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A Study on the Effect of Environmental Stress Caused by Air Pollution on Cockerel Bird

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Abstract - The air quality they reduce is significant, and their harmful impacts on people's health are well-documented. Their impact on wildlife, especially birds like the cockerel, is still a topic of study and concern. Cockerel birds face a predicament due to environmental stresses such air pollution from diesel generators, which may have far-reaching ecological effects. The effects of pollution on cockerel birds, have not received as much attention as they deserve. In this study, I looked at the risks that generators pose in the form of noise and air pollution. There is rising concern in the contemporary world about the complex relationship between environmental stresses and the wellbeing of living creatures. The usage of diesel generators has greatly contributed to the rise in air pollution that has accompanied the growth of industry and urbanization. The air quality they reduce is significant, and their harmful impacts on people's health are well-documented. Their impact on wildlife, especially birds like the cockerel, is still a topic of study and concern. The current study was undertaken to educate the public on the dangers posed by generator-caused air pollution, which has been shown to reduce the nutritional value and decrease the overall quality of chicken products.

Keywords - Air Pollution, Cockerel Bird, Air Quality, Nutritional Value

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INTRODUCTION

Air pollution is the product of human activities which make certain gases, solids and liquids aggregate in the earth atmosphere. While the chemicals used in the stgnating process are not immediately dangerous to humans or the environment, they do grow toxic over time (Dally and Zannetti, 2007:01). The danger posed by air pollution is not new. Air pollution was already a problem by 400 BC, when Hippocrates wrote about it. Coal became widely employed as a cheap fuel for heating and cooking in England in the late thirteenth century, which exacerbated the country's air pollution issue. This led the English aristocracy to adopt many laws controlling coal use (Trivedy and Goel, 2003:01).

Air pollution is defined by the WHO as "the discharge into the atmosphere of foreign gases, vapours, droplets, and particulates, or of excessive amounts of normal constituents," which may come from either natural causes like volcanoes or from human activity. This concept accounts for both natural (geogenic) and anthropogenic (man-made) emissions (Cited in Maanvizhi, 2012: 04). On the other hand, according to Trivedy and Goel (2003), the air pollution is defined as 'the presence in the outdoor atmosphere of one or more contaminants in such an amount and duration as to be determinantal to the human health, safety and welfare, and animal and plant life, or as to interfere with the full use and enjoyment of his property'. (Sharma, Dinesh C. 2005)

Human activity is the primary source of these pollutants, which include emissions from cars, wood stoves, and diesel-powered machinery (Lippmann et al., 1998; Kleeman et al., 1999; Shi et al., 1999). A cockerel bird's ears may be found on each side of its head, behind its eye. Although the ear looks and functions similarly to that of mammals, there are a few key distinctions. There is no pinna in a chicken's ear, and instead of the three bones seen in mammals' middle ear, a single bone and cartilage structure called the columella auris serves this purpose.

One of the leading causes of sensory neuronal hearing loss is damage to the inner ear from prolonged or excessive exposure to loud noise. The hair cells in the auditory nerve are the most prevalent disease caused by acoustic trauma. The organ of corti, found in the cochlear section of the inner ear labyrinth, is buried deep inside the temporal bone, the body's hardest and most inaccessible bone, in both birds and mammals. Depending on the severity of the damage to the inner ear tissues, hearing loss after exposure may be either transient or permanent. (Aade, U.P 2012)

The death of farm-raised broilers that are close to being ready for sale is often attributed to environmental stress. Stresses such as transportation difficulties, overcrowding, and polluted air all contribute to fatalities, as can stresses such as heat (Yalcin et al. 2003), cold (Li- shize et al. 2001), and noise (Davis et al. 1989).

Poultry are the main food of human beings. Egg production and meat quality depends upon better rearing of poultry. It is essential to avoid any environmental stress to these delicate birds which are used as food value. On one hand air pollution and noise pollution caused by diesel generators causes a decline in bird's populations and on the other hand the quality of its meat is also adversely affected by air pollution (Sabir et al. 2003).

