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Occurrence of Biting Lice Species on Chickens, Gallus gallus domesticus (Linnaeus, 1758) (Chordata: Phasianidae) at Pano Akil region, Sukkur - Sindh

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Key words: Lice, *M. gallinae, G. disimilis*, *M. clyae* and *C. tschyulyschma*, abiotic factors.

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Abstract

Present study was carried out at different locations oftaluka Pano Akil of Sukkur region on fortnightly interval basis during, 2013-14.Overall total poultry birds (1200) were kept under observation, from which (462) found to be infested, out of them only (38) birds randomly selected and overall mean of ten birds effected were observed (52.20),The sever infestation of poultry lice, *M. gallinae* with overall mean population observed was (21.00) with (40.22%) followed by *G. dissimilis* (14.49) with (27.75%), *M. clyae* (11.49) with (22.93%) and *C. tschulyschma* (7.18) with (13.75%), respectively. Therefore, twenty severely infested chickens were observed from neck, chest and cloacal regions on fortnight interval bases these were never been injected or used any drugs for precaution of lice repellent or kill. Only the naturally population was kept under observations. There were 4 kinds of lice species namely; *Menopon gallinae, Goniodes disimilis*, *Machaeriaemus clyae* and *Columbicola tschyulyschma*were reported first time from this Sukkur region. The results indicate that peak population of lice were observed at taluka Pano Akil in the month of June (35.78) / bird and least population in January (10.26) with the overall mean population (44.75) / bird, respectively. It was further observed that in the taluka Pano Akil, the overall infection present population of *M. gallinae* was observed (40.22%) / bird followed by *G. dissimilis* (12.94), *M. clyae* (22.93) and *C. tschulyschma* (13.75). It is recommendedthat, integrated control strategies should be done in place to improve chicken productivity and enhance smallholder livelihood in Pano akail aria of Sukkur region.

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Introduction

Lice (Insecta: Phthiraptera) are permanent ectoparasites of birds and mammals. Heavy lice infestation has negative effects on health condition and reproductive ability of bird(Johnson *et al.*, 2005) (Johnson and Clayton, 2003);(Price, 1977)(Price, 1971);(Smith, 2004)(Smith,v.s.,2004),it had seen &reported from the oven birds ,like about 34 species of louse, *Rellicola cephalosa (*Crarrikar, 1944) ware found.The chicken, *Gallus gallus domesticus* (Linnaeus,1758) (Chordata: Phasianidae) is well known domesticated bird, it is widely spreading domestic bird as compare to others, mostly human being harbor for their feeding purpose as meat and eggs. From olden days, these were used for domestication with an Indian origin kept for the cockfighting in different continents such as; Europe, Africa and Asia,It has been claimed that chickens were domesticated in Southern China in 6000 BC however, according to a recent study (Eda ,M *et al.,*2015).

