

MONOCROTOPHOS TOXICITY IN PEA FOWL IN HARYANA

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ABSTRACT

Monocrotophos is an organophosphate insecticide acutely toxic to birds and human beings. Deaths of peafowls were reported during the 2nd week of November 2014 in Rewari district and during 3rd week of January 2015 in Sonapat district of Haryana. All the deaths were sudden without any clinical symptoms. Gizzard and crop contents were subjected to pesticide residue analysis for detection of organochlorine, organophosphate and pyrethroid pesticides by gas liquid chromatography. Residues of monocrotophos (8.8 mg/kg) and chlorpyrifos (0.022 mg/kg) were detected in the gizzard contents of the peacock from Rewari district. Monocrotophos was detected from gizzard (2.399 mg/kg) and crop (4.722 mg/kg) contents in one peacock from Sonapat district while in the second peacock, monocrotophos (16.48 mg/kg) and chlorpyrifos (0.034 mg/kg) residues were detected in the gizzard contents. The history, postmortem examination and pesticide residue analysis of ingesta clearly indicated monocrotophos toxicity as the cause of death in peafowls at both places.

Key words: Haryana, insecticide, peafowl, monocrotophos toxicity

Pesticides are used for preventing, fighting and killing a variety of pests. Monocrotophos, an organophosphorus insecticide and acaricide, is extremely toxic to birds and is used as a bird poison (Smith, 1993). It is used to control a variety of sucking, chewing and boring insects and spider mites on cotton, sugarcane, peanuts, ornamentals and tobacco (Kidd and James, 1991; Meister, 1992). Although application of pesticides is meant for pests only, but non-target species (domestic and wild animals) also get exposed to these pesticides.

Indian peafowl (*Pavo cristatus*), the national bird of India, is a resident breeder across the Indian subcontinent. Peafowls are omnivorous and eat seeds, insects, fruits, small mammals and reptiles. Around cultivated areas, peafowl feed on a wide range of crops such as groundnut, tomato, paddy, chili and even bananas (Johnsingh and Murali, 1978) and may eat contaminated grains or pesticide treated grains in fields. Earlier, Narang *et al.* (2006) and Aulakh *et al.* (2005, 2006) had reported deaths in peafowls in India due to pesticide toxicity. The present research work puts on record another episode of mortality in peafowls due to monocrotophos toxicity.

MATERIALS AND METHODS

It was reported that nine adult peafowls (8 males and 1 female) died in Rewari district and nine adult peafowls (4 males and 5 female) died in Sonapat district of Haryana during November 2014 and January 2015, respectively. All the deaths were sudden and without any symptoms. In Rewari episode, the postmortem examination

on three peafowls was carried out and samples of heart, liver, kidney, intestine, lungs and gizzard contents were collected for toxicological and histopathological investigations. In Sonapat episode, the postmortem examination of two peafowls (male and female) was carried out. After postmortem, the samples of heart, lungs, brain, kidney, liver and spleen were collected and subjected to histopathology. Tissue pieces from different organs collected in 10% buffered formalin were processed and stained with haematoxylin and eosin for histopathological studies (Luna, 1968). Gizzard and crop contents obtained from dead birds from both places were subjected to pesticide residue analysis by gas liquid chromatography (GLC) as per Dutch method (AMPRE, 1996) earlier standardized for poultry feed and meat in the laboratory (Mishra *et al.*, 2015).

RESULTS AND DISCUSSION

Postmortem Observations: In Rewari episode, the postmortem examination revealed pneumonia, catarrhal exudates in trachea and mouth and mild necrotic changes in liver. The postmortem examination of the birds from Sonapat revealed that both the carcasses were in good condition with no external injury. Bones and feathers were intact; however, vent feathers were soiled with fecal material. Crop was found to contain wheat grain, rice grains along with some green leaves (Fig 1A). Proventriculus and gizzard were also full of ingesta (Fig 1B). Size of liver was normal but slightly discolored. Lungs were slightly congested and oedematous. Petechial haemorrhages were seen on intestinal mucosa but there

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was no evidence of parasite throughout the length of intestine. Tracheal lumen was clear with no exudates except for some congested areas on tracheal mucosa.

Histopathological Observations: The changes in peafowls from Rewari district included congestion, mild haemorrhages and mononuclear cell infiltrations in heart; fatty changes, congestion in sinusoids, central vein and portal triad vessels in liver and severe congestion of intertubular blood vessels in kidney.

