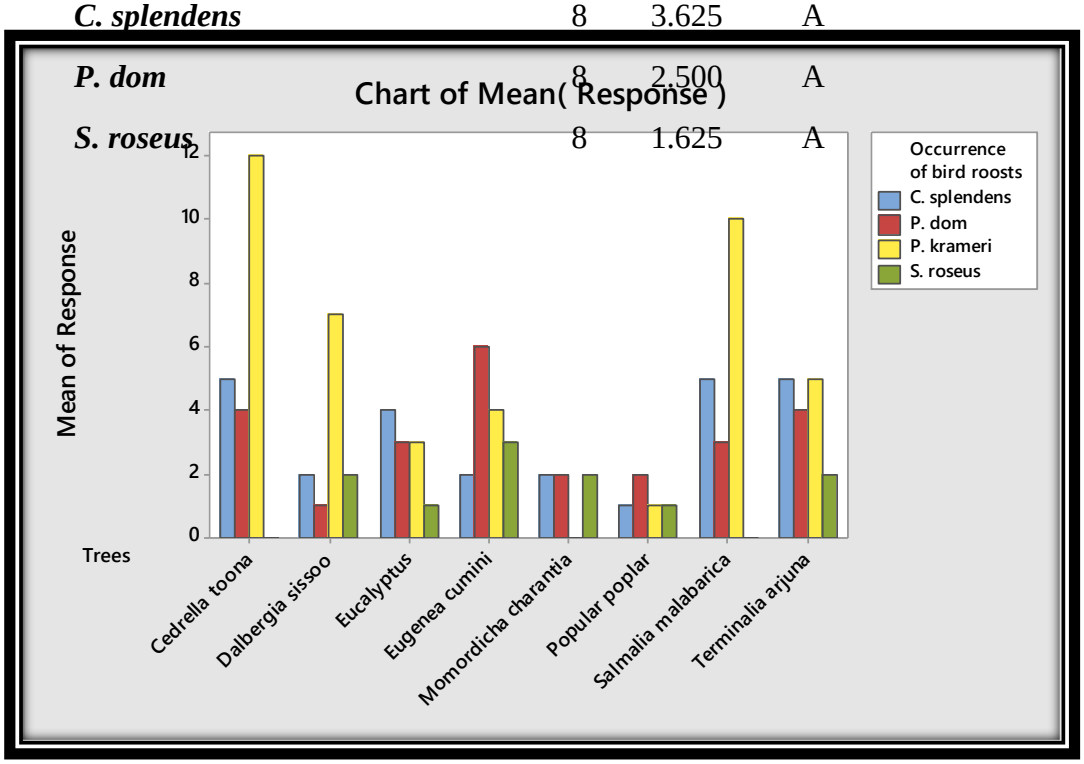


Figure 16: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.17: Information is computed in this table regarding bird roosts and tree variety and gathered in table from the 2nd week of April (04-14-2017 to 04-17-2017) and observed value is enclosed in range of <50 to <70 (cm).

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica		15		10	5	3	0	1.20
Dalbergia sissoo			10	7	2	1	1	1.10
Eucalyptus		7		3	4	3	1	1.57
Terminalia arjuna	7			5	4	4	2	2.14

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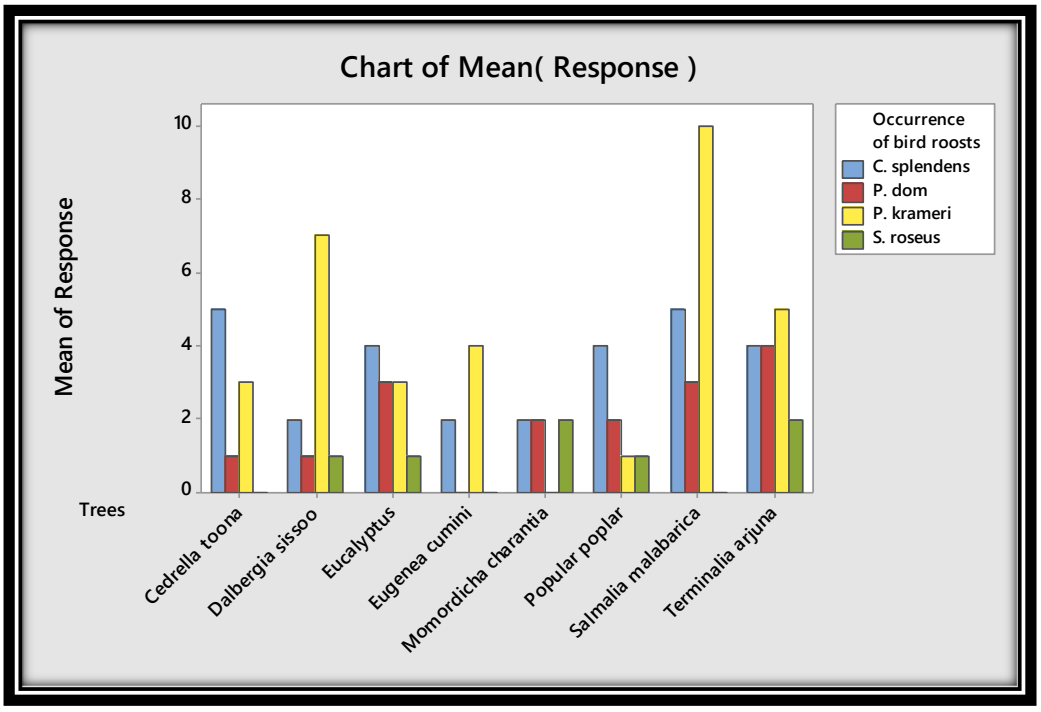
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Cedrella toona	**10**			**3**	**5**	**1**	**0**	**0.90**
Eugenea cumini			**11**	**4**	**2**	**0**	**0**	**0.54**
Popular poplar		**5**		**1**	**4**	**2**	**1**	**1.60**
Momordicha charantia		**7**		**0**	**2**	**2**	**2**	**0.85**
Total	**17**	**34**	**21**	**31**	**28**	**16**	**7**	**1.14**
±SE	**17±1.68**	**34±0.64**	**21±0.64**	**31±0.45**	**28±0.34**	**16±1.58**	**4±0.53**	**1.14±0.09**

Table 4.17.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	SS	MS	F-Value	P-Value
Trees	7	31.50	4.500	1.35	0.279
Occurrence of bird roosts	3	51.75	17.250	5.16	0.008
Error	21	70.25	3.345		
Total	31	153.50			

Table 4.17.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts



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Occurrence of bird roosts	N	Mean	Grouping	
P. krameri	8	4.125	A	
C. splendens	8	3.500	A	
P. dom	8	2.000	A	B
S. roseus	8	0.875	B	

Figure 17: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.18: Information is collected in table for the mean value of roosting of birds on eight tree species in 3 days (18- 04-2017 to 20-04-2017) during the 3rd week of April (2017).

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C .splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica	6			10	5	3	7	4.17
Dalbergia sissoo		7		7	3	1	2	1.71
Eucalyptus			8	3	4	3	2	1.50
Terminalia arjuna		10		5	4	4	2	1.50
Cedrella toona	9			3	6	3	0	1.33
Eugenea cumini		11		4	2	0	3	0.82
Popular poplar			4	1	4	2	1	2.00
Momordicha charantia	7			4	7	2	2	2.14
Total	22	28	12	35	35	16	19	1.69
±SE	22±0.66	28±1.68	12±1.10	35±0.65	35±0.65	16±1.21	19±1.70	1.69±0.48