There are about 12 species of lice recorded from *Columba livia* worldwide (Bilal, D.I.K., 2010.)*Anas platyrhynchos* (L.) accommodated 7 species of Mallophaga (Phthiraptera) throughout the world, viz. *Anaticola crassicornis* (Scopoli), *Anatoecus dentatus* (Scopoli), *A. icterodes* (Nitzsch), *Holomenopon leucoxanthum* (Burmeister), *H. maxbeieri Eichler*, *H. transvaalense* (Bedford) and *Trinoton querquedulae* (L.) (Ansari, 1955) reported only two species, *Anaticola crassicornis* and *Anatoecus dentatus*, from *Anas platyrhynchos* from Lyallpur (Faisalabad), but no chewing louse species of the common duck has yet been reported from Karachi (Ansari, 1955) this was considered first record in Pakistan with the genus Holomenopon found over *Anas platyrhynchos* from region Karachi, Sindh - Pakistan. These minute lice sporadically spread (Keirans, 1975) but unusually bit tractable at the time of studies to host parasite co-ordination (Clayton *et al.*, 2001), speciation (Hafner *et al.*, 1995), population genetics (Nadler *et al.*, 1990), ecological population (Lee and Clayton, 1995) and with the host preference ability(Johnson *et al.*,2005)whereas; the quantification and collection techniques were described by the (Clayton and Walther, 2001).Most of these were cosmopolitan and have highly adaptive for various geographic regions and climatic conditions(Sychra O.,2008).included (*M. cornutus, M. stramineus, M. pallidulus* and *M. gallinae*) and (*C. heterographus, G. gallinae, G. dissimilis, G. gigas, L. sinensis, L. caponis, L. tropicalis* and *O. dentatus.(*González-Acuña, D., 2009),andabout 12 species recorded from *Columba livia* worldwide.(Ansari, 1955) reported only two species, *A. crassicornis* and *A. dentatus*, from *A. platyrhynchos* from Faisalabad, but no chewing louse species has yet been reported from Karachi (Ansari, 1955). The six identified species of different lice damaged about (74%) of *M. stramineus,* (63%) *M. gallinae*, (48%) *L. coponis,* (25%) *C. heterographus,* (18%) *G. gigas* and (14%) *G. gallinae* also found epidemic on poultry birds. Keeping in view the above facts and figures about the prevalence of poultry lice, the aim of this study was to identify lice species of poultry birds from different adjacent areas of Sukkur, Sindh.Studied lice appearance on some 243, including 133 from Mansehra and 110 from Peshawar, in North West Frontier Province, Pakistan (Shahjehan, I.A. and Iqbal, S., 1995), were checked for lice infestation. The five species were found, viz. *Menopon gallinae, Menacanthus stramineus, Cuclotogaster heterographa, Goniocotes gigas* (*Goniodes gigas*) and *Goniodes dissimilis*. Of the 243 chickens, 150 were found infested (61.72%). The predominant species at Mansehra was *C. heterographa* (74.90%) while at Peshawar, it was *M. stramineus* (59.47%). *G. gigas* was not found in Peshawar and *G. dissimilis* was not in Mansehra. *C. heterographa* and *G. dissimilis* were new records for Pakistan.

In Pakistan, the published work mostly pinned out on its occurrence of endo and ectoparasites found in the livestock animals, chicken birds as well as wild animals / birds reported by (Nadeem .M.,*et al* 2007).In Nigeria, about four areas of Sokto metropolis, the presence of the ectoparasites found over chicken were evaluated from the 160 under the free ranging systemLawal, J.R., 2017. Therefore,

feathers were plucked and the skin was thoroughly kept under observations to check its possibility appearance of these ectoparasites during the months of July – December, 2009. The reared poultry chickens were (100%) examined with the lice, the shaft louse, *Menopon gallinae* found (8.1%), the chicken body louse, *Manacanthus stramineus* (6.9%) then the wing louse, *Lipeurus caponis* (5.0%) the feather and the body lice, *Gonoides gigas* (4.4%),finally the fluff louse namely; *Gonoicotes gallinae* found about (3.1%), respectively (Bela *et al.,* 2011). Keeping in view the above facts and figures about the prevalence of poultry lice, the aim of this study was to identify lice species of poultry birds from different adjacent area of taluka Pano Akil in Sukkur region.

Materials and methods

The domestic chicken, *Gallus gallus domestic* (Linnaeus, 1758) (Chordata: Phasianidae) were used in the studies of both sexes (male ♂: female ♀) with age fluctuation of 4 to 9 months up to 2 years old. Those were varied in colours from light to dark grey and included some which were brown barred. These were kept in windowed room as in poultry farms, most of them were reared at village sides in the cropping field of a taluka Pano Akil region Sukkur with tropical and sub-tropical conditions.

In shadow or windowed room, the chickens were fed with grains of wheat, rice, pulses etc. whereas; chickens reared in villages were fed with wheat and meal pieces but released in field cultivated crops where they use to eat insects, worms and green grass. The temperature and relative humidity were varied at different taulkas of sukkur as taluka Pano Akil is places as; 16 to 25°C in winter with relative humidity % 25 - 35. In summer season, 35 to 48°C with RH% 45 – 65.Out of huge flock only, twenty (20) chicken birds were randomly captured and observations were made. For the collection of lice 30 houses were visited and their domestic chickens were thoroughly examined. Thus, the collected samples (lice) were sent to the Natural History Museum, Department of Zoology, and University of Sindh – Jamshoro to (Dr. Saima Naz – Lice specialist), for their proper identification.

