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Nest Site Selection and Habitat Preference of Baya Weaver *Ploceus philippinus* in Agricultural Landscape

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***Abstract*:** Study on nest site selection and habitat preferences of Baya Weaver (*Ploceus philippinus*) was carried out in the breeding season of 2018 to 2020 in three districts namely Ludhiana, Rupnagar and Ferozepur. Three sites per district were selected and a total of nine nesting colonies were studied. A total of 298, 312 and 240 nests were recorded at selected locations during breeding season of 2018, 2019 and 2020 respectively. Maximum number of nesting colonies were 77.77% on date palm (*Phoenix dactylifera*) followed by 11.11% each on fishtail palm (*Caryota Urens*) and royal palm (*Roystonea regia*). The 66.66% of them were located near human habitations, 44.44 % within the houses/building premises and 22.22% were within the villages. The 33.3 and 77.73% were located in the agricultural fields and in vicinity of water bodies respectively. Positive correlation of distance from agricultural fields, water body and different species of palm trees with number of nests as well as with population number showed the significance of these habitat features for nest site selection of Baya Weaver.

***Keywords*:** Agricultural landscape, Baya Weaver, Habitat, Nest site selection, Palm, Water bodies

India is a home to 1263 bird species including four weaver species belonging to family Ploceidae, out of the 124 weaver species recorded worldwide (Hoyo et al 2016, Parveen et al 2016). Baya Weaver (*Ploceus philippinus* Linnaeus 1766) is familiar throughout the Indian subcontinent and the adjoining countries of Pakistan, Bangladesh, Thailand Malaysia and Sri Lanka (Ali and Ripley 1983). Baya Weaver is a colony nester bird; workers had recorded the nesting colonies of Baya Weaver on thorny plants (Raju 2009). Different workers had recorded baya weaver preferring palm trees as their nesting sites on the west coast of India. Borges et al (2002) observed diverse types of nesting sites including eucalyptus trees were recorded. Raju (2009) had noted the use of leaves of *Cycas sphaerica* for nest construction by baya weaver near Tirumala Hills. Sohi and Kler (2017) had observed natural and man-made materials used by different avian species including baya weaver for nesting in Punjab. There was lack of information on the population and preferred nesting sites of baya weaver in Punjab from last 40 years. Keeping that lacuna in consideration, work on nest site selection and habitat preferences for nesting of Baya Weaver was undertaken.

MATERIAL AND METHODS

The present study was carried out during the breeding season of 2018 to 2020 in three districts of Punjab State namely Ludhiana, Rupnagar and Ferozepur termed. Data was taken on nest site selection and habitat preferences of baya weaver (*Ploceus philippinus*) at nine selected sites in Baranhara (nesting colony I), Raghunath enclave (nesting colony II) and Rattan (nesting colony III) falling in district Ludhiana; Fatehpur (nesting colony IV), Mukarabpur (nesting colony V) and Manjitpur (nesting colony VI) in district Rupnagar; village Haraj (nesting colony VII), Wan (nesting colony VIII) and Toot (nesting colony IX) in district Ferozepur. Point count method was followed to observe the Baya Weaver's population and habitat preferences for nesting colonies (Verner 1985). Observations were made on weekly basis in morning between 6:00 am to 8:00 am in summers and between 7:00 am to 9:00 am in winters. For statistical analysis, correlation was carried out using SPSS v 16.0.

RESULTS AND DISCUSSION

Pre-survey was carried out in 16 villages of three districts as mentioned before. Nesting colony I, II and III were located on a Fishtail Palm *Caryota Urens* (9.75 m tree height) in residential house, Date Palm *Phoenix dactylifera* (7.62 m tree height) in residential house and on Royal Palm Roystonea regia (8.53 m of tree height) situated in religious place. Distance to the crop fields and water body was highest for colony I followed by II. Distance to crop fields was least in case of colony III (Table 3). Nesting colonies IV, V and VI were observed on the Date Palm of tree heights ranging from 10.36 to 13.10m (Fig. 1, Table 1). Nesting colonies VII, VIII and IX of baya weaver were located on date palm of varying heights. Nesting colonies of baya weaver were highest on

date palm followed by fishtail palm and royal palm. In absence of preferred date palm at Baranhara and Rattan, colonies were noted on fishtail palm and royal palm (Table 1). Six colonies were present near human habitation and seven colonies were within the vicinity of water body (Fig. 1). Trees selected for nesting colony I, VII, VIII and IX were solitary trees and nesting colony III was found on trees planted in a row. The nesting colonies IV and V were found on tree groups.

