EFFECT OF SOME ENVIRONMENTAL FACTORS ON EGG PRODUCTION RATE IN SOME LOCAL STRAINS OF CHICKENS

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Abstract

Egg production rate was studied for four local strains of chicken, namely, Mandarah, Golden Montazah, Silver Montaza and Matrouh, to study the effect of temperature, day light and relative humidity on egg production rate.

The observation obtained was that egg production rate was significantly affected by the degree of temperature where the egg production rate decreased by the increase of temperature, and the highest rate of production was obtained when the temperature ranged from 15.0 to 19.9 °C and from 20.0 to 24.9 °C. On the other hand, rate of production was higher when the relative humidity ranged from 65 to 85 % than when it ranged from 31.0 to 64.9 % .The results showed that egg production rate decreased by the decrease of day light from 14.0-14.6 hour/day to 10.1-11.0 hour/day. The differences were significant for all strains except for Matrouh strain.

INTRODUCTION

Many investigators had reported that egg production rate was affected by high environmental temperature. This effect differed from strain to anther and by the differences in degree of temperature that the layers subjected to (Ahmed *et al.* 1967, Thomason *et al.* (1972 – 1976) and Marsoden *et al.* (1987). These investigators reported that the rate of production decreased by the increase of temperature, but, the effect was not significant, while, De-Andrade *et al.* (1976 and 1977) found significant difference in rate of laying by the increase of temperature. Cyclic temperature was less effective than constant temperature (Muller, 1962). When the minimum temperature varied, the egg production was more affected by these temperatures (26.7-35.0, 21.1-35.0 and 15.6-35.0 °C), and so, egg production rate decreased by the increase of minimum temperatur (Deaton *et al.* 1981).

For White Leghorn females selected for heat tolerance, there was non-significant difference in production at temperature as high as 40.6 °C (Wilson *et al.* 1975). Arad *et al.* (1981) found that the effect of daily exposure to increasing ambient temperature (for7 months) on egg production in the desert Bedouin fowl of Sinai, commercial White leghorn and the two reciprocal cross breeds, did not adversely affect laying rate of the acclimatized hens .The best productivity was obtained during period of exposure to 38-40 °C in all birds.

The rate of difference in egg production varied also as it was higher by 4-12% when hens were exposed to 65°F (18.3°C) than these exposed to 70-100°F (21,1-37 °C), (Clark *et al.*, 1964). Marsoden and Morris (1975) reported difference of 2% in egg production when hens were exposed to diurnal temperature cycle within moderate range of temperature (maximum of 30°C), while, Nordstorm (1973) reported that egg production rate of Single Comb White Leghorn was 59% at 32 °C and 74% at 21°C. Also, Riad and Weber (1973) found that rate of laying was 44.4 % at 35°C, while, it was 73.2 % at 21 °C .Similar results were reported by Abou-El-Fetouh, (1994) who found that in S.L.S. the mean value of egg yield was 75.7, 68.3, 65.3 and 48.7 eggs for control, 28, 30 and 35 °C , respectively for egg number from 24 up to 44 weeks of age.

In the study herein, the birds were raised in open house system where the environment had the greatest direct effect on layers and the temperature ranged from 15-40 °C throughout the year of production.

Concerning daylight, egg production was higher when daylight ranged from 14.0-14.6 hour /day and decreased significantly by the decrease of rate of lighting.

MATERIALS AND METHODS

This study was conducted at Inshas Poultry Research Farm , Sharkia Governorate, to study the effect of some environmental factors (Temperature, daylight and Relative humidity) on egg production rate in some local strains of chickens, namely Mandara, Golden Montazah, Silver Montazah and Matrouh, throughout season of production (from June to May) .Daily maximum temperature, daylight and mean of relative humidity were from the record of "The Egyptian Meteorological Authority " recorded for Inshas zone.

The correlation between egg production rate (egg/hen/day) and daily maximum temperature, daylight and relative humidity and interaction between temperature and relative humidity was studied also.