Table 4.18.1: Analysis of variance for Trees and occurrence of bird

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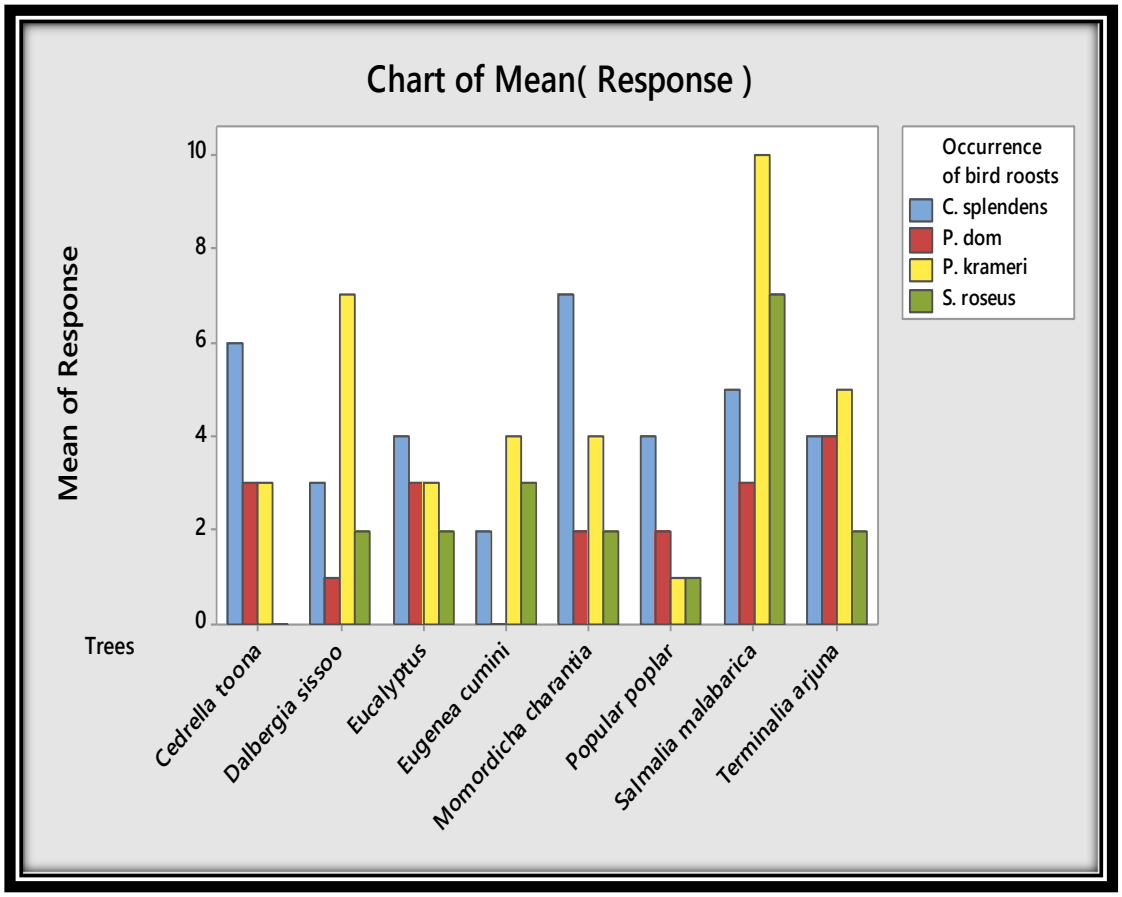
Occurrence of bird roosts	N	Mean	Grouping
P. krameri	8	4.625	A
C. splendens	8	4.375	A
S. roseus	8	2.375	A
P. dom	8	2.250	A

roosts

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Trees	7	47.97	6.853	2.21	0.076
Occurrence of bird roosts	3	38.59	12.865	4.15	0.019
Error	21	65.16	3.103		
Total	31	151.72			

Table 4.18.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

Figure 18: Graphical representation of birds roosts with respect to different



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trees within range of (<50 to <70 cm) DBH

Table 4.19: Observation were recorded and aggregated in one table, observed values are from the last week of April and mean value for bird roosts is also shown in table on eight diverse species

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. rosseus*	
Salmalia malabarica		15		10	5	3	0	4.50
Dalbergia sissoo			10	7	2	1	1	2.75
Eucalyptus		7		3	4	3	1	2.75
Terminalia arjuna	7			5	4	4	2	3.75
Cedrella toona	10			3	5	1	0	2.25
Eugenea cumini			11	4	2	0	0	1.50
Popular poplar		5		1	4	2	1	2.00
Momordicha charantia		7		0	2	2	2	1.50
Total	17	34	21	33	28	16	7	1.17
±SE	17±1.68	34±0.53	21±0.64	33±0.52	28±1.67	16±1.21	7±0.52	1.17±0.02

Table 4.19.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Trees	7	31.50	4.500	1.35	0.279
Occurrence of bird roosts	3	51.75	17.250	5.16	0.008
Error	21	70.25	3.345		
Total	31	153.50			

Table 4.19.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

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Occurrence of bird roosts	N	Mean	Grouping	
P. krameri	8	4.125	A	
C. splendens	8	3.500	A	
P. dom	8	2.000	A	B
S. roseus	8	0.875	B	

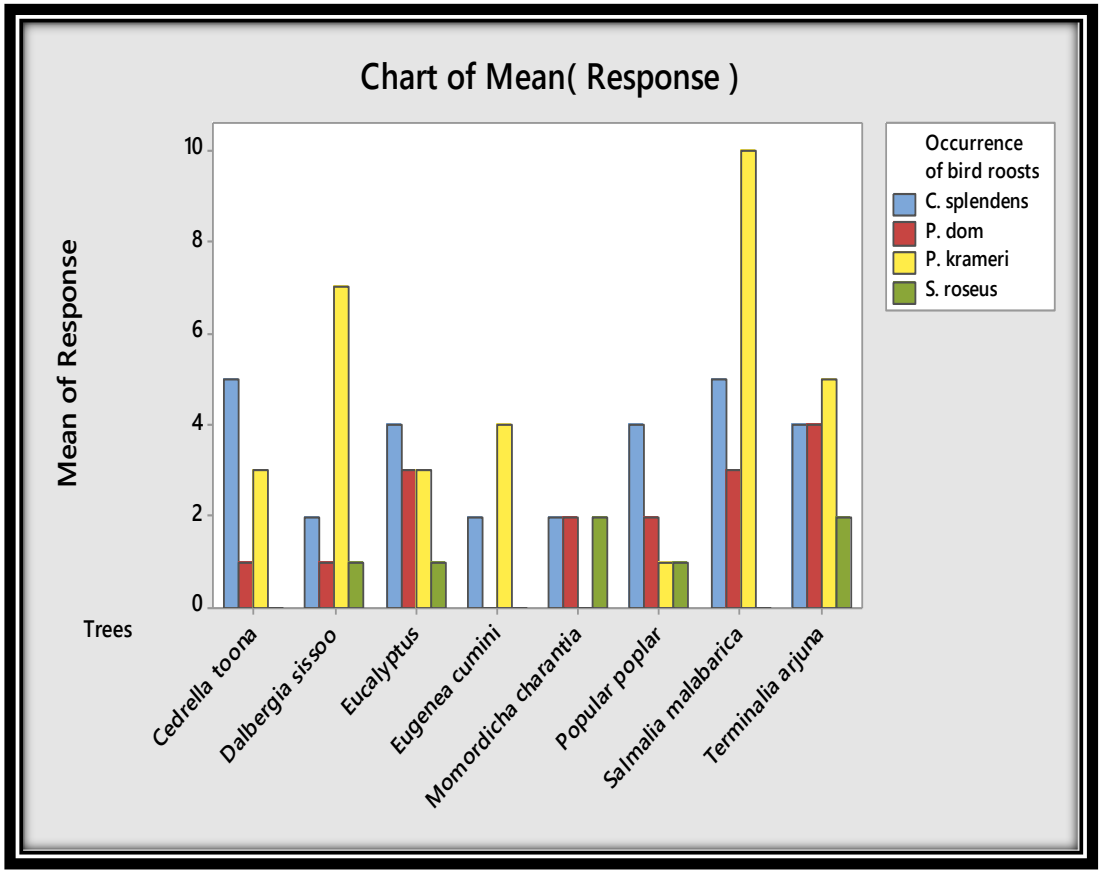


Figure 19: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

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Table 4.20: Information is lumped in one table by making observation in agro-ecosystem of Faisalabad about 4 birds on 8 trees with DBH of <50 to <70 (cm) in April (2017)

