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Comparative Toxicity of Two Different Pesticides on the Skin of Japanese quail (*Cortunix japonica*)

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ABSTRACT

The effect of pesticides spray and exposure on the skin was assessed in Japanese quails. Fifteen adult quails were randomly sorted in to 3 different groups of five birds each. Birds were exposed to Carbendazim (CBZ) and Lambda-cyhalothrin (LCT) and observed daily for two weeks after which skin biopsies were taken. The findings suggest cutaneous reaction to these pesticides. Comparably, quails that had contact with CBZ showed more adverse reactions than quails that had contact with LCT. Exposure of wildlife over an extended period of time to pesticide may result in chronic poisoning due to dermal absorption

Key words: Pesticides, Carbendazim, Lambda-Cyhalothrin, Dermal Exposure, Wildlife.

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INTRODUCTION

There are many sources of environmental toxicity, organic or inorganic like the use of pesticides which include insecticides, fungicides, rodenticides and herbicides. Most of these compounds persist in the environment after application some even remain for years. Pesticides affect human, environment and wildlife including birds (Mitra et al., 2011). Reports have shown that insecticidal products containing pyrethroids like Lambda-cyhalothrin LCT have been widely used to control insect pests in agriculture, public health, homes and gardens (Ezemonye and Tongo, 2010; Omonona and Emikpe, 2011; Omonona, 2014). Also Carbendazim (Methyl 2-benzimidazole carbamate CBZ) is a widely applied fungicide (Omonona and Jarikre, 2015; Omonona, 2015). Cutaneous exposures of wildlife to myriad of pesticides have not been well studied. Nonetheless, the skin due to its distribution on the body surface serves as a physical barrier and fist-line exposure to toxic agents like pesticides. Most of these pesticides, have largely replaced the more environmentally and biologically persistent organochlorine pesticides and have become widely used throughout the world (Osteen, 1993; Hill, 1995). Pesticides affect animals by inhibiting enzymes and disrupting endocrine activities.

Quail inhabit a variety of ecosystems, but they prefer areas with high grass or scrubby vegetation. Increasing use of pesticides has resulted in the need to find methods for predicting hazards to humans, domestic and wild animals alike. The indicator species concept for predicting hazards from pesticides to wildlife include the use of sentinel organisms in assessing acute and prolong exposures to pesticides (Schafer and Brunton, 1979). Wild bird mortality due to pesticide toxicity also has been documented in other parts of the world (Grue et al., 1983, Mitra et al., 2011). The aim of this study is to evaluate the effects of pesticides spray and exposure on the skin of Japanese quails.

MATERIAL AND METHODS

Experimental design

The experiment was carried out at the domestication unit of department of Wildlife and Ecotourism Management, University of Ibadan, Nigeria. Research protocol followed ethics for biomedical research.15 adult quails (about six weeks old) were randomly divided in to 3 different groups of five birds each. Two groups were exposed to the different pesticide sprays and first group served as control.The pesticide used for second group included forcelet, a synthetic agricultural fungicide which contains 50% carbendazim, belonging to the toxicity class IV. The pesticide used for the third group included Lara Force which had lambda-cyhalothrin 2.5%EC as the active ingredient (toxicity class II). Pesticide dosage was 1.25mg/g body weight dissolved in water and sprayed.

Physical observations

The birds exposed to pesticide sprays and control birds were observed daily for two weeks for signs of cutaneous reactions.

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Skin biopsy & processing

The area of affected Skin was locally anesthetized with lignocaine and incisions of 2.5 by 2.5 cm^2 was made to take skin samples, immediately fixed in 10% neutral buffered formalin and then routinely processed for paraffin embedding. Sections of thickness 4µm were stained with hematoxylin and eosin and examined using the Olympus light microscope (CX21) attached to a digital computerized camera (AmScope, MU900).

RESULTS AND DISCUSSION

Physical observation

The quails that had contact with carbendazim showed signs of pruritus as increased self-beak picking, restlessness, and ruffling of the feathers. There was moderate generalized loss of plumage (alopecia) especially in the neck region of the quails that had skin contact with carbendazim; also there were a few petechial subcutaneous hemorrhages. Contrastingly, mild alopecia was observed in the quails that had skin contact with lamda-cyalothrin and normal in the control quails.

Microscopic examination

There was moderate necrosis and atrophy of the epidermal cells with moderate perifolliculitis and vascular congestion in the dermis (Fig. 1) of quails that had contact with carbendazim. Mild similar reactions were also observed in the quails that had contact with LCT (Fig. 2) as compared to the control birds (Fig. 3)