It was easy to capture and observe the chicken birds kept into windowed rooms as captured to field released or open birds. For this purpose, those were greed with grains to motivate that was bit tough to capture after all, observations and samples were made. After that, the bird was divided into regions (head, neck and tail), the count of parasite lice were made for the prevalence and density checking purpose. The chicken bird enveloped in to welling to do not disturb the lice population or suddenly harassed. The cotton soft towel was covered up to 3 to 5 minutes to be relaxing the lice. Then towel was turned over the chicken body and population of lice was counted. Besides, samples were taken under the laboratory conditions for their proper identification. Therefore, the permanent mounts were prepared through series and photography were made through digital camera 10x² magnifier microscope interconnected with CPU, computer at Herbarium, Biodiversity nearby and opposite of department of Zoology, SALU – Khairpur.

Specimen collection

An entomological survey of ecto-parasites order Mallophaga of chicken was conducted and specimens of biting lice, chewing and sucking were collected by using the collection techniques of (Prelezov and Koinarski, 2006) and (Changbunjong *et al.*, 2009).Chickens from the various sites were collected randomly from houses, poultry forms, poultry meat shops at Sukkur district. The head was further sub-divided in to the crown, gular, nape regions, the neck extended from the head to the anterior of the sternum that lined with breast region whereas, the ventral side extended from the posterior of the sternum to lead to the tail and both sides covered with the feathers folded with wings thus included part of rump (Including the head, cloacal, brachial, ventral, and femoral areas). So, the both regions like; wings and tail parts of the body those lead to legs were also thoroughly examined with the help of magnifying glass. The eggs were laid at the silky and fluffy portion

of the feather in abundant population and lowest at contour portion. Thus, the nymph and adults mostly observed on the neck, back sides, breast and ventral fluffy part of the feather near to rachis. When those were disturbed the nymph and adults were found scattered over the body and moved rapidly over the surface of the chicken skin. Only the feeding behavior of the lice was studied to determine their possible influence on the distribution of the lice on chicken at this adjacent area. The search for lice was carried out manually or with the help of hand, covered with plastic removable hand gloves whereas, the feathers on different parts were examined carefully. Besides, the date of collection of the samples and other information related to the parasite and its host was got from the owner of the farm and thus data were recorded accordingly. Each species laid its eggs on a different part of the body but all behaviorally fed on the fluffy part of the body feathers and suck the blood.

Densities level of infestations

During the data collection, we used such a following categories to determine the infestation densities of lice on chicken such a way; miner density infestation, 3 - 5 per region or up to 15 on whole body regions per chicken bird either male or female, medium density infestation 5 – 7 per part or up to 25 – 30 on whole body regions per chicken as host, heavy density infestation, 20 – 30 per area or 70 – 80 lice on whole body regions per host and severe infestation 50 – 70 per part of the body or 100 – 120 or more than 200 on whole body per chicken bird recognized their density populations. These kinds of categories could be considered among the poultry farming community at the different regions of Sukkur division, Sindh – Pakistan used for individually poultry lice densities levels related with temperature and RH% factors.

Identification of lice

The dry powder, Pyrethroid was dusted on the body of each host chicken, applied under wings, tail and body feathers with the help of a plastic squeeze-bottle or talcum powder bottle. Having sprayed, the chicken bird was put into a plastic bag or soft towel and only head left outside for breathing whereas; whole body left covered and due to suffocation, the lice shed off in the plastic bag or on the towel within 10-12 minutes later on, those were collected and brought at laboratory conditions where the sampled lice were ruffed over a white collecting paper sheet. Only 20 chicken bird subsequently feather by feather and whole body regions checked thoroughly. Those repelled parasites were identified and recorded besides the samples of the observed parasites were removed from the chicken host with the help of thumb, iron forceps and zero point camel hair brush which were later transferred in to Petri dish for laboratory observations. The specimen were collected from the sheet and preserved in the solution of 85% ethanol alcohol and 2% glycerin in glass vials and each sample was labeled with the date, locality and host information.

Preparation of permanent lice mounts

For preparation of permanent slides, lice were cleared for few hours in cold KOH solution and then dehydrated with ascending grades of ethanol till absolute grade, thereafter were washed with Xylene. Each louse was picked up with the help of fine hair brush and placed on glass slide and slowly pressed by an insect pin to remove all internal content through anal opening. For mouth parts and genitalial studies, 3-4 adult lice of both sexes were boiled in 10% KOH solution in water bath for few minutes. Dissections and mounting of specimens were made by following techniques used by (Palma, R.L., 1994). Each louse was studied under light compound microscope and was identified by following keys furnished by (Clayton, D.H., Drown, D.M., 2001).Specimens collected from different parts of the same host were preserved separately in different vials and brought under laboratory conditions. Further, prevalence of different lice species at different locations of same region was evaluated with the under given formula:

$$\text{Louse specie on chicken host} \frac{\text{no. of affected birds with lice}}{\text{total no. of chicken birds}} = 100$$

