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EVALUATION OF NORFA PRODUCTIVE PERFORMANCE AS AN EGYPTIAN SYNTHETIC STRAIN

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ABSTRACT: The present study objective was to investigate the time-lapse factor under the local scientific research environment on the productive performance of Norfa chickens as a locally synthetic strain. Data were collected manually from 62 sources of previous studies from 1987 to 2023, which were done on Norfa chickens during that period. that is about 37 years of study. This period was divided into four decades P_1 (from 1987 to 1996), P_2 (from 1997 to 2006) P_3 (from 2007 to 2016), and P_4 (from 2017 to 2023) to evaluate productive performance (age at sexual maturity (ASM), body weight at sexual maturity ($B.W_{sm}$), egg weight at sexual maturity ($E.W_{sm}$), body weight at maturity ($B.W_m$), egg weight at maturity ($E.W_m$), egg number at 90 d. of production (EN_{90}), egg numbers at 42 w.k. of age (EN_{42}), fertility percent (F%) and hatchability (H%)) for Norfa chickens during the aforementioned period. Limits of some productive traits of Norfa chickens as a synthetic strain were (ASM=141 d., $B.W_{sm}$=1330.5 gm., $B.W_m$= 1684.5 gm., $E.W_{sm}$= 41.5 gm., $E.W_m$=55.9 gm., $E.N_{42}$= 86.4 egg, $E.N_{90}$=56.3 egg, F%= 94.75 and H%=86.23).

So, it may be concluded from previous inventory that the Norfa strain has distinctive production limits that can compete against the rest of the local breeds. In addition to that, it tolerates local conditions and factors, which makes it suitable for breeding at the narrow level as well as at the commercial level.

Keywords: Norfa, chickens, local strain, productive performance.

INTRODUCTION

Norfa is a synthetic local strain that is the product of a joint research and training project between the Faculty of Agriculture, Menoufia University, Egypt, and the Department of Animal Science, Agricultural University of NORAD. Which was approved in 1978 and started in 1980 with the support of the Norwegian Agency for International Development for five years that is, after 1985 and the end of support, it depended on the support of Menoufia University, for research in the college (Kolstad and Abdou,1999) and (Abdou et.al.,2017). The main objective of the project was to combine the advantages of local chickens (good adaptation ability, special taste, flavors of its products, and high disease resistance) with higher egg production of the exotic chickens to formulate a strain with improved egg production and able to adapt to our modest production conditions presented in (Kolstad and Abdou, 1999 and Abdou et.al., 2017).

Abdou (1996) presented in detail the formation history of the Norfa chicken breed. Briefly, in 1987 one-day-old pedigreed chicks of two selected strains of single-comb White Leghorn were imported from Norway. The first strain was selected for egg number (L_2), while the second strain was selected for egg weight (L_7). In addition, pedigreed chicks from Fayoumi and White Baladi local breeds were brooded and reared together with imported chicks at the same time under the same environmental conditions. All possible conditions of crossing, random mating, and selection programs were applied to select and develop the Norfa breed of chickens.

The main aim of the recent study was to investigate the time-lapse factor under the local scientific research environment on the productive performance of Norfa chickens as a locally synthetic strain.

MATERIALS AND METHODS

The present experiment was carried out at the Poultry and Fish Production Department, Faculty of Agriculture, Menoufia University, Egypt. Data were collected manually from 62 sources of previous studies from 1987 to 2023 that were done on Norfa chickens. That was about 37 years of study. Previous studies include different M. Sc theses, Ph.D. theses, and research papers to evaluate Norfa chickens.

This period was divided into four time periods as follows:

1. The first period, P_1, includes studies published during the period from 1987 to 1996.
2. The second period, P_2, includes studies published during the period from 1997 to 2006.
3. The third period, P_3, includes studies published during the period from 2007 to 2016.
4. The fourth period, P_4 includes studies published during the period from 2017 to 2023.

Numerous studies have been done on Norfa strain since its inception and up to our time to assess the productive, physiological, performance of the strain in different stages and conditions when applying for selection programs. Forming lines and studying the impact of many environmental factors such as nutrition, lighting, ventilation ..... etc. and other factors. During this period, many phenotypic and genetic measurements were estimated. In this study, the focus

was on studies that included in the study the most important traits average of a local egg-producing strain as follows:

1. Age at sexual maturity (ASM).
2. Body weight at sexual maturity ($B.W_{sm}$).
3. Egg weight at sexual maturity ($E.W_{sm}$).
4. Body weight at maturity ($B.W_m$).
5. Egg weight at maturity ($E.W_m$)
6. Egg number at 90 d. of production (EN_{90}).
7. Egg numbers at 42 weeks of age (EN_{42}).
8. Fertility percent (F%).
9. Hatchability (H%).

All the data included in the recent study are the general average of the values of each trait in the recent study.

Statistical analysis:

Data were computerized and analyzed according to the following model by the SPSS Program (2004).

$$Y_{ij} = \mu + P_i + e_{ij}$$

Where:

Y_{ij} = the observation of the ij^{th}

μ = the common mean.

P_i = the fixed effect of the I^{th} periods.

e_{ij} = Random error component**.**

RESULTS AND DISCUSSION

When we look at both Figure (1) and Table (1) of Appendix I, it becomes clear to us that the values shown in the table are averages of age at sexual maturity (ASM.) for Norfa chickens during the period 1987 to 2023 which were collected from several previous studies during this period amounting to forty-eight it is clear from the table and the figure that the general average of ASM. of Norfa chickens was 168.56 d. of age. The lowest value of the trait recorded by (Enab, 1991) was 141 d. of age, while the highest value recorded by (El-Wardany et.al. 1992) was 192 d. of age.

Figure (2) and table (2) of Appendix I showed the averages of body weight at sexual maturity ($B.W_{sm}$) of Norfa chickens during the period 1987 to 2023 which were collected from several previous studies during this period amounting to forty-two. The average of $B.W_{sm}$ of Norfa chickens was 1100.9 gm., the lowest value of the trait added by (Seleim 2012) was 859.7 gm., while the highest value was reached by (El-Sakka, 1999) was 1330.5 gm.

Figure (3) and table (3) of Appendix (I) showed the effect of the time-lapse factor on body weight at maturity ($B.W_m$) of Norfa chickens during the period 1987 to 2023 which were collected from several previous studies during this period amounting to 37 studies showed that the average mature body weight of Norfa chickens in this study was 1279.4 gm. The lowest value of the trait was 1027.9 gm. by (El-Wardany et.al., 1992), while the highest value recorded was 1684.5 gm. as shown by (Sewalem, 2014).

Figure (4) and table (4) of Appendix I showed the effect of the time-lapse factor on egg weight at sexual maturity (EW_{sm}) of Norfa chickens during the period 1991 to 2023 that collected from several previous studies during this period amounting to 18 studies and showed that the average egg weight at sexual maturity of Norfa chickens in these studies was 37.7 gm. The lowest value of the trait was 35 g. was recorded by (El-Noomany 2015), while the highest value recorded was 41.5 gm. recorded by (Sebea, 2021 and Gebriel et.al.,2021a).

Figure (5) and Table (5) of Appendix I, showed averages of egg weight at

maturity ($E.W_m$) for Norfa chickens during the period 1991 to 2023. This was collected from several previous studies during this period amounting to twenty-eight, where the general average of E.Wm. For Norfa chickens was 47.5 gm. The lowest value of the trait recorded by (Abdou et.al. 2019) was 41.97gm., while the highest value recorded by (Enab et.al. 2023) was 55.9 gm.

Figure (6) and Table (6) of Appendix I showed the effect of the time-lapse factor on egg number at 42 wks. of age ($E.N_{42}$) of Norfa chickens during the period 1996 to 2023 Which was collected from several previous studies during this period amounting to 22 studies and showed that the average egg number at 42 weeks of age of Norfa chickens in these studies was 64.8 eggs. The lowest value of this trait was 40.7 eggs recorded by (El-Noomany, 2015), while the highest value recorded was 86.4 eggs. showed by (Heaba,2010).