Ambient temperature, daylight were classified into five temperature levels, and relative humidity was classified into two humidity levels (Table 1). The symbols used for the different strains were (MN) for Mandarah, (GM) for Golden Montazah, (SM) for Silver Montazah and (MAT) for Matrouh. Laying hens were fed ad-libitum, a commercial ration containg (16% C.P and 2780 K.cal / Kg diet) .

The data obtained were analyzed by GLM program using the SAS (General Linear Model Procedure- SAS Institute, 1994).

RESULTS AND DISCUSSION

Results presented in Table 2 and Figure 1 show the average and standard deviation for egg production rate (egg / hen / day) for the four local strains studied. The average egg production ranged from 0.181 to 0.497 egg / hen /day for (MN) hens when the temperature was 35.0 - 40.0 ^{0}C (T_1) and (MAT) hens when temperature was 15.0 – 19.9 $^\circ$C (T 5), respectively.

Generally, the average egg production rate for all strains was decreased by the increased of environmental temperature, where the lower egg production rate was recorded when the temperature level was 35.0- 40.0 ^{0}C (T_1) for (MN), (MAT), (SM) and (GM), being 0.181, 0.222, 0.259 and 0.265 egg /hen /day, respectively, and when the temperature was 30.0 - 34.9 $^\circ$C (T_2) for (MN), (SM), (MAT) and (GM), being 0.208,0.227,0.242 and 0.284 egg/ hen / day, respectively, while, the higher egg production rate was recorded when the temperature was 15.0-19.9 $^\circ$C (T_5) for (MAT) and (GM) 0.497 and 0.457 egg / hen /day, respectively, while it was recorded when the temperature was 20.0 - 24.9 $^\circ$C (T_4) for (MAT) and (SM), 0.469 and 0.468 egg /hen /day, respectively. Moderate values for egg production rate was recorded when temperature was 25.0-29.9 $^\circ$C (T_3) for all strains studied being 0.284, 0.292, 0.304 and 0.367 egg / hen /day for (MN), (GM), (MAT) and (SM), respectively (Table2). The differences between the temperature levels were significant.

Egg production rate values were higher when the relative humidity was 65.0-85.0% (RH1) for all strains studied being 0.314, 0.379, 0.364 and 0.329 egg / hen / day vs. 0.293, 0.352,0.340 and 0.341 egg/ hen /day when the relative humidity was 31.0-64.9 % (RH_2) for the four strains (MN), (GM), (SM), and (MAT), respectively. The differences between the two relative humidity were significant except (MAT) 0.329 vs. 0.341.

As the environmental temperature is correlated with the month of the year, the least egg pro-duction rate was recorded in June being 0.102, 0.218, 0.236 and 0.193 egg/ hen /day for (MN), (GM), (SM) and (MAT), respectively (Table 3.) By the same token, the highest egg production rate was recorded in November and December for (MN), (GM), and (SM) being 0.496, 0.492 and 0.530 egg/ hen/day, respectively in November vrs 0.455, 0.495 and 0.515 for the same three strains, respectively, while, the highest rate of production was recorded in February and March for (MAT), being 0.548 vrs 0.565, respectively. The differences between egg production rate throughout the months of the year of production were significant.

The overall mean recorded for the four strains for egg production rate in this study showed that (SM) ranked first followed by (GM) and (MAT), while, (MN) ranked the fourth (0.361, 0.361, 0.342 and 0.307, respectively. The differences between strains were significant (Table 3).

Table 4 and Table 5 present the least square means analysis of variance for temperature (Temp) and relative humidity (RH) and interaction (Temp* RH) for (MN), (GM), (SM) and (MAT). There were significant differences between strains due to the effect of temperature degree (Temp), while, there were non-significant differences due to the effect of relative humidity (RH) for all strains, and so, the interaction (Temp* RH) except for (SM), while the interaction between temperature levels and humidity levels showed significant difference (Table 5).