Statistical analysis

The data statistically analyses of variances (ANOVA) were done through student statistical package software, SXW, USA version 8.1 and means were

compared with *t*-test and correlation were measured through temperature with host and relative humidity with lice host. Before analysis, the data entered into MS, Excel spread sheet and latter exported for descriptive analysis to obtain frequencies, means and standard deviations using Statistix software. Statistically significant differences were considered at (P<0.05) level.

Results and discussions

Prevalence of poultry lice species at taluka Pano Akil, region of Sukkur

The findings from the research conducted at the taluka Pano Akil, are presented in the (Table- 1) which reveals that out of (100) only (85) birds found highly infected in the month of July during 2013 and only (21) birds were observed infected in the month of December 2014. Out of the infected birds only (10) were randomly selected for data collection, for the proper identification and checking of infestation level throughout the year, 2013-14. The overall maximum mean of infested birds were observed (85.39) in the month of June, 2013 in summer season and the minimum (31.15) in the month of January, 2014 in winter season, respectively.

Table 1. Prevalence of poultry lice species at different locations of taluka Pano Akil during, 2013-14.

Months	Birds	Infected birds	10 birds (over all mean)	*Menopon gallinae* (Mean and %)	*Goniodes dissimilis* Denny (Mean and %)	*Machaeriaemus clyae* (Mean and %)	*Columbicola tschulyschma (Mean and %)*
May	100	47	75.8	39.90 (53.20)	10.00 (13.33)	9.3 (12.04)	2.80 (3.73)
June	100	85	85.39	28.04 (32.83)	21.50 (24.65)	18.66 (21.85)	11.93(13.97)
July	100	23	65.78	23.60 (35.67)	17.82 (27.09)	15.89 (24.15)	11.23 (17.04)
Aug.	100	22	67.84	26.71 (39.37)	21.39 (31.53)	13.57 (20.00)	12.2 (17.98)
Sept.	100	41	42.18	22.57(53.73)	10.27 (24.34)	12.10(28.68)	6.12 (14.50)
Oct.	100	55	41.14	14.80 (35.97)	13.85 (33.66)	10.58 (25.71)	5.10 (12.39)
Nov.	100	33	38.69	16.77 (43.39)	14.29 (36.93)	10.97 (28.35)	5.66 (14.62)
Dec.	100	21	35.32	13.74(38.91)	12.01 (34.00)	10.12 (28.65)	3.95(11.18)
Jan.	100	22	31.15	11.02 (35.58)	10.44 (33.67)	8.95(28.73)	2.49(8.00)
Feb.	100	31	34.29	16.26(47.41)	11.70 (34.12)	9.33(27.20)	3.59(10.46)
Mar.	100	38	49.91	18.00(36.06)	13.99(28.03)	10.00(20.53)	10.98(21.99)
April	100	44	58.88	20.65(35.07)	16.68(28.32)	14.27(24.23)	10.17(17.27)
Total+ (Mean and%)	1200	462	52.2	21.00[a]	14.49[b]	11.97[b]	7.18[c]
				-40.22	-27.75	-22.93	-13.75
CV				37.67	28.03	25.35	53.04
SE				2.28	1.17	0.87	1.1

The maximum prevalence of different lice species such as; *M. Gallinae* observed was (39.90) with (53.20%) per bird in the month of May, 2013 and minimum (14.80) with (35.97%) in the month of October of the same year. *G. dissimilis* found with the maximum overall mean population (21.39) with the infestation level (31.53%) with the minimum population (10.44) and (33.67%) in the month of Januarry, 2014. The specie, *M. clyae* showed its population fluctuation with peak level in the month of June (18.66) with the (21.85%) whereas; the lesser population was observed in the month of January, (8.95) with the (8.97%). Thus, the specie, *C. tschulyschman* showed its peak level (12.20) and (17.98%) in the month of August and least (2.49) with (8.00%) in the month of January 2014, respectively. The overall total poultry birds (1200) were kept under observation, in which the (462) found to be infested,

out of them only (38) birds randomly selected and overall mean of ten birds effected were observed (52.20). The sever infestation of poultry lice, *M. gallinae* with overall mean population observed was (21.00) with (40.22%) followed by *G. dissimilis* (14.49) with (27.75%), *M. clyae* (11.49) with (22.93%) and *C. tschulyschma* (7.18) with (13.75%), respectively. The analysis of variance showed the significant difference (DF = 11, 3; F = 24.33; P = 0.001) among the all poultry lice species (P<0.05) recorded throughout the year at district Pano Akil, region of Sukkur - Sindh, Pakistan.

