International POPs Elimination Project

Fostering Active and Efficient Civil Society Participation in Preparation for Implementation of the Stockholm Convention

Establishing the Prevalence of POPs Pesticide Residues in Water, Soil and Vegetable Samples and Creating Awareness About their Ill-effects

Janhit Foundation

India
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About the International POPs Elimination Project

On May 1, 2004, the International POPs Elimination Network (IPEN http://www.ipen.org) began a global NGO project called the International POPs Elimination Project (IPEP) in partnership with the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Program (UNEP). The Global Environment Facility (GEF) provided core funding for the project.

IPEP has three principal objectives:

- Encourage and enable NGOs in 40 developing and transitional countries to engage in activities that provide concrete and immediate contributions to country efforts in preparing for the implementation of the Stockholm Convention;

- Enhance the skills and knowledge of NGOs to help build their capacity as effective stakeholders in the Convention implementation process;

- Help establish regional and national NGO coordination and capacity in all regions of the world in support of longer term efforts to achieve chemical safety.

IPEP will support preparation of reports on country situation, hotspots, policy briefs, and regional activities. Three principal types of activities will be supported by IPEP: participation in the National Implementation Plan, training and awareness workshops, and public information and awareness campaigns.

For more information, please see http://www.ipen.org

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Activity Overview

Janhit Foundation took up a study in November 2005 with the aim of confirming the continued presence of some "Dirty Dozen" POPs in the agricultural soil, drinking water and vegetables of three districts of Western Uttar Pradesh, namely Meerut, Muzzafarnagar and Ghaziabad.

The samples from these three districts were collected phase-wise as per the technical guidance of the scientists from the Peoples' Science Institute, Dehradoon (Uttaranchal). In all, 30 samples of vegetables, 30 samples of drinking water and 30 samples of agriculture soil were collected and analyzed for POPs.

POPs were detected in each of the samples collected from all the three districts and some were present at very high levels even in water. This suggests the continued use of POPs by the farming community despite a ban. Below is a detailed report of the three districts along with the findings.

Following the study findings, Janhit Foundation organized a public meeting in Meerut, Uttar Pradesh to educate the farmers about the adverse impact of POPs. The meeting was a grand success with farmers in large numbers attending the meeting and participating actively in it. Copies of the analysis report were also circulated among the participants/ delegates. The meeting was addressed by officials from the various concerned departments. A poster has been designed and printed and widely disseminated in the region (Western Uttar Pradesh).

To further disseminate the study findings, Janhit Foundation organized a press conference at Muzzafarnagar. Forty-two journalists both from the print and electronic media attended this event. The results and other information were covered by the leading newspaper *Jansatta* on the first page. The subject was also taken up for discussion by the reviewers during a news broadcast on All India Radio.

The organization also conducted two small meetings highlighting the ill impacts of POPs in agriculture soil, water and vegetables. As a solution to this pressing issue, Janhit Foundation stressed the need for gradual elimination of pesticides and POPs in agriculture by the farming community.

Since all the POPs pesticides are long banned in the country, their continued use is illegal. The organization has therefore initiated a signature campaign among the community members, which shall be submitted to the District Commissioner demanding action against pesticides dealers. Janhit Foundation would also organize awareness programs in two schools in each of the districts.

Report on the Study on Rampant use of POPs in Western Uttar Pradesh

Agriculture soil, ground water and vegetables in the districts of Meerut, Muzaffarnagar and Ghaziabad contain heavy doses of Persistent Organic Pollutants (POPs) according to a study recently conducted by Janhit Foundation a Meerut-based voluntary organization.

Samples of agriculture soil, drinking water, river water and vegetables like tomato, brinjal, potato, cauliflower, cabbage etc were collected by the organization from these three districts and sent to the laboratory of the Dehradoon-based Peoples' Science Institute for POPs analysis.

It is worthwhile to mention that nine pesticides, which have a life span running in decades, have been legally banned in the country (except for DDT which is restricted). These deadly pesticides include DDT, Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, HCB, Mirex, and Toxaphene. Unfortunately, some pesticides manufacturing companies continue to manufacture these harmful pesticides under different names and sell them on the market through pesticides and chemicals outlets. Also note that the state of Kerala has banned endosulfan. This toxic pesticide has been severely restricted in 21 countries and banned by 10 including Sri Lanka.