Monthly correlation between different levels of temperature (T) and between levels of relative humidity (RH) by different strains is shown in Table 6, while, Table 7 shows the correlation between different temperature levels and humidity levels, by different strains studied.

In this study we can conclude that egg production rate for the four strains studied was significantly affected by the degrees of temperature where the egg production rate decreased by the increase of temperature and the highest rate of production was obtained when the temperature ranged from 15.0 - 19.9 °C and from 20.0-24.9 °C. On the other hand, rate of production was higher when the relative humidity ranged from 65 - 85 % than when it ranged from 31.0 - 64.9 %. Also, egg production rate decreased by the decrease of day light from 14.0 – 14.6 hour/day to 10.1 – 11.0 hour/day The differences were significant for all strains except for Matrouh (MAT) strain. These results agreed with those obtained by Cowan and Michie (2000).

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Table 1. Values of different levels of Temperature (^{o}c), Day light (hours) And Relative humidity (%).

TEMPERATURE LEVELS	MINIMUM	MAXIMUM	MEANS
T -1	35.0	40.0	37.0
T -2	30.0	34.9	33.0
T -3	25.0	29.9	27.0
T -4	20.0	24.9	23.0
T -5	15.0	19.9	18.0
DAYS LIGHT LEVELS	MINIMUM	MAXIMUM	MEANS
DL-1	14.0	14.5	14.2
DL-2	13.0	14.0	13.4
DL-3	12.0	13.0	12.6
DL-4	11.0	12.0	11.5
DL-5	10.1	11.0	10.5
R. HUMIDITY LEVELS	MINIMUM	MAXIMUM	MEANS
RH-1	65.0	85.0	70.0
RH-2	31.0	64.9	55.0

Table 2. Average egg production ± S.D for different strains exposed to different levels of temperature, day light and humidity.

STRAINS	MN	GM	SM	MAT	OVER ALL
TEMP.LEVELS					
T -1	0.181 ^{e} ± 0.017	0.265 ^{d} ± 0.016	0.259 ^{c} ± 0.017	0.222 ^{e}± 0.015	0.234^{d}± 0.011
T -2	0.208 ^{d} ± 0.013	0.284 ^{c} ± 0.011	0.227 ^{d} ± 0.054	0.242 ^{d} ± 0.014	0.240 ^{d}± 0.006
T -3	0.284 ^{c} ± 0.032	0.292 ^{c} ± 0.022	0.367 ^{b} ± 0.021	0.304 ^{c} ± 0.028	0.312 ^{c}± 0.012
T -4	0.439 ^{a}± 0.016	0.434 ^{b} ± 0.013	0.468 ^{a} ± 0.014	0.469 ^{b} ± 0.017	0.452 ^{b}± 0.014
T -5	0.405^{b} ± 0.017	0.457 ^{a} ± 0.015	0.453 ^{a} ± 0.012	0.497^{a} ± 0.014	0.437^{a} ± 0.008
D.light levels	MN	GM	SM	MAT	OVER ALL
DL-1	0.452^{a} ± 0.060	0.479^{a} ± 0.492	0.502^{a} ± 0.047	0.410^{a} ±0.103	0.458 ± 0.062
DL-2	0.319^{b} ± 0.102	0.356^{b} ± 0.075	0.384^{b} ± 0.079	0.421^{a} ± 0.153	0.371 ± 0.102
DL-3	0.275^{c} ± 0.099	0.310^{c} ± 0.041	0.277^{c} ± 0.093	0.363^{b} ± 0.115	0.304 ± 0.087
DL-4	0.291^{d} ± 0.091	0.291^{d} '± 0.064	0.265^{c} ± 0.081	0.241^{c} ± 0.081	0.272 ± 0.079
DL-5	0.128^{c} ± 0.066	0.244^{e} ± 0.049	0.241^{d} ± 0.034	0.207^{d} ± 0.041	0.205 ± 0.047
R.humidity levels	MN	GM	SM	MAT	OVER ALL
RH-1	0.314^{a} ± 0.015	0.379 ^{a} ± 0.012	0.364 ^{a} ± 0.142	0.329^{ab} ± 0.014	0.336 ± 0.007
RH-2	0.293^{b} ± 0.010	0.352 ^{b} ± 0.009	0.340 ^{b} ± 0.010	0.341 ^{a} ± 0.011	0.334 ± 0.005

