

Effect of irrigation with waste water on physiological properties and quality of jajmau area, Kanpur, (U.P.) India

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Abstract: Plants samples of field pea at different stages of plant growth were collected from Jajmau, Kanpur nagar; three village, each village have five different sites of irrigation (several irrigation, medium and low irrigation land category) about 20 years back. Plant samples were collected at different stages i.e. 100 days after sowing, pre-flowering, and post-flowering and maturity stages. Samples were analyzed by standard methods. Ni contents in grains are 3.07ppm, 2.78ppm, 1.80ppm; Cr contents in grains are 1.71ppm, 1.22ppm, and 0.81ppm; Pb contents in grains are 4.08ppm, 3.40ppm and 3.01ppm; Cd contents in grains are 1.83ppm, 1.34ppm and 0.91ppm in Shekhpur, motipur and Kishanpur villages of jajmau are of Kanpur respectively. The contents of heavy metals in field pea crop are more than their permissible limits (PFA India).

(Keywords : Industrial effluent, field pea, heavy metals (Ni, Cr, Pb, Cd))

Introduction

Soil is considered contaminated when chemicals are present or other alterations have been made to natural environment. This is often due to release of chemicals or the improper disposal of hazardous waste. Indiscriminate disposal of sewage and industrial effluents is a major cause of pollution of water bodies and rivers into which they are discharged. The use of industrial effluents carrying a heavy load of heavy metals such as Pb, Zn, Cr, Ni and Hg for irrigation of crops also produces adverse effects on plants growth. There are several reports of phytotoxic effects resulting from irrigation of crops

with effluents from different types of industries from different part of India.^{1,2,3,4,5,6,8,9,10} The present study is a part of investigations undertaken to evaluate the pollution potential of the effluents from the major industries located within the urban limits of Kanpur (U.P.) and discharged into the river Ganga passing through the city. An earlier paper¹¹ showed high accumulation of heavy metals (Cd, Cr, Cu, Ni and Zn) in vegetables irrigated with the effluents discharged from a major industry involved in electroplating and manufacture of torchlight batteries. In this paper, we make an evaluation of some heavy metals pollutants (Ni, Cr, Pb, Cd) absorbed by field pea crop where industrial effluent discharged from different tanneries and used for irrigation purposes.

Experimental

Material and methods-

A number of farmer's fields (sites) plant samples of different stages were randomly collected within jajmau area of district Kanpur (U.P.), India, irrigated by industrial effluents about 20 years back (several irrigated land, medium and irrigated land category). The plants of fields pea and were uprooted mechanically from the farmer's field at different villages. The plant samples were washed with ordinary water then deionized water. These plant samples of different stages were air dried, finally oven dried at 70°C. The samples were ground and digested in diacid (HNO₃+HClO₄) mixture¹², and analyzed by standard methods, using atomic absorption spectrophotometer¹³.

Results and Discussion

Infield Pea: Nickle (Ni) : The pooled data of Heavy metal contents in filed pea crop from five different site of each village were presented in table 1. Ni contents at 50 days after sowing in fieldpea were recorded 3.30 ppm in Shekhpur village, 3.15 ppm in Motipur village and 2.63 ppm in Kishanpur village. At pre-flowering stage Ni contents were increased 3.91 ppm (17.41%) in Shekhpur village followed by 3.59 ppm (13.96%) in Motipur village and 3.21 ppm (22.05%) in Motipur village. At post-flowering stage decreasing trend of Ni i n the grains of filedpea were recorded 3.07 ppm in Shekhpur village followed by 2.78 ppm in Motipur village, 1.08ppm in Kishanpur village. The Ni contents in stover were recorded 0.80 ppm, 0.88ppm, 0.30ppm in Shekhpur, Motipur and Kishanpur villages respectively. It is of interest mention here that the value of Ni contents in grains were comparatively higher than permissible limit i.e. 2.50ppm (PEA India).

