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*Full Length Research Paper*

# Impact of some common diseases on profitability of broiler farms

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**This study aimed to evaluate the effect of different diseases in broiler farms under Egyptian conditions on the profitability of production to determine the worst disease from the economic point of view. Data of 138 production cycles were randomly collected from different farms in different localities in Daqahlia governorate in north delta of Egypt of same housing systems. The data include disease, feed amount, costs of production, and returns of production, mortality and livability percentages, marketing age and weights from the records. The data were grouped into nine groups according to the disease spread, group 1 (respiratory disorders), group 2 (coccidiosis), group 3 (Newcastle), group 4 (mixed infection) or (respiratory and digestive disorders), group 5 (Gumboro), group 6 (IB = infectious bronchitis), group 7 (CRD = chronic respiratory disease), group 8 (ILT = infectious laryngiotrachiitis) and group 9 (salmonellosis). The data were summarized and calculated for each 100 birds then analyzed by statistical computer program (SPSS/PC, 16). The results of the study revealed that mixed infection (respiratory and digestive disorders) followed by IB are the worst diseases causing economic losses in broiler farms and has a significant effect on the profitability of broiler production causing highest mortality %, highest TC and lowest net returns.**

**Keywords:** broiler production farms, profitability, economic losses and broiler diseases.

## INTRODUCTION

Production losses due to diseases and high cost of medication are one of main restrains in Poultry production **(Appiah, 1993)**. The health of broilers influences feed intake and growth performance **(Adela et al., 2013).**

Controlling diseases from the beginning is important for the success of the operation. Diseases can be transmitted via newly introduced chicks, humans, contaminated equipment, or other bird. The management of the newly introduced flock is one of the most difficult and important phases in poultry farm management. A good disease prevention program should be available for the newly introduced chicks to avoid any future losses for a profitable business. **(Mobley and Kahan, 2007).**

In Egypt many viral diseases attack broiler farms and most of them became endemic disease. Many economic losses in broiler farms caused by Newcastle disease (ND), Avian Influenza and (IBD) Infectious Bursal disease viruses. Throughout the developing countries, Newcastle

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disease is a major constraint to village poultry production causing mortality rates of 75% to 100% in unvaccinated flocks **(Spradbrow, 1992).**In some African countries the highly infectious Newcastle disease is reported to have almost reached 100% mortality **(Tadelle and Jobre, 2004).**

Prevalent diseases in poultry production which affect birds at various stages of life include bacterial as Chronic respiratory disease (CRD), viral as Newcastle disease (ND) and Gumboro and protozoan as Coccidiosis **(Koney, 1993).**

Reduction in the growth rate and may be the high mortality are main losses due to Avian infectious bronchitis (IB) that considered as a major threat to the poultry industry **(Gorgyo et al., 1984).** Infectious bronchitis and Newcastle disease are two major causes of economic losses in the poultry production **(Cavanagh and Gelb, 2008).**

Avian colibacillosis has an important economic impact on poultry production and has been noticed to be worldwide major infectious disease in birds of all ages. The majority of economic losses results from mortality and decrease in productivity **(Otaki, 1995)**.

Salmonellosis and colibacillosis are very important bacterial diseases as increase mortality in the initial few weeks of the life of chicks **(Shane, 1999).** Salmonellosis cause morbidity and mortality up to 100 % in young birds and result in heavy economic losses, while in older birds cause very little mortality and reduce productivity **(Haider et al., 2004).**

Secondary infections by bacteria such as E. coli or O. rhinotracheale especially when infection occurs in the last weeks prior to slaughter may increase condemnation at the processing plant **(Cavanagh and Naqi, 2003).**

Gumboro reduces the immune system function and increases susceptibility to other diseases. Characterized by appetite loss and quickly leads to death. Almost all individuals in a herd get sick, but mortality varies between 0-20 %, depending on the age, breed, viral virulence and immune status **(Blomqvist et al., 2010).**

Fowl typhoid is a systemic disease in poultry and results immortality and morbidity rates may reach up to 80% **(Shehata et al., 2012)**.

