

A Research on Heavy Metal Statues in Some Pasture Soil of Antalya

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Abstract: Meadow and pasture resources fulfill many important tasks, besides feature of being a source of feed for livestock production. Being natural balance element, erosion prevention, clean water, air and food production and protection of genetic resources of many plant and livestock organism can be accepted among these.

Because of rapidly growing urbanization, industrialization and tourism, meadow and pasture resources in the Mediterranean region have been polluted with different pollutants. In this study, soil pollution research was done in pastures near intensive industry and tourism region of Antalya. Concentration of Cd, Cr, Cu, Ni, Pb, Zn and Hg elements were analyzed in 12 samples from 3 different pastures as 4 samples from each one.

Results showed us that the concentration of Ni was higher than the limits written in Turkey Soil Pollution Control Regulation. The other concentrations are lower than the limits written in Regulation. This study is a precursor study which shows the needs of other detailed study.

Key words: Pasture, Soil, Heavy metal

Introduction

Meadow and pasture are being one of the important natural richness of a country (Altin et al., 2005). According to last evaluations, nearly half of the land of the earth is taken in to pasture concept and these areas have been accepted as valuable part of the nature and they should be protected as tropic forest (Avcioglu, 1999). Meadow and pastures have important tasks such as protection of soil, protection of genetic resources and using as livestock feed (Avcioglu, 1983). It is known that increasing with industrial activity, energy production, transportation and urbanization is caused to environmental pollution. Environmental pollutants are dangerous to human health, plants and other goods (Hodges, 1977; Biggins and Harrison, 1980).

The most negative effect of pollutants is carrying heavy metals which are toxic and carcinogenic (Lagerwerf and Specht, 1970; Linton et al., 1980; Biggins and Harrison, 1980; Sakai et al., 1988). Pb, Cd and Ni pollution are more common in urban areas than rural areas because they are caused by industrial sources. Normally Pb and Cd are not found in plants. Whether if they are found trace amount in plants, it is accepted as a sign of pollutions (Foy et al., 1978). Heavy metals such as Pb, Cd, Ni, Cr are toxic for human and animals (Lagerwerf et al Specht, 1970; Linton et al., 1980). These toxic heavy metals are spread out to environment by industrial activities and emissions of motor vehicles (Biggins and Harrison, 1980; Miller and McFee, 1983; Chow, 1970).

Antalya is one of the provinces which has highest emigration rate in Turkey. This emigration causes to industrialization. In this study, soil pollution of 3 selected pastures which have great role as livestock feed source and near to urban and industry areas.

Material and Method

Oil samples were taken from 4 stations of each 3 pastures, totally 12 stations. Each sample was formed by mixing 5 samples taken from 100 m² representative areas of pasture. Samples were taken from 10 cm depth. Analyses were carried out at Atmosfer Agriculture Analysis Laboratory.

Soil samples were prepared to analyses by sieving them through 2 mm sieves after making them as air dry at laboratory conditions (Jackson, 1967). In soil samples, structure analysis were done by hydrometric method (Bouyoucos, 1962), and water soluble total salt content were done by measuring electricity resistant in sature soil priming (U.S. Soil Survey Staff, 1951). Amount of CaCO₃ were analysed by Scheibler calcimeter (Schlichting ve Blume, 1966), organic materials were analyzed by crossing organic C percentage, which were evaluated by fresh burning method, with 1.724 factor (Reuterberg and Kremkus, 1951), total N was analyzed by modified macro Kjeldahl method (Bremner, 1965).

In soil and ash samples, content of some trace elements (Fe, Zn, Mn, Cu, Cd, Co, Cr, Ni, Pb) and heavy metals, which were extracted in aqua regia (HNO₃+HCl), were analyzed at ICP-OES after extraction by aqua regia extraction methods.

Result and Discussion

Analysis results of researched pasture soil are given in Table 1, contents of some useful macro and micro nutrition elements are given in Table 2, results of some heavy metals are given in Table 3, changing of pollutant heavy metals according to each station are shown in Figure 1. Pb content of soil is changed from 1.8 ppm to 13.16 ppm. The lowest Pb content of soil is at the Aşağıoba 3 and the highest one is at the Yağca 1 (Table 3). According to values which were given by Kloke (1980) that shows the Pb pollution of soil (100 ppm), it can be said that there is no Pb pollution at the researched soils (Figure 1).