In present investigation, I have studied hazards of generator caused in the form of air pollution and sound pollution. This type of pollution adversely affects the hematology of avian species as Cockerel birds and their growth performance. Beside, its sound also affects on the inner ear hair cells which are responsible for receiving sound of different frequencies. (Mishra, Mrutyunjaya 2007)

Domestic fowls (*Gallus domesticus*) are reared for meat in poultry farming. Usually in local farms, they are stressed by many environmental challenges such as overcrowding stress, exhaust smoke, heat stress, cold stress and transport stress etc. (Chauhan, A.2008)

Major Sources of Air Pollution

Pollutants in the air include dangerous gasses and particles that are already in the air. Most of the pollution in the air comes from these primary contributors. Sulfur oxides (SO2 and SO3), nitrogen oxides (NOx), ozone, carbon monoxide (CO), volatile organic compounds (VOCs), hazardous pollutants, and certain gaseous forms of metals and particulate matter of varying aerodynamic sizes (PM10 and PM2.s) are all examples of gaseous pollutants.Sulfate, nitrate, black carbon (as a pure element), and crustal material are the four main categories into which these chemicals fall. Both human activity and atmospheric processes contribute to air pollution. Some pollutants, like ground-level ozone6, are generated when the sun reacts with oxides of nitrogen and volatile organic compounds; this includes SO2, crustal material, particulate matter, and elemental chemicals. (Afolabi, K.D 2011)

Sources of Air Pollution in India

In order to determine the total amount of emissions from all of the polluting activities in India, many research were performed. For four primary sources including industrial point, small industry, transportation, and residential coal consumption, the Central Pollution Control Board (CPCB) conducted the first emission inventory assessment for Delhi in 1994. The National Environmental Engineering Research Institute (NEERI) also performed a study in 1995 called "Air Accounts for NCT, Delhi Study" to determine the many factors that contribute to Delhi's air quality. Both studies agree that the majority of Delhi's PM and SO2 problems can be traced back to emissions from the industrial sector. Additionally, the transportation sector was identified as the primary contributor to Delhi's NOx and CO emissions in a 2006 report by the Asian Development Bank (ADB). In 1997, as part of the Urban Air Quality Management Strategy (URBAIR), an extensive research was done for Mumbai. Approximately 40%, 14%, 31%, and 15% of TSPM exposure were attributed to resuspension from roadways caused by automobiles, 14% to diesel and gasoline vehicles, and 31% to household wood and trash burning, respectively. (Modi, Ashwin 2013)

Status of Air Quality in India

The Central Pollution Control Board (CPCB) established a framework for nationwide National Ambient Air Quality Monitoring (NAAQM) in 1984. This was done in order to evaluate the status and trends of air quality, as well as the health risks associated with air pollution and the methods for controlling and disseminating air quality data. There are currently 28 stations located in 7 cities. (CPCB, 1998) reports that there are now 290 of these stations located in 92 different cities and towns throughout the country. (Tiwari, S.L.1991)

LITERATURE REVIEW

Morgan et al. (1980) performed hematological experiments and observed a reduction in the amount of hemoglobin, which may be connected to a decrease in the number of RBC and, as a consequence, suggests induction of an anemic state due to toxic effects.

Kodavanti and colleagues (2002) found a connection between the increased prevalence of respiratory illness symptoms and death rates in recent years and the presence of particle pollution in the air.

Sharma et al. (2004) conducted research to investigate the impact that particle air pollution has on the respiratory health of persons living in three different areas of Kanpur, India. Baskurt and colleagues (1990) demonstrated that changes in the structure and function of erythrocytes may take place under the influence of environmental factors, notably air pollution, which might influence the rheological behavior of blood. The significance of these results seems to lie in the fact that they may provide light on the physiological relationship that exists between air pollution and cardiac mortality.

Watanbe and Oonuki (1999) found that exposure to diesel exhaust decreased the rate of spermatogenesis in developing male rats. Additionally, diesel exhaust was shown to increase the synthesis of gonadotropin releasing hormone in the adrenal cortex.

Pachpande et al. (2005) conducted hearing tests on children and teachers who had been exposed to high levels of traffic noise and looked for signs of hearing loss. An investigation of the levels of noise pollution in the city of Visakhapatnam, India, was carried out by Vidyasagar (2006). During the Deepawali festival in Meerut City, Uttar Pradesh, Singh and Joshi (2010) examined the data collected over the course of three years on the level of noise pollution. Singh and Davar (2004) conducted research on the factors that lead to noise pollution, as well as its effects and potential solutions.