Chromium (Cr):

The Cr contents in filedpea plants at 50 days after sowing were recorded 2.21 ppm in Shekhpur village followed by 1.75 pp in Motipur village and 50 days after sowing were increased 2.41 ppm (9.04%) in Shekhpur village followed by 1.98 ppm (13.41%) in Motipur village 1.51 ppm (31.30%) in Kishanpur village. At post-flowering

stage i.e. 2.22 ppm, 1.66 ppm, 1.24 ppm in Shekhpur, Motipur and Kishanpur village following by 1.22 ppm in Motipur village and 0.81 ppm in Kishanpur village which is marginally more than permissible limit i.e. 1.10 ppm (PFA India). In the stover, contents of were also recorded 0.68 ppm, 0.71 ppm and 0.66 ppm in Shekhpur, Motipur and Kishanpur villages respectively.

Lead (Pb) :- The Pb contents in filedpea plants at 50 days after sowing were recorded 4.50 ppm in Shekhpur village, 3.73 ppm in Motipur village and 1.15 ppm in Kishanpur village. The Pb contents at pre-flowering stage were recorded 5.24 ppm (16.44%) in Shekhpur village, 4.49 ppm (20.37%) in Motipur village and 4.10 ppm (23.12%) in Kishanpur village. The values of pre-flowering stage were recorded more than 50 days after sowing. Decreasing trends were observed in pos-flowering stage i.e. 4.83 ppm (7.33%) in Shekhpur village, 4.12 ppm (10.45%) in Motipur village and 3.76 ppm (12.91%) in Kishanpur village in comparison to post-flowering stage Pb contents in grains of fieldpea recorded 4.08 ppm Shekhpur village, 3.40 ppm in Motipur village and 3.01 ppm in Kishanpur village which is more than permissible limit i.e. 2.50 ppm (PFA India). In the stover, contents of Pb analysed 0.98 ppm in Shekhpur followed by 0.97 ppm in Motipur village and 0.90 ppm in Kishanpur Village.

Table - 1 Effect of Industrial effluent irrigation of field pea crop at Jaimau area of Kanpur

Name of Crop	Name of Villages	Elements (ppm)	Crop stages				
			50 days after sowing	Pre-flowering	Post-flowering	Maturity	
						Grain	Stover
Field pea	1- Shekhpur	Nil	3.33	3.91	3.57	3.07	0.86
		Cr	2.21	2.41	2.22	1.71	0.68
		Pb	4.50	5.24	4.83	4.08	0.98
		Cd	2.06	2.55	2.34	1.83	0.76
	2-Motipur	Ni	3.15	3.59	3.22	2.78	0.88
		Cr	1.75	1.98	1.66	1.22	0.71
		Pb	3.73	4.49	4.12	3.40	0.97
		Cd	1.63	2.12	1.79	1.34	0.79
	3- Kishanpur	Ni	2.63	3.21	2.89	1.80	0.8
		Cr	1.15	1.51	1.24	0.81	0.66
		Pb	3.33	4.10	3.76	3.01	0.90
		Cd	1.05	1.61	1.34	0.91	0.72

Cadimium (Cd):

The Cd contents in filedpea plants at 50 days after sowing were recorded 2.06 ppm in Shekhpur village followed by 1.63 ppm in Motipur village and 1.05 ppm in Kishanpur village. At pre-flowering stage of filedpea plants Cd contents were recorded 2.55 ppm (23.78%) in Shekhpur village, 2.21 ppm (30.06%) in Motipur village. The values of Cd were increased at pre-flowering stage in comparison to 50 days Shekhpur village, 1.79 ppm in Motipur, 1.34 ppm in Kishanpur village in comparison to pre-flowering stage. The Cd

contents in grain were recorded 1.83 ppm in Shekhpur village, 1.34 ppm in Motipur village, 0.91 ppm in Kishanpur village which is marginally more than permissible limit i.e. 1.50 ppm (PFA India). The Cd contents in stover of filedpea were recorded 0.76 ppm in Shekhpur village, 0.79 ppm in Motipur village, 0.72 ppm in Kishanpur village.

Continuous use of industrial effluents for irrigation, increased the heavy metal contents in plants parts upto level of permissible limits.

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