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RESEARCH ARTICLE

BEHAVIOUR AND MANAGEMENT GUIDE OF SOME ORNAMENTAL BIRDS IN RELATION TO DIURNAL HOURS.

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Abstract

This study was conducted to study the effect of diurnal hours of the day on some maintenance behaviour of psittaciformes birds as cockatiel and blue Budgerigars. A total number of apparently healthy thirty nine birds (14 birds budgerigars and 25 birds cockateil aged from (12 month up to 10 years) belonged to the zoo at zagazig city, Sharkia governorate were housed in 2 large cages and aviaries. During the experiment, the duration and frequency of observed maintenance behaviour were recorded. From the obtained results, that there was a significant differences ($P \leq 0.05$) of feeding time of Cockatiel in relation to the diurnal effects. As the feeding behaviour time and frequencies were increased at mid day than other times of the day. The sleeping behaviour and the time staying in the cage of cockatiel were increased with dusk and late afternoon and the differences were highly significant ($P \leq 0.01$). There were a non significant differences of sexual and social bond of budgerigars with in the total day hours. Form this study, can mentioned that the family variety play an important role in change some behavioural patterns and habits of the ornamental birds as flying ,walking and sleeping behaviour according to body mass of each bird family.

Introduction:-

The most common pet bird is the budgerigar, they has a good creatures that are very adaptable and friendly. They are sociable and like to have a group. The males are to be easier to tame and teach to talk. Budgerigars are long–lived birds with a life span of 7-10 years and with low purchase cost **(Nicol and Pope, 1993).** Domesticated budgerigars come in large range of colours are always green with a yellow area and live in huge flocks. They originate from Australia and their name means song parrots. The hen have brown or white core but the male is blue (**Gebhardt- Henrich and Steiger, 2006).**

Budgerigars are one of the most commonly kept pet birds and are of the used as laboratory animals **(Isenbugel, 1999).** Most organisms have a clocks in their brain that regulate the timing of biological processes and daily behaviour, these clocks are known as circadian rhythms. They allow maintenance of these processes and behaviour relative to 24 hour day / night cycle **(Kolmos and Davis , 2007).** Budgerigars also known as the common pet parakeet or shell parakeet and in formally nicked name is the budgie from order psittaciformes, family psittacidae (Melopsittacus andulatus) (**Marshall, 2013**) are small size , cheap in cost and ability to mimic human speech. The

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cockatiel also known as quarrion and is a bird that is a member of cockatto family of genus Nymphicus, order psittaciforms family cocatuidae species, Nymphicus hollandicus **(Cockatiel , 2008).**

Material and Methods:-

Birds used and management:-

Thirty nine birds (14 birds budgerigars and 25 birds cockatiel aged from 12 month up to 10 years) belonged to the zoo at zagazig city, Sharkia governorate were housed in 2 large cages each one (2.5 length breadth x 2.5 m height) as, well as, 5 aviaries (5 cm x 5 cm) for rest and sleep, all cages had two perches .

Each cage had been large enough to ensure plenty of room to spreed it's wings and flutter about easily. The bird prefer natural perches to fly and climbing about it and they are suitable for its small feet. Bird cages sand paper is best for the base. Temperature of the cage was about 17-24ºC in light, draught–free place at about shoulder height as ,well as, avoiding direct sun light or heat.

cleanliness is important to the birds, health, so that sand paper needs changing daily. Food was offered on bottom of the cage.

The Feeding:-

The feed for healthy and happy budgerigars is important to provide it with correct amount of food to provide lots of variety according to (**WOAW, 2014),**60% of cockateil and budgie's diet as bird seeds food as sorghum of sun flower seeds, cooked rice, seedling grasses and whole meal bread, 10% of it's diet is fresh vegetables as peas, carrots and sweet potato, 5% of its diet should be fruits as apple. Do not feed the budgie sun flower seeds only, his will make it very sick and fat **(Enkerlin- Hoeflich, 1995).**

Water: should be provided with fresh water every day it has been given to the birds at least once or twice a day.The cage and all equipment has been cleaned once a day with mild disinfectant.

