

# Some aspects of feeding ecology and behavior of House crow (*Corvus splendens*) in an urban habitat of city Prayagraj (U.P.), India

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## ABSTRACT

The present article explains some aspects of feeding ecology and behavioral strategies adopted by house crow (*Corvus splendens*) in urban habitats. The house crow (*C. splendens*) is an omnivorous, scavenger, and highly opportunistic bird. Feeding ecology and behavior were observed in each study area following a suitable sampling method. House crow significantly feeds in unhygienic places and prefers food items from miscellaneous sources (human refuses, carcasses, etc.) over plant and animal sources during the day time. In the early morning, house crow mostly relied on plant and animal sources as food items. House crow significantly prefers to feed in the morning. Irrespective of the abundance of the various plant species house crow significantly prefers to feed products of five plant species, namely, *Ficus religiosa*, *Azadirachta indica*, *Ficus racemosa*, *Ziziphus*, *Ficus indica*, and *Artocarpus lacucha*. Other plants are only occasionally visited for feeding purposes. House crow significantly prefers to feed in the congregation; however, feeding solitary is not uncommon. House crow utilizes carcasses in congregation with the aid of feral dogs if otherwise unable to crack open carcasses alone. It also feeds on ticks present on the body surface of *Sus scrofa*. Instances of both inter and intraspecific competitions have been observed. Interspecific competitive events were significantly more common in comparison to intraspecific competitive events. *Acridotheres tristis*, *Acridotheres ginginianus*, *Gracupica contra*, *Passer domesticus*, *Bubulcus ibis*, *Egretta garzetta*, *Columbia livia*, and *Milvus migrans* are bird species, house crow showed aggressive behavior. Apart from this, house crow showed both aggressiveness and appeasement toward *Macaca sp.* and feral dogs. House crow significantly spends more time in search of food items than actual feeding time. Four types of feeding methods, namely, searching, stealing, specific food offerings, and food retrieved from cached sites were observed to be adopted by house crows. Present outcomes will definitely help us to understand what strategies are adopted by birds to survive in the current urban scenario, at least by this bird. In addition, the present study will give some idea about how to manage the population of this invasive bird species.

## 1. INTRODUCTION

House crow is a common bird of crow belonging to family *Corvidae* of order *Passeriformes*. House crow is omnivorous, scavenger bird. The food preference of house crow is highly opportunistic [1,2]. House crow also eat agricultural produce and stored food [3-8]. House crow is highly adaptive to the urban environment [9,10]. It is a strongly commensal, vocal, gregarious bird, generally unafraid of the public. Its abundance is closely associated with the human population up to the extent that non-dependent population may no longer exist [11]. Habitat abundance relationships suggest that house crows are highly dependent on anthropogenic food [1]. It is an invasive species, that is, negatively alters its new environment causing ecological,

environmental, and economic damage [12-14]. Reports are available that mark house crow as the carrier of pathogens that cause diseases in human beings [13,15,16]. In India, the house crow is also associated with religious rituals. Feeding ecology of a bird is important aspect of the basic ecology of species concerned. Feeding behavior is the way, in which a bird exploits resources for feeding purpose. This explains how a bird species utilize their environment and help to identify the factors which are crucial for their survival and propagation [17]. The present study aims to describe some aspects of feeding ecology and behavior of house crow. Outcome definitely will help us to understand how population of this invasive bird species can be managed up to a sustainable level.

## 2. MATERIALS AND METHODS

The present investigation was carried out in certain parts of the city Prayagraj (Allahabad; 25°45' N to 81° 85' E) located in the southernmost part of the state Uttar Pradesh, India. Average elevation

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is over 90 m above sea level. Prayagraj has three seasons. Summer expand from March to June with temperature up to 48°C. Monsoon starts in June and lasts up to August and even up to mid-September having annual rainfall of 1027 mm. Winter runs from November to February, with average minimum temperature of about 9°C. Annual mean temperature is around 26°C. Recorded average relative humidity is about 53%. Prayagraj is the seventh most populous city of the state concerned and 36<sup>th</sup> in country. Huge quantities of food scrap/human left over, animal remains, are produced in the city every day. City also covers considerable vegetation and river bank areas. Thus, studied city is right choice for the study of feeding ecology of house crow in an urban habitat.