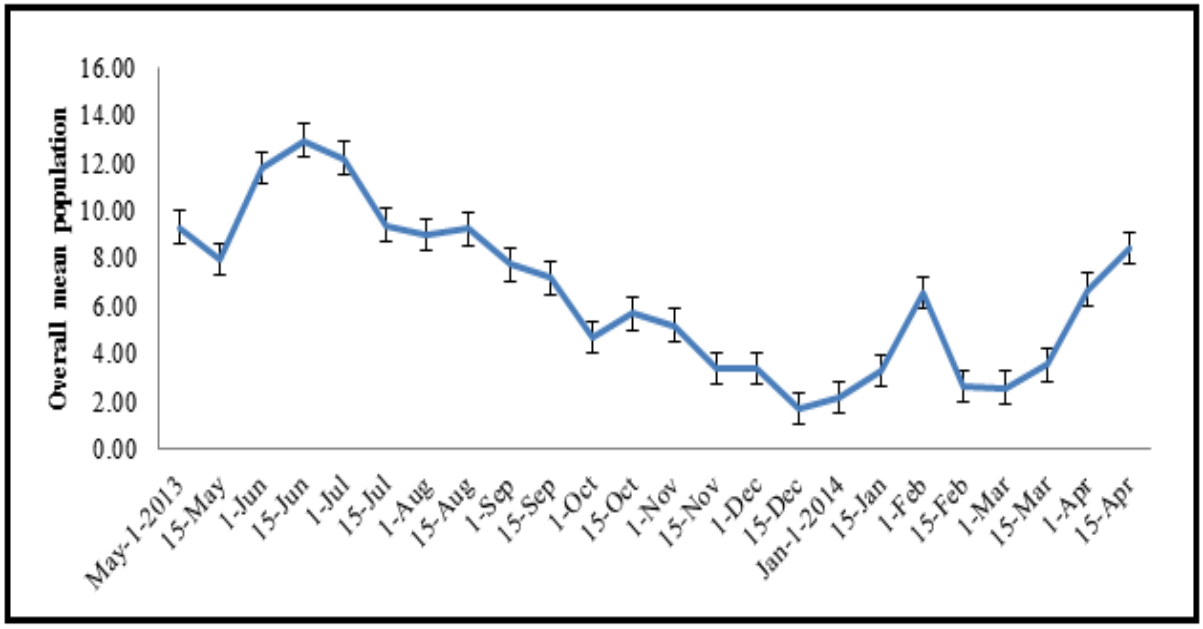

Fig. 1. Mean+SE of chicken lice surveyed at fortnightly interval basis from head region at different locations of Pano Akil during, 2013-14.

Prevalence of poultry lice species at taluka Pano Akil

The research trials were conducted for the checking of different poultry lice species prevalence at taluka Pano Akil during, 2013-14. The data was gathered on lice population per bird but in starting the overall mean population of twenty birds was recorded on different body parts. As, it was first recorded over the head region starting from the month of May, 2013 till the next coming year in the month of April, 2014. During the starting month, the population of chicken lice was observed up to (9) then reduced for the month and it went beyond the peak level during in consequent months of June and July during, 2013 after it smoothly reduced up to January, 2014 during in the month of February. Later on, it also found increased up to (8-9) in the month of April, 2014 (Fig. 1). Thus, the prevalence of poultry lice species were also found on the chest region which were about more than the neck region observed up to (13-14) in the summer season in May, 2013 and it frequently came down through the winter season till the January, 2014 after that it flared up and reached at its peak level till the April, 2014 (Fig. 2). The population of lice species was also observed on the cloacal region which was found higher in the summer season comparatively to winter season (Fig. 3). Finally, the results were taken with the overall mean population of different lice species which were observed (30-31) per poultry bird in starting months and went beyond the peak levels up (35) in the consequent months in June and July, 2013 later on it reduced in the months of January, 2014 and slowly and gradually increased in the consequent hot season. It was observed during the research study that summer season may help to increase the lice on poultry birds when it was compared with the winter season. The analysis of variance showed the significant difference on the population prevalence on different body parts of the poultry birds (P<0.01) from the taluka Pano Akil region Sukkur, Sindh.