* Means with the same letter in the same column are not significantily different at 5% level.
For T, DL, and RH levels (see Table 1)

Mn=Mandarah Gm =Golden Montazah

Sm =Silver Montazah Mat = Matrouh

Table 3. Monthly average of temperature , day light and relative humidity and egg production rate ± S.D for different strains studied.

ITEMS	T (c°)	DL (hour)	RH (%)	MN	GM	SM	MAT
MONTHS							
Jun	34.5	14.1	14.1	0.102 ^{h} ± 0.065	0.218 ^{e} ± 0.042	0.236^{de} ±0.037	0.193 ^{f} ± 0.054
Jul	35.0	13.7	13.7	0.199 ^{g} ± 0.047	0.327 ^{c} ± 0.062	0.235 ^{de} ± 0.030	0.195 ^{f} ± 0.042
Aug	33.1	13.1	13.1	0.265 ^{ef} ± 0.120	0.253^{de} ± 0.037	0.245^{de} ± 0.094	0.253 ^{ed} ± 0.050
Sep	32.0	12.4	12.4	0.180 ^{g} ± 0.041	0.327 ^{c} ± 0.040	0.215 ^{e} ± 0.037	0.266 ^{ed} ± 0.044
Oct	28.0	11.5	11.5	0.266 ^{ef} ± 0.111	^0.284 ^{cd}± 0.063	0.376 ^{b} ± 0.086	0.276 ^{ed} ± 0.050
Nov	23.6	10.5	10.5	0.496 ^{a} ± 0.073	0.492 ^{a} ± 0.063	0.530 ^{a} ± 0.045	0.447 ^{b} ± 0.047
Dec	19.5	10.2	10.2	0.455 ^{a} ± 0.038	0.495 ^{a} ± 0.054	0.515 ^{a} ± 0.023	0.430 ^{bc} ± 0.042
Jan	17.9	10.6	10.6	0.435^{ab} ± 0.041	0.471 ^{a} ± 0.033	0.481 ^{a} ± 0.051	0.304 ^{d} ± 0.100
Feb	19.2	11.0	11.0	0.386 ^{bc} ± 0.034	0.416 ^{b} ± 0.024	0.426 ^{b} ± 0.0 47	0.548 ^{a} ± 0.034
Mar	21.4	12.0	12.0	0.356 ^{cd} ± 0.036	0.387 ^{b} ± 0.037	0.392 ^{b} ± 0.045	0.565 ^{a} ± 0.054
Apr	27.0	12.9	12.9	^0.311^{de}± 0.101	0.310 ^{c} ± 0.069	0.313 ^{c} ± 0.110	0.380 ^{c} ± 0.114
May	34.4	13.5	13.5	0.235 ^{fg} ± 0.040	0.285 ^{cd} ± 0.014	0.273 ^{cd} ± 0.065	0.246 ^{ef} ± 0.048
Overall mean				0.307 ± 0.134	0.355 ± 0.102	0.353 ± 0.126	0.342 ± 0.132

+Means with the same letter in the same column are not significantly different at 5%.

T.=Temperature DL= Day light RH =Relative humidity

Table 4. Least square means and analysis of variance for egg production rate as affected by Temperature, Day light and Relative humidity for different strains studied.

