Research Article

Iron Asseveration in Soil, Forage and Animals Blood and Feces Samples Collected from Different Districts of Punjab, Pakistan

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Abstract | The man's existence is closely linked with animals in multiple use, to earn livelihood and even used as food. The fodder and forages are the major nutritional items along with other supplements. In Pakistan and sub-continent, the shortage of fodder and forages is very common particularly in kharif season because shortage of the fresh water resources. The waste water is manly passed down as supplemental irrigation source to irrigate field crops including fodder and forages. The studies showed the provisions of Iron (Fe) in feces, forages, soil, fodder and grazing animal's blood data collect from the Sargodha, Jhang, Layyah and Bhakkar districts of the Punjab. Five sites, three animal's (Cow, Sheep and Goat) and two origins (Blood and Feces) were selected. Standard samples preparation methods were worker to check occurrence of the heavy rock's metals in the forage and soil samples. The Atomic Absorption Spectrophotometer was used to check Iron (Fe). The results revealed that Fe were found in safe limit, as per WHO.

Received | August 16, 2021; **Accepted** | November 09, 2021; **Published** | January 18, 2022
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Citation | Noorka, I.R., B.A. Khan, K. Ahmad, Z.I. Khan, M.A. Nadeem, A. Nawaz, T. Ahmad and H. Bashir. 2022. Iron asseveration in soil, forage and animals blood and feces samples collected from different Districts of Punjab, Pakistan. *Pakistan Journal of Agricultural Research,* 35(1): 1-4.
DOI | https://dx.doi.org/10.17582/journal.pjar/2022/35.1.1.4
Keywords | Forage, Fodder, Iron, Livestock, Waste water

Introduction

Agriculture and livestock are intimately connected to man's life, especially in rural regions. It is the world's largest livestock business, which endures hot and humid weather around the clock (Noorka *et al.*, 2020). The survival of livestock is an important element of our civilization in the face of changing environmental circumstances. It isn't only the desire to raise animals that motivates people to do so (Noorka and Heslop-Harrison, 2019; Noorka, 2020). For the animal's own survival, a survival ship is a key priority. Indeed, numerous environmental elements such as temperature, geography, and genetic differences all have a role in improving the nutritional values of fodder and forages for cattle (Noorka, 2020; Noorka *et al.*, 2017; Noorka *et al.*, 2020). Animal feed quality differ from location to location (Habib and Siddique, 1994).

In the current world, countries that utilize grain as ruminant feed get 75 percent of their nutrition from forages for ruminants. Those nations who did not rely on grains as a source of fodder, on the other hand, would get 95 percent of their ruminant nutrition from roughage (Bulla *et al.*, 1977). The main winter fodder is berseem (Ali *et al.*, 2020).

"Sarson" is the most prevalent fodder, mustard or "rai" are also utilized as fodder. As a minor winter crop, barley (*Hordeum sativum*) and *Hordeum vulgare* are cultivated. Vetches (Vicia spp.) have a good track record in trials but aren't widely used as a staple. The animal is also fed dry foods (Al-Saleem *et al.*, 1996). Pesticides, fertilizers, and soil crops all contribute to the accrertion of heavy rocks metals (Onianwa, 2001).

Agricultural supplemental irrigation is one of the primary applications of wastewater (Noorka, 2020). The number of heavy metals that accumulate in waste-water irrigated soils is determined by the length of time that it is applied (Noorka and Heslop-Harrison, 2019). Despite having the worldwide biggest canals irrigation system, Pakistan's decreasing freshwater supplies have forced farmers to use wastewater as a supplemental or even exclusive source of water. In urban regions of poor nations, the waste water is utilized on agricultural lands to satisfy water shortages. Keeping in mind the goals of determining Fe levels in fodders and forages under the control and wastewater conditions.

Materials and Methods

Samples of soil, fodder, forage and animals (urine, blood, feces and hairs) were collected form all sits. Fresh fodder and forage samples were collected from different sites of Bhakkar, Layyah, Jhang and Sargodha districts (Figure 1). Most of the fodder and forage consumption during both summer and winter seasons were managed from these sites. Three Blood samples (Sheep, Goat and Cow) were taken from Bhakkar, Layyah, Jhang and Sargodha districts. Sites and treatments of the experiment are of following.