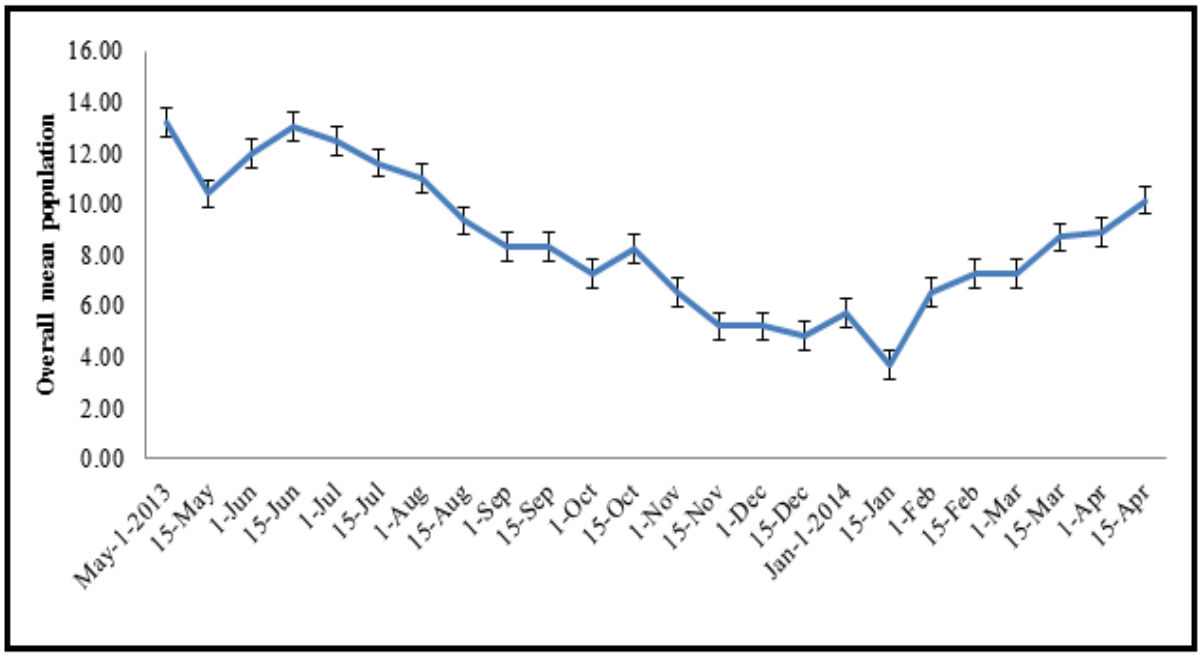

Fig. 2. Mean+SE of chicken lice surveyed at fortnightly interval basis from chest region at different locations of Pano Akil during, 2013-14.

