Egypt. J. Anim. Prod. **24**, No. 1-2, pp. 1-11 (1984)

The Embryo Malpositions in Pekin Duck Eggs

G.A.R. Kamar, H. H. Hussain, L. Goher, and M. M. El Nadi

Faculty of Agriculture, Cairo and Menofia Universities Egypt.

PEKIN duck eggs were used in studying the embryo malpositions. The experiment was carried under the usual system of mating and nutrition in the Poultry Research Station, Faculty of Agriculture, Cairo University.

The study included 3748 eggs, 2151 eggs in the first year (from January to May), and 1597 eggs in the second year (from January to April).

The embryo malposition in Pekin duck eggs were malpositions type 2 (head is found in the small end of the egg), type 3 (head to left side), type 5 (feet over head), type 7 (body across the egg) and combination of type 2+1 and 2+3. Malposition of type 4 (the beak is not directed toward the air cell), and type 6 (beak above rightwing) were not found. Malposition 3 was the most frequent (83.99 % of the total number of malposition) followed by type 2 (13.59 %), type 5 (1.38 %) type 7 (0.81 %) and combination of type 2+1 and 2+3 (0.12 % for each).

There were not any appreciable effect of egg measurements or egg index on embryo malposition.

Among embryos which failed to hatch, more than 50 percent were found to be in position different from normal just previous to hatching (Senctuary, 1924, 1925). Half of the embryos that die after the eighteenth day of development or that fail to hatch are in malpositions.

This constitutes approximately one-fourth of the total embryonic mortality (Sanctuary, 1925 ; Smith, 1931, Hutt and Cavers, 1931 and Byerly and Olsen, 1935 a) Sanctuary (1925) and Helmy (1958) reported that malposition I (head between thighs) is the most frequent, while Hutt (1929), and Byerly and Olsen (1933, 1936 b) found that malposition 2 (head in the small end, was more frequent reaching about 25.7% of the total malposition, and malposition I had the least frequency as it comprised about 0.6% only of the total malposition.

Among eggs incubated horizontally, malposition 2 and 4 (embryo rotated that beak is not direct towards the air cell) were more frequent (Byerly and Olsen, 1936 b) Malposition are not all a direct cause of death or failure of hatching (Byerly and Olsen, 1934). Some malposition may be the result of death or delayed development.

Malposition 1 is always lethal, while chicks in other malposition (2,3,4 and 6) sometimes pip and hatch. Embryos rarely pip the shell when they are in malposition 3 or in combination of 1 and 2 or 2 and 2, (Asmundson, 1938).

Some of the malpositions are the normal position of the embryo at certain age (Waters, 1935). He found that the majority of the embryos were in malpositions during approximately the eighteinth day of incubation and if embryonic death occurs during this period, the embryo will not probably be in the normal hatching position.

The position of the eggs during incubation, the number of egg turning size of the egg and temperature were found to effect the incidence of the different types of malpositions.

Malposition 2 and 4 are common among horizontally incubated egg than among those incubated with the large end up, whereas the reverse is true for malposition 3 (Byerly and Olsen, 1936 b).

High incubation temperature was found to raise the frequency of malposition 1 and 2, where as malposition 2 was found to be more than ordinarly common at temperature below as well as above the optimum (Byerly, 1938).

Frequent turning of the eggs during incubation tends to reduce the incidence of malposition (Insko and Martin, 1933, Olsen and Byerly, 1936).

Malposition 3, occurred more frequently in large eggs than in small ones (Hutt,1938), but there is no significant difference in this respect (Asmundson, 1935).

Few abnormal, embryos occurred in eggs which had been turned hourly than in those turned 3 times every day, but the difference did not reach significance (Visschedijk and Kuiper, 1955).

Malposition may be genetically conditioned as its incidence is greater in eggs of certain hans, or in eggs of some breeds, it may result from inbreeding. Non-genetic causes are also mentioned (Hoogendoorn, 1955).

Material and Methods

The study was carried out at the Poultry Research Station, Faculty of Agriculture, Cairo University.

The work has been done on the White Pekin duck (Anas playtrhynchos) through two successive hatching seasons. The first season was during the period from January to May and the second was from January to April the next year.

Eggs were collected and kept for a period not less than 24hr, and not more than 7-10 days.

Before incubation they were given a serial number, and measured for the two axis to detect the egg index($\frac{\text{width}}{\text{length}} \times 100$). The eggs were candeled to exclude the unsuitable ones for incubation (invisible crack, malposition of the air space and porosity of the egg shell.

Throughout the incubation period, endling was performed twice : at the 8th and 22 day of incubation. Dead and unhatched embryos were examined to determine their age and to detect their abnormalities.