Strains	MN		GM		SM		MT	
Items	df	MS	df	MS	df	MS	df	MS
T.	4	0.1971 **	4	0.0449 **	4	0.1501 **	4	0.4024 **
DL.	4	0.1115 **	'4	0.1502**	'4	0.1071 **	'4	0.0766 **
RH.	1	0.0001	1	0.1120 **	1	0.0002	1	0.0031
T X R	4	0.0181 **	4	0.0111 *	4	0.0169 **	4	0.0167 *
ERROR	352	0.0049	352	0.0024	352	0.0029	352	0.0063

* significant at 5% ** significant at 1%l

For T , DL and RH levels (See footnote Table1) .

MN = Mandarah GM = Golden Montazah.

SM = Silver Montazah. MAT = Matrouh

Table 5. Least square means ± S.D of interactions (T x RH) effect on different studied strains.

STRAINS	MN	GM	SM	MAT
INTER.LEVELS				
T1 x RH1	0.188^{d}± 0.043	0.235^{d}± 0.041	0.290$^{d e}$± 0.067.	0.248$^{d e}$± 0.039
T1 x RH2	0.174^{d}± 0.067	0.295$^{b c}$ ± 0.074	0.247$^{e f}$ ± 0.040	0.197^{e} ± 0.053
T2 x RH1	0.236^{d}± 0.104	0.293$^{b c}$ ± 0.053	0.209^{f} ± 0.062	0.254^{de}± 0.041
T2 x RH2	0.180^{d} ± 0.075	0.275$^{c d}$± 0.051	0.244$^{e f}$± 0.042	0.229$^{d e}$± 0.061
T3 x RH1	0.247^{d}± 0.096	0.257^{b}± 0.035	0.340^{c} ± 0.076	0.270^{d}± 0.036
T3 x RH2	0.322^{c} ± 0.024	0.328^{b}± 0.102	0.395^{c} ± 0.094	0.337^{c}± 0.0294
T4 x RH1	0.477^{a} ± 0.061	0.447^{a}± 0.080	0.499^{a}± 0.079	0.448$^{a b}$± 0.021
T4 x RH2	0.401^{b}± 0.085	0.423^{a}± 0.085	0.437b^{c}± 0.083	0.491^{a}± 0.083
T5 x RH1	0.421$^{a b}$ ± 0.043	0.460^{a}± 0.045	0.484a^{b} ± 0.040	0.425^{b}± 0.135
T5 x RH2	0.389^{b} ± 0.065	0.441^{a} ± 0.041	0.423^{c}± 0.086	0.449^{ab} ± 0.172

- Means with the same letter in the same column are not significantly different at 5 % level.

For T and RH Levels (See foot note Table1).

MN = Mandarah GM = Golden Montazah.

SM=Silver Montazah MAT = Matrouh

Table 6 . Monthly correlation coeffecient between means of egg production rate and temperature, day light and relative humidity for different studied strains.

STRAINS		MN	GM	SM	MAT
MONTHS	ITEMS				
Jun.	T	-0.0856	-0.0513	0.0276	0.15370
	DL	0.9183 **	0.8095 **	-0.1550	0.7288 **
	RH	0.4200 *	0.3240 *	-0.5358	-0.0969
Jul.	T	0.08710	-0.0989	0.0856	-0.3631 *
	DL	-0.2444	-0.0213	0.1367	0.097
	RH	0.1808	-0.5533 **	0.0847	0.0221
Aug.	T	-0.7376 **	-0.3366 *	0.6767 ***	-0.1223
	DL	-0.7725 **	-0.7703 **	0.4427 *	-0.7079 **
	RH	-0.0532	-0.2022	-0.4215 *	-0.3875 *
Sep.	T	0.5192 **	0.0760	-0.3021	-0.1667
	DL	-0.3303 *	-0.0372	-0.4021 *	0.7830
	RH	0.3012	-0.2285	-0.4494 *	0.1265
Oct.	T	-0.4128 **	-0.3372 *	-0.6965 ***	-0.6419 ***
	DL	-0.3051 *	-0.1169	-0.3112 **	0.5625 **
	RH	-0.1609	-0.2671	-0.5693 **	-0.2254
Nov.	T	-0.1496	0.5123 *	-0.2416	-0.5080 **
	DL	0.4043 *	-0.7787 **	-0.6834 ***	0.4919 **
	RH	0.11266	-0.1434	0.4240 *	-0.0713
Dec.	T	0.3829 *	-0.0978	-0.3969 *	0.2769
	DL	-0.1283	0.1072	-0.0904	-0.7177 **
	RH	0.1430	-0.3+387 **	0.5059 **	-0.0014
Jan.	T	0.195	0.2784	-0.6881 **	0.6486 **
	DL	-0.3949 *	0.2207	-0.7214 **	0.7066 **
	RH	0.3998 *	-0.1845	0.2065	-0.0883
Feb.	T	-0.4197 *	-0.4351 *	-0.1718	-0.1834
	DL	0.021	-0.5543 **	-0.6591 **	-0.4888 **
	RH	0.3789 *	0.4473 *	-0.6072 **	0.1647