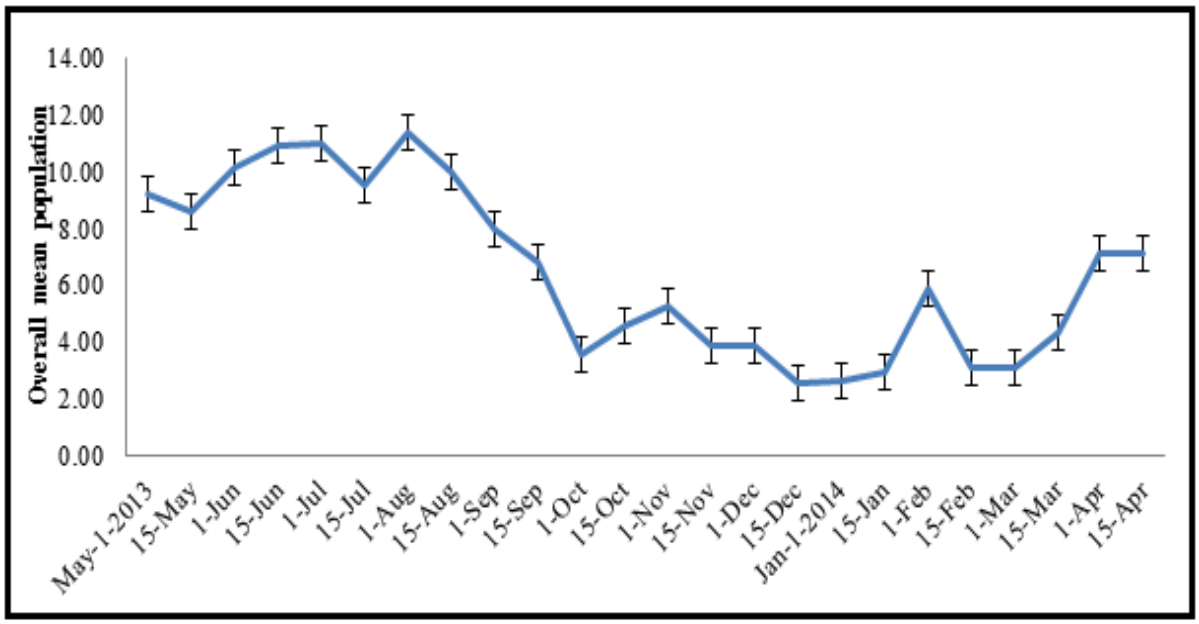

Fig. 3. Mean+SE of chicken lice surveyed at fortnightly interval basis from cloacal region at.

Regression analysis of poultry lice at Pano Akil region, Sukkur

During the research studies the different poultry growers of the Pano Akil region which were kept under observation during the both the summer and winter seasons, 2013-14 which was started in the month of May and continued up to next year April. The results further showed that population fluctuation was occurred with responsible of different abiotic factors such as; temperature and relative humidity %. Both of these factors had the positive and negative effect which was focused through this research study. During data collection, the different samples on random basis were collected and brought at laboratory conditions for their proper identification, in which main four species namely; *M. gallinae, G. disimilis*, *M. clyae* and *C. tschyulyschma* were observed and identified through the help of

special taxonomist. The proper permanent mounts were made and kept at the Measum of Department of Zoology, Shah Abdul Latif University, Khairpur – Sindh. For checking the correlation among the abiotic factor with the parasite of poultry host, the least squares linear regression analysis was applied.

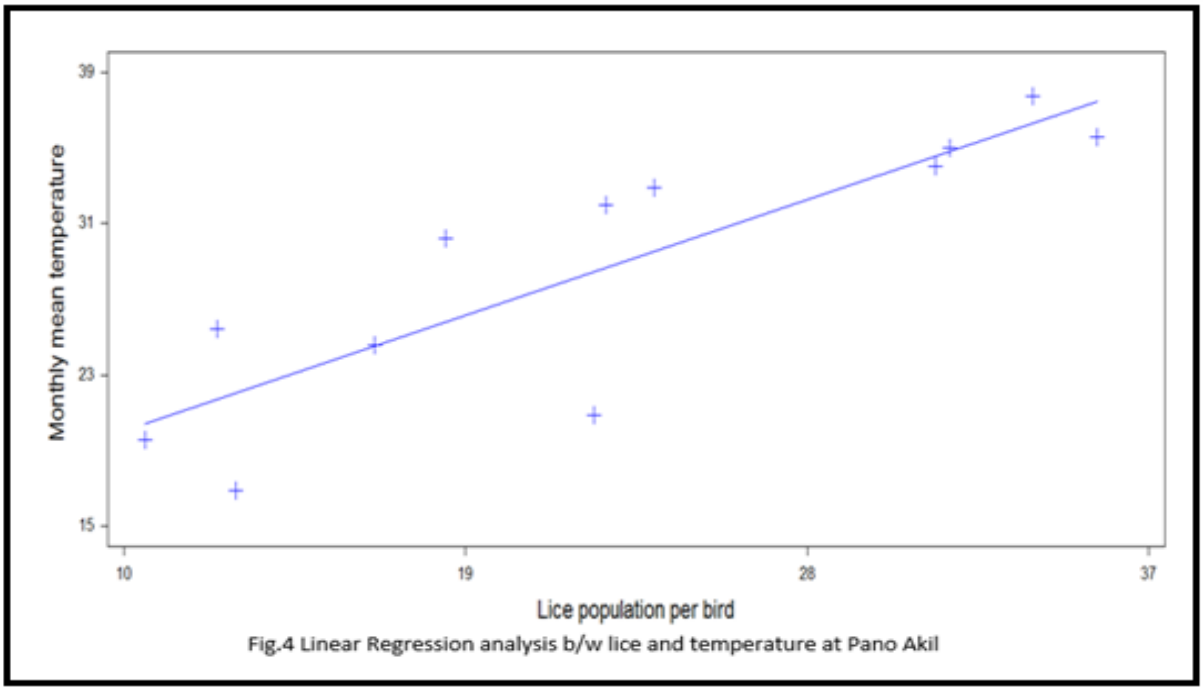

Fig. 4. Linear Regression analysis b/w lice and temperature at Pano Akil.