Figure (7) and table (6) of Appendix I showed the effect of the time-lapse factor on egg number at the first 90 d. of production ($E.N_{90}$) of Norfa chickens during the period 1994 to 2023 that were collected from several previous studies during this period amounting to 24 studies showed that the average egg number at 90 d. of production of Norfa chickens in this study was 43.9 eggs. The lowest value of the trait was 33.7 eggs by (El-Noomany, 2015), while the highest value recorded was 56.3 as shown by (El-Salamony,1996).

Figure (8) and Table (7) of Appendix (I) showed the effect of the time-lapse factor on the fertility of Norfa chickens during the period 1996 to 2022 data were collected from several previous studies during this period amounting to nine studies. It was clear that the average fertility percent of Norfa chickens in these studies was 87.01% of all hatched eggs. The lowest value of the trait was 79.01% (Abou-Elewa et.al. 2017) while the highest value recorded was 94.8 % showed by (Al-Shoquiry,1999).

Figure (9) and table (7) of Appendix (I) showed the effect of the time-lapse factor on the hatchability of Norfa chickens during the period 1996 to 2022 which was collected from several previous studies during this period amounting to ten studies. It showed the average hatchability percent of Norfa chickens in these studies was 78.4% of all hatched eggs. The lowest value of the trait was 64.3% (Abou-Elewa et.al., 2017), while the highest value recorded was 94.8 % as shown by (Abd El-Rahman, 2006).

All averages of all traits in the recent study shown in Figures (1,2,3,4,5,6,7,8 and 9) and Appendix I in range averages or lightly increase in some production traits compared with indigenous chickens in several studies in the same time interval (Al-Rawi,1980; Abou El-Ella, 1982; Bakir et.al.,1988; Shebl,1991; El-Hossari and Dorgham,1992; Kosba et.al., 2002; Kosba et.al. 2008; Balat et. al.,2008; El- Afifi et.al. 2008; ……)

We find that it has a good degree of stability despite the local and global environmental, economic, and political challenges. This strain has passed many of it during the past thirty-seven years of the emergence of infectious diseases such as avian influenza, which caused many deaths in poultry flocks worldwide COVID-19 virus and its impact on the movement of exports and imports and

transfers between countries. Endless changes especially in the last decade economic changes, the rise in the price of the dollar and its impact on raw materials needed for the poultry industry, Modest local scientific research conditions and many exciting challenges. Despite all this, the strain is present and has a great degree of stability.

Looking at the minimum and maximum of studied traits for Norfa chickens in Table (1), it becomes clear to us the limits of this strain as a local strain were (ASM=141 d., $B.W_{sm}$=1330.5gm., $B.W_m$= 1684.5 gm., $E.W_{sm}$= 41.5 gm., $E.W_m$= 55.9 gm., $E.N_{42}$ = 86.4 egg, $E.N_{90}$ = 56.3, F% = 94.75 and H% = 86.23).

We find from this inventory that the Norfa strain has distinctive production limits, in addition to that, it tolerates local conditions and factors, which makes it suitable for breeding at the narrow level.

Table (2) illustrates the effect of different divided decades (P_1, P_2, P_3, and P_4) on (ASM, BW_{sm}, $B.W_m$, $E.W_{sm}$). Means of age of sexual maturity (ASM) at different decades P_1, P_2, P_3, and P_4 were 169.67, 167.81, 165.79, and 172.19, respectively. The fourth decade has the highest value (172.19 d.) whereas the lowest value of age at sexual maturity in the third decade (165.79 d.). Differences between decades were not significant differences. Means of body weight at sexual maturity ($B.W_{sm}$) in different decades (P_1, P_2, P_3, and P_4) were 1206.46, 1228.87, 1053.67, and 1028.99 gm., respectively. The second decade has the highest value (1228.87gm.), whereas the lowest value of body weight at sexual maturity in the fourth decade (1028.99 gm.).

Means of mature body weight ($B.W_m$) in different decades (P_1, P_2, P_3, and P_4) were 1219.56, 1501.24, 1482.83, and 1206.20 gm., respectively. The second decade has the highest value (1501.24 gm.), whereas the lowest value of body weight at maturity in the fourth decade (1206.20 gm.). there are highly significant differences between the four decades of ($B.W_{.sm}$) and significant differences between the four decades at ($B.W_m$).

Means of egg weight at sexual maturity ($E.W_{sm}$) in different decades (P_1, P_2, P_3, and P_4) were 36.77, 37.57, 36.91, and 38.78 gm., respectively. The Fourth (P_4) decade has the highest value (38.78 gm.) whereas the lowest value of body weight at maturity in the first (P_1) decade (36.77 gm.). Differences between decades had no significant differences in ($E.W_{sm}$).

It is noted that the percent of change in four traits (ASM, BW_{sm}, $B.w_{.m}$, $E.W_{Sm}$) over the four decades was (1.49,-14.71,-1.09548, and 5.466), respectively. The trend of change % was decreasing for body weight. Mature body weight ($B.W_m$) and body weight at sexual maturity ($B.W_{sm}$) where body weight at sexual maturity was decreasing. The trend of change was increasing for both age at sexual maturity as well as the weight of eggs at sexual maturity and the weight of eggs at sexual maturity had the largest share of the increase.

Table (3) illustrates the effect of different divided decades (P_1, P_2, P_3, and P_4) on ($E.W_m$, $E.N_{42}$, $E.N_{90}$, Fertility, and hatchability) of Norfa chickens. Means of egg weight at maturity ($E.W_m$) at different decades P_1, P_2, P_3, and P_4 were 47.2, 47.7, 45.6, and 49.2 gm., respectively. The fourth decade had the highest weight (49.2 gm.), whereas the lowest weight at sexual maturity age in the third decade (45.6 gm.). Differences

between decades were not significantly different for ($E.W_m$). Means of egg number at 42 weeks. of age ($E.N_{42}$) in different decades (P_1, P_2, P_3, and P_4) were 78.2, 66.5, 62.6, and 63.4 eggs., respectively. The first decade had the highest number (78.2 eggs), whereas the lowest number of eggs at 32 weeks of age in the third decade (62.6 eggs.) Differences between decades were not significantly different at ($E.N_{42}$). This means that egg numbers at 90 d. of production ($E.N_{90}$) in different decades (P_1, P_2, P_3, and P_4) were 47.4, 45.7, 41.3, and 43.8 eggs, respectively. The first decade had the highest number (47.24), whereas the lowest number of eggs at 90 d. of production in the third decade (41.3 eggs). Differences between decades were significantly different at (EN_{90}). Means of fertility (F%) at different decades P_1, P_2, P_3, and P_4 were 81.7, 94.5, 93.5, and 84.0%. The second decade had the highest fertility (94.5%), whereas the lowest fertility % in the third decade (81.7%.). Differences between decades were significantly different for (F%).

Means of hatchability (H%) at different decades P_1, P_2, P_3, and P_4 were 78.4, 82.1, 82.4 and 76.4 %, respectively. The third decade had the highest hatchability percentage (82.1%), whereas the lowest hatchability % in the first decade (78.4%.). Differences between decades were significantly different for (H%).

Also, Table (3) shows the percent of changes in five traits ($E.W_m$, $E.N_{42}$, $E.N_{90}$, Fertility, and hatchability) over the four decades that was (4.34, -18.874, -7.30, 2.87 and -2.59), respectively. The trend of changes % was decreasing for $E.N_{42}$, $E.N_{90,}$ and hatchability, respectively. Egg number at 42 weeks of age was decreasing, while the trend of change was increasing for both mature egg weight as well as the fertility percentage, where mature egg weight had the largest increase.

We can summarize the most important results as follows:

1. The fourth decade had the highest age at sexual maturity (172.19 d.), whereas the lowest age in the third decade (165.8 d.). Differences between decades were not significant.
2. The second decade had the highest body weight at sexual maturity (1228.9 gm.), while the lowest weight was in the fourth decade (1028.99 gm.). There were highly significant differences between the four decades for (B. Wsm).
3. The second decade had the highest body weight at maturity (1501.24 gm.), while the lowest weight in the fourth decade (1206.2 gm.). Significant differences were noticed between the four decades for (B. Wm).
4. The fourth (P_4) decade had the highest body weight at maturity (38.78 gm.), whereas the lowest weight in the first (P_1) decade (36.77 gm.). Differences between decades were not significant for ($E.W_{sm)}$.
5. The fourth decade had the highest mature egg weight (49.2 gm.), whereas the lowest weight in the third decade (45.6 gm.). Differences between decades were not significantly different for ($E.W_m$).
6. The first decade had the highest egg number at 42 weeks. (78.2 eggs), whereas the lowest value at the third decade (62.6 eggs). Differences between decades were not significantly different for ($E.N_{42}$).