Janhit Foundation, mainly working towards larger environmental protection and particularly in the field of agriculture, felt the need to take up a study to verify the presence of POPs in Western Uttar Pradesh. The results confirm the widespread presence of highly toxic POPs and suggest that these pesticides continue to be used by the innocent farming community in the region. To help interpret results we chose regulatory limits from the European Union (EU) and a recent EU member country, the Czech Republic. Janhit Foundation thanks Jindrich Petrlik of Arnika Association for providing the relevant Czech and European Union limits.

The study supported by the International POPs Elimination Project (IPEP) shows the heavy presence of deadly pesticides, which is an alarming threat to human lives, and the ecology of the region. Even in samples that did not exceed regulatory limits, the bioaccumulative nature of POPs gives rise for serious concerns for human health and the environment.

Regulatory standards

Since POPs are inherently unmanageable and bioaccumulate in living things the acceptable standard for any POP in any sample is zero. However, to help illustrate the gravity of the sampling results we compared levels of pesticides measured in soil, vegetables, and water with regulatory standards from Europe and India. European standards included those for the entire 25-country European Union (EU) and standards from the recently-admitted member state, Czech Republic. The standards themselves illustrate different approaches to POPs and indicate that Indian standards permit vastly increased levels of POPs exposures. For Lindane (BHC), regulatory levels in India are 100 times higher than those in the EU. Aldrin and dieldrin are permitted in Indian food at 10 times the level allowed in the Czech Republic. Seven times more DDT and/or its metabolites, five times more heptachlor, and 40 times more endosulfan are permitted in food in India than in the Czech Republic. For drinking water, India permits 20 times more Lindane than the Czech Republic; more than 30 times the heptachlor than the EU; and 200 times the amount of aldrin and endosulfan allowed in the Czech Republic. If India is serious

about eliminating POPs, a revision of regulatory standards is needed to make them more protective.

Meerut

The agricultural soil samples collected from Lawad, Hapur Bypass, and Lohia Nagar *Mandi* showed the presence of Stockholm Convention POPs including Endrin, Dieldrin, Heptachlor, and the DDT metabolite, DDE. In addition, residues of toxic pesticides such as Fipronil, and Endosulfan were also found. A tomato field contained nearly 80 μg/kg Endrin; nearly eight times the regulatory limit for this substance in the Czech Republic. This same field contained more than 450 μg/kg DDE; more than 45 times the limit for this toxic substance in the Czech Republic. Two of the three sugar cane fields that contained Heptachlor and/or Heptachlor Epoxide showed levels higher than Czech limits. All nine fields contained levels of Fipronil that exceeded Czech limits by 3 – 18-fold.

Analysis for pesticides in 12 vegetable samples picked from fields confirmed the presence of aldrin, dieldrin, DDT metabolite DDE, endosulfan, heptachlor, and Lindane isomers, α –B.H.C., β -B.H.C., δ -B.H.C.. Eight of the 12 samples (67%) contained more than one toxic pesticide. In one of the samples of ladyfinger, four pesticides were detected. It is shocking to find these toxic chemicals in widely consumed vegetables such as lady finger, brinjal, potato, tomato, tori, ghiya, radish and cucumber. The two most widely detected pesticides were Lindane and Heptachlor. Levels of Lindane isomers exceeded Czech limits in lady finger (2 out of 3 samples); brinjal (1 out of 3); and tori. High levels of Heptachlor were found in brinjal and tomato. Some of these samples were two times higher than Czech limits. Dieldrin in lady finger and brinjal; and aldrin in brinjal also exceeded Czech limits, in some cases by more than two-fold. Not surprisingly, none of the samples containing these toxic substances exceeded weak Indian standards.