Nickel contents of soils are changed between 12.76 ppm and 78.25 ppm. The lowest nickel level belongs to Aşağıoba 4 soils and the highest one is belong to Kovanlık 2 (Table 3). According to values which were given by Kloke (1980) that shows the Pb pollution of soil (50 ppm), some researched soil samples nickel contents are higher than Klokes's data. They are also higher that the limits (75 ppm) written in the Turkey Soil Pollution Control Regulation (Figure 1). But according to Regulation, analysis results can be exceeded to this limit, if it is proven scientifically, that they are not dangerous for human and environment at the feed crop cultivated areas.

Cupper contents of soils are changed between 0.7 ppm and 27.63 ppm. The lowest cupper level belongs to Yağca 4 soils and the highest one is belong to Yağca 2 (Table 3). According to values written in the Turkey Soil Pollution Control Regulation (140 ppm) there is cupper pollution at the researched soils (Figure 1).

Station	pH	EC (mmhos/cm)	CaCO ₃ (%)	Organic materials (%)	Total Nitrogen (N), %	Structure %
Aşağıoba 1	6,1	0,7	2,0	0,9	0,10	31
Aşağıoba 2	5,4	0,7	2,0	1,6	0,14	36
Aşağıoba 3	6,1	0,9	2,0	1,0	0,12	35
Aşağıoba 4	6,4	1,0	2,0	1,5	0,10	40
Kovanlık 1	8,1	1,6	16,0	2,7	0,15	64
Kovanlık 2	7,9	1,4	10,0	2,5	0,14	63
Kovanlık 3	7,9	1,3	8,0	2,3	0,13	59
Kovanlık 4	7,9	1,2	9,0	2,3	0,14	63
Yağca 1	7,8	1,7	6,0	4,4	0,27	66
Yağca 2	7,6	1,6	3,0	3,9	0,23	57
Yağca 3	7,7	1,2	5,0	4,6	0,35	65
Yağca 4	7,3	0,4	2,0	4,6	0,25	63

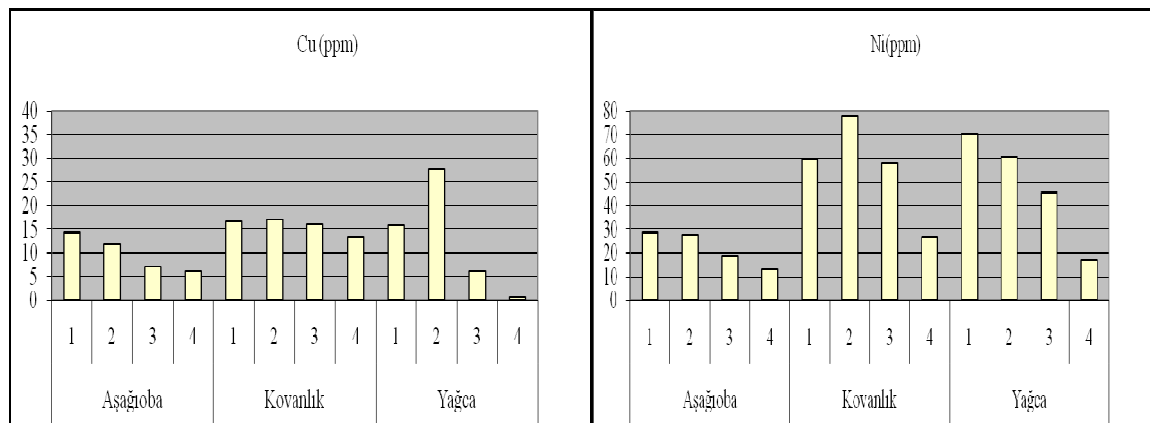
Table 1. Some soil properties of research area

Station	P ₂ O ₅ (kg/da)	K ₂ O (kg/da)	Ca (ppm)	Mg (ppm)	Fe (ppm)	Mn (ppm)	Zn (ppm)	Cu (ppm)
Aşağıoba 1	2,15	21,02	1559	249,00	32,4	35,78	0,24	0,87
Aşağıoba 2	6,14	32,40	2250	348,00	71,4	55,74	0,01	1,62
Aşağıoba 3	5,95	56,64	2492	366,00	33,8	29,19	0,24	1,28
Aşağıoba 4	4,08	33,60	3255	417,00	11,8	34,93	0,42	1,69
Kovanlık 1	2,15	41,04	7310	367,00	0,7	0,39	0,68	1,76
Kovanlık 2	0,82	37,44	7518	468,00	1,2	0,08	0,74	1,24
Kovanlık 3	1,88	37,68	6301	339,00	0,6	0,44	0,68	1,20
Kovanlık 4	1,60	40,80	7436	416,00	0,6	0,04	0,53	1,72
Yağca 1	42,73	158,16	7813	358,00	1,0	0,04	0,53	1,66
Yağca 2	3,25	188,16	7975	383,00	1,5	3,88	6,20	1,19
Yağca 3	31,24	206,40	7485	330,00	0,2	2,84	1,53	0,39
Yağca 4	8,34	262,56	6874	434,00	1,5	2,94	6,90	2,43