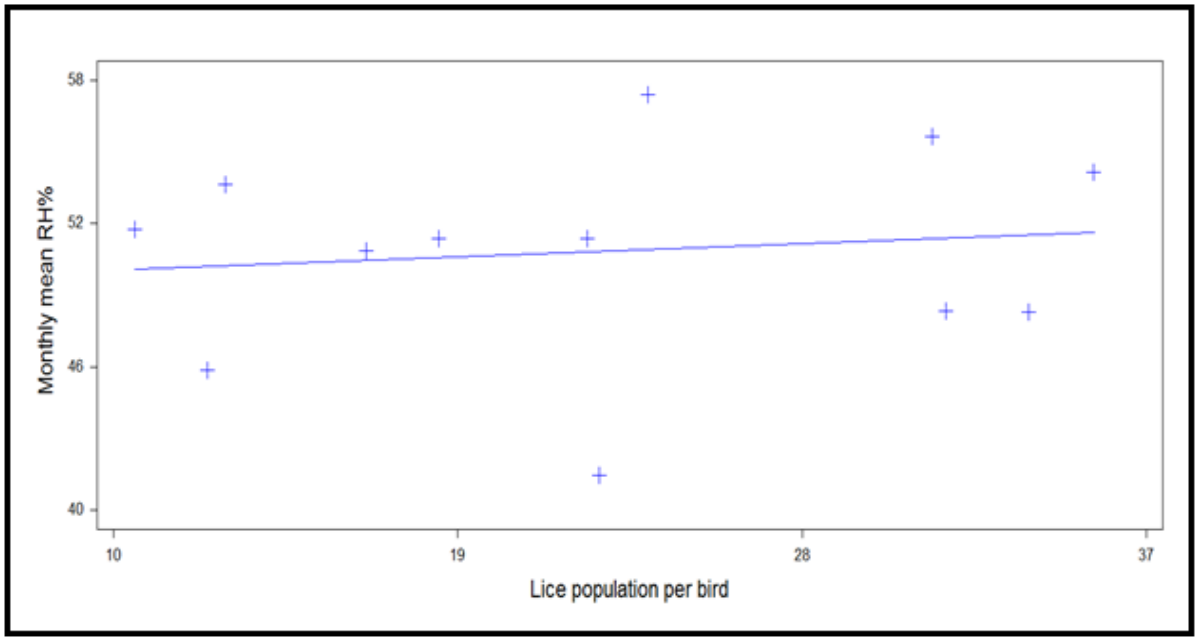

Fig. 5. Linear Regression analysis b/w lice and RH% ar Pano Akil.

It was observed from this research study, that the temperature provided positive effect to enhance the lice parasites on poultry birds whereas; the relative humidity % found to be no any effect for development of the lice on poultry birds located from the different locations of district Sukkur. This region which is known as upper Sindh mostly found with high temperature, comparatively higher to lower Sindh whereas relative humidity matter is concerned it was found low when we compared it with the lower region

parts of Sindh as in Hyderabad to Karachi regions. The results were further depicted with the effect of temperature and relative humidity % under given (Fig. 4 and 5), respectively.

The data statistically analyses of variances (ANOVA) were done through student statistical package software, SXW, USA version 8.1 and means were compared with *t-test* and correlation were measured through temperature with host and relative humidity with lice host. Before analysis, the data entered into MS, Excel spread sheet and latter exported for descriptive analysis to obtain frequencies, means and standard deviations using Statistix software. Statistically significant differences were considered at ($P<0.05$) level. One-way analysis of variance was used to analyze the influence of species and the agro-ecological zone on the prevalence and chicken lice / parasite burden / (intensity in the tropical region). Therefore, a critical probability of ($P<0.05$) was adopted throughout as a cut-off point for statistical significance between specie wise compared.

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