Surprisingly, even the drinking water in the *Doab* (land between the Ganga and the Yamuna) once known for its safe drinking water properties also contained POPs. Heptachlor Epoxide, Fipronil, Aldrin, Heptachlor, β– B.H.C., λ– B.H.C have been detected in the drinking water and the water used for irrigation. This indicates that over a period of time these pesticides have leached down to the ground water level. The most heavily contaminated sample came from the Kali River. This single sample of river water contained Lindane, Heptachlor, Heptachlor Expoxide, Aldrin, and Fipronil. Levels of β– B.H.C. were over 500 μg/l; more than 5000 times higher than the regulatory limit for this substance in the European Union (EU). Heptachlor was measured at more than 60 μg/l; more than 2000 times higher than the regulatory limit in the EU. Similarly, Heptachlor Expoxide levels exceeded the EU limit by more than 5000-fold. Levels of Aldrin were more than 500 times higher than EU limits and Fipronil more than 190 times higher.

The PSI laboratory co-coordinator Anil Gautam has expressed concern towards the rampant use of POPs by the farming community of district Meerut, which ultimately cause havoc to agriculture and human health. The villages containing deadly pesticides in soil, water, and vegetables have seen a growing number of patients suffering from cancer, neurological disorders, nervous breakdown and other deadly diseases.

Muzaffarnagar

The situation of the presence of POPs in soil samples in district Muzaffarnagar is also very alarming. Eight of the nine samples contained more than one toxic pesticide. Lindane and its isomers were widely found in river sludge, cauliflower fields, and sugarcane fields. Eight of the nine samples contained at least one Lindane isomer and all of them exceeded Czech limits, one of them by 7-fold. Heptachlor was found in two sugarcane fields; one of them exceeded Czech regulatory limits by more than 4-fold. Heptachlor epoxide was present in Kali River sludge and two sugarcane fields. In the fields, one of the samples exceeded Czech regulatory limits by 4-fold. Aldrin was present in four fields at levels ranging from 23 – 200 µg/kg. These levels were more than 2 – 20 times higher than permissible levels in the Czech Republic. Finally, endosulfan levels in a sugarcane field were 12 times higher than Czech limits and Fipronil was found in seven samples at levels that exceeded Czech regulatory levels by 1.5 – 22-fold.

Vegetables grown in district Muzaffarnagar contain a variety of pesticides including Fipronil, Lindane, Heptachlor Epoxide, Dieldrin, and Endosulfan. For example, the brinjal sample collected from N*ai Mandi* in Muzaffarnagar city has confirmed the presence of β-B.H.C., Fipronil and Endosulfan-I in it. The potato sample collected from Budhana, a town in Muzaffarnagar district, has confirmed the presence of Heptachlor Epoxide. The same is the case with the samples of radish, cauliflower and cucumber etc. that people eat as green vegetables for a healthy body. Unfortunately, these green vegetables could be adversely affecting the health of the community. Not surprisingly, none of the samples containing these toxic substances exceeded weak Indian standards.

The *Doab* area of Muzaffarnagar district is witnessing ground water getting poisonous due to the widespread presence of POPs in the samples collected from this district. All six water samples contained more than one toxic pesticide. In one of the river water samples of the Kali River near the Shamli bus stand in Muzaffarnagar city, about half a dozen pesticides have been detected in the river water, which is being used by the farming community as a source of irrigation. The vegetables grown on these banks are sold in the vegetable markets of Muzaffarnagar.

Lindane and its isomers were found in the Kali River, two hand pumps, the Hindou River, and a tubewell. All of these locations exceeded EU limits for Lindane in drinking water and one of them slightly exceeded even the permissive Indian standard. Heptachlor levels in the Kali River, tubewell (Rashid), hand pump, and the Hindou River were 3 – 53 times higher than EU limits for drinking water. Heptachlor epoxide was present in two hand pumps and the Kali River at levels 6 – 77 times higher than EU limits. Four samples contained Aldrin at levels that were 2 – 69 times higher than EU limits. Two samples contained Endosulfan and both exceeded EU limits (3-5-fold). Two river samples contained Fipronil at levels 15 – 50 times higher than EU limits.

Ghaziabad

The vegetable, agricultural soil and drinking water samples collected from district Ghaziabad have also shown a strong presence of POPs on the basis of the laboratory report. Ghaziabad supplies vegetables to the country's capital. Hence, the rampant use of POPs in the agriculture of district Ghaziabad is an eye opener to everybody.

