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Theme 2. Grassland production and utilization
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Evaluation of grasses raised through sewage water in Musi, Hyderabad

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Introduction

Growing of various crops utilizing sewage is a common scenario in many urban and sub-urban areas. The crops mostly include forage crops, leafy vegetables, vegetables and sometimes food grains. These sewage waters are known to contain undesirable constituents like heavy metals, pesticide residues besides, harmful pathogens. These undesirable components can make way very possibly from sewage to soils, plant parts; there by to even milk, thus entering into food chain. Musi, a tributary of Krishna on whose banks Hyderabad lays is the main fodder bank of the city. Thousand of hactares of land resembling vast grassland ecosystem is under cultivation of forage crops. Para grass (*Bracharia mutica*) is the dominant crop grown in and around Musi along with several other crops. So far the path of the undesirable factors in sewage into forage crops and thereby food chain is not studied. Hence, this work is emphasized to study the level of pesticide residues in soil, water and plant.

Materials and Methods

Samples of sewage water, soil and fodder are collected at different points along the course of river Musi in Hyderabad. The samples of soil, water and forage were processed and analysed for pesticide residues of organo chloro, organo phospho and synthetic pyrethroids by Gas Chromatography (Sharma, 2000)

Water: The collected samples of waterare preserved in deep freezer until analyses was taken up. About 500ml of water sample was taken in a separatory funnel and 2 tea spoons of NaCl was dissolved in it. About 100ml of methylene dichloride was added to it and shaken till both liquids get mixed well. Once liquids get separated the dichloromethane is collected into a clean bottle and the extract was concentrated to dryness using rotary evaporator. Final residues were dissolved in n-Hexane for GC.

Soil: Dried 2mm sieved soils were analysed for pesticide residues. Fifteen grams of soil was mixed with 0.3g Charcoal, 0.3g Floursil and 15g Na_2SO_4 . The mixture was taken in a column and the column was eluted with 100 ml of hexane: acetone (9:1) solution. The extract collected are concentrated to 1ml or 5ml for analyses on GC.

Plant: To 50 gm of plant tops, 200ml of 1:1 Hexane: Acetone solvent is added and kept aside for 24 hrs. Next day using buchner funnel and vacuum pump the solvent is extracted. The extractant is concentrated to near dryness using rotary evaporator. A 100ml of 10% NaCl solution and 50-60 ml of N-Hexane are added to it and shifted to seperatory funnel. Non-aqueous solution is collected into bottle through a funnel with cotton+sodium sulphate. Take aqueous solution again in seperatory funnel and add 50-60 ml dichlomethane and shake and repeat the process. Clean up these extracts in a column of NaSo4/ florisil/ Na SO_4 layers one after the other. The extract is dried and later dried is dissolved in 5ml n-Hexane for analysing them by GC

Results and Discussion

Organic chloro pesticides: The residues of aldrin, endosulphan (α and β isomers), PPDDE, PPDDD and HCH isomers were detected in water samples. The magnitude of these pesticides was however very low and fall within the safe limits. It was also observed that forty percent of samples did not record any residues. The highest concentration was observed with respect to β- HCH (23.435ppb) at Amberpet bridge. These pesticides obviously paved their way into soil as observed from the soil analyses. The magnitude however increased in soils owing to their accumulation over time. The lowest and highest levels of residues were found with respect to α HCH (0.0054 ppm) and δ HCH (0.2821 ppm), respectively.

Channelization of these OC compounds into the fodder (predominantly para grass) was remarkable only regarding PPDDD (para para dichloro diphenyl dichloro ethane).However, residues of α and β HCH and α endosulphan also entered the crop component though the magnitude was found to be very meager. The residues of PPDDD were found in most of the plant samples (0.0307 to 0.5933 ppm). Animal feed samples collected from Ludhiana Punjab, India by Kang *et al.* (2002) were evaluated for presence of pesticide residues. They observed the limiting values of Beta-HCH, Gamma-HCH, Delta-HCH and total DDT exceeded in 13, 6.5, 6.5, and 9.7 % of animal feed samples, respectively. While monitoring pesticide residues in feed, fodder and butter in Assam Deka *et al.* (2004) in their study reported that out of fifteen samples of feed and fodders analyzed, no residues were detected in fodder samples. On other hand feed samples were contaminated with lindane (0.025-0.041 mg/kg), ß- endosulfan (0.028 mg/kg) and endosulfan sulfate (0.045-0/049 mg/kg).

Organic phosphorus pesticides: Most commonly found residues in forage samples were found to be those of dichlorvas and quinolphos. In exceptional cases residues of dimethoate and chlorpyriphos were also recorded. However path of these residues into soil and plant component was very less. The residues of dichlorvas (0.0496 to 0.0565ppm) were recorded in three samples while those of dimethoate, and profenophos were observed in only one sample each.

Synthetic pyrethroids: Neither water/ soil nor fodder crop recorded any trace of synthetic pyrethroid pesticides which could be attributed tyo their quick degradability. Thus it could be inferred that the forages grown on the banks of Musi in and around Hyderabad have traces of OC compounds and measures have to be taken to counter their entry into food channel.

Table 1: Concentration of OC and OP pesticide residues in fodder samples

Residues Site no.	Organo Chloro pesticides				Organo phosphor pesticide res.		
	α HCH	**β HCH**	**PPDDD**	**α Endosulphan**	**Dichlorvas**	**Dimethoate**	**profenophos**
1	ND	ND	ND	ND	0.0565	ND	0.0093
2	0.0164	ND	0.5933	ND	ND	ND	ND
3	ND	ND	0.0307	ND	ND	ND	ND
4	ND	ND	0.1472	0.0039	ND	ND	ND
5	ND	0.0796	0.0823	ND	ND	0.0902	ND
6	0.0051	ND	ND	ND	ND	ND	ND
7	ND	ND	0.0421	ND	ND	ND	ND
8	ND	ND	0.0540	ND	ND	ND	ND
9	ND	ND	0.0542	ND	0.0496	ND	ND
10	ND	ND	0.0318	ND	0.0525	ND	ND

Conclusion

The fodders grown in and on the banks of river Musi are laden with traces of organochloro pesticide residues especially PPDDD. However, their magnitude is too low to affect the cattle growth or milk quality. Though residues of Dichlorvas were observed entering water → soil → fodder their concentration was minimal to affect animal health by any means. The soils are found to contain residues of organo chloro pesticides viz., isomers of HCH, and Aldrin and few other OC residues. The residues of OP compounds were negligible. The water consisted residues of OC and OP compounds however, their channelization into fodder was negligible thus leaving the cultivated forages of Musi safe for animal consumption in Hyderabad.

References

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