RELATION OF AMBIENT TEMPERATURE WITH EGG PRODUCTION AND EGG WEIGHT IN LYALLPUR SILVER BLACK PULLETS

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The effect of morning and afternoon temperatures on egg weight and egg production in Lyallpur Silver Black Pullets at the West Pakistan Agricultural University, Experiment Station was studied. Rise in temperature adversely affected the various productive behaviour of poultry. Egg weight and egg production both declined as the temperature arose, no matter if it was in the morning or in the afternoon.

INTRODUCTION

The poultry industry in Pakistan has to face numerous setbacks. One of the major problems challenging poultry is the ambient temperature. The domestic fowl can live comfortably only in a relatively narrow temperature range, extending from 60.7°F (81.0°F, (Dukes, 1947; Wilson, 1948). Any deviation specially on the higher side depresses both survival and production. Temperatures in Pakistan usually remain well beyond the higher side of the thermoneutral zone for the greater part of the year. This affects adversely the viability, and egg production of poultry, making a year round egg production a difficult and uneconomical business. The high ambient temperature on the eve of tropical heat waves can result in abrupt mortality from prostration amongst layers bred for heavy egg production.

REVIEW OF LITERATURE

Egg Weight

Bennion and Warren (1933) observed a decline in egg weight in the domestic fowl when the environmental temperature was above 85°F. The observations of Funk and Kempster (1934) showed that maximum egg weight reached in February (Winter) and decreased during spring and summer months. High environmental temperature depressed egg size as observed by Lorenz and Almquist (1936). Warren (1939) secured data on egg size at latitudes extending from the equator to as far north as Scotland and found that high atmospheric temperature reduced the size of eggs considerably. Dukes (1947) stated that the lower range in thermoneutral was 60°F. Reduction in egg size and thinning of egg shells began at 70°F. (Wilson, 1949). Warren *et al.* (1950) reported that a constant temperature of 65°F. was high enough to reduce

egg size below the maximum. Reduction of 1.1 gm. in mean egg weight when layers were exposed to short daily periods of heat stress of 99°F. for 107 to 214 minutes (unadapted state) as compared to birds living continuously in warm climate at 85°F. (adapted state) was reported by Hutchinson (1953). The average monthly egg weight of Fayoumi and Baladi fowls was observed by Rajab and Assem (1953) as maximum (45.1 and 40.0 gm. per egg) in January, and minimum (36.6 and 33-4 gm. per egg) in August, which showed that high summer temperature had depressed the egg weight even in the case of locally adapted birds in warm sub-tropical climates. Smith *et al.* (1954) reported that egg size and proportion of albumen to yolk were influenced by environmental temperature. The reduction in egg size due to high temperature has been reported to affect the egg components though water content does not vary with the variation in egg size. Carmon and Huston (1965) and Yaqoob (1966) worked on similar project and observed that egg weight declined due to heat stress.

Egg Production

Temperature is one of the main causes of seasonal variation in egg number laid by fowl (Brody, 1948). Ota *et al.* (1953) reported that 55°F. was the optimum temperature for maximum egg production and feed efficiency. The adverse effect of high environmental temperature on numbers of eggs produced in the domestic fowl was reported by Rajab and Assem (1953). It was observed that the mean egg production in the local Egyptian breeds of Baladi and Fayoumi was 16 and 16.92 eggs in January and 9.95 and 9.96 eggs in August respectively. Reports of Mitchel and Kosin (1954) showed that temperature and light controlled environment depressed the sustained rate of egg laying in Turkeys subjected to environment from December to August. The rate of lay for the 8 months period was significantly higher in the environment in which temperature fluctuated with day to day fluctuations in out door temperature. Huston *et al.* (1957) reported that regardless of the influence of the rise in temperature, a 24 hours exposure to 1000°F., whether raised at the rate of 4°F. per hour or 5°F. per day caused an equally severe but temporary drop in egg production among Rhode Island Reds and one strain of White Leghorn. Weiss (1959) stated that the relationship of productive state of the fowl and its resistance to lethal high temperatures revealed that non-laying White Leghorns survived longer at 105°F and 70 per cent relative humidity than the laying hens. Studies on the egg production in two strains of White Leghorns by Campos *et al.* (1960) developed over years in a cool and in a hot climate indicated that the birds from hot areas laid fewer eggs at cool temperature