One of the important and dangerous protozoan diseases affecting broiler is Coccidiosis, and is related to management practices**.** Coccidiosis result in worldwide huge economic losses costing about 800 million $ annually which is the greatest economic impact on poultry production **(Yousuf and Tak, 2013)**.The severity of the disease signs range from diarrhea, blood in the dropping, poor general conditions to sudden death **(Blomqvist et al., 2010).**

After the occurrence of highly pathogenic avian influenza (HPAI) outbreaks in many parts of the world avian influenza become the most important threat to the poultry industry all over the world **(Swayne, 2007)**.

## MATERIAL AND METHODS

### Data collection

The data collected from a cross-section survey from a random sample of broiler farms in Dkahlia governorate from different localities. The data collected from accurate records in the selected farms and from structured questionnaire in case of no records according to **Atallah, (2000)**. The data were collected about different diseases in farms as in table (1).

### Data classification

All the production, costs and returns parameters within different diseases were calculated for each 100 birds to overcome the variation in the broiler numbers of the different farms.

According to the methods implied by **Osman et al., (2008)** Data classified into**:**

**1. Production parameters:** It includes feed amount, mortality and livability percentage, marketing age, marketing average body weight and marketing price per kg meat.

**2. Production costs:**

**a. Fixed costs (TFC)**: included the rent of the buildings and depreciation of equipment. The depreciation rates were calculated according to **(Muhammad, 2002)** for the equipment on 5 year and for the buildings on 25 year, while the rent value used directly during the calculation in case of the farms not owned **(Atallah, 2000).**

**b. Variable costs (TVC):** included drugs cost, , disinfectants cost, veterinary supervision cost, vaccines cost, chicks cost, feed cost, labour cost, litter costs and miscellaneous costs **(Atallah, 2000 and Bano et al., 2011)**.

**c. Total costs (TC)**: included both fixed and variable costs (TC= TVC+TFC).

**3. Returns:** includes the total returns (TR)that calculated from sales of total body weights and litter sales according to the market prices and the net returns (NR) that calculated by the following equation (NR= TR – TC).

### Data analysis

The data collected, summarized and analyzed using SPSS/PC(SPSS, 2007) computer program to test the effect of different diseases on profitability of broiler farms using One-way ANOVA and Duncan's multiple comparisons of the means to compare data obtained. Data were expressed as means standard errors. Differences between treatments were considered significant when $P< 0.01$

**Table (1): the number of cycles for each disease in broiler farms in the study.**

| Disease | No. of cycles | Spread % |
|---|---|---|
| Respiratory disorders | 28 | 20.28 |
| Coccidiosis | 26 | 18.84 |
| Newcastle | 22 | 15.94 |
| Mixed infection (respiratory and digestive disorders) | 16 | 11.59 |
| Gumboro | 15 | 10.87 |
| IB | 11 | 7.97 |
| CRD | 8 | 5.79 |
| ILT | 6 | 4.34 |
| Salmonellosis | 6 | 4.34 |
| Total | 138 | 100% |