7. The first decade had the highest number (47.2 eggs), whereas the lowest egg number at 90 d. of production was noticed in the third decade (41.3 eggs). Differences between decades were significantly different for (EN_{90}).
8. The second decade had the highest fertility percentage (94.5%), whereas the lowest percentage was in the third decade (81.7%.). Differences between decades were significantly different for (F%).
9. The third decade had the highest hatchability percent (82.1%), whereas the lowest percentage was in the first decade (78.4%.). Differences between decades were significantly different for (H%).

Acknowledgment:
It is worth noting that I mention my sincere thanks and gratitude to Professor Dr. Farouk Hassan Abdou, the main founder of Norfa strain. My thanks go to his excellency for the support he provided me. I also extend my sincere thanks to the late Professor Dr. Ahmed A. Enab, may God have mercy on him, and Professor Dr. Abd El-Monem A. El Fiky, Because of the efforts they have made over the years to establish and continue Norfa strain until now.

Table (1): Total averages, minimum, and maximum of some economic traits (ASM, $B.W_{sm}$, $B.W_m$, $E.W_{sm}$, $E.W_m$, $E.N_{42}$, $E.N_{90}$, F %, and H%) through the period from 1987 to 2023 of Norfa chickens

Trait	ASM	$B.W_{sm}$	$B.W_m$	$E.W_{sm}$	$E.W_m$	$E.N_{42}$	$E.N_{90}$	F%	H%
Average	168.59	1100.893	1279.36	37.721	47.49	64.82	43.92	87.006	78.38
Min.	141	859.67	1027.93	35	41.97	40.74	33.67	79.4275	64.31
Max.`	192	1330.5	1684.5	41.52	55.88	86.4	56.33	94.75	86.23

Table (2): Effect of different periods (P_1, P_2, P_3, and P_4) on studied traits (ASM, BW_{sm}, $B.w_m$, $E.W_{Sm}$) in Norfa chickens.

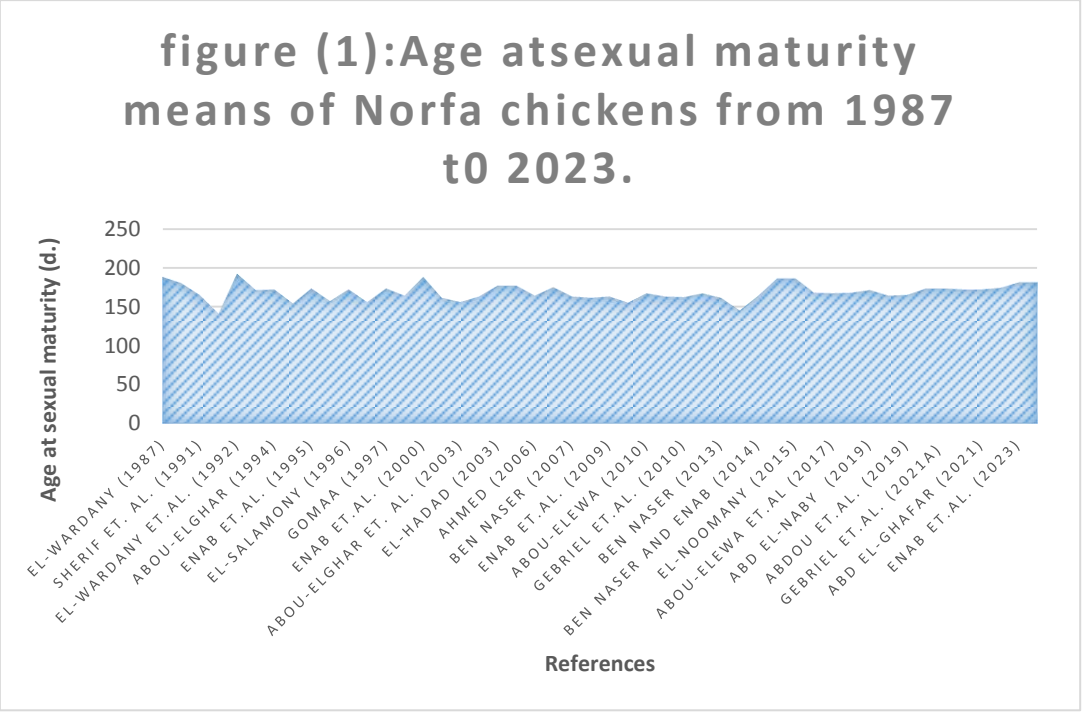
Traits	A.S.M	$B.w_{sm}$	$B.w_m$	$E.W_{Sm}$
Mean±S.E.				
P_1(from 1987 to 1996)	169.67±4.50	1206.46±81.36^a	1219.56±36.82^b	36.77±0.45
P_2 (from 1997 to 2006)	167.81±3.26	1228.87±27.65^a	1501.24±97.82^a	37.57±0.64
P_3 (from2007 to 2016)	165.79±2.75	1053.67±31.83^b	1482.83±76.07^a	36.91±0.50
P_4 (from 2016 to 2023)	172.19±1.51	1028.99±15.59^b	1206.20±27.70^b	38.78±0.78
Change % $=\left(\frac{p_4-p_1}{p_1}\right)x100$	1.49	-14.71	-1.09548	5.466413
Variance analysis				
mean square	105.26	113683.15	263013.16	4.87
F value	0.93	4.79	3.65	2.01
Significant	0.432	0.006	0.020	0.155
Probability	N.S.	**	*	N.S.

** significant differences at P≤ 0.01, * significant differences at P≤ 0.05, N.S. non-significant

Table (3): Effect of different periods (P_1, P_2, P_3, and P_4) on studied traits ($E.W_m$, $E.N_{42}$, $E.N_{90}$, Fertility, and hatchability) for Norfa chickens.

Traits	$E.W_m$	$E.N_{42}$	$E.N_{90}$	F%	H%
Mean ± S.E.					
P_1(from 1987 to 1996)	47.19±1.53	78.15±0.00	47.24±9.09^a	81.65±0.00^b	78.44±0.00^b
P_2 (from 1997 to 2006)	47.70±0.85	66.53±4.97	45.73±1.73^a	94.47±0.00^a	82.13±0.00^a
P_3 (from2007 to 2016)	45.58±0.62	62.56±4.47	41.34±2.06^c	93.46±1.30^a	82.40±3.84^a
P_4 (from 2016 to 2023)	49.24±1.18	63.40±2.32	43.79±0.63^b	84.00±1.16^b	76.41±2.70^b
Change % $=\left(\frac{p_4-p_1}{p_1}\right)x100$	4.344141	-18.874	-7.30313	2.878138	-2.58797
analysis Variance					
mean square	21.43	82.62	30.59	70.87	23.21
F value	2.09	0.79	1.29	11.74	0.56
Significant	0.127	0.517	0.030	0.011	0.017
Probability	N.S.	N.S.	*	*	*