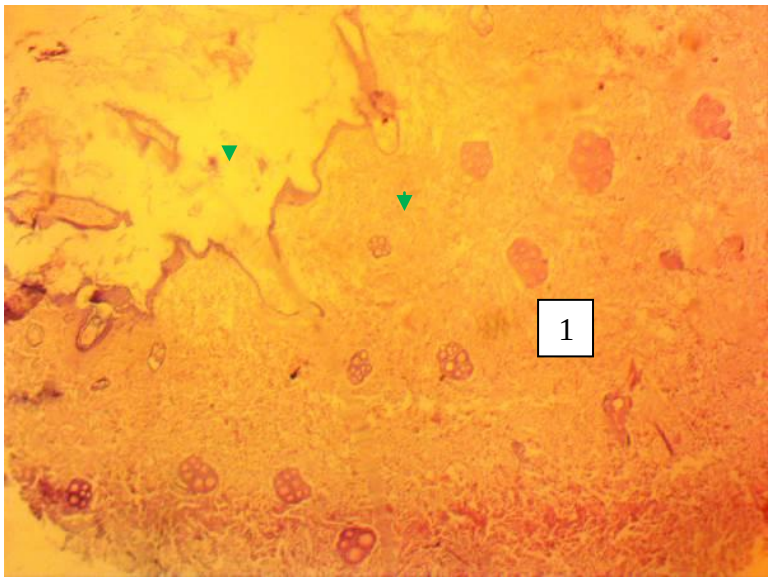

Figure 1. Photomicrograph of the skin from CBZ contact adult Japanese quail showing epidermal atrophy (arrow head) and peri-folliculitis (arrow) X40.

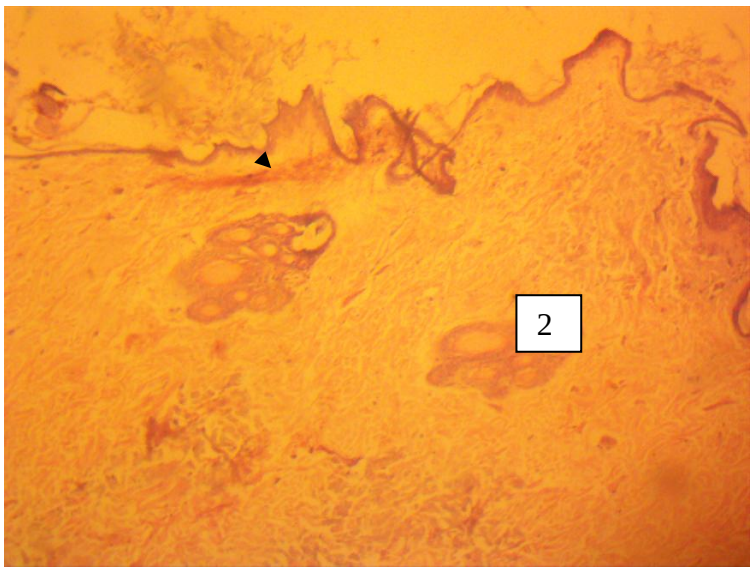

Figure 2. Photomicrograph of the skin showing perifolliculitis in LCT contact adult Japanese quail. (Arrow) X40.

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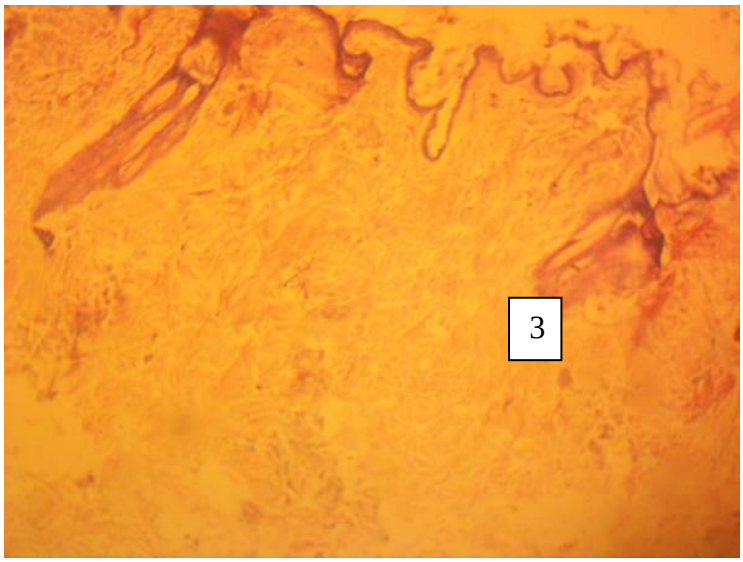

Figure 3. Photomicrograph of the skin from control adult Japanese quails. X100 H&E

Organ toxicity has been previously studied on carbendazim and Lambda-cyhalothrin toxicities in quail (Omonona, 2014; Omonona, 2015) but this report on dermal reaction might be the first. Mild to moderate dermatotoxicities were observed in quails however, carbendazim might have induced remarkable changes as compared to Lambda-cyhalothrin. It might be as a result of the cutaneous absorption and/or toxicity class of these pesticides.

In the United States, individual incidents to pesticide poisoning have been reported in a diversity of wild birds, including wild turkeys (*Meleagris gallopavo*) (Nettles, 1976), raptors (Henny et al., 1987), waterfowl and gulls (Hill and Fleming, 1982) and passerines (Augspurger et al., 1996). Other researchers have described multiple mortality events caused by one or more organophosphates. Stone and Gradoni (1985) reported 54 avian mortality events involving diazinon, also Littrell (1988) described 22 waterfowl incidents caused by carbofuran. Grue et al. (1983) listed 30 documented wildlife mortality incidents involving 12 different organophosphates in North America between 1965 and 1983. Franson and Smith (1999) summarized severity of toxicities from selected avian incidents involving 9 organophosphates and carbamates. All of these cases had contact exposures to the different pesticides and the ensuing toxicities.

CONCLUSION

This study has ascertained the dermato-toxicity of carbendazim and Lambda-cyhalothrin to quails. Studies should be geared in areas of environmental toxicity to manage reaction of wildlife to adverse effect of pesticides.

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