**Table (2): diseases effect on mortality%, livability% and marketing age (day)**.

| group | disease | N | Mortality % | Livability% | Marketing age (day) |
|---|---|---|---|---|---|
| | | | Mean±SE | Mean±SE | Mean±SE |
| 1 | Respiratory disorders | 28 | 7.44 ± 0.49 $^{D}$ | 92.55 ± 0.49 $^{B}$ | 40.82 ± 1.14 $^{E}$ |
| 2 | Coccidiosis | 26 | 4.46 ± 0.64 $^{E}$ | 95.53 ± 0.64 $^{A}$ | 50.92 ± 2.64 $^{C}$ |
| 3 | Newcastle | 22 | 17.92 ± 3.72 $^{B}$ | 82.07 ± 3.72 $^{D}$ | 47.00 ± 3.03 $^{D}$ |
| 4 | Mixed infection | 16 | 25.04 ± 4.14 $^{A}$ | 74.46 ± 4.46 $^{E}$ | 47.83 ± 4.12 $^{D}$ |
| 5 | Gumboro | 15 | 11.65 ± 1.64 $^{C}$ | 88.34 ± 1.64 $^{C}$ | 47.83 ± 3.16 $^{D}$ |
| 6 | IB | 11 | 18.83 ± 4.25 $^{B}$ | 81.16 ± 4.25 $^{D}$ | 51.40 ± 2.78 $^{C}$ |
| 7 | CRD | 8 | 5.98 ± 2.32 $^{DE}$ | 94.01 ± 2.32 $^{AB}$ | 56.33 ± 7.17 $^{A}$ |
| 8 | ILT | 6 | 5.66 ± 1.03 $^{DE}$ | 94.33 ± 1.03 $^{AB}$ | 42.33 ± 1.66 $^{E}$ |
| 9 | Salmonellosis | 6 | 7.21 ± 2.44 $^{D}$ | 92.78 ± 2.44 $^{B}$ | 53.00 ± 12.00 $^{B}$ |
| Total | | 138 | 11.78 ± 1.02 | 88.17 ± 1.04 | 47.09 ± 1.05 |

Means within the same column of different litters are significantly different at ($P < 0.01$)

**Measures of economic and productive efficiency**

These measures were calculated for 138 cycles of nine different diseases from different broiler farms**.** The measures were:

1. Average broiler meat production per kilogram = Number of live birds X Average body weight at the marketing age.
2. Average total costs per EGP (Egyptian pound) **(New, 1991)**: = Average fixed costs + Average variable costs.
3. Average total variable costs
4. per EGP **(Atallah, 1997)**.
5. Average fixed costs per EGP**(Atallah, 2004 and Omar, 2009)**.
6. Average total returns per EGP.
7. Average net income **(Rosegrant et al., 2008)** = Average total returns – Average total costs.

**RESULTS AND DISCUSSION**

A. **Effect of different diseases on mortality %, Livability % and Marketing age:**

The results in table (2) showed that, there is a significant difference ($P < 0.01$) of the different and common diseases on the mortality %, livability% and marketing age (day). The highest mortality % observed in group 4 (mixed infection or respiratory and digestive disorders) followed by group 6 and group 3 for IB and Newcastle diseases as the values were 25.04 %, 18.92 % and 17.83% respectively,

**Table (3): diseases effect on VMC (Veterinary Management Cost), TVC (total variable cost), and TC (total cost).**

| group | disease | N | VMC (EGP) | TVC (EGP) | TC (EGP) |
|---|---|---|---|---|---|
| | | | Mean ± SE | Mean ± SE | Mean ± SE |
| 1 | Respiratory disorders | 28 | 240.16 ± 6.44$^{BC}$ | 1934.82 ± 31.52 $^{E}$ | 1989.75 ± 31.33 $^{E}$ |
| 2 | Coccidiosis | 26 | 214.77 ± 7.64 $^{D}$ | 2095.54 ± 48.25 $^{BC}$ | 2174.18 ± 45.88 $^{A}$ |
| 3 | Newcastle | 22 | 264.89 ± 15.62 $^{A}$ | 2011.79 ± 47.54 $^{D}$ | 2072.80 ± 49.53 $^{D}$ |
| 4 | Mixed infection | 16 | 230.37 ± 19.70 $^{C}$ | 2104.19 ± 85.38 $^{B}$ | 2169.23 ± 80.12 $^{A}$ |
| 5 | Gumboro | 15 | 235.63 ± 10.00 $^{C}$ | 2041.78 ± 46.79 $^{C}$ | 2101.16 ± 45.46 $^{C}$ |
| 6 | IB | 11 | 254.24 ± 13.86 $^{AB}$ | 2032.06 ± 70.65 $^{C}$ | 2083.27 ± 68.49 $^{D}$ |
| 7 | CRD | 8 | 228.11 ± 10.19 $^{C}$ | 2107.70 ± 144.86 $^{B}$ | 2149.72 ± 140.88 $^{B}$ |
| 8 | ILT | 6 | 213.97 ± 43.31 $^{D}$ | 1901.00 ± 80.23 $^{F}$ | 1962.86 ± 78.67 $^{F}$ |
| 9 | Salmonellosis | 6 | 249.19 ± 16.46 $^{B}$ | 2126.81 ± 57.18 $^{A}$ | 2168.23 ± 71.32 $^{A}$ |
| Total | | 138 | 238.11 ± 4.43 | 2025.09 ± 19.87 | 2086.46 ± 19.57 |