The histopathological changes in one peacock from Sonapat district included marked congestion, mild hyaline and mononuclear cell infiltration in heart, mild congestion in brain, congestion of alveolar capillaries, blood vessels along with emphysema in lungs, congestion of major blood vessels and mild depletion of reticulo-endothelial (RE) cells in spleen, and congestion of portal vessels, central vein with mild fatty changes in liver with no abnormality in kidney.

The changes in another peacock from Sonapat revealed severe congestion, mild serous exudation, hyaline degeneration of myocardium and mononuclear cell infiltration with noticeable haemorrhages in heart, congestion of meningeal blood vessels as well as brain tissues, and severe congestion of intertubular vessels, glomerulitis, mild coagulative necrosis in tissues with marked haemorrhages in kidney were seen. Lungs indicated congestion, peribroncheolar lymphoid follicle formation and thickening of alveoli walls and rupture of alveoli along with emphysema. Congestion of sinusoids,

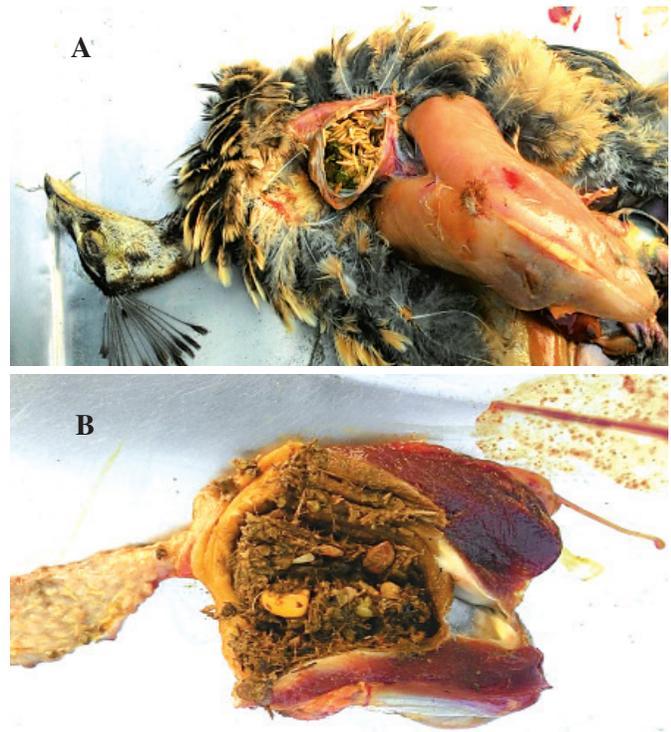


Fig 1. Cut open crop (A) & gizzard (B) of peafowl showing rice and wheat grains

central vein and portal vessels with mild fatty changes along with mild haemorrhages were noticed in liver. The spleen revealed severe congestion, RE cell hyperplasia and depletion of lymphocytes.

Pesticide Residue Analysis: Figs. 2 and 3 show the presence of monocrotophos and chlorpyriphos residues in

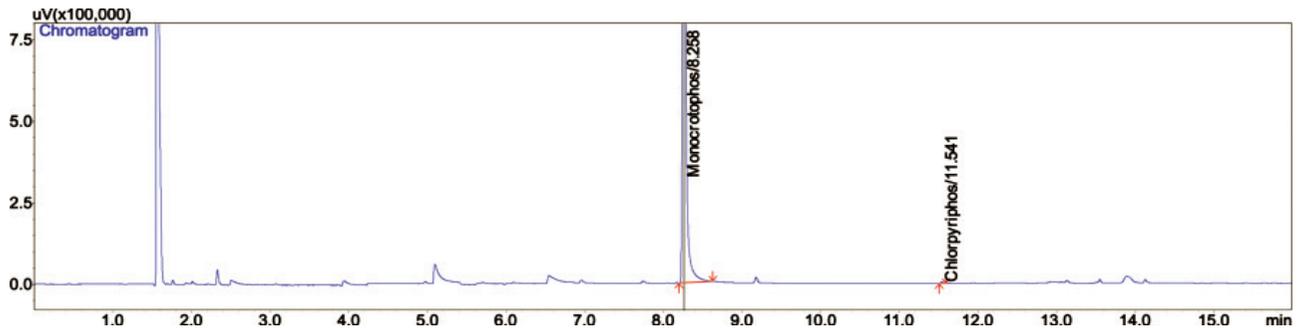


Fig 2. Chromatogram of gizzard content of peafowl from Rewari showing the presence of monocrotophos and chlorpyriphos pesticides

