ISSN 1682-8356
ansinet.org/ijps

INTERNATIONAL JOURNAL OF

POULTRY SCIENCE

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

International Journal of Poultry Science 8 (2): 188-191, 2009
ISSN 1682-8356

Effects of Refined Petroleum Product (Kerosene) Flame and Fumes on the Performance of Broiler Chickens

A.O. Amakiri, O.J. Owen and I.I. Iboh
Department of Animal Science, Rivers State University of Science and Technology,
P.M.B 5080, Port Harcourt, Nigeria

Abstract: An investigation was carried out to evaluate the effects of refined petroleum product (kerosene) flame on body weight gains, feed intake, feed conversion, mortality and internal organ weights (liver, lungs, kidney and heart) of broiler chickens. One hundred and twenty day old broiler birds (Aboika breed) were randomly assigned to 4 treatment groups of 30 birds per treatment, replicated thrice with 10 birds per replicate using Completely Randomized Design (CRD). Kerosene flame in a designed burner was placed 4, 8 and 12 metres from the birds respectively, which represented treatments 1, 2 and 3 while treatment 4 was in another poultry house without flame. The birds were fed *ad-libitum* on a proprietary starters mash for 5 weeks and a broiler finisher mash for 3 weeks. Water was provided *ad-libitum*. Routine inoculations and other medications were administered when due. Burning was from 6.00 am-10.00 pm daily for 56 days. Results indicated that the distances (treatments) did not significantly ($p>0.05$) affect mortality and organ weights. However, the flame distance significantly ($p<0.05$) affected weekly feed conversion, body weight gains and feed consumption. This research was a simulation of what obtains in a gas field, where gas flaring is carried out close to poultry farms and also to determine the impact of using kerosene in lanterns and stoves for brooding day old chickens.

Key words: Aboika breed, broiler chickens, performance, kerosene

INTRODUCTION

When crude oil is burnt as when natural gas is flared, various gaseous by-products are emitted into the atmosphere causing air pollution. Flames and fumes from crude oil wells and flared natural gas release approximately 82% of all pollutants discharged into the atmosphere by the oil industry (Uchegbu, 1998; Villasenor *et al*., 2003).

Gas flaring which is a controlled disposal of surplus combustible vapours by igniting them started in 1957 when commercial petroleum production began. It is a well established fact that Nigeria petroleum reserves are richer in gas than in crude oil (Aston-Jones, 1998). These gases are grossly under utilized (Egbuna, 1987) and constitute a waste to the economy (Osakwe, 1985) and are known to damage the atmosphere on which all life depends (Anijah-Obi, 2001).

Crude oil is the chief source of hydrocarbons and when fractionally distilled, the various components are often collected over a range of boiling points (Ababio, 1993). The main fractional distillates of petroleum include natural gas, light petroleum (petroleum ether), ligroin (light naphtha), petrol (gasoline), paraffin (kerosene), gas oil, lubricating oil and asphalt (bitumen) (Table 1).

Refined petroleum product (kerosene) is a mixture of hydrocarbons that contains 12-18 carbon atoms per molecule and it boils between 190-250^{0}C. It is a fairly volatile liquid which is used as a fuel for lighting lamps (illumination), heating or cooking, fuel for automobiles driving, modern jets and aeroplanes, burning bush, grasses and wood (incineration) (Murray, 1972; Jumoke, 1999). Kerosene is also a good solvent for grease and paints. It is also used as an insect repellant because of its odour. Developing countries with epileptic electricity supply use kerosene in lanterns and stoves for heating and brooding chicks and other livestock. When kerosene burns, it produces a flame which could be blue, luminous flame or yellow sooty flame, depending on the type of burner used. Fumes from sooty kerosene flame are laden with Volatile Organic Carbon (VOC) and Suspended Particulate Matter (SPM), which irritate the respiratory tract when inhaled either by man or livestock. The objective of this study is to determine the effect of burning refined petroleum product (kerosene) on broiler chicken performance so as to simulate what happens in an oil field, where gas flaring is carried out close to poultry farms and also to determine the impact of using kerosene in lanterns and stoves for brooding day old chicks.

MATERIALS AND METHODS

This study was done at the Rivers State University of Science and Technology Teaching and Research Farm Port Harcourt, Nigeria.