Embryos that were not in the normal position (Head under the right wing) were detected and recorded a malposition.

The malpositions were classified to seven types as follows, which is accepted by the majority of research workers (Sancturary 1925, Hutt 1929, Smith 1931 and Landauer, 1948).

Malposition 1 : Head between thighs.

Malposition 2 : Head in small end of the egg.

Malposition 3 : Head to left instead of under right wing.

Malposition 4 : Embryos rotated in such away that the beak is not directed towards the air cell.

Malposition 5 : Feet over head.

Malposition 6 : Beak above right wing instead of underneath it.

Malposition 7 : Embryos across the egg.

Malpositions were estimated in percent of the total dead embryos and of the total in shell at the 28th day of incubation. The frequency of each type of the seven embryo malpositions was estimated in percent of the total number of malpositions.

Analysis of variance was carried out according to Snedecor (1956) for testing the differences in embryonic malpositions between years and months.

Results and Discussion

Among the dead and unhatched embryos some can be found in malposition.

As appears from Table 1 only 36.90% of the dead embryos were in malpositions (36.64% and 37.32% in the first and second year respectively).

TABLE 1. Malposition as percentage of total embryonic mortality and dead-in-shells.

Years	No. of egg set	No. of dead embryos	No.of dead in-shells	No. of malpositions	% Malposition	
					of dead embryos	of dead-in-shells
1971	2151	1933	730	525	36.64	70.82
1972	1597	919	460	343	37.32	74.57
Total	3748	2352	1190	868	36.90	72.95

These percentages reached about 72.95% of the dead-in-shell (70.82%, 74.57% for the two years, respectively). These results were higher than those found in chicks by Byerly and Olsen (1936 a) who found that malpositions were about 25% of all the dead embryos. Sanctuary (1925) in chicks also found that half of the dead in-shell only were in malposition.

The types of malpositions occurred in this study and their percentage are given in Table 2.

It was found that malpositions found in Pekin duck eggs were malposition of type 2 (head is found in small end of the egg), malposition 3 (head to left instead of under right wing), malposition 5 (feet over head) and malposition 7 (Body across the egg). In two cases, the embryos had a combination of two types of malpositions together (malpositon 1+3 and malposition 2+3). Malposition 4 (Embryo rated in such away that the beak is not directed towards the air cell), and malposition 6 (Beak above right wing instead of underneath it) were not found in this experiment.

Malposition 3 was the most frequent type. It had an average frequency of 83.99% of the total number of malpositions in the two years (82.48% in the first year and 86.30% in the second year).

Type 2 was less frequent than type 3, followed by type 7, type 5, type 3 combined with type 1 and type 2. Their frequencies were 13.59, 1.38, 0.81, 0.12 and 0.12% of the total number of malpositions for type 2,7,5,3 combined with 1 and 3 combined with 2, respectively

The results contradic those obtained by Sanctury (1925) and Helmy (1958) in chicks. They reported that malposition I was the most frequent followed by malposition 2. The findings that described by Amer and El-Mahdy (1963) are in agreement with the present study. They found that malposition 3 was the most frequent type. Beside the above mentioned results, Byerly and Olsen (1936b) and Amer (1962), reported that type 2 was more frequent than type 1.

TABLE 2. Number and percentage of different types of malposition.

Years	No. of eggs set	No. of embryo malposition	Types of malposition								Combinations			
			II		III		V		VII		I+III		II+III	
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1971	2151	525	84	16.00	433	82.48	6	1.14	2	0.38	—	—	—	—
1972	1597	343	34	9.91	296	86.30	1	0.29	10	0.92	1	0.29	1	0.29
Total	3748	868	118	13.59	729	83.99	7	0.81	12	1.38	1	0.12	1	0.12

TABLE 3. Effect of egg length on embryo malpositions.

Class intervals	No. of dead embryos	Malpositions													
		II		III		V		VII		I+II		I+III		Total	
		No.	%	No.	%	No.	%	No.	%	No	%	No.	%	No.	%
5.0—5.5	38	—	—	7	18.42	—	—	—	—	—	—	—	—	7	18.42
5.6—6.0	729	32	4.39	193	26.47	—	—	3	0.41	—	—	—	—	228	30.28
6.1—6.5	1388	74	5.33	462	33.29	7	0.50	9	0.65	1	0.07	1	0.07	554	39.00
6.6—7.0	192	12	6.25	64	33.33	—	—	—	—	—	—	—	—	76	39.58
7.1—8.0	2	—	—	—	—	—	—	—	—	—	—	—	—	2	1.80
Total	2319	118	5.02	728	30.99	7	0.30	12	0.51	1	0.04	1	0.4	867	36.08