S1: Control	D1: Sargodha	A1: Goat	S1: Blood
S2: Waste water	D2: Jhang	A2: Sheep	S2: Feces
S3: Waste water	D3: Layyah	A3: Cow	
S4: Waste water	D4: Bhakkar		
S5: Waste water			

Samples digestion, heavy metal determination and sample preparation by wet digestion method were done by revealed by [10]. Dried samples were digested with concentrated H_2O_2 and HNO_3 (2:1) on hot plate. This process continued until the appearance of colorless solution.

Metals concentration

For the determination of heavy metals, processed samples ware passed through the Atomic Absorption Spectrophotometer.

Statistical analysis

Recorded data was analyzed by using SAS software 9.2. Date was analyzed by using Comparison of results done with international results given by USPEA (US Environmental Protection Agency).

Results and Discussion

Fe in Soil

Table 1 depicted that the Fe values were significantly affected by sites, districts and site × districts. Fe in the soil ranged from 17.75-27.53 mg/kg. Site 1 (Sargodha) showed the lowest value, while, site 2 (Bhakkar) showed the highest value (Figure 1). Fe values were frequently lower than the critical levels (150 mg/kg) declared by (WHO, 1989).

Table 1: *Analysis of variance of Fe in soil sample.*

Sources	D	S. S	M.S	F value
Districts	3	352.187	117.396	18.321*
Sites	4	35.496	8.874	1.385*
Districts × Sites	12	107.669	8.972	1.400*
Error	40	256.302	6.408	
Total	60	29882.364		

Forage

Data about the forage shown a significant effect on sites, districts and site × districts (Table 2). Fe in the forage ranged from 20.72-29.41 mg/kg. Lower values were observed from site 5 of Bhakkar and highest values was examined under site 3 of Jhang (Figure 2). Fe in the forage was also lower than the critical value (40mg/kg) declared by (WHO, 1989).

Table 2: *Analysis of variance of Fe in forages sample.*

Sources	DF	S. S	M.S	F value
Districts	3	155.818	51.939	28.921*
Sites	4	95.095	23.774	13.238*
Districts × Sites	12	94.479	7.873	4.384*
Error	40	71.837	1.796	
Total	60	38802.898		

Animals

A significantly different effect was observed about

animals of districts, animals, sources, districts x animals, districts x sources, animals x sources and districts x animals x sources (Table 3). Fe ranged from 2.38- 5.39 mg/kg in animals. Fe concentration in animals blood samples were higher than the critical values determined by the (WHO/FAO, 2007).

Table 3: *Analysis of variance of Fe for animals.*

Sources	DF	S. S	M.S	F value
Districts	3	15.442	5.147	4.796*
Animals	2	9.270	4.635	4.319*
Sources	3	116.778	38.926	36.268*
Districts × Animals	6	10.369	1.728	1.610*
Districts × Sources	9	36.669	4.074	3.796*
Animals × Sources	6	7.693	1.282	1.195*
Districts × Animals × Sources	18	29.346	1.630	1.519*
Error	432	463.658	1.073	
Total	480	6913.480		

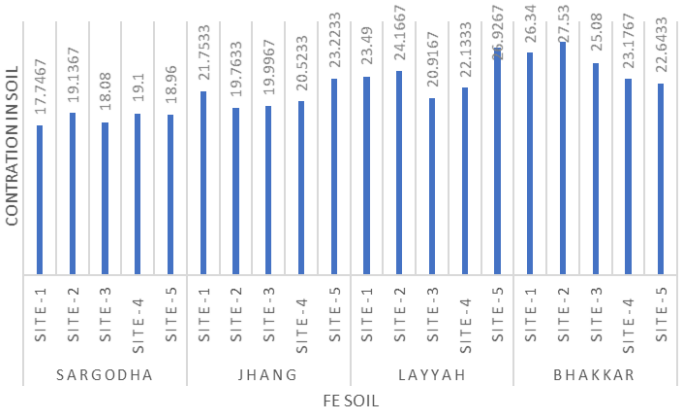

Figure 1: *Graph of concentration of Fe found in soil of districts of Sargodha, Jhang, Layyah and Bhakkar.*

The results depicted that the diverse amount of Fe was found among the samples obtained from districts from the five different sites (Sargodha, Layyah, Jhang and Bhakkar) of Punjab. The graph showed that District Bhakkar site 2 found maximum amount of Fe in its sample followed by site 5 of district Layyah.