Four of the seven vegetable samples contained more than one type of toxic pesticide. The cauliflower sample from Ghaziabad contained Aldrin, α-B.H.C, β-B.H.C, and δ-B.H.C. An analysis of a brinjal sample collected from Harsinghpur near Hapur on the Bulandshahr road has detected β-B.H.C., Heptachlor and δ -B.H.C.. Similarly, the potato sample from Simbholi and the brinjal sample from Muradnagar have also shown the presence of more than one POP in them. This combined presence of toxic bioaccumulative substances in food raises concerns about public health, not only in the local community but also in the capital where these products are sold and consumed. Not surprisingly, none of the samples containing these toxic substances exceeded weak Indian standards.

The agricultural soil samples collected from Ghaziabad are the worst examples of the presence of POPs in the 'rich' agriculture soil of this district. Eight of the 11 samples (73%) contained at least two POPs. Even the soil sample of a rose garden in Pilakhua has also shown the presence of α–B.H.C, Heptachlor, Heptachlor Epoxide and Aldrin.

The most striking characteristic of the samples was the predominant presence of a Lindane isomer (δ –BHC) and Heptachlor in almost all of the samples. The delta isomer of Lindane was found in 10 of the 11 samples at levels ranging from 2.3 – 35.6 μg/kg. Half of the samples exceeded limits for this substance in the Czech Republic. Nine of the 11 samples contained Heptachlor and eight of them exceeded Czech limits with several of them 2 – 4 times higher than the limit. Two samples exceeded Heptachlor epoxide limits by 1.4- and 5-fold respectively. One sample contained Aldrin at levels 22 times higher than permissible in the Czech Republic. These results are an eye opener to the community. The policy makers should think seriously of ways to actually ban POPs in true letter and spirit.

The ground water of district Ghaziabad is also contaminated with POPs. Five of the six samples contained more than one type of pesticide. For example, the *Kali* river sample collected from Hapur contained α–B.H.C., β-B.H.C., δ -B.H.C and Fipronil. The waste water drain in Brijnathpur contained three Lindane isomers, Heptachlor epoxide, Aldrin, and Fipronil.

The hand pumps that are routinely used for drinking water contained a variety of toxic substances at levels violating regulatory limits. The Hapur hand pump contained Heptachlor, Aldrin, and Fipronil. Heptachlor levels were more than twice the EU limit; Aldrin levels were 10 times higher than the EU limit; and Fipronil was twice the EU limit. The hand pump at Bisnoli contained Heptachlor (27 times higher than EU limit) and Endosulfan (four times EU limit). The hand pump at Ghaziabad contained Heptachlor (25 times higher than EU limit).

The study team of Janhit Foundation which collected the samples (comprised of Raman Tyagi and Devpal Singh) informed us that there are serious cases of patients suffering from various ailments in a number of villages in this region. This study is the first of its kind in the region that brings to light these glaring facts. To avoid the situation from getting any worse and to protect human health and environment from the ill effects of POPs, a massive campaign needs to be taken up to make policy makers and the government aware of the rampant use of POPs. The results here prompt questions about what is happening in the rest of the country.

Presence of POPs in Vegetables

Regulatory standards for POPs in vegetables

Country	α-BHC (µg/kg)	β-BHC (µg/kg)	δ-BHC (µg/kg)	Heptachlor (µg/kg)	Dieldrin (µg/kg)	Endosulfan I (µg/kg)	4'4'DDE (µg/kg)	Aldrin (µg/kg)
India	1000	1000	1000	50	100	2000	3500	100
Czech Republic	10 Sum α + β			10	10	50	50	10

Czech Republic: Note that the endosulfan levels are for tomato, soya and 500 other vegetables. Note that the DDT level refers to the sum of DDT metabolites.

Meerut District

S.No	Vegetable	α-BHC (µg/kg)	β-BHC (µg/kg)	δ-BHC (µg/kg)	Heptachlor (µg/kg)	Dieldrin (µg/kg)	Endosulfan I (µg/kg)	4'4'DDE (µg/kg)	Aldrin (µg/kg)
1.	Lady Finger 1		25.44						
2.	Lady Finger 2	5.9	15.20			11.90	20.1		
3.	Lady Finger 3		9.60						
4.	Brinjal 1		10.40						45.00
5.	Brinjal 2			6.1	20.80	15.40			
6.	Brinjal 3				10.40	4.15	8.2		
7.	Potato		9.60	9.8					
8.	Tomato				24.00			23.9	
9.	Tori		11.00						
10.	Ghiya			11.8	5.90				
11.	Radish		6.40		6.02				
12.	Cucumber		8.30						