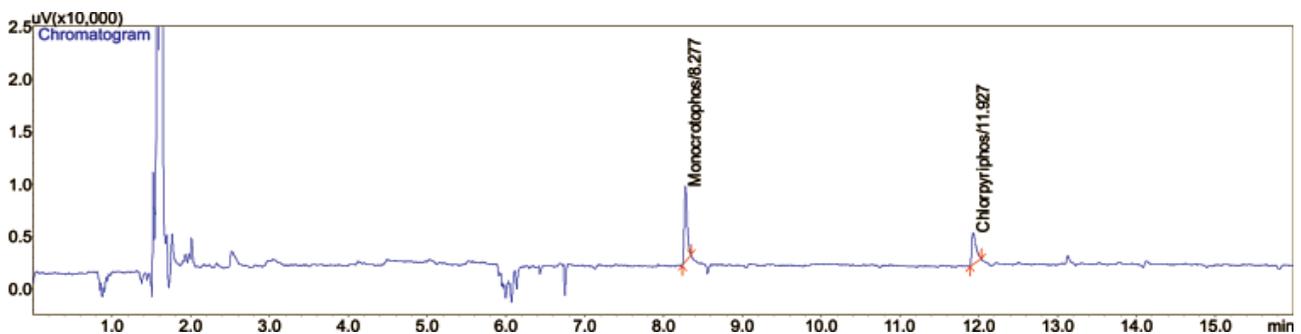


Fig 3. Chromatogram of gizzard content of peacock from Sonapat showing the presence of monocrotophos and chlorpyriphos pesticides

the gizzard contents of peacock from Rewari and Peacock-II of Sonapat, respectively. Amongst the seven OC, three pyrethroids and eight OP pesticides tested, only monocrotophos and chlorpyrifos could be detected. Concentration of monocrotophos was found to be very high (8.8 mg/kg) in the gizzard contents of peacock from Rewari district, and 4.72 and 16.48 mg/kg in the gizzard contents of peacock-I and II from Sonapat district. While in the crop content, it was found to be 2.399 mg/kg. Chlorpyrifos was also detected in traces i.e. 0.02 mg/kg in sample from the peacock of Rewari district and 0.034 mg/kg in second peacock of Sonapat. Remaining all pesticides tested were found to be below detectable limit.

Monocrotophos is one of the most toxic pesticides to birds (Goldstein *et al.*, 1999), the acute LD50 for birds ranges from 0.9-6.7 mg/kg. It is being extensively used as a spray on rice fields and for soil treatment. The mortality of peafowls occurred during the months of November and January, just after the harvesting of rice and onset of sowing of wheat. It is possible that the pesticide treated wheat seeds might have been picked up by the birds in large amount from the recently sown fields as the wheat grains were found in the ingesta from crop and gizzard during postmortem examination. During the visit to the affected villages, it was observed that farmers sprayed pesticides on cow dung heaps in the village to keep the insects/pests and mosquitoes away. The peafowls were also seen picking up grains from these cow dung heaps which were probably contaminated with the pesticides. High concentration of monocrotophos residues detected in the ingesta in this study indicated that the peafowls might have consumed much higher levels of this insecticide leading to sudden deaths without showing clinical symptoms. The postmortem examination, histopathological changes and laboratory findings were also indicative of monocrotophos toxicity.

Earlier, Aulakh *et al.* (2005) and Narang *et al.* (2006) reported deaths of 25 peacock owing to chlorpyrifos (an OP pesticide) which was present in the stomach contents of dead birds. Similarly, Pain *et al.* (2004) reported mortality in Sarus cranes (*Grus antigon*) after eating monocrotophos treated wheat seed.

Concentration of pesticide in the alimentary tract contents was found to be 0.2–0.74 ppm. Researchers from other countries also reported mortality due to monocrotophos in birds e.g. Swainson's Hawks in Argentina (Goldstein *et al.*, 1999) and Franklin's Gulls in Texas (White and Kolbe, 1985).

It was concluded that the death of peafowls at both places was due to monocrotophos toxicity. The pesticide

contaminated seeds were available to the peafowls in recently wheat grown fields or from recently sprayed cowdung heaps. The farmers were advised to dispose off the extra pesticide treated seeds properly and use the pesticides as per recommendations to avoid undue environmental contamination and to prevent the recurrence of such problems.

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