Means within the same column of different litters are significantly different at ($P < 0.01$)

while the lowest mortality present in group 2 of coccidiosis as the value was 4.46 %. The livability % was higher in group 2 (coccidiosis) as the value was 95.53 %, while the lowest livability level was74.46% for group 4 of mixed infection. These results showed that the mortality rate was higher in group 4 (mixed infection), while livability was higher in group 2 (coccidiosis) than group 1 and 2. This may be agreed with **(Gorgyo et al., 1984)** who mentioned that the high mortality is one of main losses due to IB that considered as a major threat to the poultry industry and with **(Cavanagh and Gelb, 2008)** who illustrated that Infectious bronchitis is one of two major causes of economic losses in the poultry production.

The highest marketing age noticed in group 7(CRD) as were 56.3 day, followed by group 9 of (salmonellosis) and group 6 of (IB)as were 53.00 and 51.4 day respectively. Whereas, the lowest marketing age were 40.82 day and observed in group 1 (respiratory disorders). Results cleared that the marketing age or the length of production cycle is increased in all groups than normal marketing ages in market that owed to diseases effects on growth and conversion rates plus the period of treatment course, among different diseases groups the higher marketing age observed in group 7 of (CRD) that means increased time till reach the marketing and prolonged production cycle and this may owed to slow growth rate and reduced conversion ratio unlike group 8 of (ILT) and group 1of (respiratory disorders) that have shorter marketing age and also the shorter production cycle than other different groups.

**B. Effect of different diseases on VMC (veterinary management cost), TVC (total variable cost) and TC (total cost):**

The results in Table (3) cleared that, there is a significant difference ($P < 0.01$) of the different diseases on VMC, TVC and TC values. The higher value of VMC was in group 3 of (Newcastle) as recorded 264.89 EGP whereas, the lowest value of VMC were 214.77 EGP and 213.97 EGP in group 2 of (coccidiosis) and group 8 of (ILT) respectively. The values of TVC showed highest value in group 9of (salmonellosis) as were 2126.81 EGP and the lowest value in group 8 of (ILT) were 1901.00 EGP. Meanwhile, value of TC was highest in group 2, 4 and 9 of (coccidiosis), (mixed infection) and (salmonellosis) as were 2174.18 EGP, 2169.23 EGP and 2168.23 EGP respectively. The lowest value of TC showed in group 8 of (ILT) and was 1962.86 EGP.

These results concluded that group 3 of (Newcastle)showed the higher value of VMC and the lowest value of VMC was in group 2 of (coccidiosis) and group 8 of (ILT). This difference in values among groups in VMC is owed to the change in costs of vaccination and medications which was higher in Newcastle group than other groups. The differences of total variable cost among different groups as group 9 of salmonellosis has the higher value and group 8 of ILT has the lowest value attributed to the changes in VMC and feed cost. The differences in TC among the different diseases groups as the higher values