Muzaffarnagar District

S.No	Vegetable	Fipronil (µg/kg)	δ-BHC (µg/kg)	Heptachlor Epoxide (µg/kg)	Dieldrin (µg/kg)	Endosulfan I (µg/kg)
1.	Radish				2.6	
2.	Potato 1			1.6		
3.	Potato 2		4.80			
4.	Cauliflower	3.6	3.21	5.4		
5.	Brinjal	1.3	7.40			3.9
6.	Cabbage		5.32	3.3		

Ghaziabad District

S.No	Vegetable	α-BHC (µg/kg)	β-BHC (µg/kg)	gamma-BHC (µg/kg)	δ -BHC (µg/kg)	Heptachlor (µg/kg)	Heptachlor Epoxide (µg/kg)	Endosulfan I (µg/kg)	Aldrin (µg/kg)
1.	Potato 1				0.62	3.18			0.39
2.	Potato 2					3.65			
3.	Tomato			11.18	3.42				
4.	Brinjal 1		4.57		3.27		4.1		
5.	Brinjal 2		3.54		8.50				
6.	Cauliflower 1				7.84	2.20			
7.	Cauliflower 2	8.3	2.51		3.73				11.50

Presence of POPs in Soil

Regulatory standards for POPs in soil

Country	Fipronil (µg/kg)	Endrin Aldehyde (µg/kg)	Heptachlor (µg/kg)	Heptachlor Epoxide (µg/kg)	Dieldrin (µg/kg)	Endosulfan I (µg/kg)	4'4'DDE (µg/kg)
Czech Republic	10	10	10	10	10	10	10

The Czech limits were set up in MoE decree No. 13/1994 Sb.

Meerut District

S.No	Soil	Fipronil (µg/kg)	Endrin Aldehyde (µg/kg)	Heptachlor (µg/kg)	Heptachlor Epoxide (µg/kg)	Dieldrin (µg/kg)	Endosulfan I (µg/kg)	4'4'DDE (µg/kg)
1.	Sugarcane Field 1	30.6			26.32			
2.	Sugarcane Field 2	60.81						
3.	Tomato Field	233.7	78.82			5.73	5.21	465.7
4.	Sugarcane Field 3	145.5		6.78	8.68			
5.	Sugarcane Field 4	175.76		11.10	22.33			
6.	Cucumber Field 5	41.33						
7.	Maize Field	142.70						
8.	Pumpkin Field	35.48						
9.	Sugarcane Field 6	28.47						

Regulatory standards for POPs in soil

Country	α-BHC (µg/kg)	β-BHC (µg/kg)	gamma-BHC (µg/kg)	δ -BHC (µg/kg)	Heptachlor (µg/kg)	Heptachlor Epoxide (µg/kg)	Endosulfan I (µg/kg)	Aldrin (µg/kg)	Fipronil (µg/kg)
Czech Republic	10	10	10	10	10	10	10	10	10

Muzaffarnagar District

S.No	Soil	α-BHC (µg/kg)	β-BHC (µg/kg)	gamma-BHC (µg/kg)	δ -BHC (µg/kg)	Heptachlor (µg/kg)	Heptachlor Epoxide (µg/kg)	Endosulfan I (µg/kg)	Aldrin (µg/kg)	Fipronil (µg/kg)
1.	Sludge of Kali River			12.65	15.68		3.5			15.30
2.	Cauliflower Field 1				15.70				23.5	17.90
3.	Sugarcane Field 1				18.10	45.6		123.9		45.30
4.	Cauliflower Field 2				73.90					22.56
5.	Sugarcane Field 2		25.4		2.14					
6.	Sugarcane Field 3	27.8			14.20		18.7			75.68
7.	Sugarcane Field 4			46.4		9.3	34.3		24.0	225.90
8.	Sugarcane Field 5								51.7	
9.	Sugarcane Field 6				15.70				203.5	178.80