Oont.

Table 6, Cont.

Mar.	T	0.6845 **	0.3451 *	0.0282	-0.0282
	DL	0.146	-0.9091 **	-0.2371	-0.2371
	RH	0.148	0.2747	0.6269 **	0.6269 **
Apr.	T	-0.3159 *	-0.2431	-0.3673 *	-0.4183 *
	DL	-0.3884 *	-0.1612 **	-0.2295	-0.5449 **
	RH	0.126	-0.2064	0.0675	0.3142 *
May.	T	-0.7092 **	-0.6337 ***	-0.2182	-0.8833 **
	DL	-0.4874 **	-0.5600 **	-0.5809 **	-0.3234
	RH	0.8020 **	0.8468 ***	0.5297 **	0.8286 **
Overall mean	T	-0.7496 **	-0.7349 **	-0.7754 **	-0.7084 **
	DL	-0.7617 **	-0.7911 **	-0.8159 **	-0.5681 **
	RH	0.3395 **	0.326 **	0.3314 **	-0.0877 *
	T x RH	0.3395 **	0.3226 **	0.3314 **	0.0876 *
	T x DL	0.7309 ***	0.7086	0.7583 **	0.7137
	DLxRH	-0.3655 **	-0.3166 **	-0.3171 **	-0.1767 **
	TxDLxRH	0.7414 **	0.7283 **	0.7414 **	0.7771 **

* Significant at 5% **Significant at 1%

T = Temperature (° C) DL= Day light (hour) RH = Relative humidity (%)

MN =Mandarah Gm=Golden Montaza

SM = Silver Montazah MAT = Matrouh

Table 7. Correlation between temperature, day light, relative humidity and performance of strain within class of temperature, day light and relative humidity.

STRAINS	MN	GM	SM	MAT
T. Levels				
T-1	-0.207	-0.1716	-0.04377	-0.64908 *
T-2	-0.24024	-0.20656	0.11640	-0.33242 *
T –3	-0.15472	-0.18695	0.05796	-0.28145
T –4	0.02086	-0.03113	-0.07792	-0.00676
T –5	-0.07355	-0.10399	-0.22514	0.27554
Overall mean	-0.552 **	-0.710 **	-0.671 **	-0.619 **
DL. levels				
Dl-1	-0.102	-0.477 **	-0.567 **	0.105
Dl-2	-0.545 **	-0.158	0.537 **	-0.278 *
Dl-3	0.077	-0.568 **	-0.197	0.078
Dl-4	-0.539 **	-0.170 *	-0.314	-0.470 **
Dl-5	0.242 **	0.824 **	-0.070	0.532 **
Overall mean	-0.761 **	-0.791 **	-0.816 **	-0.569 **
Humidity levels				
RH –1	0.46338 **	0.51651 **	0.51427 **	0.14631
RH –2	0.20157	0.25635 *	0.28518 *	0.03988
Overall mean	0.259 **	0.377 **	0.369 **	0.286