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica	6		4	10	7	3	0	2.00
Dalbergia sissoo		7		4	2	1	2	1.28
Eucalyptus		10		3	6	3	1	1.30
Terminalia arjuna	8		11	5	4	4	5	0.94
Cedrella toona			3	5	7	1	0	4.33
Eugenea cumini		8		4	0	3	4	1.37
Popular poplar	11		2	3	2	2	1	0.67
Momordicha charantia		6		0	2	2	0	0.67
Total	25	31	20	34	30	19	18	1.36
±SE	25±1.53	31±0.48	20±1.72	34±0.64	30±0.42	19±1.70	18±1.70	1.36±0.26

Table 4.20.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Trees	7	48.00	6.857	1.59	0.194
Occurrence of bird roosts	3	35.25	11.750	2.72	0.070
Error	21	90.75	4.321		
Total	31	174.00			

Table 4.21.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

Occurrence of bird roosts	N	Mean	Grouping

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P. krameri	8	4.250	A
C. splendens	8	3.750	A
P. dom	8	2.375	A
S. roseus	8	1.625	A

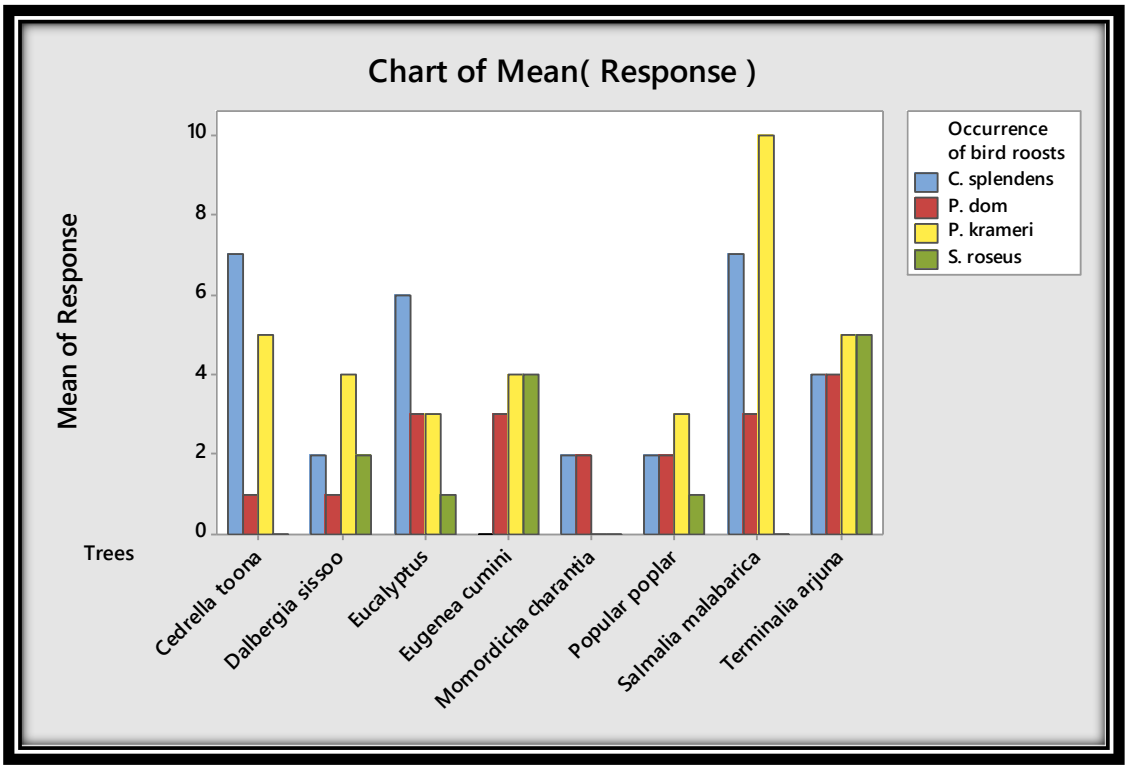


Figure 20: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.21: During the 1st week of May in first 3 to 4 days following observation has been recorded four species of birds and eight species of plants with in <50 to <70 (cm) diameter range of breast height.

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica	2		3	10	5	3	0	3.60
Dalbergia sissoo		10		7	2	1	1	1.10
Eucalyptus		7		3	4	3	1	1.57
Terminalia			9	5	4	4	2	1.67

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arjuna								
Cedrella toona	**15**			**3**	**5**	**1**	**0**	**0.67**
Eugenea cumini			**11**	**4**	**2**	**0**	**0**	**0.54**
Popular poplar		**5**		**1**	**4**	**2**	**1**	**1.60**
Momordicha charantia	**6**	**7**		**0**	**2**	**2**	**2**	**0.46**
Total	**23**	**28**	**23**	**31**	**28**	**16**	**7**	**0.98**
±SE	**23±0.66**	**28±1.57**	**23±0.66**	**31±0.48**	**28±1.68**	**16±1.21**	**7±0.52**	**0.98±0.02**

Table 4.21.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	SS	MS	F-Value	P-Value
Trees	7	31.50	4.500	1.35	0.279
Occurrence of bird roosts	3	51.75	17.250	5.16	0.008
Error	21	70.25	3.345		
Total	31	153.50			

Table 4.21.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

Occurrence of bird roosts	N	Mean	Grouping	
P. krameri	8	4.125	A	
C. splendens	8	3.500	A	
P. dom	8	2.000	A	B
S. roseus	8	0.875	B	

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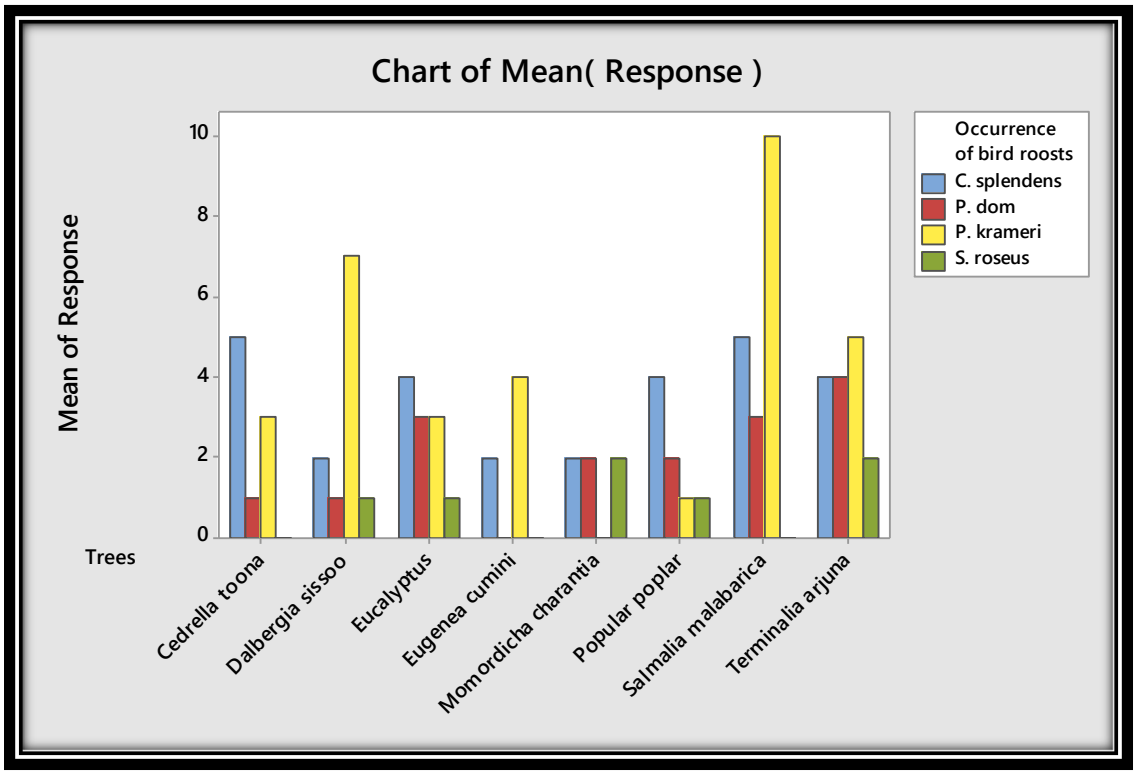


Figure 21: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.22: Summary of four days observation by visiting field in first week of May and this table showed average roosts of Parakeet, Sparrow, House Crow and Starling.