In breeding season of 2018, 2019 and 2020, a total of 298, 312 and 240 nests were recorded. In breeding season 2018, 136 nests were recorded out of which 58 were noted in nesting colony I, 43 in nesting colony II and 35 in nesting colony III during breeding season of 2018. At LI, 46, 30 and 26 nests were recorded active out of 58, 43 and 35 nests in nesting colony I, II and III. Total number of nests 28, 38 and 30 were observed in the nesting colony IV, V and VI. Out of total 96 nests, 71 were recorded active while 25 were recorded abandoned. During the breeding season of 2018, the nesting colonies were extended to adjoining Date Palm trees. A number of 21, 18 and 27 nests (66 in total) were recorded in nesting colony VII, VIII and IX during breeding season of 2018. Active nests 53 and abandoned nests 13 out of total 66 nests were noted (Table 1). Maximum population number of 340 was recorded at nesting colony I and minimum population number of 111 was recorded at nesting colony VII. During present study, nesting colonies were observed on the trees with height ranging from 25-43 ft. Selection of higher tree height seemed to make nests inaccessible to predators thus giving survival advantage.

In 2019, maximum of 72 nests were noted in nesting colony I wherein 59 nests were active and 13 nests were abandoned. Thirty-seven nests were noted in nesting colony II out of which 28 nests were active and 9 were abandoned. A total of 32 active nests were recorded out of 46 nests in nesting colony III. Thirty nests were observed on main nesting tree whereas 2-10 nests were extended to other palm trees present in the row adjoining to the main nesting tree during the breeding season of 2019 at III. During breeding season of 2019, 17 nests were recorded in nesting colony IV. A total of 33 and 19 nests were recorded in nesting colony V and VI in which colonies were extended to adjoining date palm trees. A total of 80 nests were located during breeding season of 2019, out of which 19 and 41 nests were noted in nesting colony VII and IX. In nesting colony VIII, 28 nests were recorded in which eight nests were extended to the adjoining Dhek tree *Melia azedarach* (Table 1).

In 2020, there were 51 active nests out of total 64 nests recorded in nesting colony I. Thirty-nine nests were observed in nesting colony II out of which 29 nests were active. A total of 27 active nests out of total of 43 nests were recorded in nesting colony III. A total of 19 nests were noted and active nests were 14 in nesting colony IV. A total of 30 and 20 nests were recorded in nesting colony V and VI. A total of 79 nests were located during breeding season of 2020, out of which 16, 26 and 37 nests were noted in nesting colonies VII, IX and IX. In nesting colony VII, there were 16 total nests having13 active and 3 abandoned nests. In nesting colony VIII and IX, 19 and 28 active nests out of total 26 and 37 nests were recorded respectively. Baya weaver was observed using palm fronds at nesting colonies constructed at different palm trees. Broad strand leaves of sorghum *bicolor* crop were utilized in nesting colonies III, IV, V, VI, VII, VIII and IX. Leaves of pearl millet *Pennisetum glaucum* were also observed in construction of nesting colonies V, VI and VII. Thin strands from grasses and the dry strands from the heaps of husk

Table 1. Nesting tree types**,** active nests and population number of Baya Weaver Birds

Nesting colonies	Nesting tree	Tree height (m)	Number of nests during different breeding seasons						Population number in		
			2018		2019		2020		2018	2019	2020
			Total	Active	Total	Active	Total	Active			
Baranhara (I)	Fishtail Palm	9.75	58	46	72	59	64	51	340	354	349
Raghunath enclave (II)	Date Palm	7.62	43	30	37	28	39	29	244	180	205
Rattan (III)	Royal Palm	8.53	35	26	46	32	43	27	214	275	223
Fatehpur (IV)	Date palm	10.36	28	22	17	13	19	14	173	139	142
Mukarabpur (V)	Date palm	13.10	38	24	33	25	30	21	273	256	238
Manjitpur (VI)	Date palm	12.80	30	25	19	16	20	17	195	154	157
Haraj (VII)	Date palm	13.10	21	17	19	17	16	13	111	168	141
Wan (VIII)	Date palm	11.27	18	15	28	20	26	19	261	193	206
Toot (IX)	Date palm	12.19	27	21	41	30	37	28	128	254	248