Direct observations were made to record the food habits, feeding behavior, inter- and intraspecific struggles, and some other aspects of feeding ecology of the house crow. Focal animal sampling with 5 min interval was used to record individual feeding behavior. For group observation, all animal sampling together with ad-libitum were considered. All sampling methods were applied with procedure described by Altmann [18] and Lehner [19]. We observed group feeding up to the time participating species disintegrated or it was not possible to continue observation otherwise. Food stealing events were observed until house crow disappears or was beyond to tackle. We approximated food hoarding if captured/stolen food item was avoided to consume immediately and house crow flew away along with it up to the untraceable extent. Each study area has been visited 5 times in a month during period of April 2019 to April 2021. The observation started following sunrise and ended up to 09.00 AM and in evening 04.00 PM to 06.00 PM. Occasional visits were also made during day time whenever required. Identification of flora and fauna has been made using most preferred references. Bird's counts were made at each study area using point count method [20]. Stopwatch and binocular (Olympus 10 × 50) have been used to observe feeding activity and bird's counting whenever required with observation free of possible human interference. Photographs and videos were taken with the help of Cannon power shot digital camera with ×40 zoom (model no. SX430IS) with 20 mega pixel capacity. Suitable graphical presentation and statistical treatment have been made using Microsoft Excel 2007 version.

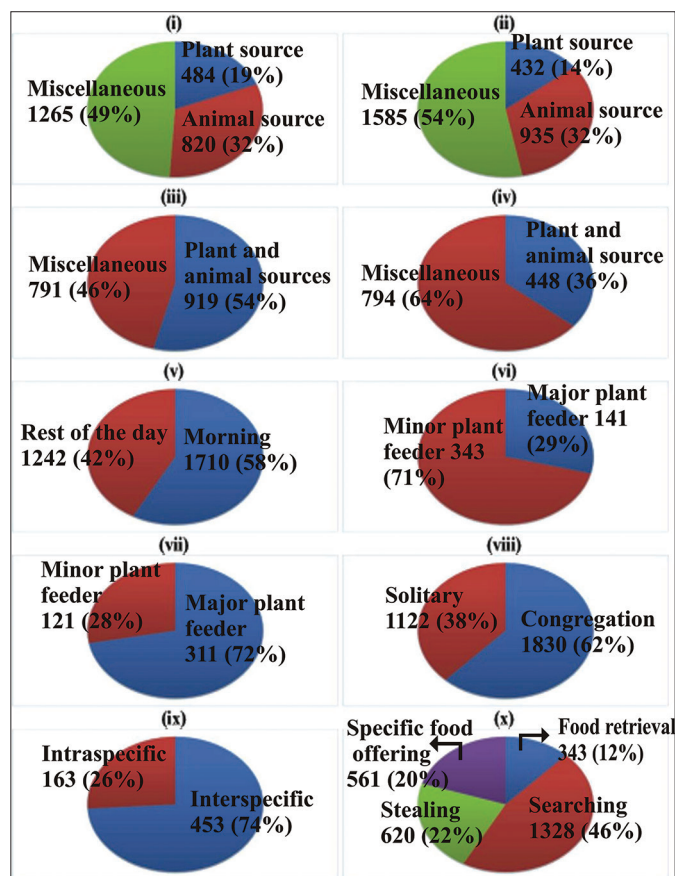
### 3. RESULTS AND DISCUSSION

Total 41 feeding grounds have been visited, of which only eight sites were located in neat clean places; rest resides in grubby/garbage collecting sites. House crow thus significantly feeds in unhygienic condition (calculated  $\chi^2$  value 9.01 > critical  $\chi^2$  value 3.84;  $P < 0.002$ ). Feeding sites were almost full of human refuges, cooked left over, wastes from food stall, wastes recovered from vegetable/meat/fish market, animal remains, and other organic/inorganic constituents. It was perceived that roosting sites of house crow coincide with feeding sites. Principle diet consists of caterpillars, beetles, weevils, bugs, wasps, various other insects and small fishes, amphibians, reptiles, and fledglings. Kitchen leftover, human refuges, and various other edible organic/inorganic substances contribute a lot in its menu. Flowers and fruits of various plant species are also part of its diet. House crow frequently spotted to eat carrion and rotten meat [Table 1].