One hundred and twenty day old broiler chicks of Aboika breed were divided into 4 groups of 30 birds each, replicated thrice with 10 birds per replicate in a Completely Randomized Design trial. The distances

Table 1: Crude oil distillation fractions

Fraction	Temperature range °C	Approx No. cabom atoms	Use
Residue	>400	25	Heavy fuel oil and bitumen
Heavy gas-oil, light lubricating oil	300-400	18-25	Fuel lubricants, paraffin wax, medicinal paraffin
High gas-oil	250 -300	13-17	Fuel oil, Diesel engine
Kerosene (Paraffin oil)	190-250	12-18	Fuel oil, tractor and jet-engine
Naphtha	100-200	5-10	Solvent and raw material
Petrol (Gasoline)	40-180	5-10	Fuel
Petroleum ether	40-60	5-10	Solvent
	60-80		Alkanes
Gas fraction	<40	1-5	

Source: Ababio (1993)

from the flame point were 4, 8, 12 m and a control, representing treatments 1, 2, 3 and 4, respectively (Fig. 1). Treatment 4 was located in a separate building without flame. The birds were distributed randomly into 12 pens and brooded in an open sided brooding pen on deep litter. Brooding temperatures ranged from 33-35°C. The refined petroleum product (kerosene) was ignited in a designed metal burner, 22.86 cm high, 17.80 cm diameter and a thickness of 1.27 cm (Fig. 2).

The birds were fed *ad-libittum*, on a proprietary broiler starter mash containing (2285.6 KcalME/kg and 24.91% crude protein) for 5 weeks and a broiler finisher mash (2304.9 KcalME/kg and 20.05% crude protein) for 3 weeks. Water was provided *ad-libitum*, feed intake and mortality values were recorded daily. Body weights were taken on a weekly basis. Body weight gains and feed conversion ratio were calculated on a weekly basis. At the end of the 8th week, three birds per treatment were slaughtered by severing the jugular vein and the liver, lungs, heart and kidney removed and weighed. Statistical analysis was carried out using analysis of variance (Steel and Torrie, 1980) and treatment means were separated using Duncan's Multiple range test as modified by Gomez and Gomez (1984).

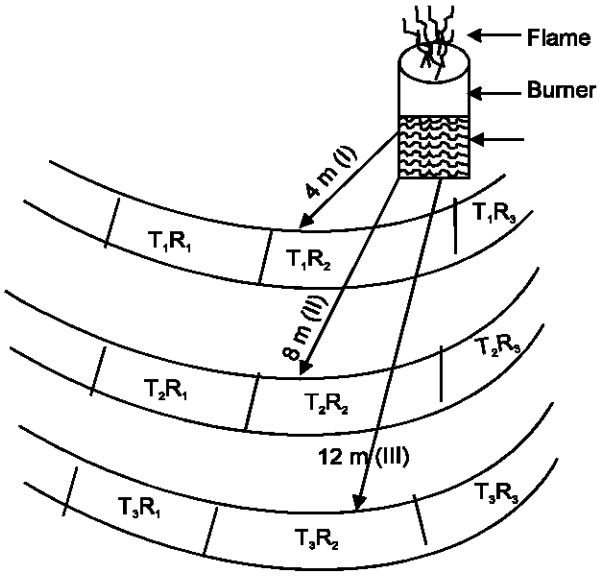

Fig. 1: Poultry pen experimental design, showing the distances from the flame point

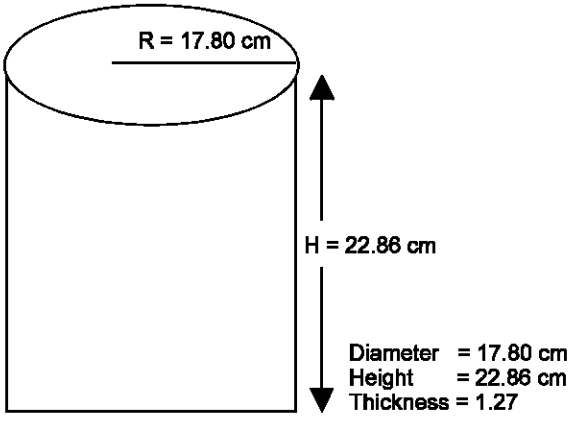

Fig. 2: Designed metal burner that was used to burn the kerosene to produce the flame

RESULTS AND DISCUSSION

Results of growth performance of the treated broilers are presented in Table 2. The results showed that the distances (treatments) did not significantly ($p>0.05$) affect body weights, mortality and organ weights. However, the flame distances significantly ($p<0.05$) affected feed conversion, body weight gains and feed consumption.