** significant differences at P≤ 0.01, * significant differences at P≤ 0.05, N.S. non-significant.



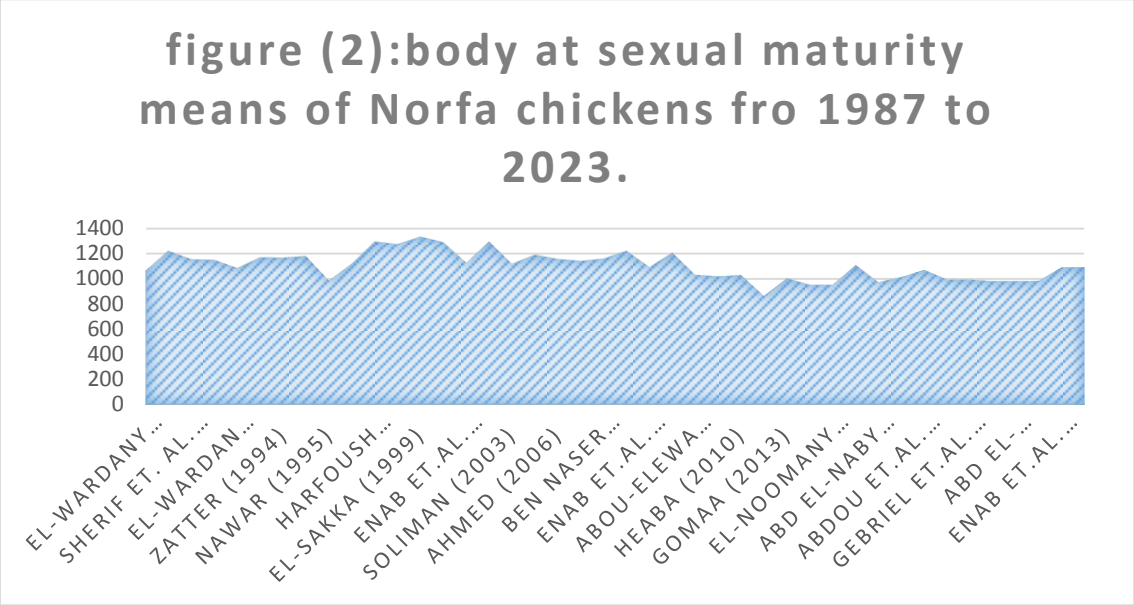


figure (2):body at sexual maturity means of Norfa chickens fro 1987 to 2023.
1400
1200
1000
800
600
400
200
0
EL-WARDANY...
SHERIF ET. AL....
EL-WARDAN...
ZATTER (1994)
NAWAR (1995)
HARFOUSH...
EL-SAKKA (1999)
ENAB ET.AL....
SOLIMAN (2003)
AHMED (2006)
BEN NASER...
ENAB ET.AL....
ABOU-ELEWA...
HEABA (2010)
GOMAA (2013)
EL-NOOMANY...
ABD EL-NABY...
ABDOU ET.AL....
GEBRIEL ET.AL....
ABD EL-...
ENAB ET.AL....