Food preference to above categorized items [Table 1] has been estimated by number of house crows spotted to feeding on it. House crows were found to significantly feed on human refuses and other miscellaneous food item (calculated  $\chi^2$  value 183.39

> critical  $\chi^2$  value 5.99;  $P < 0.0001$ ) [Figure 1i]. Similar results were obtained when we consider feeding states (calculated  $\chi^2$  value 357.03 > critical  $\chi^2$  value 5.99;  $P < 0.0001$ ) clearly indicating that house crow very unlikely to feed on plant products [Figure 1ii]. In the early morning, house crows significantly feed on plant and animal source (calculated  $\chi^2$  value 4.79 > critical  $\chi^2$  value 3.84;  $P = 0.028$ ) [Figure 1iii]. Rest of the day they mostly relayed on miscellaneous food items (calculated  $\chi^2$  value 49.14 > critical  $\chi^2$  value 3.84;  $P = 0.001$ ) [Figure 1iv]. In addition to this, house crow significantly like to feed in the morning (calculated  $\chi^2$  value 37.33 > critical  $\chi^2$  value 3.84;  $P < 0.0001$ ) [Figure 1v].

Koul and Sahi [17] in their study on feeding ecology of house crow in open agricultural fields listed the food items under three categories, namely, plant, animal, and other food items. House crow spends much time in searching for food on the ground and occasionally feeds on trees. The food preference of house crow is very broad and highly opportunistic; it includes seeds, fruit, grain, nectar, berries, bird's eggs, nestlings, fledglings, reptiles, amphibians, fish, insects, carrion, and food scraps [1,2]. Alam and Nooralam [21] studied the feeding habit



**Figure 1:** Pie chart showing various feeding aspects of *Corvus splendens*.

(i) Number and percentage feeding on different food sources; (ii) number of feeding states under different feeding sources; (iii) number of feeding states at different feeding sources in the morning; (iv) number of feeding states during rest of the day at different feeding sources; (v) number of feeding states during morning and rest of the day; (vi) number of house crows feeding on major and minor plant feeder; (vii) number of feeding states at major and minor plant feeder; (viii) number of feeding states under different feeding patterns; (ix) number and percentage of inter and intraspecific competitive events; and (x) number and percentage of different feeding methods utilized.

in urban habitat of Kolkata and reported that maximum count of house crow was made in residential area followed by commercial and public parks. They suggested that house crow prefers to feed significantly on residential wastes followed by food available at commercial places. Anjum *et al.* [22] reported feeding of house crow at a dumping site full of organic (fruit residues, vegetables remains, meat/chicken pieces, corn, and eggs) and inorganic (bulbs, plastic spoons, different packaging materials, cloths, pampers, animal dung, etc.) substances. Khan *et al.* [23] recorded foraging rhythms of house crow on some crops and found enhanced foraging activity in the early morning and late afternoon. Similarly, maximum feeding activity was observed in the early morning and in evening [14,22]. Minimum feeding activity was observed in the evening and middle of the day [14]. In the present study, we observed similar feeding characteristics.