Ghaziabad District

S.No	Soil	α-BHC (µg/kg)	β-BHC (µg/kg)	gamma-BHC (µg/kg)	δ -BHC (µg/kg)	Heptachlor (µg/kg)	Heptachlor Epoxide (µg/kg)	Aldrin (µg/kg)	Fipronil (µg/kg)
1.	Wheat Field				2.3				
2.	Potato Field				11.9				
3.	Cabbage Field 1		12.7		10.7	14.53			
4.	Cabbage Field 2				5.6	19.50			16.5
5.	Tomato Field 1				8.7	5.20			
6.	Potato Field 1				18.9	28.80			28.1
7.	Sludge Bone Mill drain	152.2		46.2	35.6	43.20	51.8	224.1	16.6
8.	Rose Field	14.1				38.76	3.6	3.7	
9.	Cauliflower Field 1	16.7			5.4	20.50	14.5		
10.	Cauliflower Field 2				12.5	12.90			
11.	Tomato Field 2				5.9	30.90			

Presence of POPs in Water

Regulatory standards for POPs in water

Country	β-BHC (µg/l)	δ-BHC (µg/l)	Heptachlor (µg/l)	Heptachlor Epoxide (ug/l)	Aldrin (ug/l)	Fipronil (µg/l)	Endosulfan (µg/l)
India	1.00	1.00	1.00	1.00	1.000	1.0	1.000
Czech Republic	0.05	0.01			0.005		0.005
European Union	0.10	0.10	0.03	0.03	0.030	0.1	0.100

India: Note that the regulatory standard for pesticide residues in drinking water is 1 ug/l.
Czech Republic: Note that the endosulfan levels are for surface water, presumably available for drinking in these samples. Surface water standards are set in the Czech Government Regulation No. 61/2003 Sb. The level for beta BHC refers to the sum of isomers.
European Union: EU limits for drinking water are set up in an EU Directive **98/83/EC**. Note that limits for BHC isomers are 0.1 ug/l.

Meerut District

S.No	Water	β-BHC (µg/l)	gamma-BHC (µg/l)	Heptachlor (µg/l)	Heptachlor Epoxide (µg/l)	Aldrin (µg/l)	Fipronil (µg/l)	Endosulfan (µg/l)
1.	Hand pump (Nagli 35 feet)						0.04	0.02
2.	India Marka Hand pump (Jalalpur 100 feet)						0.06	
3.	India Marka Hand pump (Mawana 100 feet)						0.04	
4.	Pond (Parikshitgarh)				0.10			
5.	Hand pump (Poothi 35 feet)				0.08			
6.	Kali River (Jalalpur)	546.75	63.82	60.44	153.46	16.10	19.61	

Muzaffarnagar District

S.No	Water	α-BHC (µg/l)	β-BHC (µg/l)	gamma-BHC (µg/l)	δ -BHC (µg/l)	Heptachlor (µg/l)	Heptachlor Epoxide (µg/l)	Endosulfan I (µg/l)	Aldrin (µg/l)	Fipronil (µg/l)
1.	Kali River (Shamli bus stand)	2.3			0.31	1.40	2.60	0.50	2.07	5.40
2.	Tubewell (Rashid 100 feet)					0.21			1.19	
3.	Hand pump (near Kali river 40 feet)		1.06	0.15		0.10	0.19	0.31	0.12	
4.	Hindon River	0.23	0.31			1.60				1.52
5.	Tubewell (Budhana 60 feet)		0.20						0.06	
6.	Hand pump (Janshat 60 feet)	0.28	0.01				0.29			

Ghaziabad District

S.No	Water	α-BHC (µg/l)	β-BHC (µg/l)	gama-BHC (µg/l)	δ -BHC (µg/l)	Heptachlor (µg/l)	Heptachlor Epoxide (µg/l)	Endosulfan II (µg/l)	Aldrin (µg/l)	Fipronil (µg/l)
1.	Kali River (Hapur)	6.02	1.54		2.80					3.36
2.	Bone mill waste water (Hapur)			0.36	2.30				1.22	
3.	Waste water drain (Brijnathpur)		6.31	1.69	2.45		0.79		0.88	3.74
4.	Hand pump (Hapur 35 feet)					0.07			0.30	0.20
5.	Hand pump (Bisnoli 70 feet)					0.80		0.43		
6.	Hand pump (Ghaziabad 40 feet)					0.74				