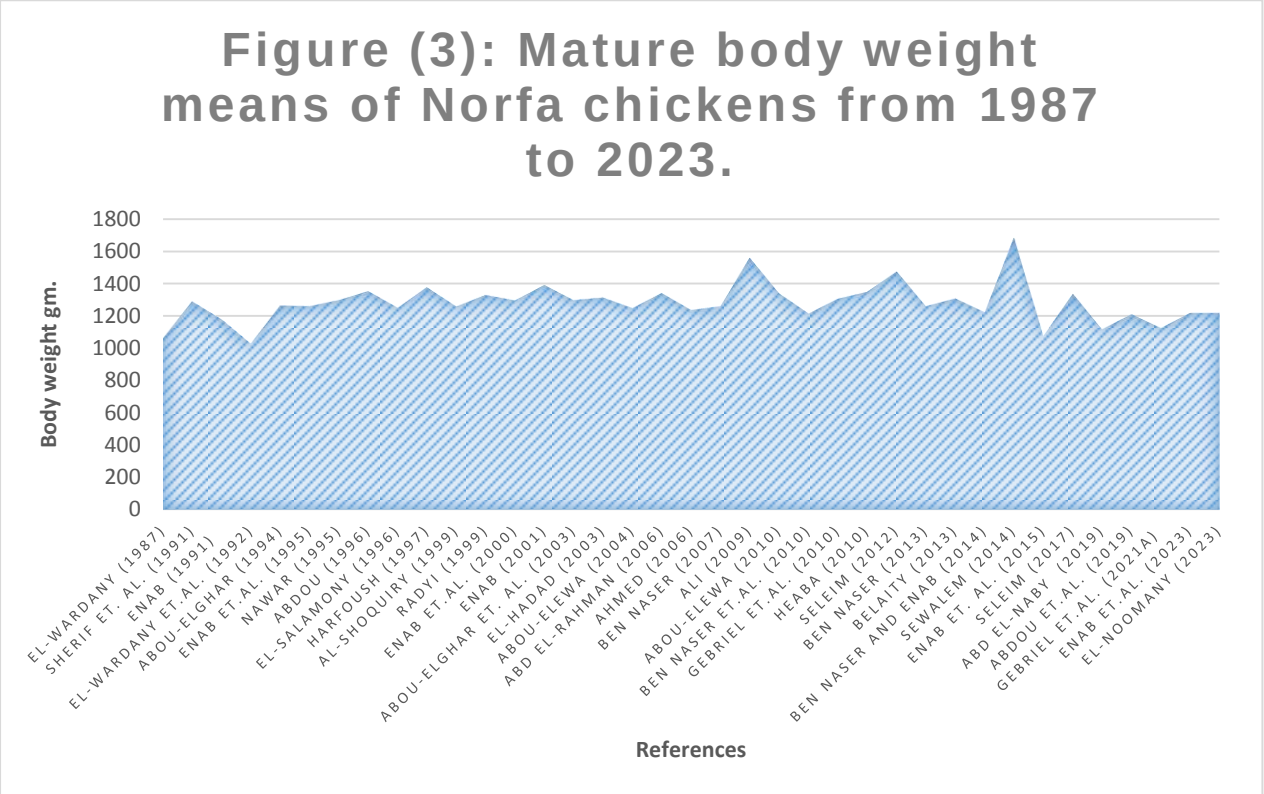


Figure (3): Mature body weight means of Norfa chickens from 1987 to 2023.
Body weight gm.
1800
1600
1400
1200
1000
800
600
400
200
0
EL-WARDANY (1987)
SHERIF ET. AL. (1991)
ENAB (1991)
EL-WARDANY ET. AL. (1992)
ABOU-ELGHAR (1994)
ENAB ET. AL. (1995)
NAWAR (1995)
ABDOU (1996)
EL-SALAMONY (1996)
HARFOUSH (1997)
AL-SHOQUIRY (1997)
RADYI (1999)
ENAB ET. AL. (2000)
ENAB (2001)
ABOU-ELGHAR ET. AL. (2003)
EL-HADAD (2003)
ABOU-ELEWA (2004)
ABD EL-RAHMAN (2004)
AHMED (2006)
BEN NASER (2007)
ALI (2009)
ABOU-ELEWA (2010)
BEN NASER ET.AL. (2010)
GEBRIEL ET. AL. (2010)
HEABA (2010)
SELEIM (2012)
BEN NASER (2013)
BELAITY (2013)
BEN NASER AND ENAB (2014)
SEWALEM (2014)
ENAB ET. AL. (2015)
SELEIM (2017)
ABD EL-NABY (2019)
ABDOU ET. AL. (2019)
GEBRIEL ET. AL. (2019)
ENAB ET. AL. (2021A)
EL-NOOMANY (2023)
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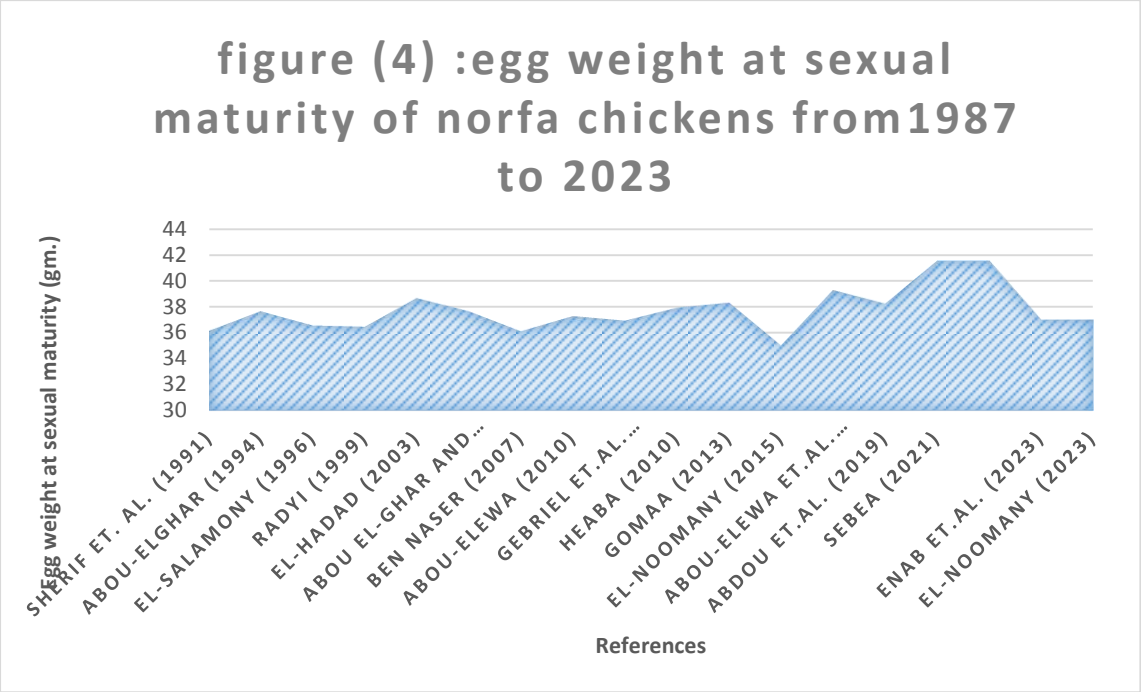
figure (4) :egg weight at sexual maturity of norfa chickens from1987 to 2023
Egg weight at sexual maturity (gm.)
44
42
40
38
36
34
32
30
SHERIF ET. AL. (1991)
ABOU-ELGHAR (1994)
EL-SALAMONY (1996)
RADYI (1999)
EL-HADAD (2003)
ABOU EL-GHAR AND...
BEN NASER (2007)
ABOU-ELEWA (2010)
GEBRIEL ET.AL....
HEABA (2010)
GOMAA (2013)
EL-NOOMANY (2015)
ABOU-ELEWA ET.AL....
ABDOU ET.AL. (2019)
SEBEA (2021)
ENAB ET.AL. (2023)
EL-NOOMANY (2023)
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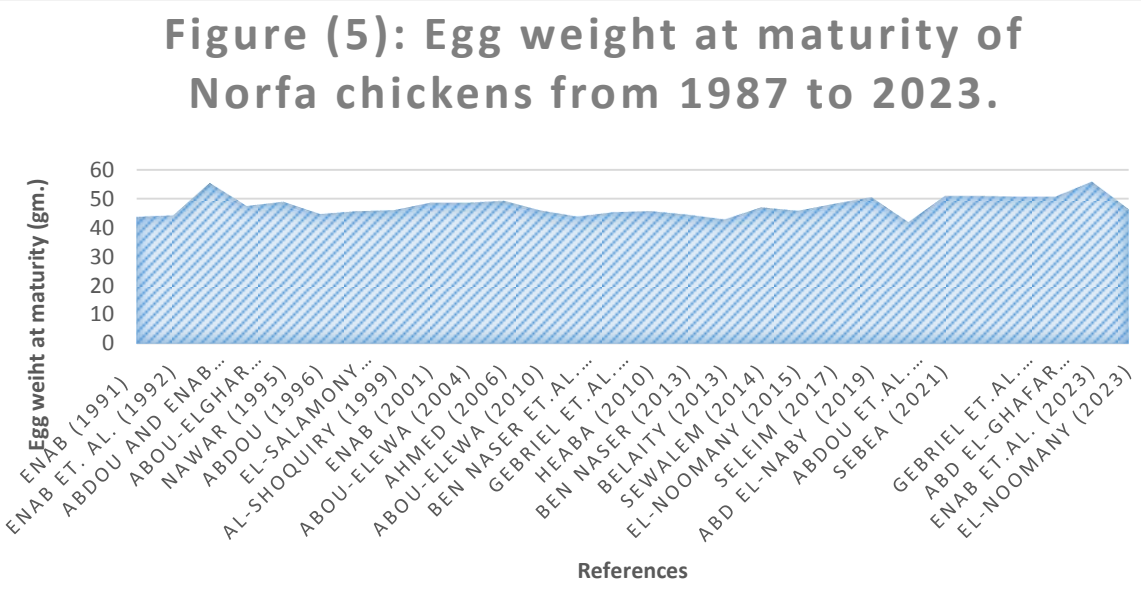
Figure (5): Egg weight at maturity of Norfa chickens from 1987 to 2023.
Egg weiht at maturity (gm.)
60
50
40
30
20
10
0
ENAB (1991)
ENAB ET. AL. (1992)
ABDOU AND ENAB...
ABOU-ELGHAR...
NAWAR (1995)
ABDOU (1996)
EL-SALAMONY...
AL-SHOQUIRY (1999)
ENAB (2001)
ABOU-ELEWA (2004)
AHMED (2006)
ABOU-ELEWA (2010)
BEN NASER ET.AL....
GEBRIEL ET.AL....
HEABA (2010)
BEN NASER (2013)
BELAITY (2013)
SEWALEM (2014)
EL-NOOMANY (2015)
SELEIM (2017)
ABD EL-NABY (2019)
ABDOU ET.AL....
SEBEA (2021)
GEBRIEL ET.AL....
ABD EL-GHAFAR...
ENAB ET.AL. (2023)
EL-NOOMANY (2023)
References

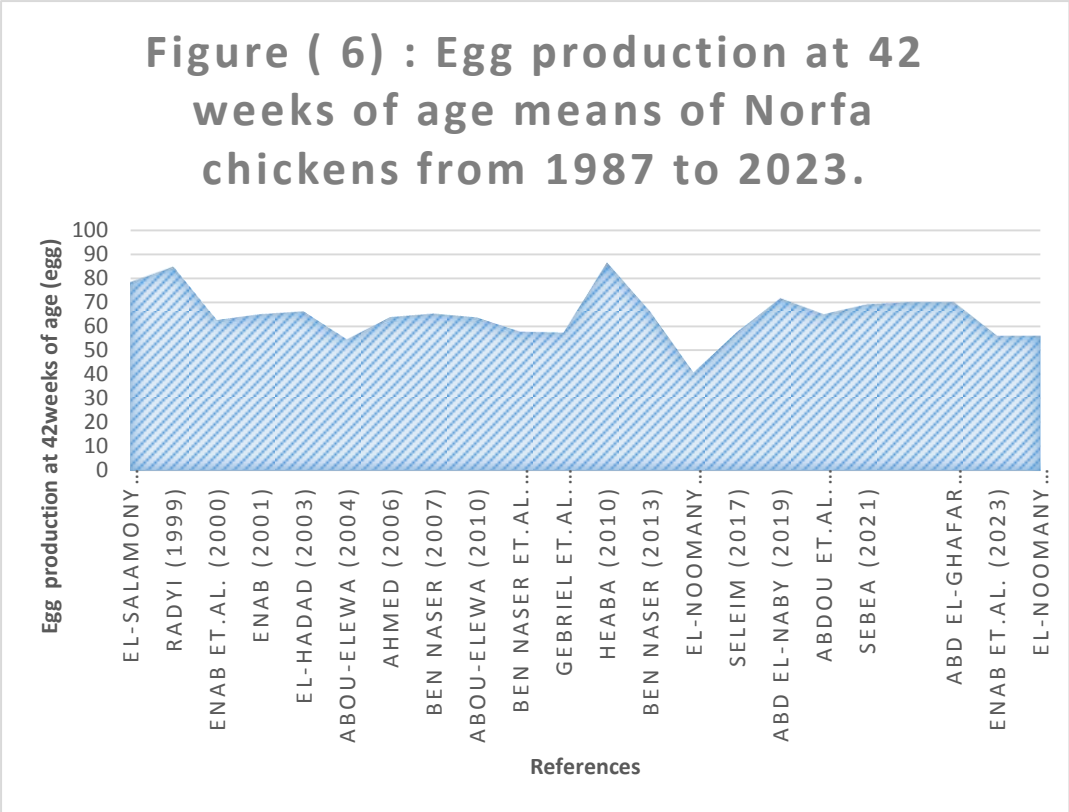
Figure (6) : Egg production at 42 weeks of age means of Norfa chickens from 1987 to 2023.
Egg production at 42weeks of age (egg)
100
90
80
70
60
50
40
30
20
10
0
EL-SALAMONY ...
RADYI (1999)
ENAB ET.AL. (2000)
ENAB (2001)
EL-HADAD (2003)
ABOU-ELEWA (2004)
AHMED (2006)
BEN NASER (2007)
ABOU-ELEWA (2010)
BEN NASER ET.AL. ...
GEBRIEL ET.AL. ...
HEABA (2010)
BEN NASER (2013)
EL-NOOMANY ...
SELEIM (2017)
ABD EL-NABY (2019)
ABDOU ET.AL. ...
SEBEA (2021)
ABD EL-GHAFAR ...
ENAB ET.AL. (2023)
EL-NOOMANY ...
References