Observation technique:-

The behavioural observations were done using a focal sample technique, Video taping, camera and additional lamps were setup. The behaviour of the cockateil and budgerigars was recorded and analysed using the soft ware observers (observation sheet) according to **(Gebhardt- Henrich and Steiger, 2006)**. Behavioural observations in both cages were recorded at 6 minutes interval through 3 hour observation period /week for each group for three months (experimental period) from January 2016 till march 2016, which represented the different diurnal hours as early morning (8-9 A.M), mid day(1-2 P.M) and afternoon (5-6 P.M).

The following behavioural activities, feeding, manipulation are object and feeding on the bottom, flying, climbing at the bar, preening, walking on bottom mounting on the perch at least once forward and back, Jumping , social bond, sexual bond, lifting the wings, rubbing head, back against perches, stretching wing. The frequency and duration were measured for all status, while for events only the frequency was determined.

Statistical Analysis:-

Results were statistically analyzed by use one way ANOVA according to **(Snedecor and Cochran, 1989).**

Results:-

Behaviour of Cockatiel in different diurnal hours:-

The obtained results in table (1) revealed that there was a significant differences P ($\leq$ 0.05). of feeding time of Cockatiel in relation to the diurnal effects. As the feeding intake was increased at mid day than early morning and afternoon as following (340.00 $\pm$ 47.25, 519.00 $\pm$ 85.50 and 224.00$\pm$ 38.35) sec. respectively The feeding frequencies were nearly three times in all day times. There were a non significant differences of flying, standing, walking behaviour (time and frequencies) with in different day times. The sleeping behaviour and the time staying in the cage of Cockatiel were increased with late after noon (603.67$\pm$96.83 sec.)and the differences were highly significant P ($\leq$ 0.01). There were a non significance differences of sexual and social bond and vocalization of Cockatiel with in the day hours.

Comfort behaviour of Cockatiel in different diurnal hours:-

The frequency of preening and feather shaking (15.33+3.17& 13.33+1.20) of Cockatiel in **Table (2)** not affected by diurnal factors, although it increased with dusk. Shaking of head was increased with late afternoon(19.66+1.76) while rolling was increased at mid of day hours(21.33+3.38) and the differences were highly significant P (≤ 0.01).

Behaviour of Budgerigars in relation to different diurnal hours:-

Table (3) showed that there were a non significant differences of the feeding behaviour of budgerigars according to the diurnal factors, although the flying time was highly increased with early hours of the day light(372. 67 ± 26.74 sec.) and the differences were highly significant P (≤ 0.01). The standing time of budgerigars was at lowest level with late afternoon (434.67±146.85sec.) while the sleeping was at highest level at late afternoon (1627.70±192.68 sec.) and the differences were highly significant P (≤ 0.01). There were a non significance differences of sexual and social bond of budgerigars with in the day hours.

Frequencies of comfort behaviour of Budgerigars in different diurnal hours:-

Regarding to **(table 4)** there were a non significant differences of preening behaviour of budgrigars in relation to diurnal factors, although it increased with early morning and dusk. Shaking head was increased with late afternoon(24.00+4.72) and the differences were highly significant P (≤ 0.01).The frequency of rolling was increased early morning (15.33+1.76) and the differences was significant P (≤ 0.05).

Maintenance behaviour of Cockatiel and Budgerigars in relation to family variation:-

Concerning the different behavioural patterns of ornamental birds according to family variation in **table(5)** there were a non significant differences of the feeding behaviour between Cockateil and Budgerigars while there were a highly significance differences P (≤ 0.01) of flying frequency(15.00 ± 1.42) and walking behaviour (429.11 ± 42.05 sec.) as it increased with budgerigars. There were a non significant differences of sexual bond and social bond between Cockatiel and Budgerigars.

Table 1:- Some maintenance behaviour of Cockatiel in relation to different diurnal hours.