Irrespective of the abundance of the various plant species, house crow significantly feed on five species, namely, *Ficus religiosa*, *Azadirachta indica*, *Ficus racemosa*, *Ziziphus*, *Ficus indica*, and *Artocarpus lacucha* (calculated  $\chi^2$  value 44.07 > critical  $\chi^2$  value 3.84;  $P < 0.0001$ ) [Figure 1vi]. Plant species whose products were observed to frequently use as food source have been recognized as major plant feeder. Minor plant feeders were those occasionally visited by house crow for feeding purpose. Similar plant species preference has been calculated by considering occurrences of feeding states. About 72% of the total 432 feeding states were found to be associated with major plant feeder, that is, significantly more than 28% occurred on minor plant feeder species (calculated  $\chi^2$  value 35.65 > critical  $\chi^2$  value 3.84;  $P < 0.0001$ ) [Figure 1vii]. Plantations such as citrus, sunflower, guava, unripe zizyphus, and jaman were frequently visited for feeding purpose by house crow [23]. Behrouzi-Rad [24] observed that most preferred trees for roosting and nesting purpose by house crow were *Ficus bengalensis*, *Eucalyptus*, and *Ziziphus aucherii*. Kaur and Sahi [25], during their study on community ecology of cattle egret, found vegetation consists of *Acacia nilotica* (babul), *Dalbergia sissoo* (sheesham), *Eucalyptus*, *Zizyphus mauritiana*, *F. bengalensis*, *F. religiosa*, and other plant species. House crow was one of important bird species of this community. Kaur and Kumar [26] found that six trees, namely, banyan (*F. bengalensis*), Jamun (*Syzygium cumini*), Mulberry (*Morus alba*), Neem (*A. indica*), Peepal (*F. religiosa*), and Sheesham (*D. sissoo*) harbor most of the bird diversity including house crow. We found similar pattern of vegetation with regional variation used by house crow for feeding and roosting purpose [3]. House crow significantly prefers to feed in congregation (calculated

$\chi^2$  value 96.31 > critical  $\chi^2$  value 3.84;  $P < 0.0001$ ) [Figure 1viii]. Feeding observed to occur in group of 3/4 to more than 30 individuals [Figure 2a]. However, feeding solitary is not uncommon in house crow. It was observed that, in populated area they prefer to feed solitary, but in open field communal feeding is more common. House crow seen to utilize carcasses in congregation. Some individuals lie at the periphery of carcass waiting for their turn and rest feed untroubled. It seemed that waiting ones were probably act as sentries. It was important to note that when carcasses were intact they feed mutually along with feral dogs [2] possibly due to dependency to crack open the carcasses by them. Feral dogs rags the dead body that was subsequently utilized by the house crow. House crow was unafraid of any harm to be made by feral dogs [Figure 2b]. However, in case of cut open carcasses, house crow observed to have independent assess and showed aggression toward *Sus scrofa* that were feeding along [Figure 2c]. It was also seen that house crow feeds on ticks present on the body surface of *S. scrofa* and domestic buffalo (*Bubalus* sp). Whether the association of ticks to their host was beneficial/harmful, carriers never found tried to get rid of house crow. Probably tick's feeding by house crow was a pleasant act. House crow seen to steal fish and rotten meat without any hesitation in places even with human interference. The instances of intraspecific competition were seen in feeding of carcasses and specific food offered to them. We have taken clawing, pecking, flapping of wings, and chasing as part of aggressive behavior. Interspecific competition was quite common. *Acridotheres tristis*, *Acridotheres ginnianus*, *Gracupica contra*, *Passer domesticus*, *Bubulcus ibis*, *Egretta garzetta*, *Columbia livia*, and *Milvus migrans* were bird species, house crow showed aggressive behavior. Interspecific competitive events were significantly more common in comparison to intraspecific competitive events (calculated  $\chi^2$  value 72.26 > critical  $\chi^2$  value 3.84;  $P < 0.0001$ ) [Figure 1ix]. Interspecific competition of house crow has been observed with other birds and mammals [Table 2]. Competition with *M. migrans* was quite interesting. It was seen that out number of house crows and their unique strategy to occupy food item made them to surpass *M. migrans*. Food item was stolen by few individuals of a flock, while others involved in entangling the other party. In the meantime stealer hoarded the item at the nearby hoarding site. The incidences of food hoardings were also noticed to be associated with other feeding methods. Besides, house crow showed both aggressive and appeasement towards *Macaca* sp. and feral dogs [Figure 2d].