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica		10		8	5	4	0	1.70
Dalbergia sissoo	4		7	7	2	2	1	1.09
Eucalyptus		9		3	2	0	1	0.67
Terminalia arjuna	8			7	4	4	7	2.75
Cedrella toona			6	3	5	1	0	0.17
Eugenea	2	5		4	1	0	0	0.71

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cumini								
Popular poplar	**9**		**3**	**4**	**3**	**2**	**9**	**1.50**
Momordicha charantia		**4**		**3**	**6**	**2**	**0**	**2.75**
Total	**23**	**28**	**16**	**37**	**28**	**15**	**18**	**1.46**
±SE	**23±0.67**	**28±1.68**	**16±1.21**	**37±0.59**	**28±1.68**	**15±1.20**	**18±1.69**	**1.46±0.27**

Table 4.22.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Trees	7	63.50	9.071	1.95	0.112
Occurrence of bird roosts	3	44.25	14.750	3.17	0.046
Error	21	97.75	4.655		
Total	31	205.50			

Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

Occurrence of bird roosts	N	Mean	Grouping
P. krameri	8	4.875	A
C. splendens	8	3.500	A
S. roseus	8	2.250	A
P. dom	8	1.875	A

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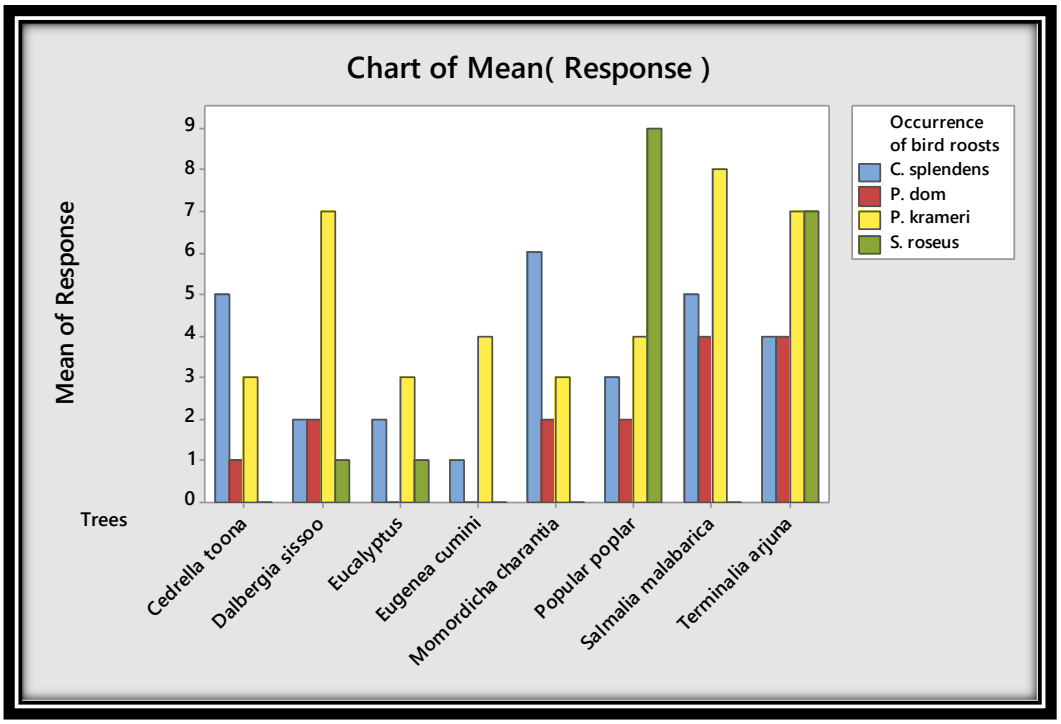


Figure 22: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.23: In 2nd week of May (2017) observed values are surmised and maximum roosting by birds were observed in *Salmalia malabarica* in range of 50 to 70 (cm)

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica		9		9	5	3	0	1.89
Dalbergia sissoo	8			7	2	4	3	2.00
Eucalyptus		8		3	6	3	1	1.62
Terminalia arjuna		6		9	4	4	2	3.16
Cedrella toona	2	3		3	5	1	0	1.80
Eugenea	2		7	3	6	4	3	1.78

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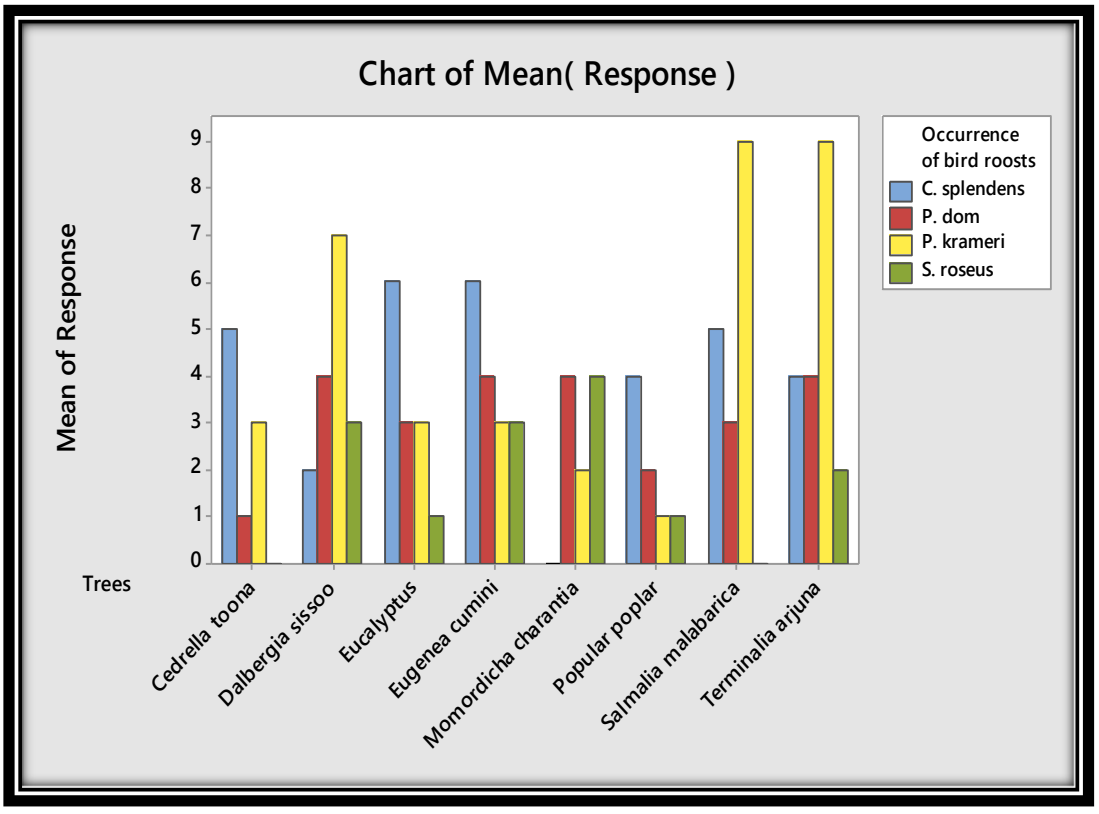
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cumini								
Popular poplar		**7**		**1**	**4**	**2**	**1**	**1.14**
Momordicha charantia	**3**		**5**	**2**	**0**	**4**	**4**	**1.25**
Total	**15**	**33**	**12**	**37**	**32**	**26**	**14**	**1.90**
±SE	**15±0.50**	**33±0.52**	**12±1.10**	**37±0.67**	**32±0.51**	**26±1.66**	**14±1.12**	**1.90±0.34**

Table 4.23.1: Analysis of variance for trees and occurrence of bird roosts

Source	DF	Adj SS	F-Value	P-Value
Trees	7	2 9.50	0.91	0.515
Occurrence of bird roosts	3	37.25	2.417 0 .072	2.70
Error	21	96.75		
Total	31	163.50		