Diurnal hour Behaviour	Early morning	Mid day	Late afternoon	significance
Feeding time	340.00 ± 47.25	519. 00 ± 85.50	224.00± 38.35	*
Feeding frequency	3.33± 0.88	3.66 ± 0.88	3.66 ± 0.88	N.S
Flying time	180. 00 ± 41.96	216.67 ± 12.17	223.33 ± 52.38	N.S
Flying frequency	15.66 ± 2.60	16.66 ± 0.88	12.66 ± 3.52	N.S
Standing time	1128.00 ± 57.35	804.00 ± 3.43	947.33±72.50	N.S
Standing frequency	17.66 ± 3.28	14.33 ± 3.84	16.00 ± 2.30	N.S
Walking time	460.00 ± 20.81	482.00 ± 67.55	345.33 ± 10.41	N.S
Walking frequency	14.33 ± 1.45	10.00 ± 3.05	9.33 ± 4.37	N.S
Sleeping time	508.00 ±86.00	85.33±20.21	603.67±96.83	**
Sleeping frequency	4.00±1.15	1.66±0.33	1.00±0.00	*
Cage staying time	186.67±29.05	495.33±13.38	490.00±65.49	**
Cage staying frequeny	3.00±0.57	8.00±1.15	8.66±2.90	N.S
Sexual bond time	26.66±17.63	35.00±18.02	23.33±12.01	N.S
Sexual bond frequency	1.66±0.88	0.66±0.33	0.66±0.33	N.S
Social bond time	93.33±16.90	76.66±12.01	40.60±6.74	N.S
Social bondfrequency	5.00±1.73	2.33±0.33	1.33±0.33	N.S
Vocalization frequency	2.33±0.88	1.00±0.57	0.66±0.33	N.S

N.S= Non significant. * = significant difference at level P (≤ 0.05). ** = highly significant difference at level P (≤ 0.01)

Table 2:- Frequencies of comfort behaviour of Cockatiel in relation to different diurnal hours.

Diurnal hour Behaviour	Early morning	Mid day	Late afternoon	significance
Preening frequency	16.00+2.30	9.66+0.88	15.33+3.17	N.S
Head shaking frequency	15.33+1.45	9.66+1.45	19.66+1.76	**
Feather shaking frequency	8.66+1.76	8.33+1.76	13.33+1.20	N.S
Rolling frequency	11.33+1.45	21.33+3.38	5.00+1.15	**

N.S= Non significant. ** = highly significant difference at level P (≤ 0.01)

Table 3:- Some maintenance behaviour of Budgerigars in relation to different diurnal hours.

Diurnal hour Behaviour	Early morning	Mid day	Late afternoon	significance
Feeding time	355.33 ± 48.66	372. 33 ± 54.77	338.67± 18.62	N.S
Feeding frequency	4.00± 1.15	3.33 ± 0.66	4.00 ± 1.15	N.S
Flying time	372. 67 ± 26.74	236.67 ± 29.49	140.00 ± 20.29	**
Flying frequency	9.66 ± 1.20	8.00 ± 2.30	8.00 ± 1.15	N.S
Standing time	1834.70 ± 49.33	1546.70 ± 151.71	434.67±146.85	**
Standing frequency	28.33 ± 4.17	28.66 ± 4.05	11.66 ± 0.88	*
Walking time	47.66 ± 6.22	79.00 ± 20.95	88.00 ± 13.31	N.S
Walking frequency	3.33 ± 0.88	2.66 ± 0.66	3.00 ± 1.00	N.S
Sleeping time	502.67 ±28.32	991.00±105.10	1627.70±192.68	**
Sleeping frequency	6.33±0.88	7.00±1.73	4.00±0.57	N.S
Cage staying time	18.00±1.15	19.33±4.05	284.00±73.32	**
Cage staying frequeny	2.00±0.57	1.66±0.33	6.00±1.15	*
Sexual bond time	5.00±5.00	11.66±11.66	30.00±15.27	N.S
Sexual bond frequency	0.33±0.33	0.33±0.33	0.66±0.33	N.S
Social bond time	66.66±9.27	60.66±13.86	65.33±6.11	N.S
Social bondfrequency	5.66±0.88	3.66±0.66	3.00±0.57	N.S
Vocalization frequency	1.33±0.33	1.33±0.33	1.66±0.33	N.S

N.S= Non significant. * = significant difference at level P (≤ 0.05). ** = highly significant difference at level P (≤ 0.01).

Table 4:- Frequencies of comfort behaviour of Budgerigars in relation to different diurnal hours.

Diurnal hour Behaviour	Early morning	Mid day	Late afternoon	significance
Preening frequency	25.33+2.40	18.33+2.02	24.00+5.29	N.S
Head shaking frequency	21.33+1.76	1.33+0.33	24.00+4.72	**
Feather shaking frequency	15.33+4.37	3.00+0.57	21.33+2.60	*
Rolling frequency	15.33+1.76	10.66+1.33	6.66+1.76	*

N.S= Non significant. * = significant difference at level P (≤ 0.05). ** = highly significant difference at level P (≤ 0.01)

Table 5:- Some maintenance behaviour of Cockatiel and Budgerigars in relation to their family variation.