were also observed used in the nest formation at nesting colonies I, IV, VI, VII and VIII. Males predominantly formed the nests; multiple trips from crop fields to nests were carried out. On an average, 2-4 minutes were spent in weaving nests between consecutive trips. Parent birds were noted using mud blebs as nesting material at five colonies while it was not noted at colonies II and V might be due to the presence of cemented border walls at water bodies (Table 2). Proximity of colonies to water bodies and agricultural fields seemed to reduce not only energy expenditure but also time spent in hunting food for nestlings. Females were observed collecting and plastering mud blebs on the inner wall of brood chamber at nesting colonies I, III, IV, VII and VIII. Cushioning of brood chamber was done using feathers collected by females at nesting colonies I and II.

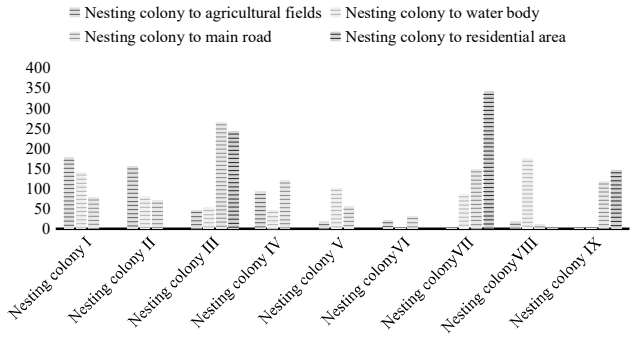

Fig. 1. Distance of nesting colonies to agricultural field, water body, main road and residential area (in meters)

Table 2. Nesting materials used at different nesting colonies

Nesting material types	Tree/crop used	Nesting Colonies
Broad strand leaves	Fishtail Palm	I
	Royal Palm	III
	Sorghum	III, IV, V, VI, VII, VIII, IX
	Pearl Millet	V, VI, VII
	Date Palm	II, IV, V, VI, VIII
Thin strands	Grasses, Weeds	I, IV, VII, VIII
	Heaps of husk	IV, VI
Mud blebs	Soil from fields, pond sides	I, III, IV, VII, VIII
Feathers	-	I, II

Dhindsa (1980) had recorded 45 colonies, out of which 20 colonies were present on small trees, bushes and other vegetation growing over abandoned wells. The most preferred trees were Babool *Acacia arabica* having 88 colonies followed by Indian date *Phoenix sylvestris* having 56 and Ber *Zizyphus jujube* having 47 colonies. Borges et al (2002) had stated affinity of Baya Weaver towards stout and tall trees because of strength attained by trees due to diameter at breast height (DBH) and safety of nestlings from predators. Workers had recorded the heights of trees having nests viz. seven to eight meter in Assam (Yashmita-Ulman et al 2017), 10m in Tamil Nadu (Ali 2009). The studied sites had experienced decline in the nests in heronries of Baya Weaver (Roshnath et al 2013, 2014).

Sohi and Kler (2017) found pendant nests of baya weaver on date palm, ber and pear trees; Baya weaver used grass blades, leaves, fibres, strips of palm fronds and cloth pieces as nesting materials. Kabir (2018) had the collection of nesting material by Baya Weaver from coconut trees and mature leaves of Palm trees. Pandian and Ahimaz (2018) had recorded 4273 nests of various stages in 52 villages in Viluppuram district of Tamil Nadu. Yasmita-Ulman et al (2017) had recorded *A. catechu*, *P. sylvasticus*, *C. nucifera* and *B. flabellifer* as potential host trees for the nesting of *P. philippinus*. Achegawe et al (2016) recorded the average tree height of nesting tree was 4.5m and nests were present on marginal parts of trees for their safety from predators. The site selection of colonial nesting can also reduce predation

Table 3. Habitat features including vegetation and sub habitat types around nesting colonies

