

# Transformation products of pesticides; a potential threat to ground water contamination

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## Introduction

➤ After application, pesticides undergo different chemical and biological reactions and converted to breakdown products (transformation products; TPs).

➤ These TPs are generally mobile in nature and also produced in excess, hence can pose a risk to contaminate surface and ground water.

➤ Generally, TPs are less toxic, and less persistent than parent compounds. In some cases, however, they are more toxic than their parent compounds (Nawab et al., 2003).

During the present study,

we aimed to find out the

➤ Priority pesticides and their TPs that can potentially contaminate ground water in Peshawar (34.0150° N, 71.5805° E) Pakistan region.

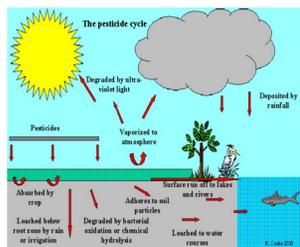


Fig. 1. Pesticide degradation and leaching

➤ To monitor the selected pesticides and their TPs in ground water of Peshawar region.

## Methodology

Due to the unavailability of annual usage data of pesticides in Peshawar Pakistan, the priority list was devised on the basis of the only the available data. The scheme of risk assessment and prioritization was carried out as explained elsewhere (Sinclair et al., 2006). Pesticides finally selected are given in Table 1.

Table 1: selected pesticides with their TPs

S.No	Pesticide parent compound	Transformation Product
1	Cymoxanil	KP533
2	Cymoxanil	JX915
3	Cymoxanil	U3204
4	Cymoxanil	reference compound 2
5	Cymoxanil	W3595
6	Cymoxanil	R3273
7	Cymoxanil	2-methyl-4-chlorophenol
8	Azoxystrobin	Reference compound 2
9	Azoxystrobin	Reference compound 36
10	Azoxystrobin	Reference compound 10
11	Azoxystrobin	Azoxystrobin acid
12	Azoxystrobin	Reference compound 3
13	Azoxystrobin	Reference compound 20
14	Azoxystrobin	Reference compound 28
15	MCPA	2-methyl-4-chlorophenol
16	Imidacloprid	1-(6-chloro-pyridine-3-ylmethyl)-N-nitro-2-imino-imidazolidine-5-ol
17	Imidacloprid	1-(6-chloro-pyridine-3-ylmethyl)-2-imino-imidazolidine
18	Imidacloprid	1-(6-chloro-pyridine-3-ylmethyl)-N-nitroso-2-imino-imidazolidine
19	Imidacloprid	6-chloro-nicotinic acid
20	Imidacloprid	1-(6-chloro-pyridine-3-ylmethyl)-N-nitro guanidine
21	Mancozeb	ethylenebis(isothiocyanide sulfide)
22	Mancozeb	ethyleneurea
23	Mancozeb	ethylenethiourea

The selected pesticides and their TPs were monitored in ground water at 27 different locations of Peshawar district. In the first stage only imidacloprid and MCPA were investigated

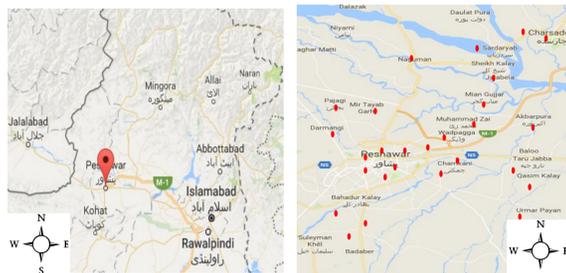


Fig. 2. Peshawar district and its surroundings, approximately 27 points were selected for. Sampling.

## Experimental

### Extraction

➤ pesticides were extracted from the samples via solid phase extraction (SPE)

➤ C18 Isolute SPE were used with different solvents such as methanol and acetonitrile (all HPLC grade) for analytical elution of the pesticides and their TPs from the samples



### Analysis by HPLC

➤ Agilent 1200 HPLC equipped with isocratic pump and UV/Vis detector was

➤ C18 with different mobile phase such as methanol, acetonitrile and water pH adjusted to 3 with help of phosphoric acid (all HPLC grade) for analytical elution of the pesticides and their TPs from the ground water.

➤ Pesticides and their TPs were detected and quantified at S/N= 3 and S/N= 6.



Imidacloprid and MCPA were extracted and analysed on HPLC separately.

## Result and discussion

➤ HPLC analysis of ground water samples showed that imidacloprid, MCPA and their TPs were present in the ground water samples

➤ Imidacloprid and its TPs were detected in samples collected from the north and east of the of the Peshawar area.

➤ Highest concentration of imidacloprid was found in samples collected from charsadda and sardaryab where its was in the range of 0.53µg L<sup>-1</sup> to 0.69µg L<sup>-1</sup> while its metabolite

➤ Imidacloprid TP; 1-(6-chloro-pyridine-3-ylmethyl)-N-nitro-2-imino-imidazolidine-5-ol was also detected along with the parent compounds but relatively at lower concentrations than the parent imidacloprid.

➤ MCPA was found in few samples, however No TP of MCPA was found in any water sample.

➤ imidacloprid and MCPA were detected in samples collected from locations with relatively higher water table.

➤ Southern part of the Peshawar district is slightly arid and depth of the ground water increases.

➤ Moreover, the North East region has rivers and streams and with greater agricultural activities than the South and central region.

## Conclusion

➤ It can be concluded that imidacloprid and its TPs can potentially contaminate ground water.

➤ MCPA was detected in samples collected from 3 different locations, while no TP of MCPA was found in any sample.

➤ TPs can be a potential threat to ground water contamination

## Future Work

➤ The research will be further extended to all of the selected pesticides and their transformation products.

➤ Laboratory based soil column and field lysimeter studies will be carried out in the future.

## References

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