Bird family group Behaviour	Cockatiel	Budgerigars	significance
Feeding time	355.44 ± 40.54	361. 00 ± 52.52	N.S
Feeding frequency	3.77± 0.52	2.88 ± 0.51	N.S
Flying time	249. 78 ± 36.12	206.67 ± 20.81	N.S
Flying frequency	8.55 ± 0.86	15.00 ± 1.42	**
Standing time	1272.00 ± 22.24	959.78 ± 112.96	N.S
Standing frequency	22.88 ± 3.28	16.00 ± 1.67	N.S
Walking time	71.55 ± 9.58	429.11 ± 42.05	**
Walking frequency	3.00 ± 0.44	11.22 ± 1.77	**
Sleeping time	1040.40 ±174.93	399.00±88.51	**
Sleeping frequency	5.77±1.15	2.22±0.57	**
Cage staying time	107.11±49.04	390.67±55.17	**
Cage staying frequeny	3.22±0.79	6.55±1.28	N.S
Sexual bond time	15.55±6.84	28.33±8.24	N.S
Sexual bond frequency	0.44±0.17	1.00±0.33	N.S
Social bond time	64.22±5.20	70.22±10.00	N.S
Social bond frequency	4.11±0.53	2.88±0.75	N.S
Preening frequency	22.55±2.07	13.66±4.60	**

N.S= Non significant. ** = highly significant difference at level P (≤ 0.01)

Discussion:-

Circadian rhythms are most important factor that affect the behaviour of the ornamental birds, it controlled by mean of endogenous diurnal clock. As the feeding time was increased at mid day than early morning and afternoon. These results were in agreement with **(Wikelski et al., 2008).** In contrast **(Lincoln et al., 2006; Holberton and Able 1992; Heideman and Bronson , 1994 ; Loudon , 1994)** as they stated that circadian factors weakly affect the behaviour of birds as, well as, it's displaying of endogenous and exogenous characters expect of one rhythms that persist for many years under persistant light-dark schedules with changing a day length. The circadian hours have great varities in seasonal behaviour occup the habit of birds in different geographical and environmental sites **(Nelson et al., 2001 ; Newton 2007).** Parrots feeding behaviour are increased only twice a day once in early to mid-morning and once in late afternoon **(Enkerlin – Hoeflich , 1995)** and bird did not attempt feeding behaviour during middle of day and may make up missed feedings.

The feeding frequencies were nearly three times in all day times. These results differ than that obtained with **(Koenig 1999)** who reported that Parrots ingestive behaviour from four to five feeding times to their nest per day excessively at midday hours. The birds have two ingestive behaviour per day except in absence of major mid day temperature stress they can consume more feeding times per day **(Snyder et al., 1999).**There were anon significant differences of flying, standing, walking behaviour (time and frequencies) with in different diurnal hours. The birds behave as rolling behaviour by poachers that have been totally eliminated from many areas as, well as, can from climbing from tree to anther in some seconds with lesser degree of human impacts conservations. Flying behaviour occupies largest amount of waking hours after feeding as maintain the feathers in good conditions and also regulate the body temperature **(Cech et al., 2001)**. Repetitive flying from perch to perch represents a stereotypic movement and associated with inferior housing management and reduced welfare **(Garner et al., 2003 and Mason, 1991a).**

Sleeping behaviour and the time staying in the cage of Cockatiel were increased with late after noon. The obtained results were similar to that obtained with **Ayala – Guerrero (1989)** who found that sleeping between 7 P.M. and 7 A.M. as, well as, they moving to the cage for sleep near to 12 hour of night time sleep, they provided with a quiet, dark sleeping area, ideally separate from their day time living area. Sleep and rest occupy the most time of 24 hour on day, the activities that take up greatest portions of their waking day are feeding and grooming (Grooming and other comfort behavior are major behavioural activities for parrots of all species **(Rattenburg, 2000).** In tropical and semi-tropical regions, their days normally roughly 12 hours of light and 12 hour of dark **(Forshaw , 1989).** In contrast, during middle of the day parrots will have a period of quiet time in form of sleeping and dowsiness **(Wirminghous et al., 2001).**

There were a non significance differences of sexual and social bond and vocalization of Cockatiel with in the day hours. In contrast. **(Kondo et al., 2006 ; Gwinner and Diltami, 1990)** they stated that the most obvious expressions of circadian rythum include change in reproductive behaviour and become restlessness under constant caged conditions**.** Social pair bonding and dominance rank increases the social status of ornamental birds with in group size **(Gill, 1995)**. Social pair bonding and sexual behaviour during perching in close contact all preening and solicitation of all preening **(Garnetzke – Stollmann and Franck ,1991)**.