Table 4.23.1: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts



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Occurrence of bird roosts	N	Mean	Grouping
P. krameri	8	4.625	A
C. splendens	8	4.000	A
P. dom	8	3.125	A
S. roseus	8	1.750	A

Figure 23: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.24: Observations were recorded in a table with the observed value of the of May, and the average of the birds was also shown in the table of eight different species

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica		13		10	5	3	0	1.38
Dalbergia sissoo	6		3	7	2	1	1	1.22
Eucalyptus		6		4	2	3	1	1.67
Terminalia arjuna		9		5	4	4	2	1.67
Cedrella toona			6	3	6	1	4	2.33
Eugenea cumini	9			4	2	0	2	0.89
Popular poplar		10		2	4	2	0	0.8
Momordicha charantia	11		4	0	2	2	2	0.4
Total	26	38	13	35	27	16	12	1.29
±SE	26±1.54	38±0.68	13±1.11	35±0.65	27±1.55	16±1.14	12±1.10	1.29±0.18

Table 4.24.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	Adj SS	Adj MS	F-Value	P-Value

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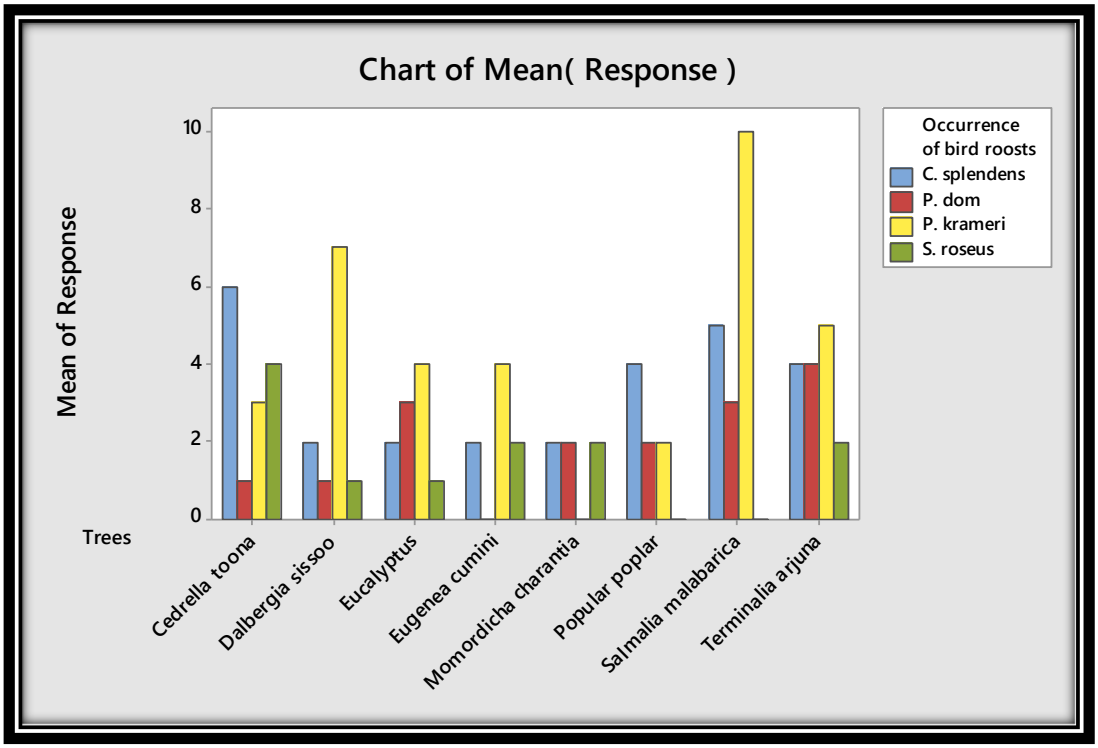
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Occurrence of bird roosts	N	Mean	Grouping		
P. krameri	8	4.375	A		
C. splendens	8	3.375	A	B	
P. dom	8	2.000	A	B	
S. roseus	8	1.500	B		

Trees	7	29.38	4.196	1.12	0.385
Occurrence of bird roosts	3	41.13	13.708	3.67	0.029
Error	21	78.37	3.732		
Total	31	148.87			

Table 4.24.2: Tukey Pairwise Comparisons: Response = Response, Term =



Occurrence of bird roosts

Figure 24: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.25: Association of trees with the roosting behaviour of birds has shown in this table nd observation were made 3rd week of May (2017).

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	

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Occurrence of bird roosts	N	Mean	Grouping				
Salmalia malabarica	**8**			**9**	**5**	**3**	**0**	**2.12**
Dalbergia sissoo		**4**		**7**	**3**	**1**	**4**	**3.75**
Eucalyptus	**2**	**6**		**7**	**4**	**3**	**2**	**2.00**
Terminalia arjuna			**6**	**5**	**4**	**4**	**2**	**2.50**
Cedrella toona		**7**		**3**	**5**	**1**	**1**	**1.42**
Eugenea cumini			**9**	**4**	**8**	**0**	**3**	**1.67**
Popular poplar		**8**		**8**	**4**	**2**	**1**	**1.87**
Momordicha charantia	**4**		**4**	**0**	**2**	**2**	**1**	**0.62**
Total	**14**	**25**	**19**	**43**	**39**	**16**	**16**	**1.96**
±SE	**14±1.12**	**25±1.53**	**19±1.70**	**43±1.14**	**39± 0.96**	**16±1.21**	**16±1.21**	**1.96±0.37**

Table 4.25.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	SS	MS	F-Value	P-Value
Trees	7	28.00	4.000	1.06	0.422
Occurrence of bird roosts	3	76.25	25.417	6.74	0.002
Error	21	79.25	3.774		
Total	31	183.50			

Table 4.25.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

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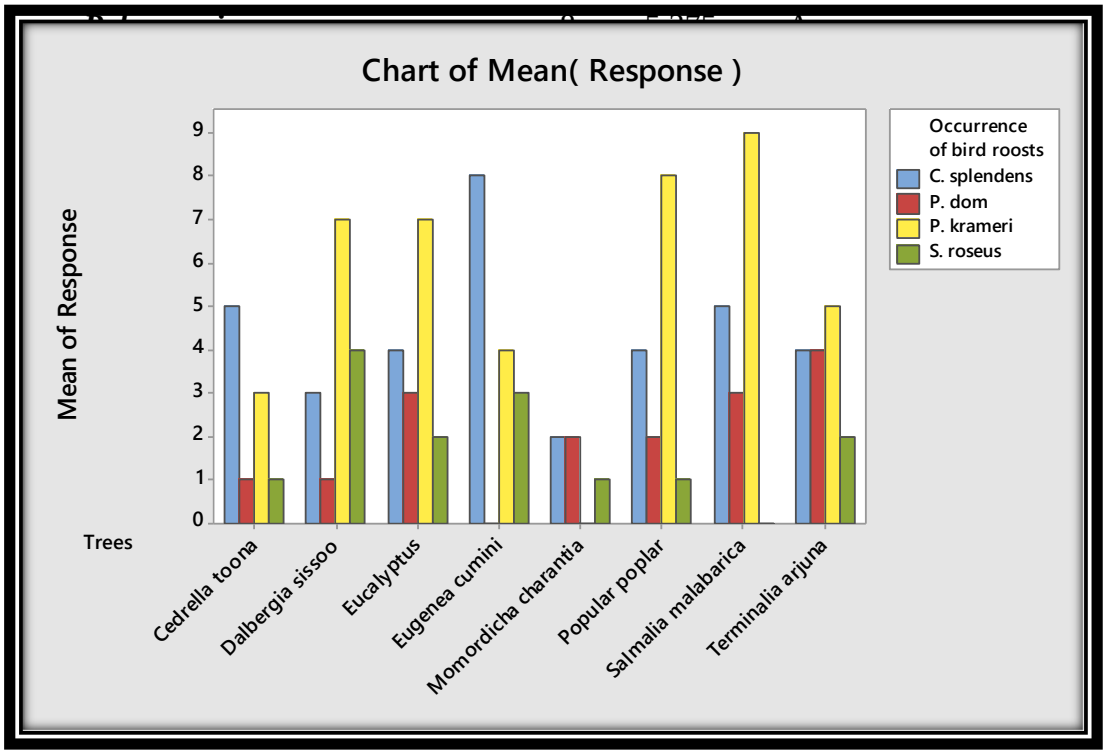


Figure 25: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.26: Record of the data for variety of trees from the roost in May (2017) to estimate the (DBH) diameter at breast height. Data for 3-days has been aggregated together in one table.

