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Short Communication

NITRATE POISONING IN DUCKS

PREMALATHA. N. AND R. RAMYA*
Veterinary University Training and Research Centre, Melmaruvathur - 603 319
Directorate of Extension Education, Tamilnadu Veterinary and Animal Sciences University, Chennai, India

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ABSTRACT

A study was carried out to determine the cause of sudden death of ducks at Mettukolathur farm, Kancheepuram district. To explore the cause of mortality; history and clinical signs were recorded. Post-mortem examination was carried out and samples were collected for laboratory diagnosis. The nitrate content of water was found to be 100mg/L. History along with clinical symptoms, tissue changes and laboratory analysis suggested nitrate poisoning. There may be possible relationship with flooding and toxic levels of nitrate since the mortality occurred immediate after floods in the area.

Key words: Nitrate poisoning, duck, water treatment, Tamilnadu

Ducks are reared by poor rural farmers for their livelihood and self employment. These are adapted to an aquatic existence consuming larvae and insects of all pests and lay more eggs than chickens. Nitrate and nitrites are composed of nitrogen and oxygen that occurs naturally in the environment as a part of nitrogen cycle. During periods of drought the amount of nitrate in the soil can increase because of lack of leaching, reduced nitrogen uptake by plants, decomposition of organic matter etc., Hence when drought breaks, nitrate uptake by plants may be high especially in the first week after rain (Sarah, 2007). Within soil and water, waste from animals, humans and fertilizer products are decomposed to form nitrates and nitrites. Nitrate toxicosis can result from accidental ingestion of fertilizer or other chemicals and largest source of nitrates in water comes from nitrogen based fertilizers and nitrate concentration may be hazardous in ponds that receive extensive feed lot or fertilizer runoff. These nitrate sources contaminate shallow drinking water sources or poorly caged wells that are typical in rural areas. Many species are susceptible to nitrate and nitrite poisoning. The effects of this toxicity are usually sudden but may be long term (Christopher, 2010). The experimental poisoning of pheasant chicks with nitrates changed the haemoglobin to methemoglobin in blood (Stornad and Persin, 1983).

The authority of the duck unit of Mettukolathur, Acharapakkam block, Kancheepuram reported sudden death of ducks in Kancheepuram district of TamilNadu. The duck unit was visited. Clinical signs, post mortem examination of dead birds and laboratory examination of the samples collected were undertaken. Necropsy was conducted systematically and gross lesions in various organs were noted. Tissue specimens such as lung, liver, intestines were collected in 50% glycerol saline and 10% formal saline for isolation of the pathogen and histopathology, respectively. Blood on filter paper from morbid ducks was collected for assessing RD titres (Suganthi *et al.,* 2008). Few drops of blood were put on white filter paper (for change of color). Water sample was collected in a sterile container and was tested using TWAD field water test kit for potability.

The domestic duck unit with a flock strength of 180 birds of 3 years of age was located amidst the agricultural fields with shallow pond like premises surrounded by water canal meant for irrigation. During first week of December 2015, heavy flood occurred in this area. The said duck unit observed sudden death after 48 h of heavy rain. Acute mortality of some ducks within an hour of onset of clinical symptoms was recorded. Overall, there was 27% (49 ducks dead) mortality. The morbid ducks (n=60) were anorectic, dull, depressed along with watery droppings, emesis, laboured breathing, tremors, incoordination etc. Similar clinical findings due to nitrate and nitrite poisoning had been reported earlier in broiler breeding hens and layers (Litjens and van Eijkelenburg, 1987; Van der Rijt, 1989).

On post mortem examination semi digested food in gizzard, hyperaemia of liver, congestion of lungs, petechial haemorrhages in the intestines was noticed. Histopathological examination revealed multiplication of the eosinophilic granulocytes in the villous stroma of small intestine. Similar findings were also reported by Stornad and Persin (1983) during experimental poisoning of pheasant chicks with nitrates and nitrites. However, the

*Corresponding author: ramyavet@gmail.com

Table 1
Results of water testing

Appearance	Odour	Turbidity	pH	Alkalinity	Hardness	Chloride	Fluoride	Iron	Ammonia	Nitrate	Nitrite	Phosphate	Residual chloride	TDS
Light yellow	Unpleasant	Turbid	7.5	500 mg/L	1000 mg/L	500 mg/L	1 mg/L	-	-	100 mg/L	-	3.0 mg/l	0.5 2000 mg/L	

tissue sections of lungs and liver did not reveal any major histopathological change.

Organs collected in 50% glycerol saline were found negative for the presence of duck viral hepatitis virus. HI titre could not be detected from blood on filter paper which confirmed the absence of haemagglutinating virus infection thus ruling out Ranikhet disease. Brownish discoloration of blood on white filter paper suggested the conversion of haemoglobin to methaemoglobin which is the major pathognomonic feature of nitrate poisoning (Stornad and Persin, 1983; Litgens and Eijkelenburg, 1987; Blood, 1991; Smith, 1995). Testing of triplicate water samples using kit revealed the water source to be polluted and non-potable with high nitrate and phosphate levels. The average values of triplicate sampling are given in Table 1. Coliform contamination of water was also noted on cultural examination with MacConkey and nutrient agar. Antibiogram revealed sensitivity of the isolated *E. coli* to enrofloxacin. Water parameters were analysed as per the guidelines of North Carolina State University's drinking water quality for poultry (www.ces.ncsu.edu/depts/poulsci/tech_manuals/drinking_water_quality.html). The nitrate contamination in water was 100mg/L which was 2.0 fold times greater than the maximum acceptable level for poultry (50 mg/L). The level of phosphate content was 3 mg/L which indicated pollution due to flood leaches. Residual chlorine was 0.5 mg/L and the chloride level was 500 mg/L. The excess level of chlorine and chloride probably caused lower water consumption and dehydration, hence dechlorination of water was done with sodium thiosulphate at the recommended dose of 0.1 g-0.3 g/10L (en.wikipedia.org/wiki/Sodium_thiosulfate). Moreover, 80% of the water in the pond was also replaced with fresh water source. The ducks were treated with 10% enrofloxacin oral suspension@ 10mg/kg. b.wt. for 5 days along with vitamins A, D, E, C in recommended doses in drinking water to combat secondary bacterial infections.

The history, clinical signs, tissue changes and the laboratory analysis indicated nitrate toxicity and the source of nitrate in the pond appeared to be runoff water contaminated with nitrates and leaches imminent to flood in TamilNadu during Nov-Dec 2015. The treatment contained the mortality and ducks rescued with recovered health status. The control measures suggested were elimination of polluted water sources, depopulation of ducks from the polluted pond, rearing of ducks in pond like enclosures which could be elevated from the ground level to prevent entry of runoff water and contamination. The farmer was also advised to retain the ducks at pens away from the runoff water during rainy season which are contaminated with nitrates.

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