* Significant at 5% **Significant at 1 %

For T , DL and RH levels. See footnote Table (1)

MN =Mandarah MN = Mandarah

SM = Silver Montazah MN = Mandarah

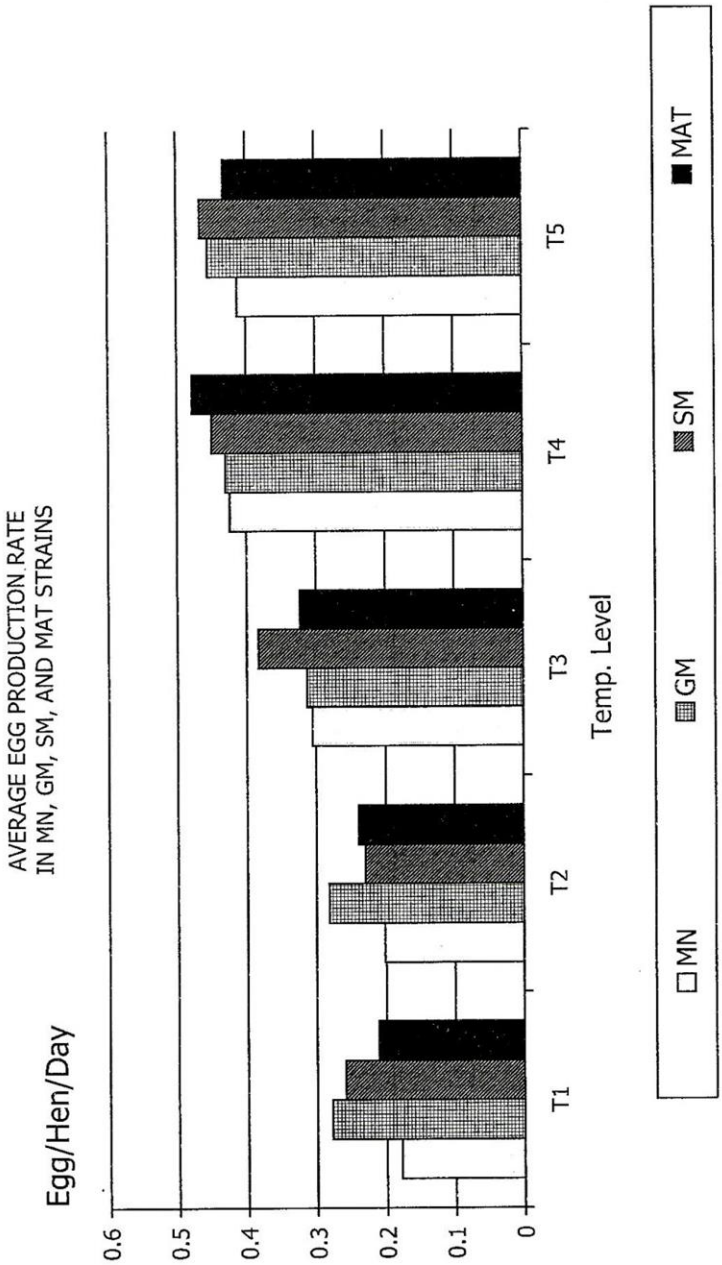
AVERAGE EGG PRODUCTION RATE
IN MN, GM, SM, AND MAT STRAINS
Egg/Hen/Day
0.6
0.5
0.4
0.3
0.2
0.1
0
T1
T2
T3
T4
T5
Temp. Level
MN
GM
SM
MAT