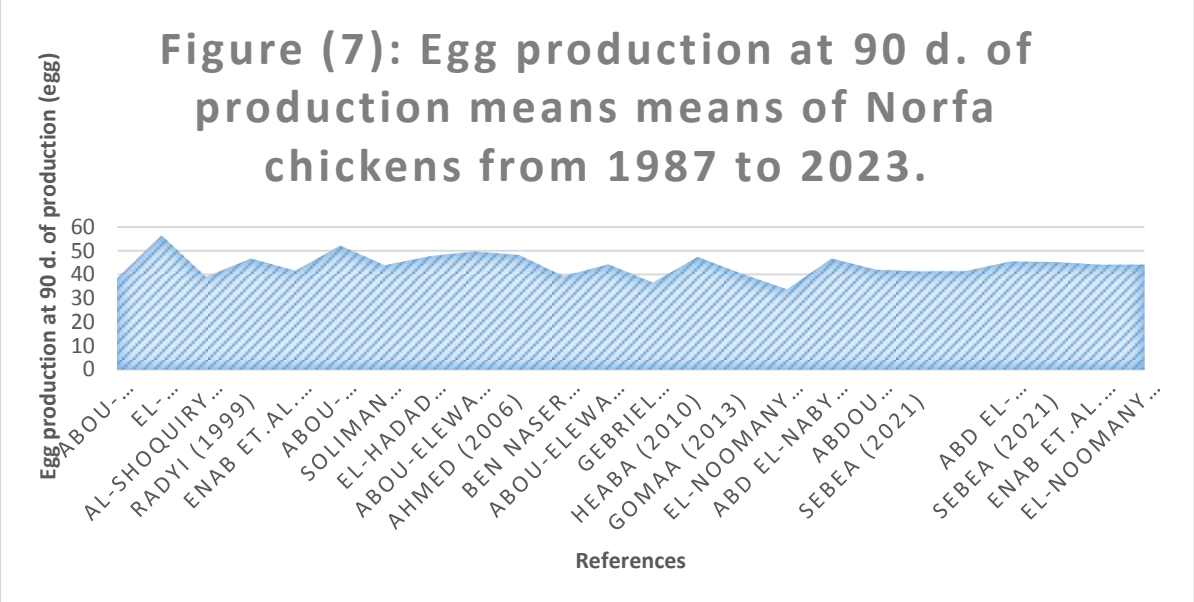
Figure (7): Egg production at 90 d. of production means means of Norfa chickens from 1987 to 2023.
Egg production at 90 d. of production (egg)
60
50
40
30
20
10
0
ABOU-...
EL-...
AL-SHOQUIRY...
RADYI (1999)
ENAB ET.AL....
ABOU-...
SOLIMAN...
EL-HADAD...
ABOU-ELEWA...
AHMED (2006)
BEN NASER...
ABOU-ELEWA...
GEBRIEL...
HEABA (2010)
GOMAA (2013)
EL-NOOMANY...
ABD EL-NABY...
ABDOU...
SEBEA (2021)
ABD EL-...
SEBEA (2021)
ENAB ET.AL....
EL-NOOMANY...
References

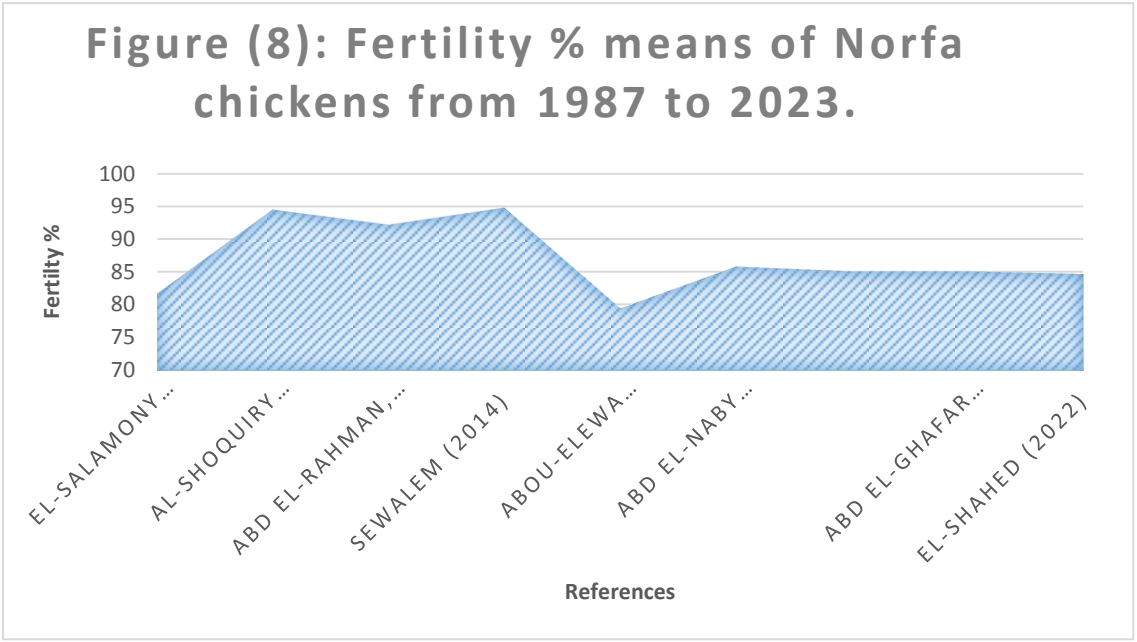
Figure (8): Fertility % means of Norfa chickens from 1987 to 2023.
Fertility %
100
95
90
85
80
75
70
EL-SALAMONY...
AL-SHOQUIRY...
ABD EL-RAHMAN,...
SEWALEM (2014)
ABOU-ELEWA...
ABD EL-NABY...
ABD EL-GHAFAR...
EL-SHAHED (2022)
References

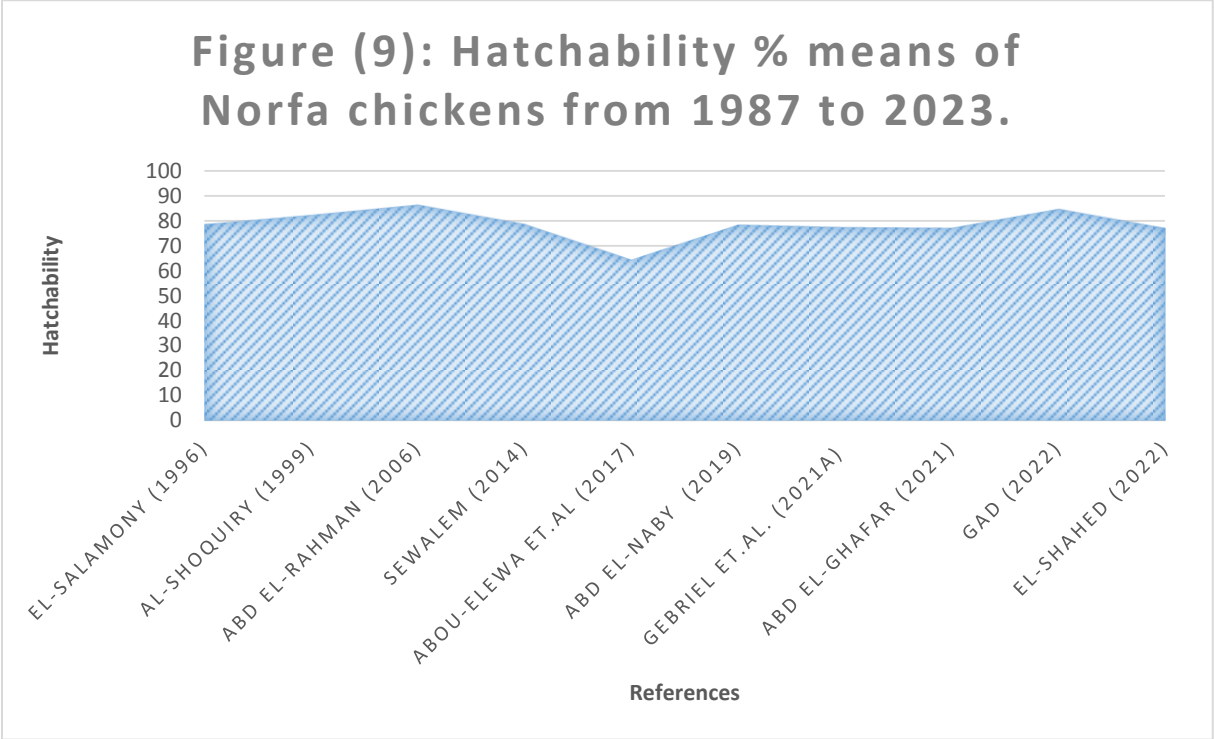
Figure (9): Hatchability % means of Norfa chickens from 1987 to 2023.
Hatchability
100
90
80
70
60
50
40
30
20
10
0
EL-SALAMONY (1996)
AL-SHOQUIRY (1999)
ABD EL-RAHMAN (2006)
SEWALEM (2014)
ABOU-ELEWA ET.AL (2017)
ABD EL-NABY (2019)
GEBRIEL ET.AL. (2021A)
ABD EL-GHAFAR (2021)
GAD (2022)
EL-SHAHED (2022)
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تقييم الأداء الإنتاجى للنورفا كسلالة مصرية مستنبطة