This study was a simulation experiment to show the effects of the noxious gases produced during gas flaring on poultry farms in the Niger Delta region of Nigeria.

It is known that in the field where gas flaring is carried out and also where oil spillage occurs, man, animals, vegetation, soil and indeed the entire environment are affected adversely through high environmental temperatures, high thermal radiation, production of toxic gases during combustion, high noise levels, continuous light intensity and injection of toxic substances (Nwokolo *et al*., 1984; Egbuna, 1987; Monsi *et al*., 1991; Ngodigha *et al*., 1999). The finding of this research agrees with this

Table 2: Overall effects of refined petroleum product (kerosene) flame and fumes on production parameters and organs of broiler chickens for experimental period of 8 weeks (56 days)

Treatment	Weekly body weight (kg)	Weekly body weight gains (kg)	Average Daily Gains (ADG) (kg)	Weekly feed consumption (kg)	Weekly feed conversion (kg)	Weekly mortality (%)	Organ weights (g) Liver (g)	Lung (g)	Heart (g)	Kidney (g)
4 m	15.17±5.97	2.62±0.07^{a}	0.38±0.01	6.03±0.09^{ab}	2.47±0.3^{ab}	0.19±0.57	36.40±1.32	9.13±2.17	7.90±0.81	1.30±0.32
8 m	12.27±4.76	2.01±0.06^{b}	0.29±0.01	5.47±0.17^{c}	2.71±0.14^{a}	0.40±0.58	35.43±4.23	11.70±0.70	7.13±0.63	1.06±0.22
12 m	13.83±4.58	2.78±0.09^{a}	0.40±0.01	6.30±0.10^{a}	2.37±0.05^{ab}	0.28±0.21	32.60±3.41	9.20±1.33	7.13±0.64	1.10±0.17
Control	15.63±6.23	2.78±0.07^{a}	0.40±0.01	5.90±0.10^{b}	3.23±0.05^{b}	0.00	33.97±0.58	12.23±1.17	7.23±0.20	1.97±054

^{a,b,c}Means within each column that bear different superscripts differ significantly ($p<0.05$)

and is also in line with (Campbell and Lasley, 1969; Ganong, 1971) who stated that high environmental temperature, injury and disease stunt growth because they increase catabolism. Wairaven (1992) had also opined that the biological effects of crude oil spills on sea birds include body weight decrease. Also results obtained indicate that the treatments significantly affected the weekly feed consumption. The treated groups tended to eat more than the control birds. Though feed intake was lowest in treatment 2. This may have resulted from higher mortality in that treatment due to disease which agrees with Williamson and Payne (1978), who attributed feed intake to be a function of the environmental temperature, metabolizable energy, protein ratio balance of the feed, stress and disease.

The result of feed conversion was also significantly affected by the treatments. Mortality rate of birds was not significantly affected. The highest mortality was recorded in treatment 2. Post mortem report attributed cause of death to asphyxiation due to inhalation of thick smoke and coccidiosis. This result agrees with observations made by Williamson and Payne (1978), who separately reported that broiler chicks mortality is attributable to suffocation, chilling, overheating and diseases.

Mortality patterns and modalities in birds exposed to crude petroleum and its products effects through ingestion and inhalation procedures may not be similar probably because of the toxicity levels. Ingested crude oil has been observed to cause mortality from alterations in the general morphology of tissues and organs in rabbits (Berepubo *et al*., 1994); goats (Ngodigha *et al*., 1999) and poultry (Nwokolo *et al*., 1984; Monsi *et al*., 1991).

Increased levels of inhalation of toxic gaseous emissions such as Nitrogen dioxide (NO_2), Sulphur dioxide (SO_2), Hydrogen Sulphide (H_2S), Carbon monoxide (CO) and Suspended Particulate Matter (SPM) from crude oil may eventually predispose various mortality levels.

Conclusion: The experiment involving 120 broiler birds was conducted to study the effects of refined petroleum product (kerosene) flame and fumes on broiler chicken production, which simulates the relationship between poultry farms and gas flaring fields. Inhalation of gaseous emissions from burning kerosene did not result in very severe toxicological effects (in relation to mortality), as compared to ingestion of crude oil, probably due to the length of exposure to fumes as well as toxicity level.