Nesting colonies	Vegetation structure around nesting colonies			Habitat structure (distance to sub habitats)
	Number of trees	Number of crops	Number of weeds	
I	13	3	4	Agriculture fields> Water body> Main Road
II	12	-	3	Agriculture fields> Water body> Main Road
III	30	4	-	Residential area> Main Road> Agriculture fields> Water body
IV	9	2	4	Main road> Agriculture fields> Residential area> Water body
V	19	12	4	Agriculture fields> Water body> Main Road
VI	10	6	1	Main road> Agriculture fields
VII	9	4	4	Residential area> Main Road> Agriculture Water body
VIII	8	4	3	Water body> Agriculture fields> Main Road
IX	5	4	-	Residential area> Main Road

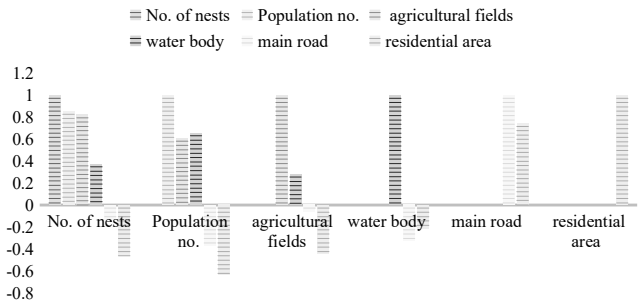

Fig. 2. Correlation of number of nests and population number of Baya Weaver with distance to the habitat structures during 2018

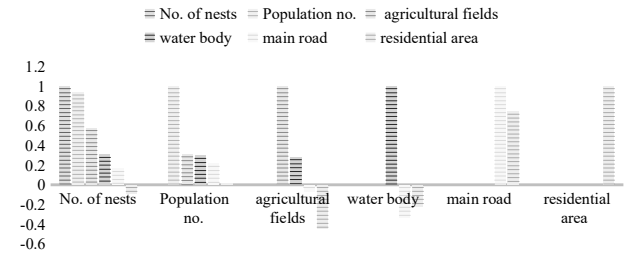

Fig. 3. Correlation of number of nests and population number of Baya Weaver with distance to the habitat structures during 2019

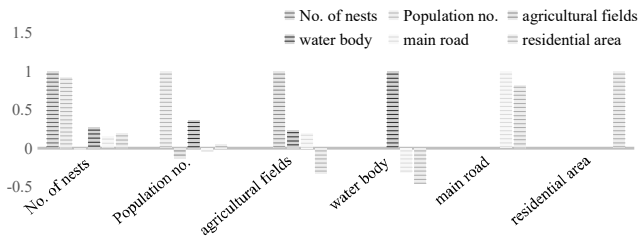

Fig. 4. Correlation of number of nests and population number of Baya Weaver with distance to the habitat structures during 2020

pressure and increase foraging efficiency (Kasprzykowski 2008). The positive correlation of avian diversity with rural ponds was observed in earlier studies (Sekhon et al 2023, Sidhu et al 2021). Statistical analysis had shown that distance from residential area is negatively correlated with population number during the year 2018 and positively correlated with population number during the year 2019 which showed the increase in population of baya weaver within the vicinity of residential premises during the breeding season of 2019 (Fig. 2, 3). Distance from agricultural fields, waterbody and main road are positively correlated with number of nests and population number of Baya Weaver that showed the importance of these habitat structures for the nesting and breeding of Baya Weaver (Fig. 3 and 4). Tree species abundance varied considerably (5-30), colony III having the highest number of trees in vicinity, while colony IX exhibited the least. Six colonies (III, V, VI, VII, VIII and IX) suggested potential dependence on crops for food and nesting materials. Four colonies (I, IV, V, VII) had substantial weed species in surrounding habitats indicating potential foraging grounds, while two colonies (III and IX) lacked it in their vicinity (Table 3).

CONCLUSION

The nest site selection by baya weaver showed preference for date palm followed by fishtail palm and royal palm. Habitat features included proximity to water bodies, agricultural fields and preferred tree heights ranging from 25-43 ft. Nest site selection seemed to be determined by factors such as safety from predators, energy expenditure during foraging trips and time saving during nest building and nestling rearing. Current investigation provides valuable information regarding significance of Palm tree diversity and small water bodies in agricultural landscape which might increase the range of habitat or nest site selection of Baya Weaver and help in sustaining stable population numbers.

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