إيمان متولى أبو عليوة

كان الهدف من الدراسة الحالية هو دراسة عامل الوقت على الأداء الإنتاجي لدجاج نورفا في ظل بيئة البحث العلمي المحلية باعتبارها سلالة تركيبية محلية. تم جمع البيانات يدويا من 62 مصدرا للدراسات السابقة خلال الفترة من عام 1987 إلى عام 2023 والتي أجريت على دجاج نورفا خلال تلك الفترة. أي حوالي 37 سنة من الدراسة. تم تقسيم هذه الفترة إلى أربعة عقود. (P1من 1987 إلى 1996)، (P2من 1997 إلى 2006) ، P3(من 2007 إلى 2016) ، و P4(من 2017 إلى 2023) لتقييم الأداء الإنتاجي (العمر عند النضج الجنسي (ASM)، وزن الجسم عند النضج الجنسي (B.Wsm)، وزن البيضة عند النضج الجنسي (E.Wsm)، وزن الجسم عند النضج (B.Wm)، وزن البيضة عند النضج (E.Wm) عدد البيض عند 90 يوم من الانتاج (EN90)، عدد البيض عند عمر 42 أسبوع (EN42)، نسبة الخصوبة (F%) ونسبة الفقس (H%) لدجاج نورفا خلال الفترة المذكورة.

وكان حدود هذه الصفات الإنتاجية لدجاج النورفا كسلالة تركيبية هي:

(ASM=141 d., B.Wsm=1330.5 gm., B.Wm= 1684.5 gm., E.Wsm= 41.5 gm., E.Wm=55.9 gm., E.N42= 86.4 egg, E.N90=56.3 egg, F%= 94.75 and H%=86.23).

لذا يمكن أن نستنتج من هذه الحصر الزمني أن سلالة النورفا لها حدود إنتاجية يمكن مقارنها مع بقية السلالات المحلية. إضافة إلى ذلك فهي تتحمل الظروف والعوامل المحلية مما يجعلها مناسبةً للتربية على المستوى الضيق وكذلك علي المستوي التجاري.

APPENDIX I

Table (1): Effect of the time-lapse factor under the local scientific research environment on the age of sexual maturity (d.) of Norfa chickens.

Year	References	Age at sexual maturity (d.)	Year	References	Age at sexual maturity (d.)
1987	El-Wardany (1987)	188	2010	Elweshahy (2010)	155
1991	Sheble et. al. (1991)	180	2010	Abou-Elewa (2010)	167
1991	Sherif et. al. (1991)	165	2010	Ben Naser et. al. (2010)	163
1991	Enab (1991)	141	2010	Gebriel et.al. (2010)	162
1992	El-Wardany et.al. (1992)	192	2010	Heaba (2010)	167
1994	Abdou and Enab (1994)	171	2013	Ben Naser (2013)	161
1994	Abou-ElGhar (1994)	172	2013	Gomaa (2013)	145
1994	Zatter (1994)	154	2014	Ben Naser and Enab (2014)	164
1995	Enab et.al. (1995)	173	2014	Sewalem (2014)	186
1996	Abdou (1996)	157	2015	El-Noomany (2015)	186
1996	El-Salamony (1996)	172	2016	Abdou et.al. (2017)	168
1997	Harfoush (1997)	156	2017	Abou-Elewa et.al (2017)	167
1997	Gomaa (1997)	173	2017	Seleim (2017)	168
1999	Radyi (1999)	164	2017	Abd El-Naby (2019)	171
2000	Enab et.al. (2000)	188	2019	Abou-Sada (2019)	164
2001	Enab (2001)	161	2019	Abdou et.al. (2019)	165
2002	Abou-ElGhar et. al. (2003	156	2019	Sebea (2021)	173
2003	Soliman (2003)	163	2021	Gebriel et.al. (2021a)	173
2003	El-Hadad (2003)	177	2021	Gebriel et.al. (2021b)	172
2004	Abou-Elewa (2004)	177	2021	Abd El-Ghafar (2021)	172
2005	Ahmed (2006)	164	2021	El-Shahed (2022)	174
2006	Abou-Sada (2007)	175	2022	Enab et.al. (2023)	181
2007	Ben Naser (2007)	163	2023	El-Noomany (2023)	181
2008	Kosba et.al. (2008)	161	2023		
2009	Enab et.al. (2009)	163			
Average					168.5625
Min.					141
Max.					192

Table (2): Effect of the time-lapse factor under the local scientific research environment on body weight at sexual maturity (B.Wsm) of Norfa chickens.

Year	References	B.w.sm (gm.)	Year	References	B.w.sm (gm.)
1987	El-Wardany (1987)	1060.67	2010	Elweshahy (2010)	1202.63
1991	Sheble et. al. (1991)	1219.50	2010	Abou-Elewa (2010)	1030.43
1991	Sherif et. al. (1991)	1152.00	2010	Gebriel et.al. (2010)	1016.75
1991	Enab (1991)	1146.25	2010	Heaba (2010)	1026.50
1992	El-Wardan yet.al. (1992)	1082.13	2012	Seleim (2012)	859.67
1994	Abou-ElGhar (1994)	1168.00	2013	Gomaa (2013)	1002.10
1994	Zatter (1994)	1166.00	2014	Sewalem (2014)	949.48
1995	Enab et.al. (1995)	1178.93	2015	El-Noomany (2015)	949.45
1995	Nawar (1995)	984.00	2017	Abou-Elewa et.al (2017)	1105.25
1996	El-Salamony (1996)	1117.64	2019	Abd-El-Naby (2019)	971.07
1997	Harfoush (1997)	1292.85	2019	Abou-Sada (2019)	1012.70
1998	Abdou et.al. (1998)	1271.50	2019	Abdou et.al. (2019)	1068.88
1999	El-Sakka (1999)	1330.50	2021	Sebea (2021)	990.67
1999	Radyi (1999)	1288.67	2021	Gebriel et.al. (2021a)	990.67
2000	Enab et.al. (2000)	1123.25	2021	Gebriel et.al. (2021b)	979.30
2002	Abou-ElGhar et. al. (2003)	1293.75	2021	Abd El-Ghafar (2021)	979.29
2003	Soliman (2003)	1116.30	2022	El-Shahed (2022)	981.86
2004	Abou-Elewa (2004)	1188.90	2023	Enab et.al. (2023)	1089.41
2005	Ahmed (2006)	1154.10	2023	El-Noomany (2023)	1089.41
2006	Abou-Sada (2007)	1140.40			
2007	Ben Naser (2007)	1156.65			
2008	Kosba et.al. (2008)	1219.00			
2009	Enab et.al. (2009)	1091.00			
Average					1100.893
Min.					859.67
Max.					1330.5

Table (3): Effect of the time-lapse factor under the local scientific research environment on body weight at maturity (B.Wm.) of Norfa chickens.