Feeding separately and becoming content with what got to eat were recognized as appeasement policy. In a 5 min of observation,

**Table 1:** List of food items observed to feed by house crow.

Plant source	Animal source	Miscellaneous
Berries of peepal ( <i>Ficus religiosa</i> )	Caterpillars	Kitchen leftover
Berries of banyan ( <i>Ficus indica</i> )	Beetles	Human refuses
Berries of Wild fig ( <i>Ficus cunia</i> )	Weevils	Pulses
Fruit of neem ( <i>Azadirachta indica</i> )	Bugs	Uncooked rice grain
Fruit of jujube ( <i>Zizyphus mauritiana</i> )	Wasps	Wheat grain
Fruit of gular ( <i>Ficus racemosa</i> )	Small fishes	Millets
Fruit of babul ( <i>Vachellia nilotica</i> )	Amphibians	Corn
Fruit of jungle jalebi ( <i>Pithecellobium dulce</i> )	Small reptiles	Shops
Fruit of chilbil ( <i>Holoptelea integrifolia</i> )	Fledglings	Candles/Wax
Fruit of chinaberry ( <i>Melia azedarach</i> )	Mites on body of domestic animals	Milk products
Fruit of barhal ( <i>Artocarpus lacucha</i> )	Eggs of birds	Plastic pieces
Fruit and flower of sagaun ( <i>Tectona grandis</i> )		Cow dung
Flower of gulmohar ( <i>Delonix regia</i> )		Clothes
Flower of eucalyptus ( <i>Eucalyptus globules</i> )		Carcasses/offal
Flower of golden shower ( <i>Cassia fistula</i> )		Remains of meat/fish
Flower of seesham ( <i>Dalbergia sissoo</i> )		Feathers of chicks



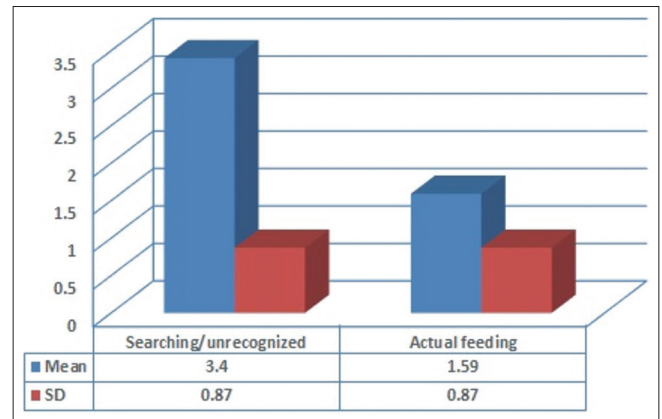
**Table 2:** Some important animal species observed to share same feeding sites with house crow.

Birds	Mammals
Jungle crow ( <i>Corvus macrorhynchos</i> )	Boar ( <i>Sus scrofa</i> )
Common myna ( <i>Acridotheres tristis</i> )	Domestic pig ( <i>Sus domesticus</i> )
Bank myna ( <i>Acridotheres ginginianus</i> )	Feral dog ( <i>Cannis sps.</i> )
Indian pied myna ( <i>Gracupica contra</i> )	Monkey ( <i>Macaca sps.</i> )
House Sparrow ( <i>Passer domesticus</i> )	Domestic buffalo ( <i>Bubalus sps.</i> )
Black drongo ( <i>Dicrurus macroercus</i> )	Cattle ( <i>Bos sps.</i> )
Rose ringed parakeet ( <i>Psittacula krameri</i> )	Three striped palm squirrel ( <i>Funambulus palmarus</i> )
Blue rock pigeon ( <i>Columbia livia</i> )	Five striped palm squirrel ( <i>Funambulus pennantii</i> )
Indian ring dove ( <i>Streptopelia decaocta</i> )	Indian grey mongoose ( <i>Urva edwardsii</i> )
Little brown dove ( <i>Streptopelia senegalensis</i> )	Lasser bandicoot rat ( <i>Bandicota bengalensis</i> )
Red wattled lapwig ( <i>Vanellus indicus</i> )	Greater bandicoot rat ( <i>Bandicota indica</i> )
Yellow watted lapwig ( <i>Vanellus malabaricus</i> )	House rat ( <i>Rattus rattus</i> )
Cattle egrets ( <i>Bubulcus ibis</i> )	
Little egret ( <i>Egretta garzetta</i> )	
Intermediate erget ( <i>Ardea intermedia</i> )	
Indian pond heron ( <i>Ardeola grayii</i> )	
Black winged stilt ( <i>Himantopus himantopus</i> )	
Large pied wagtail ( <i>Motecilla maderaspatensis</i> )	
Pariah kite ( <i>Milvus migrans</i> )	
Common babbler ( <i>Argya caudata</i> )	
Jungle babbler ( <i>Argya striata</i> )	