and those from cool areas behaved in a similar fashion at hot temperature, suggesting that there was a genetic adaptation in birds to their natural abode. The observation of Muller (1961) showed an annual production of 140 eggs in the survivors of White Leghorn layers maintained at a temperature of 55°F. The annual mortality was 35 and 6 per cent respectively at the two temperatures. Clark and Amin (1965) found that the rate of lay expressed the degree of sensitivity of the birds, adaptive mechanism to a given heat stress and that such an adaptation was influenced by the native environment of birds.

MATERIAL AND METHODS

The experiment was started with 348 Lyallpur Silver Black pullets of same age and breed. They were vaccinated against Rani Khet vaccine and housed under confinement. Feed and water was supplied to them *ad lib.* Temperature was recorded twice daily in the morning at 6 A. M. and in the afternoon at 3 P.M. Eggs were collected twice daily at 10 A.M. and at 3 P.M. The daily records of number of eggs and birds were kept. The eggs were weighed individually and the daily average egg weight was calculated. The dead birds were replaced by healthy pullets of same age and breed, which were kept as controls for this purpose. For the convenience of analysis the egg production was calculated on per cent basis.

The data were subjected to conventional statistical analysis to find out the relationship of various environmental factors including temperature on the production records including egg weight and egg production.

RESULTS AND DISCUSSION

The study of morning and evening temperatures was made on Lyallpur Silver Black pullets. The range of these temperatures, variation in egg weight and egg production are given in Tables 1 and 2. The experiment lasted over a period of eleven weeks, from 15th of June to 30th of August, 1966.

The correlation coefficient between egg weight, morning and afternoon temperature were .01 and .033 which were statistically non-significant. Regression coefficient of egg weight on morning and evening temperature was 0.012 and 0.097 respectively. The regression equation showed that for each unit rise of morning and afternoon temperature beyond 80°F. the egg weight declined by 0.012 and 0.097 gms. respectively. These findings were supported by the observations of Benion and Warren (1933), Funk and Kempster, (1934), Lorenz and Almquist (1936), Warren (1939) Dukes (1947), Wilson (1949), Warren et al. (1950), Hutchinson (1957), Rajab and Assem (1953), Smith et al. (1954), Carmen and Huston (1965) and Yaqoob (1966).

TABLE 1. *The influence of morning and evening temperature on egg weight and egg production*

Weeks	Average morning temperature (°F)	Average evening temperature (°F)	Egg weight (gms)	Egg production %
1st	83.30	90.00	42.01	7.6
2nd	85.30	99.00	40.10	7.1
3rd	83.60	90.40	38.93	7.3
4th	81.70	98.00	38.89	5.5
5th	81.60	96.50	39.65	5.1
6th	84.00	93.08	40.30	4.4
7th	80.80	90.80	39.27	4.3
8th	79.57	88.60	41.75	8.9
9th	82.25	93.60	41.89	9.1
10th	83.00	95.70	41.88	5.2
11th	81.75	92.60	42.77	6.6

The correlation between egg production, morning and afternoon temperature was 0.12 and 0.008 respectively which was statistically non-significant. Regression coefficient of egg production on morning and afternoon temperature was —0.09 and —0.04 respectively. Regression equations indicated that for each unit rise of morning and afternoon temperature, the egg production declined by 9 per cent and 4 per cent respectively, beyond 80°F. This study was in agreement with Broody (1948), Ota *et al.* (1953), Rajab and Assem (1953), Mitchel and Kosin (1954), Huston *et al.* (1957), Weiss (1959), Campos *et al.* (1960), Muller (1961), Clark and Amin (1965) and Yaqoob (1966), who observed that the stress temperatures during any period of the day affected egg production and egg weight.

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