Year	**References**	**B.w.m (gm.)**	**Yea r**	**References**	**B.w.m (gm.)**
1987	El-Wardany (1987)	1057.75	2007	Ben Naser (2007)	1258.90
1991	Sherif *et. al.* (1991)	1289.25	2009	Ali (2009)	1560.00
1991	Enab (1991)	1178.37	2010	Abou-Elewa (2010)	1339.00
1992	El-Wardany et.al. (1992)	1027.93	2010	Ben Naser et.al. (2010)	1213.57
1994	Abou-ElGhar (1994)	1264.50	2010	Gebriel et.al. (2010)	1305.84
1995	Enab et.al. (1995)	1258.90	2010	Heaba (2010)	1349.50
1995	Nawar (1995)	1297.50	2012	Seleim (2012)	1474.33
1996	Abdou (1996)	1352.20	2013	Ben Naser (2013)	1260.00
1996	El-Salamony (1996)	1249.61	2013	Belaity (2013)	1308.00
1997	Harfoush (1997)	1376.85	2014	Ben Naser and Enab (2014)	1222.20
1999	Al-shoquiry (1999)	1257.00	2014	Sewalem (2014)	1684.50
1999	Radyi (1999)	1329.13	2015	Enab et. al. (2015)	1075.70
2000	Enab et.al. (2000)	1296.00	2017	Seleim (2017)	1336.67
2001	Enab (2001)	1390.03	2019	Abd El-naby (2019)	1116.18
2002	Abou-ElGhar et. al. (2003)	1298.25	2019	Abdou et.al. (2019)	1209.49
2003	El-Hadad (2003)	1313.05	2021	Gebriel et.al. (2021a)	1124.82
2004	Abou-Elewa (2004)	1247.30	2023	Enab et.al. (2023)	1218.75
2006	Abd El-Rahman (2006)	1341	2023	El-Noomany (2023)	1218.75
2006	Ahmed (2006)	1235.10			
Average			1279.36		
Min.			1027.93		
Max.			1684.5		

Table (4): Effect of the time-lapse factor under the local scientific research environment on egg weight at sexual maturity (E.Wsm) of Norfa chickens.

Year	References	E.W Sm (gm.)	Year	References	E.W Sm (gm.)
1991	Sherif et. al. (1991)	36.13	2010	Heaba (2010)	37.90
1994	Abou-ElGhar (1994)	37.63	2013	Gomaa (2013)	38.30
1996	El-Salamony (1996)	36.54	2015	El-Noomany (2015)	35.00
1999	Radyi (1999)	36.43	2016	Abou-Elewa et.al. (2016)	39.27
2003	El-Hadad (2003)	38.65	2019	Abdou et.al. (2019)	38.23
2004	Abou El-Ghar and Abdou (2004)	37.63	2021	Sebea (2021)	41.52
2007	Ben Naser (2007)	36.10	2021	Gebriel et.al. (2021a)	41.52
2010	Abou-Elewa (2010)	37.26	2023	Enab et.al. (2023)	36.98
2010	Gebriel et.al. (2010)	36.90	2023	El-Noomany (2023)	36.98
Average			37.721		
Min.			35		
Max.			41.52		

Table (5): Effect of the time-lapse factor under the local scientific research environment on egg weight at maturity (E.Wm.) of Norfa chickens.

Year	References	E.Wm (gm.)	Year	References	E.Wm (gm.)
1991	Enab (1991)	43.73	2010	Heaba (2010)	45.70
1992	Enab et. al. (1992)	44.30	2013	Ben Naser (2013)	44.50
1994	Abdou and Enab (1994)	55.40	2013	Belaity (2013)	42.78
1994	Abou-ElGhar (1994)	47.50	2014	Sewalem (2014)	47.00
1995	Nawar (1995)	48.90	2015	El-Noomany (2015)	45.86
1996	Abdou (1996)	44.75	2017	Seleim (2017)	48.23
1996	El-Salamony (1996)	45.73	2019	Abd El-naby (2019)	50.42
1999	Al-shoquiry (1999)	46.00	2019	Abdou et.al. (2019)	41.97
2001	Enab (2001)	48.53	2021	Sebea (2021)	50.90
2004	Abou-Elewa (2004)	48.58	2021	Gebriel et.al. (2021a)	50.90
2006	Ahmed (2006)	49.20	2021	Gebriel et.al. (2021b)	50.67
2010	Abou-Elewa (2010)	45.98	2021	Abd El-Ghafar (2021)	50.65
2010	Ben Naser et.al. (2010)	43.82	2023	Enab et.al. (2023)	55.88
2010	Gebriel et.al. (2010)	45.35	2023	El-Noomany (2023)	46.39
Average			47.49		
Min.			41.97		
Max.			55.88		

Table (6): Effect of the time-lapse factor under the local scientific research environment on egg production at 90 days from sexual maturity (EN_{42}) and at 42 wk. of age ($E.N._{42}$) of Norfa chickens.

Year	References	$E.N_{42}$	Year	References	$E.N_{90}$
1996	El-Salamony (1996)	78.15	1994	Abou-ElGhar (1994)	38.15
1999	Radyi (1999)	84.70	1996	El-Salamony (1996)	56.33
2000	Enab et.al. (2000)	62.50	1999	Al-shoquiry (1999)	39.00
2001	Enab (2001)	64.90	1999	Radyi (1999)	46.60
2003	El-Hadad (2003)	66.05	2000	Enab et.al. (2000)	41.50
2004	Abou-Elewa (2004)	54.51	2002	Abou-ElGhar et. al. (2003)	52.00
2006	Ahmed (2006)	63.70	2003	Soliman (2003)	43.79
2007	Ben Naser (2007)	65.20	2003	El-Hadad (2003)	47.65
2010	Abou-Elewa (2010)	63.59	2004	Abou-Elewa (2004)	49.59
2010	Ben Naser et.al. (2010)	57.66	2006	Ahmed (2006)	48.20
2010	Gebriel et.al. (2010)	57.30	2007	Ben Naser (2007)	39.21
2010	Heaba (2010)	86.40	2010	Abou-Elewa (2010)	44.25
2013	Ben Naser (2013)	65.90	2010	Gebriel et.al. (2010)	36.55
2015	El-Noomany (2015)	40.74	2010	Heaba (2010)	47.30
2017	Seleim (2017)	57.60	2013	Gomaa (2013)	40.20
2019	**(2019)** Abd El-Naby	71.58	2015	El-Noomany (2015)	33.67
2019	Abdou et.al. (2019)	64.91	2019	Abd El-naby (2019)	46.65
2021	Sebea (2021)	69.05	2019	Abdou et.al. (2019)	41.90
2021	Gebriel et.al. (2021a)	69.90	2021	Sebea (2021)	41.33
2021	Abd El-Ghafar (2021)	69.90	2021	Gebriel et.al. (2021a)	41.44
2023	Enab et.al. (2023)	55.88	2021	Abd El-Ghafar (2021)	45.39
2023	El-Noomany (2023)	55.88	2021	Sebea (2021)	45.25
			2023	Enab et.al. (2023)	44.05
			2023	El-Noomany (2023)	44.05
Average		64.82	Average		43.92
Min.		40.74	Min.		33.67
Max.		86.4	Max.		56.33

Table (7): Effect of the time-lapse factor under the local scientific research environment on reproductive traits (fertility and hatchability) of Norfa chickens.

Year	References	Fertility	Year	References	Hatchability
1996	El-Salamony (1996)	81.65	1996	El-Salamony (1996)	78.44
1999	Al-shoquiry (1999)	94.47	1999	Al-shoquiry (1999)	82.13
2006	Abd El-Rahman, (2006)	92.16	2006	Abd El-Rahman (2006)	86.23
2014	Sewalem (2014)	94.75	2014	Sewalem (2014)	78.56
2017	Abou-Elewa et.al (2017)	79.43	2017	Abou-Elewa et.al (2017)	64.31
2019	Abd El-Naby (2019)	85.78	2019	Abd El-naby (2019)	78.35
2021	Gebriel et.al. (2021a)	85.08	2021	Gebriel et.al. (2021a)	77.31
2021	Abd El-Ghafar (2021)	85.05	2021	Abd El-Ghafar (2021)	77.00
2022	El-Shahed (2022)	84.69	2022	Gad (2022)	84.59
			2022	El-Shahed (2022)	76.89
Average		87.006	Average		78.38
Min.		79.4275	Min.		64.31
Max.		94.75	Max.		86.23

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