**Figure 2:** Photographs showing intra- and interspecific interactions.  
(a) Intraspecific interaction, (b-d) interspecific interaction with different animal species.

significantly more time was spend in searching of food items and other unrecognized activities to actual feeding event (Calculated t-value 5.66 > critical t-value 2.04;  $P < 0.0001$ ) [Figure 3]. House crow spends much time in searching for food [15]. Communal feeding is common in case of house crow. Communal feeding of house crow is well documented in case of valuable agricultural crops such as Wheat, Maize, Jowar, Groundnut, ripe fruits of fig, Mulberry, Chili, sunflower, and Grape which are some of the important crops on which losses caused by house crow depredation [3-8,23] as well as in case of carcasses [13]. Gobi *et al.* [27] observed that two house crows on either side of the food item were acting as sentries to alert the conspecifics while feeding. Sign of individual feeding can be traced in reports of stealing and food caching [28-30]. House crow dives into the water to catch stranded fish and forage on insects on the surface [31]. Interspecific competition has



**Figure 3:** Bar graph showing time spent by house crow in different activities in 5 min interval.

been noted in case of jungle crow (*Corvus macrorhynchos culminatus*) with aggressiveness toward house crow during food scarcity [32,33]. Kaur and Sahi [25], in their study on community ecology of cattle erget, listed the name of birds those share same feeding locality. *Phalacrocorax niger*, *Ardeola grayii*, *Egretta garzetta*, *Vanellus indicus*, *Porphyrio porphyrio*, *A. tristis*, *Acridotheres ginginianus*, *C. splendens*, and *Dicrurus adsimilis* are such bird species. Similar observation has been made by Kaul and Sahi [14]. Gobi *et al.* [27] found that *Corvus splendens*, *Corvus culminatus*, *A. tristis* [34], *Turdoides caudatus*, *Funambulus palmarum*, and *Herpestes javanicus* feed communally. Mishra *et al.* [35] found that four of the most common commensally and socially feeding species with Egyptian vulture are *Milvus migrans*, *C. splendens*, *Bubulcus ibis*, and *Canis sp.* They also observed that population of Egyptian vulture was positively correlated with those of house crow and feral dogs. We found similar communal structure at feeding sites in the present study.

Four types of feeding methods could be recognized, namely, searching, stealing, specific food offering, and food retrieved from cached sites. It was assumed that what house crow cached, retrieved completely

later on. Searching was significantly most preferred feeding method followed by stealing. Specific food offering by men was also common, while food retrieval from cached side was little scare (calculated  $\chi^2$  value 277.33 > critical  $\chi^2$  value 7.81;  $P < 0.0001$ ) [Figure 1x]. Stealing of food items is a common observation that we found to see or read in newspapers [13]. Food storing in corvids is well documented from centuries. Neuronal specialization of house crow with concern to food storing behavior has been studied in some detail by Srivastava *et al.* [30,36]. Specific food offerings to house crow has been reported by Saiyad *et al.* [37] and Kumar and Ojha [38]. The present finding is in agreement with these previous reports.

#### 4. CONCLUSION

It is, therefore, concluded that house crow is omnivorous, highly opportunistic, and scavenger bird utilize urban resources to its best. It is possible due to its various ecological and behavioral adaptations in relation to act of feeding. It prefers to eat such items that are almost discarded by the others. It forages mostly in unhygienic places and thus trying to avoid unnecessary conflict. Furthermore, house crow roost communally close to the feeding source. So for behavior is concern, it is highly dramatic and plastic. Various feeding habits and strategies applied during community interactions specifically at the time of feeding make this bird far beyond others. Present work put forward some details to these things. It will be helpful to manage and utilize this amazing creature for human's ecological and economic perspective.