The results showed that the concentration of Fe was found among the samples (Blood and Urine) obtained from animals (Goat, Sheep, Cow) from districts of Sargodha, Jhang, Layyah and Bhakkar. The graphical representation showed that the feces sample obtained from the sample of goat revealed maximum amount of Fe, similarly the feces sample obtained from cow at District Jhang was at number 2, followed by feces of goat at district Bhakkar.

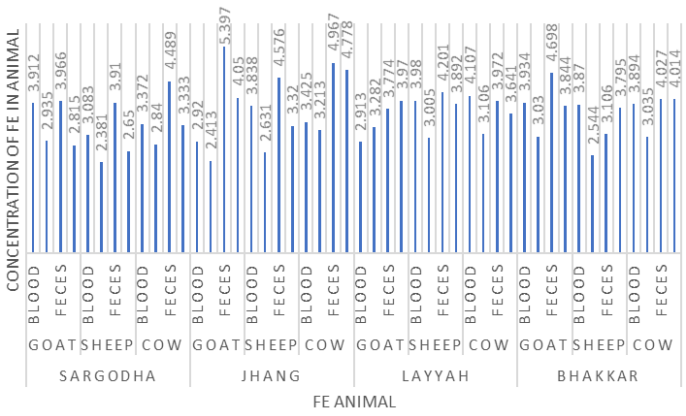

Figure 2: *Graph of concentration of Fe found in animal (Goat, Sheep and Cow) in blood, Urine, hair and feces districts of Sargodha, Jhang, Layyah and Bhakkar.*

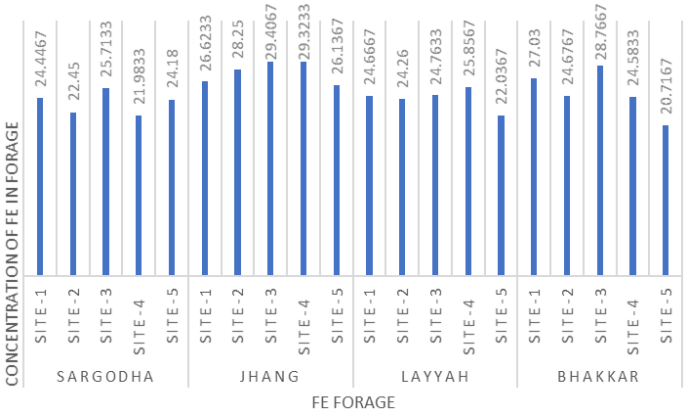

Figure 3: *Graph of concentration of Fe found in forage of districts of Sargodha, Jhang, Layyah and Bhakkar.*

The graph results showed differential amount of Fe was found among the samples obtained from five different sites. District Jhang site 3 found maximum amount of Fe in its sample followed by site 4 of same district.

Conclusions and Recommendations

World health organization reported that environmental pollution causes many diseases facing the mankind today. Irrigation with normal and polluted water have diverse effects and it contaminated the soil and cultivated land. Farming on the polluted soil may lead to heavy metal accumulation in crops edible parts, which resulting high risk to human as well as animal health. The current study concluded that Fe concentration of blood samples of cow, goat and sheep were found greater than the respective permissible limits. Therefore, this study may also help to found a baseline data to check sewage irrigation in coming time.

There is dire need for an affluent monitoring of the contamination levels of heavy metals at diverse crop

varieties, their crosses, their mode of tolerance molecular levels since they can accumulate to toxic levels.

Acknowledgement

The first author is acknowledged for financials support through research projects # Number: UOS/ORIC/2016/12.

Novelty Statement

This study revealed that Fe was found in safe limit, as per WHO in Sargodha, Jhang, Layyah and Bhakkar districts of the Punjab and three animal's (cow, sheep and goat) and two origins (blood and feces).

Author's Contribution

Ijaz Rasool Noorka and Zafar Iqbal Khan: Conceived the idea.
Bilal Ahmad Khan and Kafeel Ahmad: Wrote abstract and planned methodology.
Muhammad Ather Nadeem: Did SPSS analysis.
Amer Nawaz: Wrote conclusion
Tasneem Ahmad and Humayun Bashir: Provided technical input at every step.

Conflict of interest
The authors have declared no conflict of interest.

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