Ritz et al. (2004) performed an investigation of the production of ammonia and the emissions that came from industrial chicken farms. They came to the conclusion that ammonia was detrimental to not just the environment but also the health and well-being of animals as well as the productivity of poultry farms. Both the risk of respiratory disease and the risk of excessive concentration have harmful impacts on the health and production of birds. The former may cause respiratory illness, while the latter can cause excessive concentration.

Khan and Zafar 2005 investigated the hematological consequences of administering varying amounts of estrogen to broiler chickens. In a subtropical environment, Ladokun et al. (2008) evaluated the hematological and serum biochemical markers of both bare-necked and routinely feathered Nigerian indigenous chickens.

Bedanova et al. (2007) conducted research to investigate the impact that shackling has on the hematological profile of broiler chickens. The hematological characteristics of four different broiler strains Ross, Cobb, Arbor-acres, and Arian were analyzed and compared by Talehi et al. (2005).

Afolabi et al. (2011) investigated the effects that varying quantities of palm kernel cake had on the hematological characteristics of hens raised by Nigerian rural farmers. According to the findings of Levesque et al. (2011), being exposed to diesel exhaust for lengthy periods of time results in an increase in neuroinflammation and a rise in early indications of neurodegenerative disorder. The hematological parameters, erythrocyte size, and haemoglobin saturation of broiler chickens that were grown in commercial settings were investigated by Navecsewaski et al. (2012). Sulaiman et al. (2010) did study on muscovite ducks in Nigeria and compared the cellular composition of their blood to the composition of the blood of other species of ducks.

According to Modi and Bhojak (2013), India is the third largest emitter of carbon dioxide in the world, coming in behind only China and the United States. It is estimated that increased coal use in India is responsible for 67% of the increases in emissions that occurred between 1990 and 2009. According to the findings of this study, India was responsible for 593 million tons of carbon dioxide emissions in the year 1990, which is equivalent to 2.8% of the total global emissions. The rate of growth in emissions reached 5.4% in 2009, which is equivalent to 1548 million metric tons of CO2 released into the atmosphere. The report emphasizes the need for care by pointing out that this figure is much higher than the worldwide average of 1.7%. The report comes to the conclusion that India should transition to energy sources that are less polluting and more up to date in order to make economic progress and lessen its impact to global warming. The following is a survey of the research that has been conducted on the topic of how economic growth and environmental quality are connected, specifically in respect to air pollution

METHOD's AND METHODOLOGY

There are two parts to the current project. In the first stage, the city of Kaithal's overall layout was documented, along with the current number of generators and the degrees of air pollution and noise pollution in various residential, commercial, industrial, and quiet regions. Patients' hospital visits were also noted for their history of respiratory conditions including asthma and TB. The total number of cars, motorcycles, and trucks throughout a four-year period (2018-2022) was also reported.Cockerel birds were subjected to a 5kva diesel generator at a poultry farm during the second part of the studies. The birds were put under artificial light for 30, 60, 7, 14, 21, and 28 days at 2, 6, and 10 feet.

ASSESSING THE IMPACT OF VEHICLE EMISSIONS ON KAITHAL CITY

Research on automobile pollution in major cities and smaller towns was performed by the Central Pollution Control Board, the State Pollution Control Board, the Kaithal Municipal Corporation's pollution Control cell, and other authorities, paving the way for the introduction of "Euro standards." Carbon monoxide (CO), hydrocarbons (HC), oxides of nitrogen (NOx), and particulate matter make up around 1-4%, 18%, 20%, and 80%, respectively, of the emissions from cars and diesel generators, respectively. The air quality is becoming worse and worse as a result of these gasses and carcinogenic compounds (Sharma et al., 1996). Two- and three-wheeled vehicles powered by two-stroke gasoline engines make up about 70% of the traffic, while four-wheeled gasoline-powered vehicles make up around 14% and diesel-powered cars make up the remaining 8%. Apart from the quantity of cars, the other variables responsible for vehicular air pollution include heavy traffic, bad road conditions and age of the vehicles (Thirumarran et al. 2004).

Experimental Model

Cockerel birds were separated into two groups' viz. Experimental and control. There were six baby chicks in each group. Each experimental group was exposed to Diesel exhaust (DE) in a cage for 7, 4, 21, and 28 days, with exposure lasting 30 minutes on some days and 60 minutes on others. Each control group had the same number of birds that were released into the open air.