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica		13		13	5	3	0	1.61
Dalbergia sissoo			9	7	2	5	1	1.67
Eucalyptus		9		3	4	3	1	1.22
Terminalia arjuna	11			0	3	4	7	1.27
Cedrella toona	7			3	4	1	0	1.14
Eugenea			13	9	2	1	0	0.86

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Occurrence of bird roosts	N	Mean	Grouping
P. krameri	8	4.500	A
C. splendens	8	3.250	A
P. dom	8	3.125	A
S. roseus	8	1.500	A

cumini								
Popular poplar	**4**		**1**	**4**	**2**	**1**	**2.00**	
Momordicha charantia	**7**		**0**	**2**	**6**	**2**	**1.42**	
Total	**18**	**33**	**22**	**36**	**26**	**25**	**12**	**1.43**
±SE	**18±1.69**	**33±0.52**	**22±0.65**	**36±0.66**	**26±1.54**	**25±13**	**12±1.10**	**1.43±0.26**

Table 4.26.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	SS	MS	F-Value	P-Value
Trees	7	32.47	4.638	0.50	0.822
Occurrence of bird roosts	3	36.34	12.115	1.31	0.297
Error	21	193.91	9.234		
Total	31	262.72			

Table 4.26.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

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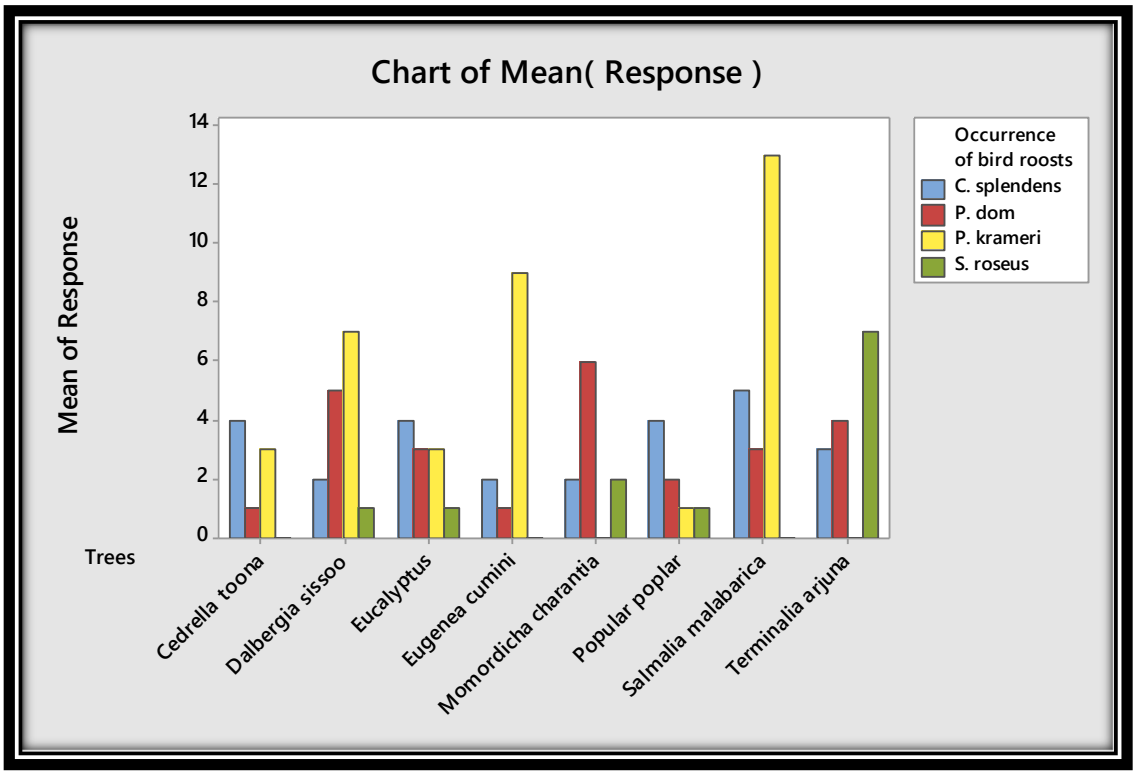


Figure 26: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.27: Data is measure for biodiversity profile of 4 birds in agroecosystem of Faisalabad by keeping 8 trees under consideration and *Eugena cumini* has seen with most roosting by birds.

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica	10			11	5	3	3	2.20
Dalbergia sissoo		8		7	2	4	1	1.75
Eucalyptus		9		3	4	3	4	1.55
Terminalia arjuna	3		4	0	4	3	2	1.28
Cedrella toona			7	7	5	1	3	2.28
Eugenea cumini		4		4	2	4	0	2.50

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Occurrence of bird roosts	N	Mean	Grouping
P. krameri	8	4.375	A
C. splendens	8	3.500	A
P. dom	8	2.625	A
S. roseus	8	2.000	A

Popular poplar			**6**	**1**	**4**	**2**	**1**	**1.33**
Momordicha charantia	**5**			**2**	**2**	**1**	**2**	**1.40**
Total	**18**	**22**	**17**	**35**	**31**	**21**	**16**	**1.83**
±SE	**18±1.69**	**22±0.65**	**17±1.69**	**35±0.65**	**31±0.43**	**21±0.64**	**16±1.21**	**1.83±0.68**

Table 4.27.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Trees	7	44.00	6.286	1.54	0.208
Occurrence of bird roosts	3	25.75	8.583	2.10	0.130
Error	21	85.75	4.083		
Total	31	155.50			

Table 4.27.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

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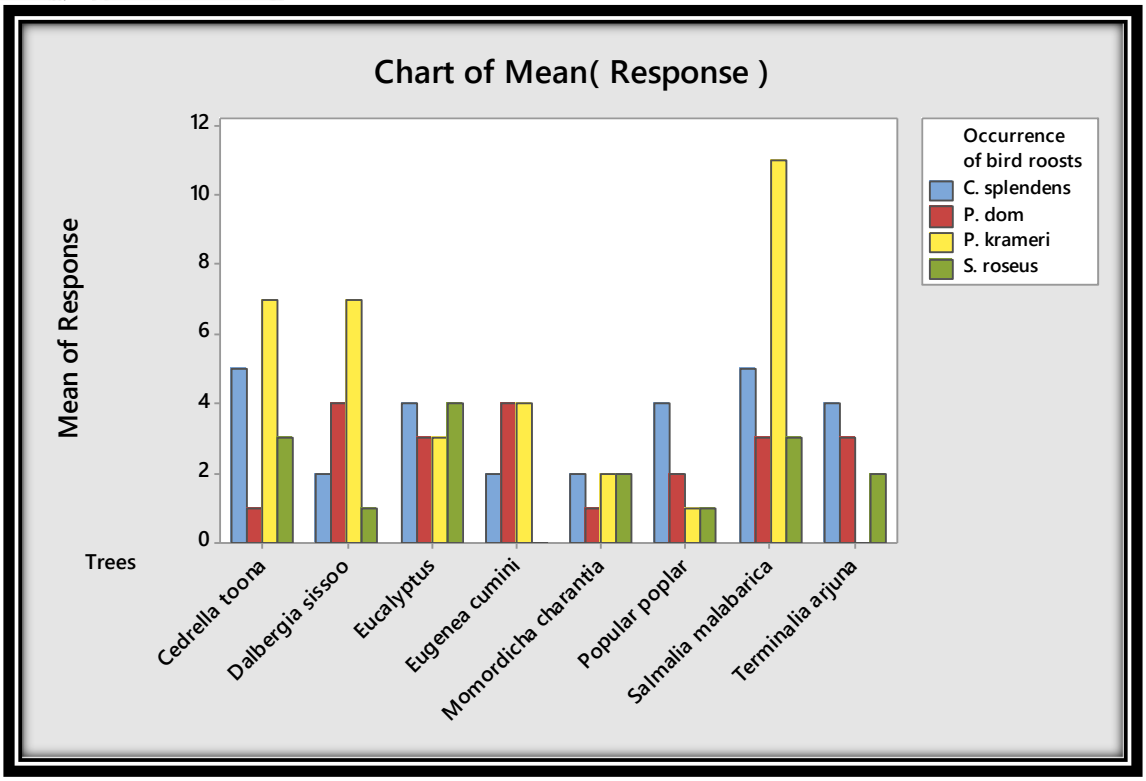


Figure 27: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.28: Variation in number of birds observed during last week of (May 2017) is estimated and presented with respect to DBH value and average birds roosting.