TABLE 4. Effect of egg width on embryo malpositions

Class intervals	No. of dead embryos	Malpositions													
		II		III		V		VII		I+II		I+III		Total	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
4.0—4.1	87	1	1.15	21	24.14	—	—	—	—	—	—	—	—	22	5.29
4.2—4.3	426	14	3.29	105	24.65	1	0.23	1	0.23	—	—	—	—	121	28.40
4.4—4.5	1073	56	5.22	338	31.50	4	0.37	9	0.84	—	—	—	—	407	37.93
4.6—4.7	663	39	5.88	233	35.14	2	0.30	2	0.30	1	0.15	1	0.15	278	41.93
4.8—5.0	100	8	8.00	31	31.00	—	—	—	—	—	—	—	—	39	38.00
Total	2349	118	5.02	728	30.99	7	0.30	12	0.51	1	0.04	1	0.04	867	36.91

TABLE 5. Effect of egg index on ebmryo malpositions.

Class intervals	No. of dead embryos	Malpositions													
		II		III		V		VII		I+II		I+III		Total	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
60—64	17	1	5.9	1	5.9	—	—	—	—	—	—	—	—	2	11.76
65—69	459	21	4.58	149	32.46	1	0.22	2	0.44	—	—	—	—	173	37.14
70—74	1311	66	5.03	420	32.04	5	0.38	8	0.61	1	0.08	—	—	500	38.14
75—79	540	28	5.19	154	28.52	1	0.19	2	0.37	—	—	1	0.19	186	34.44
More than 80	22	1	0.09	4	18.18	—	—	—	—	—	—	—	—	6	27.27
Total	2349	118	5.02	728	30.99	7	0.30	12	0.51	1	0.04	1	0.04	867	36.91

In accordance with the present results, Amer and El-Mahdy (1963) found that malposition 6 was not found in Dandarawi. Hutt (1929), Hutt and Pilkey (1934) and Cavers and Hutt (1934) confirmed that chicks in malposition 6 hatch in some cases.

The differences in the results obtained by those workers may be due to differences in species and even in breeds. The differences also may be due to differences in the hereditary factors, management conditions of the flock or to position of the eggs in the trays during the incubation, number of ternining eggs and temperature in the incubation.

Byerly (1938) stated that high incubation temperature was found to raise the frequency of malposition 1 and 3. In addition, Insko and Martin (1933), Hutt and Pilkey (1934), and Byerly and Olsen (1936a) reported that malposition 3 is more frequent among eggs incubated with large-end-up than among those incubated horizontally and the incidence of malposition 4 is determined during the second week of incubation. The same result is obtained in malposition 3 by Byerly and Olsen (1933)

The effect of egg measurements and egg index on embryos malpiositons were studied.

The results were as shown in Tables 3,4 and 5.s It can be seen that there were not remarkable effects of the egg measurements or egg index on embryo malpositions.

References

Amer, M.T.H. (1962) Embryonic mortality and maplositions in Fayoumi chicken. *Poult. Sci.*, 41, 1707.

Amer, M.F.H. and Mahady, S.El. (1963) Embryonic mortality and malpmositicns in Dandarawi and its crosses. 1*st Aarb Meet., Poul. Sci.*, Alexandria, Sept.

Asmundson, V.S. (1938). The position of turkey, chicken, pheasant, and partridge embryos that failed to hatch. *Poul. Sci.*, 17, 478.

Byerly, T.C. (1938) Effect of different incubation temperature on mortality of chick embryos. *Poul. Sci.*, 17, 200.

Byerly, T.C. and Olsen, M.W. (1933). Time and manner of determination of the malposition haed -in-small -end of the egg. *Poult Sci.* 12, 261.

Byerly, T.C. and Olsen, M.W. (1934). Causes of embryonic malposition head-under-left-wing. *Poul. Sci.* 13, 278.

Byerly, T.C. and Olsen, M.W. (1936) Lethality of embryonic malpositions in the domestic fowl. *Poul. Sci.*, 15, 158.

Byerly, T.C. and Olsen, M.W. (1936). Certain factors affecting the incidence of malpositions among embryos of domestic fowl. *Poul. Sci.*, 15, 163.

Cavers, J.R. and Hutt, F.B. (1934). The relation between abnormal orientation of the 4 day embryo and position of the chick at hatching. *J. Agric. Res.* 48, 517.

Helmy, S.A. (1958) Fertility, embryonic mortality and hatchability in poultry as affected by genetical environmental and physical factors. *Ph.D. Thesis.*, Faculty of Agriculture Cairo University.

Hoogendoorn, J. (1955) Malposition of the chicks in the egg. *Rev. Ele. Prod., Amin. France* 10, 741 (*C.F.*A.B.A. 24 349).