Among other effects, the burning of kerosene during the brooding and finishing phases of broiler production resulted in air pollution which negatively affected most of the production parameters measured, especially the weight gains, feed consumption and feed conversion. The gaseous pollutants from kerosene burning acted as stressors to the birds.

REFERENCES

Ababio, O.Y., 1993. New School Chemistry for Senior Secondary School. 3rd Edn. African Feb-Publishers Limited (AEP), Onitsha, Nigeria, pp: 112-120.

Anijah-Obi, I.N., 2001. Fundamentals of Environment Education and Management. University of Calabar Press, Calabar, Nigeria, pp: 92-124.

Aston-Jones, N., 1998. The Human Ecosystem of the Niger Delta: An Era Handbook, Environmental Rights Actions: Lagos, Nigeria. pp: 136-138.

Berepubo, N.A., N.C. Johnson and B.T. Sese, 1994. Growth potentials and organ weights of weaned rabbits exposed to crude oil contaminated feeds. Int. J. Anim. Sci., 9: 73-76.

Campbell, J.R. and J.F. Lasley, 1969. The Science of Animals that Serve Mankind. McGraw-Hill Inc., New York, USA, pp: 445-446.

Egbuna, D.O., 1987. The environmental hazards of the Nigerian gas industry. In: Petroleum Industry and the Nigeria Environment. Proceeding 1987 seminar, the Nigeria National Petroleum Corp. Lagos, Nigeria, pp: 35-47.

Ganong, F.G., 1971. Review of Medical Physiology. 5th Edn. Lange Medical Publications, California, USA, pp: 321-345.

Gomez, K.A. and A.A. Gomez, 1984. Statistical Procedure for Agricultural Research. 2nd Edn. John Wiley and Sons Inc.

Jumoke, E., 1999. Comprehensive Chemistry for Senior Secondary Schools. Sure Bet for WASSCE. Glance Series. A. Johnson Publ. Ltd. Ikate, Surulere, Lagos, Nigeria, pp: 95-96.

Monsi, A., N. Kwinji and O.U. Akpan, 1991. Response of broiler chickens to dietary and water administered crude petroleum. J. Anim. Prod. Res., 11: 99-110.

Murray, P.R.S., 1972. Principle of Organic Chemistry: A Modern and Comprehensive Text for Schools and Colleges. South East Asian reprint. H.E.B. Hong Kong, Singapore, Xuala Lumpur, London, pp: 92-96.

Ngodigha, E.M., F.O. Olayinka, B.M. Oruwari, I.K. Ekweozor and S.N. Wekhe, 1999. Toxic effects of crude oil on organs and blood cells of West Africa Dwarf goats. Nig. Vet. J., 20: 82-91.

Nwokolo, E.L., O.C. Ohale, R. Nduaguibe and E.C. Ibe, 1984. Anatomical and growth characteristics of pullet chicks exposed to various levels of Nigeria Crude Petroleum. Proceedings of the International Conference on "Petroleum and Agriculture" Petroleum Training Institute, Warri, Nigeria, pp: 34-38.

Osakwe, E.N.C., 1985. National energy policy for self-reliance: A critical evaluation of present policies. Seminar on Energy. Self Reliance and National Development. University of Port Harcourt, Nigeria, pp: 50-55.

Steel, R.G.D. and J.H. Torrie, 1980. Principles and Procedures of Statistics. McGraw-Hill book Co. Inc., New-York, pp: 113-114.

Uchegbu, S.N., 1998. Environmental Management and Protection, Precision Printer Pub, Enugu, Nigeria, pp: 17-35.

Villasenor, R., M. Magdaleno, A. Quintaner, J.C. Gallando, M.T. Lopez, R. Jurado, A. Mirananda, M. Aguvar, L.A. Malagarejo, E. Polmerin, C.J. Vallejo, and W.R. Baronet, 2003. An air quality emission inventory of offshore operation for the exploration and production of petroleum by the Pelican Oil Industry J. Atmospheric. Environ., 37: 3713-3729.

Wairaven, E., 1992. Rescue and Rehabilitation of Oiled Birds. Zoological Park Board publishers, Tarong, 300 Sydney, pp: 120-125.

Williamson, G. and W.J.A. Payne, 1978. An introduction to Animal Husbandry in the Tropics. 3rd Edn. Longman, London, pp: 601-613.