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#### 6. AUTHORS' CONTRIBUTIONS

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

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#### 8. CONFLICTS OF INTEREST

Authors declared that they do not have any conflicts of interest.

#### 9. ETHICAL APPROVALS

There is no bird ecological observation specific information in the guidelines of CPCSEA (Committee for the Purpose of Control and Supervision of Experiments on Animals, Ministry of Environment, Forest and Climate Change, Government of India), and it is not mandatory to get ethical clearance for bird observation in India.

However, the guidelines for the care and use of animals followed for the maintenance, handling and conducting this experimentation in bird and no any hurdle created by the observer for the ethological observation during study.

#### 10. DATA AVAILABILITY

All data generated and analyzed are included within this research article.

#### 11. PUBLISHER'S NOTE

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#### REFERENCES

1. Invasive Animal Risk Assessment. Indian House Crow (*Corvus splendens*). Department of Agriculture and Fisheries Bio Security. Queensland: Queensland government; 2016.
2. Patankar S, Jambhekar R, Suryawanshi KR, Nagendra H. Which traits influence bird survival in the city? Land 2021;10:1-23.
3. Chahal BS, Simwat GS, Brar HS. Bird pests of crops and their control. Pesticides 1973;7:18-20.
4. Toor HS, Ramzan M. A study on grapes lost to birds. Punjab Hort J 1974;14:46-8.
5. Verghese A, Chakravorthy AK. Infestation of groundnut by crows. Curr Res 1978;7:181-2.
6. Toor HS, Sandhu PS. Bird damage to peach, *Prunus persica* batsch. Indian J Ecol 1981;8:308-10.
7. Sandhu PS, Dhindsa MS, Toor HS. Evaluation of methiocarbend thiram as seed treatments for protecting sprouting maize from birds in Punjab (India). Trop Pest Manag 1987;33:370-2.
8. Dhindsa MS, Sandhu PS, Saini HK, Toor HS. House crow damage to sprouting sunflower. Trop Pest Manage 1991;37:179-81.
9. Ali S, Ripley SD. Handbook of the Birds of India and Pakistan Together with Those of Bangladesh, Nepal, Bhutan and Sri Lanka. Vol. 3. Oxford: Oxford University Press; 1978. p. 2.
10. Benmazouz I, Jokimäki J, Lengyel S, Juhász L, Kaisanlahti-Jokimäki ML, Kardos G, *et al.* Corvids in urban environments: A systematic global literature review. Animals 2021;11:3226.
11. Nyari AS, Ryall C, Peterson AT. Global invasive potential of the house crow *Corvus splendens* based on ecological niche modeling. Avian Biol 2006;37:306-11.
12. Suliman AS, Meier GG, Haverson PJ. Eradication of invasive house crow (*Corvus splendens*) from socotra island, republic of yemen-lessons learned from 15 years off a bird invasion. Pro Vertebr Pest Conf 2010;24:257-62.
13. Ramakrishna S, Alexander R, Deepak P, Jayashankar M. Review on Eco-biology of the house crow, *Corvus splendens* (Vieillot, 1816), (Corvidae: Passeriformes). Int J Sci Res 2014;3:488-90.
14. Nxele BJ, Shivambu CT. House crow (*Corvus splendens*) Eradication measures from eThekweni Municipality, KwaZulu-Natal, South Africa. J Biodivers Manag For 2018;7:1-5.
15. Al-Sallami S. A possible role of crows in the spread of diarrhoeal diseases in Aden. J Egypt Public Health Assoc 1991;66:441-9.
16. Cooper JE. Health studies on the Indian house crow (*Corvus splendens*). Avian Pathol 1996;25:381-6.
17. Koul S, Sahi DN. Feeding ecology of house crow (*Corvus splendens*) in open agricultural fields in Jammu (J&K), India. Int Res J Environ Sci 2013;2:85-7.
18. Altmann J. Observational study of behavior. Behavior 1974;49:227-67.
19. Lehner PN. Sampling methods in behavior research. Poul Sci 1992;71:643-9.
20. Reynolds RT, Scott JM, Nussbaum RA. A variable circular plot