Experimental design

1. Control group - Each set of six birds was given access to outside air as a control.
2. Six birds in each of the first, second, and third groups were subjected to Diesel Exhaust (DE) at distances of 2 feet, 6 feet, and 10 feet for 30 minutes for periods of 7, 14, 21, and 28 days.
3. Different groups of birds (IV, V°, and VI) were subjected to 60 minutes of exposure to diesel exhaust (DE) at distances of 2, 6, and 10 feet for 7, 14, 21, and 28 days.
4. Therefore, in the current study, we conducted a pair of experiments.
5. Before feeding the birds in each trial, blood was taken from the cockerel birds' brachial veins the next morning.

RESULTS AND DISCUSSION

Body Weight

Exposure of birds to diesel exhaust for 30 minutes and 1 hour every other day up to distances of 2, 6, and 10 feet resulted in significant changes in body weight after 7, 14, and 28 days, respectively.

A. Cockerel bird body weight (in grams) as a function of time (30 minutes) spent in diesel exhaust.

Table 1 displays the results of a statistical analysis of data on body weight 30 minutes after exposure. After 7 days, there was a substantial drop in body weight compared to the control group of 5% (p0.05) in Group II and 1% (p0.01) in Group I. At the 5% level (p0.05), there was a substantial reduction in Group I and Group II after 14 and 28 days of exposure, respectively. The birds' body weight decreased considerably at the 1% level (p0.01) as compared to the control group after being exposed for 2l days.

Table 1: Comparison of exposed cockerel birds' body weight (gm) at 2 feet (6 meters) and 10 feet (30 meters) to that of a control group that was not exposed to diesel exhaust (DE) from a 5 kilowatt (kW) generator.

Length of period Days	Control group mean + S.E. control	Experimental group mean + S.E.		
		Group-I(2ft)	Group-II (6ft)	Group-III (10 ft)
7	1164+12.99	1048+22.82b	1080+20.50a	1118+12.77
14	1410+5.20	1331+10.81a	1375+25.83	1410+5.29
21	1874+2.66	1821+10.58b	1870+2.88	1872+3.84
28	1972+32.85	1823+12.99a	1849+26.17a	1963+31.26

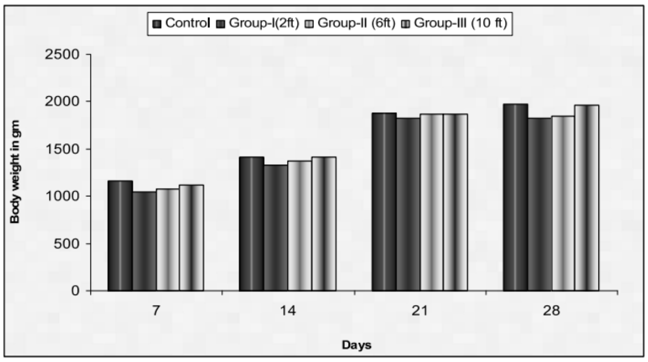

Figure 1: Cockerel bird body weight (grams) as a function of exposure to diesel exhaust (DE) from a 5kva generator at 2 feet, 6 feet, and 10 feet for 30 minutes.

B. How long-term exposure to diesel exhaust (DE) affects body weight (gm) in cockerel birds.

Consumption routines: During the course of the trial, a decrease in the amount of food and water consumed by the exposed group of cockerel birds was seen in contrast to the control group.

Mortality: During the course of the trial, the exposed groups had a total death rate of around 33 percent among the cockerel birds.

Lung weight: There was an increase in lung weight in the exposed group of cockerel birds to diesel exhaust (DE) as compared to the control group at various lengths of time (7, 14, and 28 days) up to distances (2ft, 6ftandl0ft) for 30 minutes and 1 hour/alternate day. This was the case at different distances (2ft, 6ftandl0ft) for 30 minutes and 1 hour/alternate day.

A. Cockerel bird lung and air sac weight (in grams) following exposure to diesel exhaust (DE) for 30 minutes.

Table displays the results of a weight study conducted on the lungs and air sacs of exposed cockerel birds. There was no discernible difference between the exposed and control groups after 14, 21, or 28 days. However, on day 7, there was a substantial drop in Group I of 1% (p 0.01).

Table 2: Lung and air sac weight (gm) of subjected cockerel birds at 2 feet, 6 feet, and 10 feet/30 minutes to diesel exhaust (DE) from a 5 kilowatt (kW) generator against a control group (21 days).