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica		5		10	5	3	0	3.6
Dalbergia sissoo			10	7	2	1	1	1.10
Eucalyptus		18		3	4	3	1	0.61
Terminalia arjuna			8	5	4	4	2	1.87
Cedrella toona	6			3	5	1	0	1.50
Eugenea	7		2	4	2	0	0	0.66

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cumini								
Popular poplar		**7**		**1**	**4**	**2**	**1**	**1.42**
Momordicha charantia		**9**		**0**	**2**	**2**	**2**	**0.66**
Total	**17**	**34**	**21**	**33**	**28**	**16**	**7**	**1.16**
±SE	**17±1.68**	**34±0.64**	**21±0.64**	**33±0.52**	**28±1.68**	**16±1.21**	**7±0.52**	**1.16±0.12**

Table 4.28.1: Analysis of variance for Trees and occurrence of bird roosts

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Trees	7	31.50	4.500	1.35	0.279
Occurrence of bird roosts	3	51.75	17.250	5.16	0.008
Error	21	70.25	3.345		
Total	31	153.50			

Table 4.28.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

Occurrence of bird roosts	N	Mean	Grouping	
P. krameri	8	4.125	A	
C. splendens	8	3.500	A	
P. dom	8	2.000	A	B
S. roseus	8	0.875	B	

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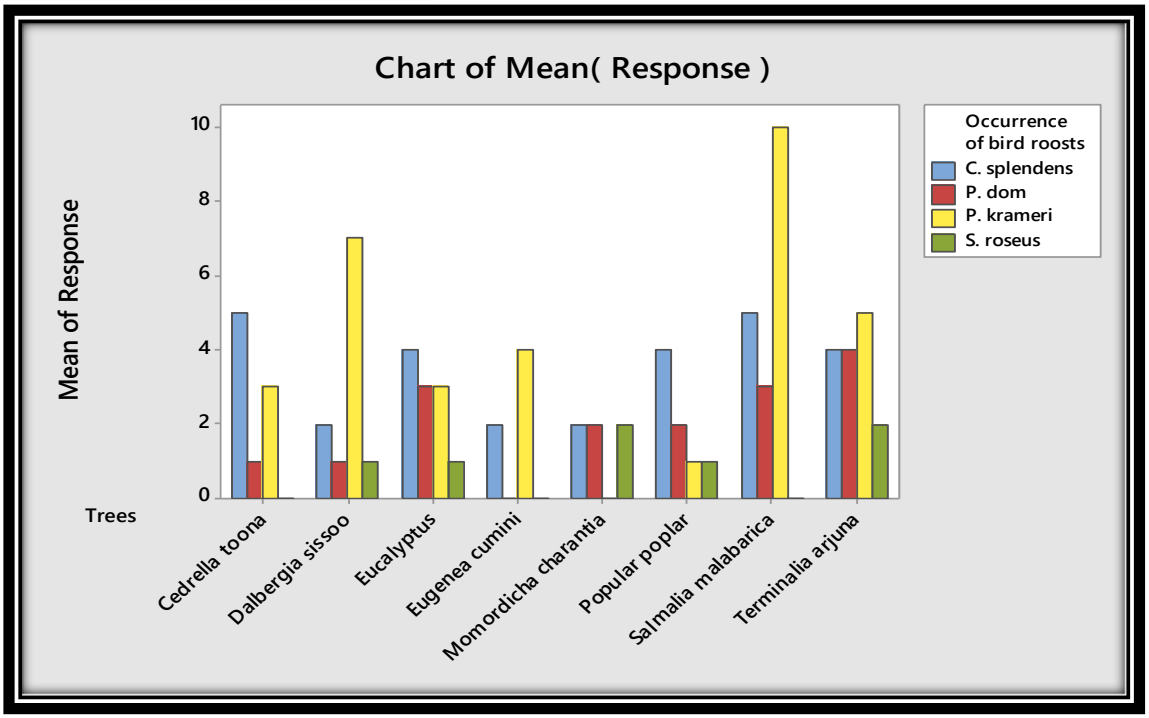


Figure 28: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.29: Information is valuated in table for the mean value of roosting of birds on eight tree species in 3 days (25- 05-2017 to 27-05-2017) during the last week of May (2017).

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica	10		3	11	5	3	0	1.46
Dalbergia sissoo		10	2	7	8	1	4	1.66
Eucalyptus	5			3	4	4	1	2.40
Terminalia arjuna			5	6	4	4	2	3.20
Cedrella toona		12		3	5	1	9	1.50
Eugenea cumini			4	4	2	0	0	1.51
Popular poplar		13		1	4	2	3	0.76

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Occurrence of bird roosts	N	Mean	Grouping
P. krameri	8	5.250	A
C. splendens	8	4.250	A
S. roseus	8	2.625	A
P. dom	8	2.000	A

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Trees	7	42.22	6.031	0.98	0.468
Occurrence of bird roosts	3	53.09	17.698	2.89	0.060
Error	21	128.66	6.126		
Total	31	223.97			

Momordicha charantia	**3**		**9**	**7**	**2**	**1**	**2**	**1.08**
Total	**17**	**34**	**21**	**33**	**28**	**16**	**7**	**1.16**
±SE	**17±1.68**	**34±0.64**	**21±0.64**	**33±0.52**	**28±1.68**	**16±1.21**	**7±0.52**	**1.16±1.10**

Table 4.29.1: Analysis of variance for Trees and occurrence of bird roosts

Table 4.29.2: Tukey Pairwise Comparisons: Response = Response, Term = Occurrence of bird roosts

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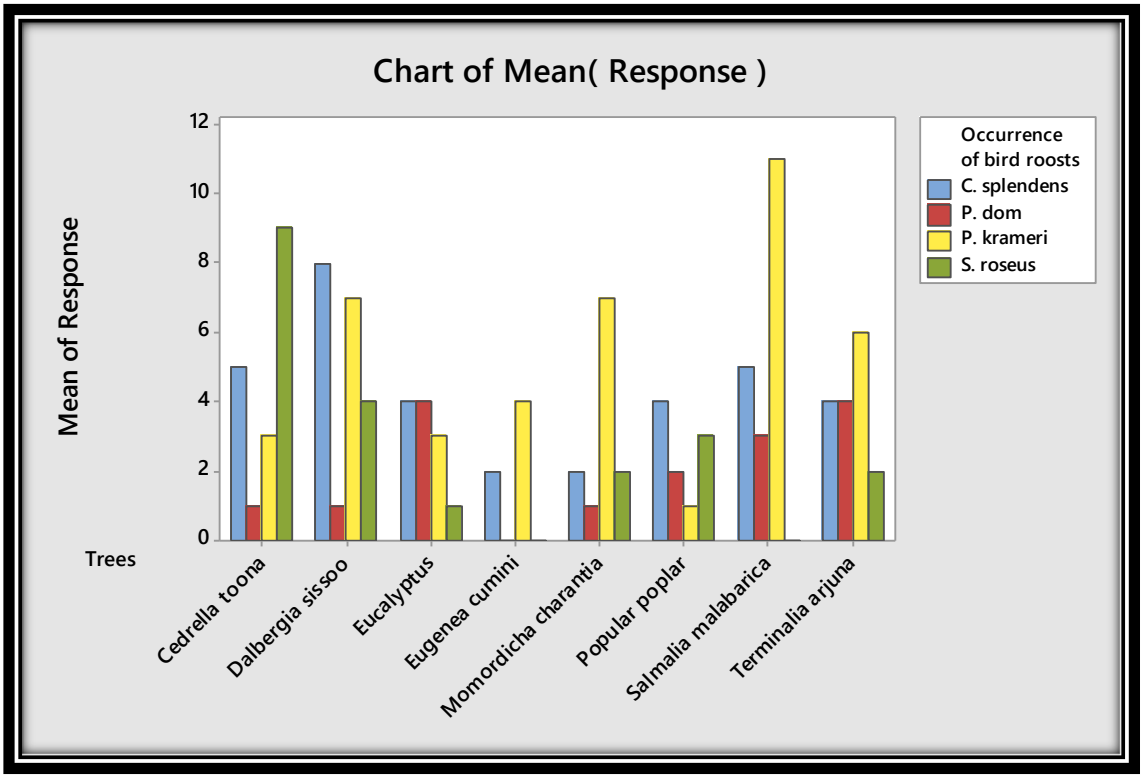