Hutt, F.B. (1929) Studies on embryonic mortality in the fowl. I. The frequencies of varios-malpositions of the chick embryo and their significance. *Proceedings of the Royal So, of Edinburgh*, 49, 118-(C.F. Landauer, 1951).

Hutt, F.B. (1938) Embryonic mortality in fowl. VII. On the relation of malposition to the size and shape of eggs. *Poul. Sci.*, 17. 245.

Hutt, F.B. and Cavers, J.R. (1931). The lethal nare of certain malpositions of the chick embryo. *Poul. Sci.*, 10,

Huut, F.B. and Pilkey, A.M. (1934) Studies in embryonic mortality in the fowl. V. Relation ship between positions of the eggs and frequencies of malpositions. *Poul. Sci.* 13, 3

Insko, J.R. W.M. and Martin, J.M. (1933) Effect of frequent turning on hatchability and distribution of embryo mortality. *Poul. Sci.* 12, 282.

Landauer, W. (1948) The hatchability of chicken eggs as influenced by environment and heredity. *Storrs. Agric. Esp. Stat. Bull. No.* 262.

Olsen, M.W. and Byerly, T.C. (1936) Multiple turning and orienting eggs during incubation as they affect hatchability. *Poul. Sci.*, 15, 88.

Sanctuary, W.C. (1924-1925) One cause of dead chicks in the shell. *Poul. Sci.* 4, 141.

Smith, J.B. (1931) Malpositions-a factor in hatchability. Proceeding of the twenty second annual meeting. *Poul. Sci. Assoc.*, 1930, 1931, PP. 66.

Snedecor, G.W. (1956) "*Statistical Methods*",*5th* Ed. Iawa State College *Press, Ames, Jawa.*

Visschedijk, A.H.J. and Kuper, J.W. (1955) Malposition of the embryo in hens eggs. *Arch. Geffugel*, 19, 73. (*C.F. A.B.A.* 24 365).

Waters, N.F. (1935) Changes in the position of chick embryos after the eighteenth day of incubation. *Science*, 82, 66-(*C.F.* Landauer, 1951).

الأوضـــاع الشاذة فى بيض البط البكينى

جمال عبد الرحمن قمر ، هاشم حسين ، ليلى محمد أحمد جوهر ومحمد محمد النادى

كلية الزراعة جامعة القاهرة وكلية الزراعة جامعة المنوفية ـ مصر

استخدم بيض البط البكينى لدراسة الأوضاع الشاذة للجنين • وقد استخدم فى الدراسة النظام المعتاد بالنسبة للتزاوج والتغذية فى محطة أبحاث الدواجن بكلية الزراعة جامعة القاهرة وقد شملت الدراسة ٣٧٤٨ بيضة منها ٢١٥١ فى السنة الأولى (من يناير حتى مايو) ، ١٥٩٧ بيضة فى السنة الثانية (من يناير حتى أبريل) •

وكانت الأوضاع الشاذة فى البط البكينى هى :

(أ) وضع الرأس فى الطرف الضيق من البيضة •

(ب) وضع الرأس الى اليسار •

(ج) الأرجل أعلى الرأس •

(د) محور الجسم عمودى على المحور الطويل للبيضة •

(هـ) اشتراك وضع الرأس فى الطرف الضيق من البيضة مع وضع الرأس بين الفخذين •

(و) اشتراك وضع الرأس فى الطرف الضيق للبيضة مع اتجاه الرأس لليسار بدلا من أسفل الجناح الأيمن •

ولم يوجد أى من وضعى المنقار أعلى الجناح الأيمن أو عدم اتجاهه ناحية الغرفة الهوائية وقد لوحظ أن ترتيب انتشار الأوضاع الشاذة ونسبها كالآتى:

أولا ـ الوضع عندما يكون الرأس متجها لليسار بدلا من اليمين وكان بنسبة ٩٩ر٨٣٪ من مجموع الأوضاع الشاذة •

ثانيا ـ الوضع عندما يكون الرأس متجها للناحية الضيقة (٥٩ر١٣٪) •

ثالثا ـ الوضع عندما تكون الأرجل فوق الرأس (٣٨ر١٪) •

رابعا ـ الوضع عندما يكون الجنين عبر البيضة (٨١ر٠٪) •

خامسا ـ اشتراك وضعين معا هما الرأس فى الناحية الضيقة للبيضة مع وجود الرأس بين الفخذين أو الرأس فى الناحية الضيقة مع اتجاهها ناحية اليسار بدلا من اليمين وكانت النسبة هى ١٢ر٪ فى كل منهما •

ولم يكن هناك تأثير واضح لمقاييس البيضة أو دليلها على الأوضاع الشاذة للجنين •