The preening and feather shaking frequencies of Cockatiel not affected by diurnal factors, although it increased with dusk. Head shaking was increased with late afternoon while rolling was increased at mid of day hours. These results were in agreement with that obtained by **(Gill, 1995 ;Crowell- Davis 2001).**

Concerning the feeding behaviour of budgerigars, it did not affected by the diurnal factors, although the flying time was highly increased with early hours of the day light. These obtained results were agree with **Rowley (1990)** who stated that parrot morning time occupy for flying and feeding for the day, after feeding they rest or stand in perches or nesting area. The standing behaviour of budgerigars was at lowest level with late afternoon while the sleeping was at highest level at mid day. Birds compensated for the smaller distance between the perches by flying more frequently **(Wyndhem 1980 a,b).** Budgerigars feeding behaviour was higher on the ground as naturally behaviour in the wild **(Gebhardt-Henrich and Steiger, 2005).** All birds regained their flying abilities after being in aviary for a couple of days **(Benz, 1982).** The body weight and flying behaviour of budgerigars were significantly influenced by the of browsing and could effect the welfare of birds **(Wedel, 1999).**

Cage staying time and sleeping were at highest level at late afternoon and the differences were highly significant. Budgerigars almost visit the cage as it's natural behaviour and excessively where lay the eggs may reach to 9 to 16

days **(Talkbudgies–Breeding, 2013).** Avian behaviour and physiology are affected by many levels of biological rhythms which important for sleep / wake cycle **.** Budgerigars spent 38% of 24 hour day in period of slow wave sleep between 7.00 P.M. and 7.00 A.M. This sleep behaviour is due to endogenous circadian rhythms **(Ayala – Guerro et al., 1987)**.

There were a non significance differences of sexual and social bond of budgerigars with in the day hours, although the sexual behaviour of budgerigars and vocalization were increased with late afternoon**.** These results were in agreement with that obtained by **Spoon (2003)** who mentioned that vocalizations comprise an important aspect of parrot sexual behaviour of Budgerigars and Cockatiels.

Regarding to preening behaviour of budgrigars, it not affected by diurnal factors although it increased with early morning and dusk. Shaking head was increased with late afternoon. Rolling was increased early morning and the significance was significance. Female budgerigars do not seem to be adapted to adlibitum feeding and consume more food than optimal amount than male **(Schnegg et al., 2007)** and the male did not significantly gain body mass due to their greater flying activity or a smaller feed intake. Individual uses it's beak to groom anther birds in important behaviour for maintain of pair bond. Grooming behaviour in parrots includes scratching with feather, stretching beak rubbing feather shaking important for communication of the bird flock **(Wirminghous et al., 2001).** The behave signs of affection to their flock mates by preening and feeding one anther than make a sex bond **(Michael and Cooper 1981; The wild bugerigars, 2006**).

Concerning the different behavioural patterns of ornamental birds according to family variation**,** the feeding behaviour didn't affected by family variation between Cockateil and Budgerigars , while flying and walking behaviour were increased with budgerigars . The obtained results go hand by hand with **Wedel (1999).** The body mass of budgerigar was lighter than Cockatiel so help them in flying and walking. The sleeping was increased with Cockatiel due to larger body mass than budgerigars. These results were similar to that obtained with **(Wirminghous et al., 2001).** There were a non significant differences of sexual bond and social bond between Cockatiel and Budgerigars, as the cort ship was the same in cockatiel and Budgerigars (**Spoon, 2003).**

Conclusions:-

The results in this work suggested that we should make a comparative studies of behaviour of different ornamental birds of different families into different diurnal hours for enhancing the conservation of this species in a number of respects.

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38. **Wyndham,E.(1980b**: Environment and food of the budgerigar Melopsittacus undulates. Australian journal of Ecology. 5:47-61.