Figure 29: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

Table 4.30: Birds roosting has been observed and highest number of was seen at DBH of 50 to 70 (cm) and *P.krameri* has shown high diversity during the second three day of last week of May (2017)

Trees	Trees categorization (DBH values) and tree numbers			Occurrence of bird roosts (numbers)				Average bird roosts
	<50 (cm)	50 to70 (cm)	> 70 (cm)	*P. krameri*	*C. splendens*	*P. domesticus*	*S. roseus*	
Salmalia malabarica		16		10	3	3	8	1.50
Dalbergia sissoo			17	7	6	1	1	0.88
Eucalyptus		7		8	4	3	4	2.71
Terminalia arjuna	7			5	4	4	2	2.55
Cedrella toona	6			6	6	1	3	2.66

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Occurrence of bird roosts	N	Mean	Grouping
P. krameri	8	5.500	A
C. splendens	8	4.125	A B

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Trees	7	48.00	6.857	1.83	0.134
Occurrence of bird roosts	3	51.25	17.083	4.56	0.013
Error	21	78.75	3.750		
Total	31	178.00			

Eugenea cumini			**11**	**4**	**2**	**0**	**0**	**0.54**
Popular poplar		**9**		**1**	**4**	**2**	**5**	**1.33**
Momordicha charantia	**8**	**7**		**3**	**4**	**2**	**4**	**0.86**
Total	**21**	**39**	**28**	**44**	**33**	**16**	**27**	**1.36**
SE	**21±0.64**	**39±0.72**	**28±1.68**	**44±0.134**	**33±0.52**	**16±1.21**	**27±1.66**	**1.36±0.18**

Table 4.30.1: Analysis of variance for Trees and occurrence of bird roosts

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S. roseus	8	3.375	A	B
P. dom	8	2.000	B	

Table 4.30.2: Tukey Pairwise

Comparisons: Response = Response, Term = Occurrence of bird roosts

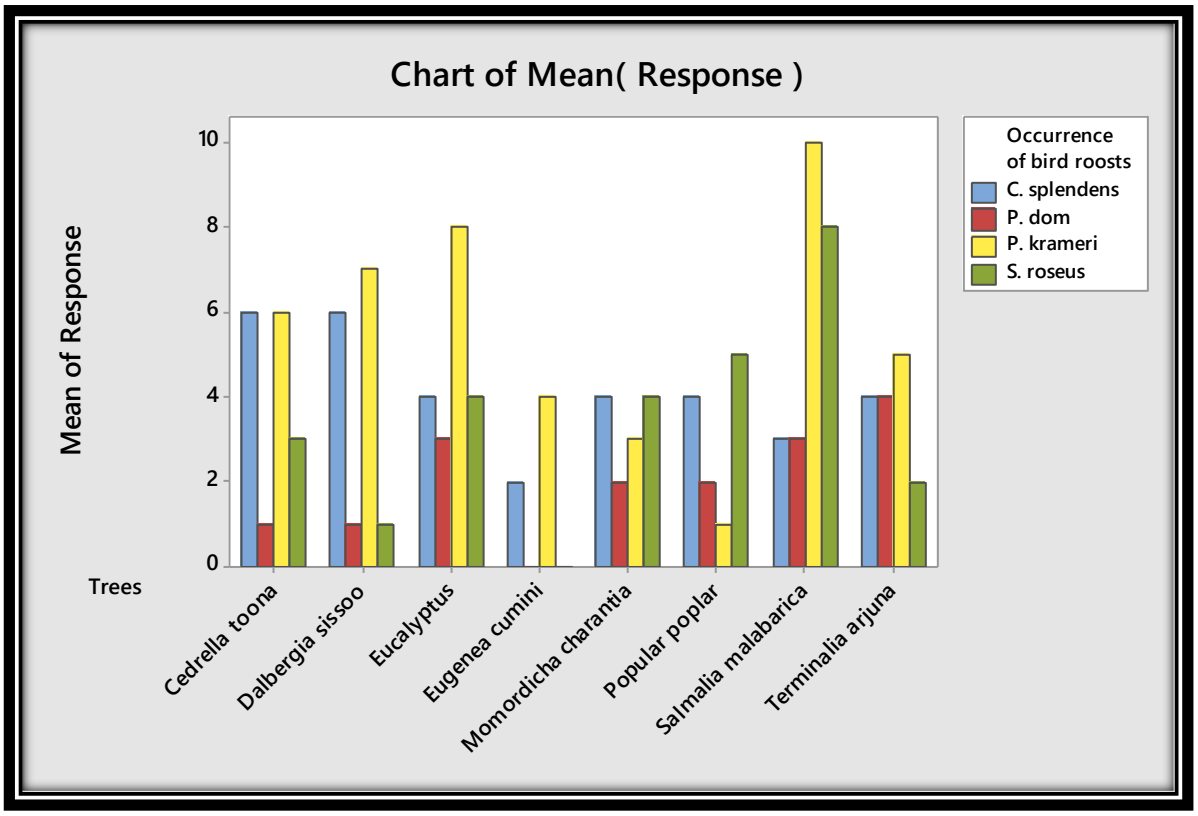


Figure 30: Graphical representation of birds roosts with respect to different trees within range of (<50 to <70 cm) DBH

This study clearly emphasized on the assessment of biodiversity profile of avian fauna of four species existed in this study. The three DBH categories are important which represented different types of trees. On the average the three DBH categories remain equally proportional in response to four species. Significant analyses of variance were recorded among all tree species at different proportion while others they remain non-existent.

Present study is also similar to those of Altaf *et al.*, (2013) who also reported similar findings in during different seasons. The rich diversity of bird was observed in the present studies which also indicated their dominance and co-dominance for various other species. In contrast the avian bird diversity according to pre-categorization of birds may be attributed to the fact that roosting habits are always important parameters for the determination of the bird agility and sustainability.

The roosts remain the focal points of birds behavior in their respective places and

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contributed to their existence in respective habitat. Evidently availability of suitable trees and plantation are always a key factor for the determination of suitable bird roost. It may be an important factor that are impacted by certain trees of various certain breast height and roost efficiency for them to survive unless the roost remain sustainable, with the supporting trees and plantation and also to assess their diameters and various species might not able to survive. These studies clearly exhibited indicative of the fact that unless the suitable plantation are critically assessed. It is difficult to curtail the aggregation of population of birds which may become obliterating regarding their pest status.

Summary

This study clearly pointed out that the diversity of avian fauna and average roosting might be important parameter to determine their overall significance. Trees are split according to DBH (>50, 50 to 70, <70 cm) with regard to four species of birds. There is no doubt that the bird roost can be important aspect to determine their sustainability on the basis of present study following conclusion can be drawn.

Conclusion

Average roosting always comprises the variable number of population.

A roost is a place to determine the balance approach between the interactions of plantation and supporting structures. And roosting may indicate high and low value depending on the availability of food reserve which can be used by birds as their nutrition. However old and tall trees may indicate sustain roosts with an augmentation the population depend on the availability of suitable ecological circumstances. Therefore the bird pest should be controlled amicably within their roost by the adoption of less favorable factors.

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