Table 2. Some useful macro and micro nutrition elements in soil samples

Pasture	No	Heavy metals (ppm)						
		Cu	Ni	Pb	Zn	Bor	Hg	Cd
Aşağıoba	1	14.34	28.62	3.42	5.95	-	-	-
	2	11.83	27.81	-	5.24	-	-	-
	3	7.08	18.65	1.8	3.35	-	-	-
	4	6.02	12.76	5.96	-	-	-	-
Kovanlık	1	16.64	59.65	6.19	31.83	-	-	-
	2	17.13	78.25	6.08	31.01	-	-	-
	3	16.00	58.11	4.44	27.52	-	-	-
	4	13.42	27.11	3.34	5.37	-	-	-
Yağca	1	15.78	70.5	13.16	76.85	-	-	-
	2	27.63	60.75	7.7	147.86	-	-	-
	3	5.97	45.54	2.73	52.17	-	-	-
	4	0.70	17.29	-	33.98	-	-	-

Table 3. Some heavy metals contents of soil samples, ppm



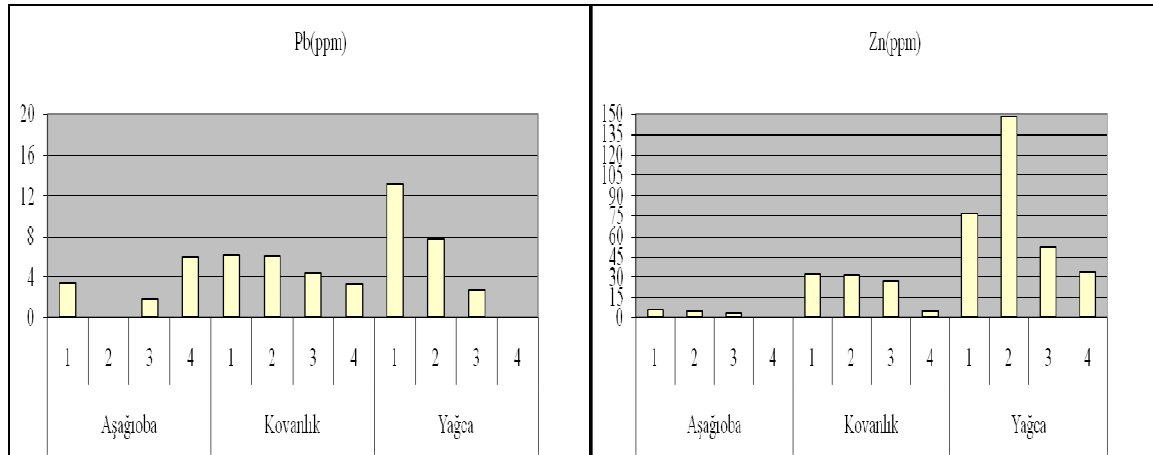


Figure 1. Concentration values of polluted heavy metals according to stations

Amount of Zn contents of soils are changed between 3.35 ppm and 147.86 ppm. Aşağıoba 3 has the lowest Zn level whereas Yağca 2 has the highest one (Table 3). According to values written in the Turkey Soil Pollution Control Regulation (300 ppm) there is copper pollution at the researched soils (Figure 1).

In this research, Bor, Cd and Hg, which were analyzed in the soils, were not found.

Results

Four elements (Ni, Pb, Cu, Zn) were found for soil pollution at the 3 pasture near to urban areas and industry centers. Heavy metal pollution of soil is now at low levels. But if any precaution does not taken, this pollution level can be increase. For this reason, this initiator research should be considered an than these type of researches should be replicated periodically (once a 3 or 4 year) and results should be taken in to consideration carefully. If it is thought, that large part of livestock feed needs are covered from pastures, pastures should be protected from non-returning soil pollution

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