**Table (4): diseases effect on marketing weight, TR (total return) and NR (net return).**

| Group | disease | N | Marketing weight (Kg) | TR (EGP) | NR (EGP) |
|---|---|---|---|---|---|
| | | | Mean±SE | Mean±SE | Mean±SE |
| 1 | Respiratory disorders | 28 | 2.00 ± 0.20 $^{B}$ | 2707.38 ± 45.79 $^{C}$ | 727.85 ± 48.66 $^{B}$ |
| 2 | Coccidiosis | 26 | 1.95 ± 0.31 $^{BC}$ | 2902.44 ± 91.59 $^{B}$ | 770.70 ± 83.64 $^{A}$ |
| 3 | Newcastle | 22 | 1.90 ± 0.31 $^{C}$ | 3041.98 ±191.58 $^{A}$ | 422.28 ± 56.78 $^{F}$ |
| 4 | Mixed infection | 16 | 1.79 ± 0.21 $^{D}$ | 1930.03 ± 95.52 $^{G}$ | 188.13 ± 29.16 $^{I}$ |
| 5 | Gumboro | 15 | 1.92 ± 0.29 $^{C}$ | 2644.28 ± 130.09 $^{D}$ | 601.30 ± 44.26 $^{D}$ |
| 6 | IB | 11 | 1.90 ± 0.27 $^{C}$ | 2304.20 ± 116.36 $^{F}$ | 257.74 ± 60.37 $^{H}$ |
| 7 | CRD | 8 | 1.96 ± 0.24 $^{BC}$ | 2608.90 ± 144.68 $^{D}$ | 497.97 ± 52.51 $^{E}$ |
| 8 | ILT | 6 | 2.16 ± 0.18 $^{A}$ | 2572.35 ± 129.58 $^{D}$ | 653.47 ± 58.93 $^{C}$ |
| 9 | Salmonellosis | 6 | 2.10 ± 0.14 $^{A}$ | 2421.05 ± 106.40 $^{E}$ | 363.85 ± 37.06 $^{G}$ |
| Total | | 138 | 1.94 ± 0.24 | 2664.09 ± 108.47 | 530.47 ± 46.42 |

Means within the same column of different litters are significantly different at ($P < 0.01$)

were in groups of coccidiosis, mixed infection and salmonellosis and the lowest value in group of ILT may be attributed to changes of VMC and TVC. These results may agree with **(Yousuf and Tak, 2013)** who stated that Coccidiosis has the greatest economic impact on poultry production

C. **Effect of different diseases on Marketing weight, TR (total return) and NR(net return):**

The results in table (4) showed that there is a significant difference ($P < 0.01$) in the average marketing weight among the different groups, the higher marketing weight were in group 8 and 9 of ILT and salmonellosis as the value was 2.16 Kg and 2.10 Kg respectively, while the lower average marketing weight observed in group 4 of mixed infection as was 1.79 Kg. The average marketing weight differ among the groups is owed to the changes in the marketing age or the length of period till reach the marketability as it differ than normal ages and weights according to the course of treatment and medication and owed to the effect of disease on growth rate, feed conversion and feed intake that differ among diseases groups. This results agreed with **(Adela et al., 2013)** who revealed that the health of broilers influences feed intake and growth performance.

The results of total return values illustrated that the higher values of total return were 3041.98 EGP and 2902.44 EGP in group 3 and group 2of Newcastle and coccidiosis respectively and lower value of total returns were 1930.03EGP in group 4 of mixed infection (respiratory and digestive disorders) followed by 2304.20 EGP in group 6 of IB. The results of net return showed that the highest values observed in group 2 of coccidiosis and in group 1 of respiratory disorders as were 770.70 EGP and 727.85 EGP respectively. Whereas, the lower values of net return in group 4 of mixed infection were 188.13 EGP followed by 257.74 EGP in group 6 of IB. These results revealed that the lowest values of total returns and net returns presented in mixed infection (respiratory and digestive disorders) group and IB group and this owed to the high mortality % and low livability % in both diseases as were 25.04 %, 18.83% and 74.46 %, 81.16 % respectively plus increased total costs in mixed infection group.

## CONCLUSION

The present study showed that from economic point of view and under the Egyptian conditions the worst diseases in broiler production farms of severe economic losses were mixed infection (respiratory and digestive disorders) causing highest mortality%, highest total costs and lowest net returns followed by IB. So the breeders' awareness of such diseases and their seriousness must be increased.

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