Length of period Days	Control group mean + S.E. Control	Experimental group mean + S.E.		
		Group-I (2ft)	Group-II (6ft)	Group-III (10 ft)
7	12.63+0.34	9.81+0.59b	11.48+0.38	12.29+0.04
14	13.03+0.25	11.54+0.99	12.64+0.62	13.26+0.20
21	12.67+0.30	13.15+0.02	12.74+0.16	12.79+0.17
28	12.93+0.26	13.16+0.11	13.44+0.26	12.94+0.28

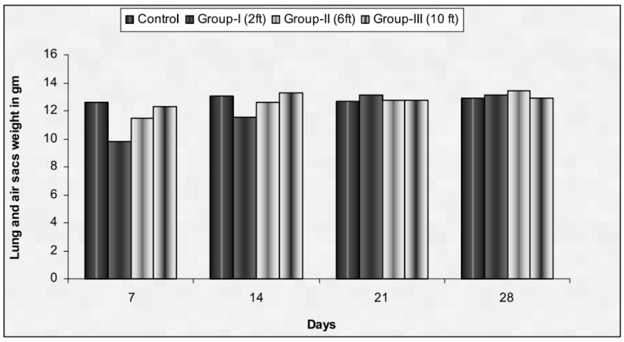

Figure 2: Comparison of lung and air sac weight (in grams) between control and diesel exhaust (DE)-exposed cockerel birds at exposure levels of 2 feet, 6 feet, and 10 feet for 30 minutes.

B. The weight and size of the air sacs (gm) in exposed cockerel birds' lungs after being exposed to diesel exhaust for 1 hour.

Table displays the results of a statistical analysis of data relating to the weight of the lungs and air sacs of exposed birds. In Group IV, there was a 0.1% drop after 7 days (p0.001). Other groups, however, showed no statistically significant changes. The average weight of the lungs and air sacs grew by 5 percent during 28 days (p 0.05).

The current study found that the growth performance of cockerels utilized for food was most negatively affected by air pollution from diesel generators. Laying chickens were also negatively impacted.

However, according to Saunders, J.C. (2010), researchers throughout the globe now know that chicks are a viable experimental animal model in which to investigate the impact of sonic damage on hair cell regeneration. As a result, the bird was chosen as the subject of this study.

Cockrel birds in the exposed groups had considerably lower body weights, as seen in Tables 9a and 9b. After 7 days, Group II had a substantial drop in body weight at the 5% level (p0.05). At the 5% level (p0.05), both after 14 days and after 28 days of exposure in Group I and Group II, respectively. Group IV, which was exposed for 7 days, had a reduction of 5% (p 0.05).

General Observations

Body mass, eating and drinking habits, experimental mortality rate, and cockerel bird lung weight are all types of data covered in this chapter.

Body weight: Cockerel birds lost body weight in distinct and similar ways when exposed to diesel exhaust (DE) for 30, 60, or 90 minutes per day for 7, 14, 21, or 28 days, and at distances of 2, 6, and 10 feet.

Feeding and drinking behavior: Experiment results showed that cockerel birds in the experimental group consumed less food and water than the control group.

Mortality %: During the tests, almost 33 percent of each group died.

Lung weight: Diesel exhaust (DE) exposure increased lung weight in cockerel birds compared to controls throughout a range of exposure times and distances from 2 feet up to 8 feet for 30 minutes and 60 minutes on average over the course of 28 days.

CONCLUSION

The current effort investigated the impact of diesel generator-induced air pollution on the development of avian species. You may find them in the thesis chapter titled "A Study on the Effect of Environmental Stress Caused by man made Air Pollution on Cockerel Bird". This research is focused on determining how diesel pollution from generators in Kaithal city affects the blood of cockerel birds. When physical, chemical, and biological circumstances are normal, the key life processes in cockerel birds used as food are at their best. (Brauer, M 2006). The content and quality of the air is crucial to the development and success of birds. Birds, the food they eat, the air they breathe, the water they drink, and the physicochemical components of the air all have an effect on one another. The Kaithal city was selected as the research location and 5kva diesel generator were used for causing air pollution and sound pollution which is act as stressor to cockerel birds. The effect on the development of Gallus domesticus, a kind of bird often used as food, was measured.

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