- method for estimating bird numbers. Condor 1980;82:309-13.
21. Alam I, Nooralam MD. Feeding habits of house crow, *Corvus splendens* in the urban ecosystem of Kolkata. Proc Zool Soc India 2018;17:57-62.
  22. Anjum S, Ahmad A, Bibi F, Ali H. Ecology of house Crow (*Corvus splendens*) in Dil lower, Khyber Pakhtunkhwa, Pakistan. Pak J Zool 2021;54:447-50.
  23. Khan HA, Jabeen G, Anwar N. Foraging rhythms of house crow (*Corvus splendens*) for 30 and 60 minutes durations on some crops in an agro ecosystem in Faisalabad. Pak J Agric Sci 2007;44:283-8.
  24. Behrouzi-Rad B. Population estimation and breeding biology of house crow *Corvus splendens* on Khargisland, Persian Gulf. Podoces 2010;5:87-94.
  25. Kaur DN, Sahi DN. Studies on the community ecology of cattle egrets *Bubulcus ibis* (Boddaert) in Jammu (Jammu and Kashmir), India. Int J Biodivers Conserv 2012;4:439-45.
  26. Kaur N, Kumar M. Avian diversity in relation to indigenous trees. J Entomol Zool Stud 2018;6:1739-45.
  27. Gobi B, Mahandran V, Murugan CM, Nathan PT. Feeding and behavioral ecology of birds and small mammals towards carbohydrate and protein rich food resources. Animalia 2016;1:64-70.
  28. Goodwin D. Crows of the World. Ithaca, New York: Cornell University Press; 1976.
  29. Clayton NS, Dickinson A. Episodic-like memory during cache recovery by scrub jays. Nature 1998;395:272-4.
  30. Srivastava UC, Singh D, Kumar P. Neuronal classes and their specialization in the corticoid complex of a food-storing bird, the Indian House Crow (*Corvus splendens*). Can J Zool 2014;92:423-32.
  31. Ryall C, Reid C. The Indian house crow in Mombasa. Swara 1987;10:9-12.
  32. Mahesh V, Suseela L. Roosting behaviour and roosting interactions between house crow *Corvus splendens* and large-billed crow *Corvus macrorhynchos* at Machilipatnam, India. Int J Zool Invest 2021;7:414-20.
  33. Shanbhag AP, Ghosh I, Umakanth B. Interspecific behavioral studies of house crow (*Corvus splendens* *protegatus*) and jungle crows (*Corvus macrorhynchos* *culminatus*) on mutual foraging sites. Glob J Environ Res 2012;6:11-6.
  34. Rahman NA, Fadzly N, Dzakwan NM, Zulkifli NH. The numerical competency of two bird species (*Corvus splendens* and *Acridotheres tristis*). Trop Life Sci Res 2014;25:95-103.
  35. Mishra S, Kumar A, Sinha A, Kanaujia A. Competitive Interactions within and between Species in Scavenger Avian Species: A Case Study of Egyptian Vulture in Uttar Pradesh, India. Recent Trends in Environment, Climate Change, Physical and Life Sciences; 2021.
  36. Srivastava UC, Singh D, Kumar P, Singh S. Neuronal diversity and their spine density in the hippocampal complex of the House Crow (*Corvus splendens*), a food-storing bird. Can J Zool 2016;94:541-33.
  37. Saiyad S, Soni V, Radadia B. Roosting site selection by Indian house crow (*Corvus splendens*). Int J Fauna Biol Stud 2017;4:10-3.
  38. Kumar P, Ojha A. Feeding resource utilization strategies of *Corvus splendens* in urban habitat of Prayagraj (U.P.), India. Uttar Pradesh J Zool 2021;42:55-61.

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