Fig.1

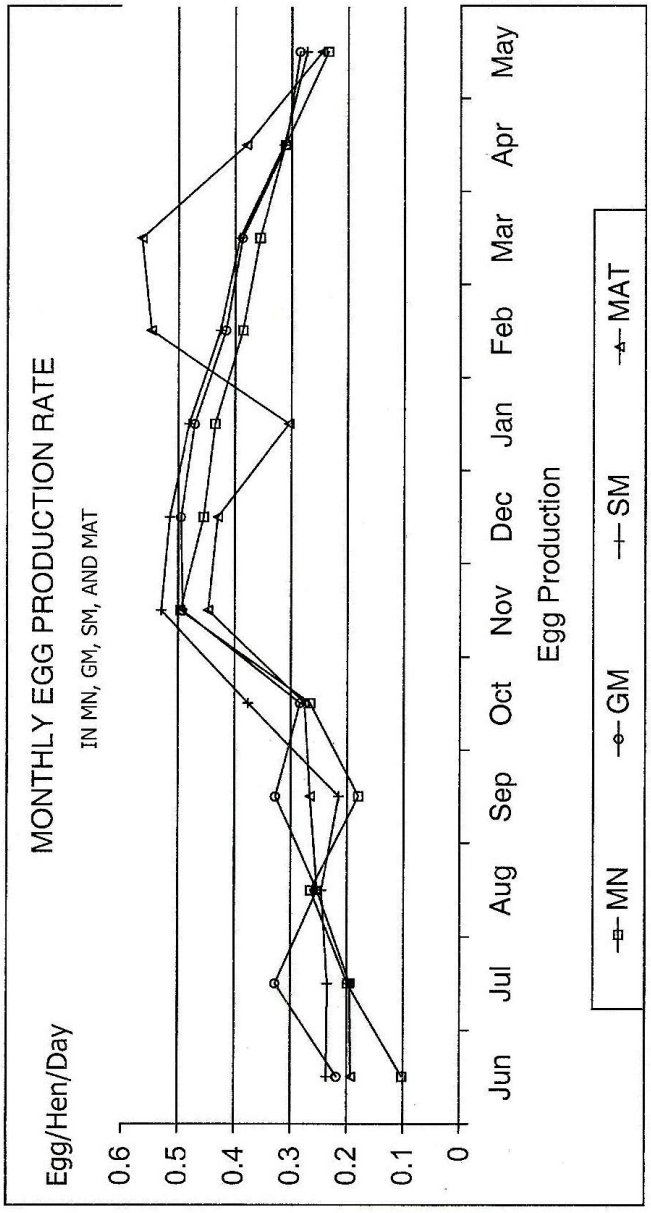
MONTHLY EGG PRODUCTION RATE
IN MN, GM, SM, AND MAT
Egg/Hen/Day
0.6
0.5
0.4
0.3
0.2
0.1
0
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Egg Production
MN
GM
SM
MAT

Fig. 2

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تأثير بعض العوامل المناخية على معدل انتاج البيض لبعض السلالات المحلية

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تمت دراسة انتاج البيض فى أربع سلالات من الدجاج المحلى هى مندرة – منتزة دهبى – منتزة فضى – مطروح وذلك لدراسة تأثير كل من درجة الحرارة وطول فترة الإضاءة اليومية (ضوء النهار) وكذلك الرطوبة النسبية على انتاج البيض.

دلت النتائج التى أمكن الوصول اليها على ان درجة الحرارة لها تأثير معنوى عكسى على انتاج البيض حيث يزيد انتاج البيض عند درجات حرارة تتراوح بين ١٥ – ١٩,٩م° وبين ٢٠ –٢٤,٩ م° عنه فى درجات حرارة اعلى من ذلك.

ومن جهة اخرى فان انتاج البيض كان أعلى عند درجة رطوبة نسبية بين ٦٥ – ٨٥ % عن الإنتاج عند درجة رطوبة ٣١ – ٦٤,٩ %.

من حيث تأثير فترة الإضاءة(ضوء النهار) فقد كانت اقل نسبة انتاج بيض عندما كان متوسط فترة الإضاءة١,٠ – ١١,٠ ساعة يوميا. فقد زاد انتاج البيض معنويا بزيادة طول فترة الإضاءة.

وكانت الإختلافات معنوية لجميع السلالات تحت الدراسة عدا سلالة مطروح.