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AFLATOXIN, HEAVY METAL AND PESTİCİDE CONTENTS OF COMPOUND RUMINANT FEEDS IN TURKEY

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ABSTRACT

Main objective of this study is to determine the pollution levels and seasonal variations of polluting agents in some compound Ruminant feeds produced in Turkey and also to determine whether legal tolerance levels have been exceed or not. In order to achieve this goal, aflatoxin B_1, B_2, G_1, G_2 (and total) lead, cadmium, mercury, arsenic, organochlorine (*Trifluralin, Gamma-HCH, Quintozone, Triadimefon, Captan, Alpha Endosulfan, 4-4' DDT, Beta Endosulfan, 2-4' DDT, Endosulfan Sulfate)* and organofosfate (*Dichlorvos, Diazinon Chlorpyrifos Ethyl, Chlorpyrifos Methyl, Metalaxyl, Fenitrothion, Malathion, Parathion Methyl, Chlorfenapyr, Triazophos)* pesticide residue analysis have been carried out on a total of 60 compound lactating cow-cattle fattening and lamb fattening feed samples collected at 3-month intervals during the fiscal year of 2005 from commercial feed compounders planted in 5 provinces at Agean, Marmara, Trace, Eastern and Central Anatolian Regions where feed production is most intensive. High performance liquid chromatography (HPLC), Atomic absorbtion spectrophotometer (AAS), gass and mass chromatographies (GC and GC-MS) have been utilized for aflatoxins, heavy metals and pesticides, respectively.

HPLC analysis indicated that 60% of the samples contained aflatoxin B_1, 36.6% contained B_2, 3.4% contained G_2 and 1.6% contained G_1 maximum residue levels (MRL) has been given in the "Instruction about Materials Undesired Materials in Feeds" prepared by Turkish Ministry of Agricultural and Rural Affairs only aflatoxin F_1. F_1 data obtained in the present study did not exceed the legal tolerance levels cited in that manuscript. No pesticide residue were found in any feed sample except 2.21, 2.51 and 2.61 ppm *quintozone* in dairy, cattle fattening and lamp fattening feeds, respectively, provided from East Anatolia at January-March period, and 0.1 ppm *diazinon* in lamp fattening feed provided from Central Anatolia at April period. Since, The Ministery of Agriculture Instruction does not include MRL figures for compound feed, no comparison hasn't been able. Hg and As in only 3.3% and Pb in 1.6% of the feeds analyzed exceeded MRL values given; while most of the feed did not contain heavy metal residue at analytical detectable levels.

INTRODUCTION

When polluted feed consumed by animals, aflatoxin, heavy metal and pesticide intakes may rich up to levels threating human health by passion into end product such as meat and milk. To prevent becoming animal food hazardous, first of all, feed utilized should be kept under the control. Although, trough out the world some study have been carried out on the raw materials, no serious work has been undertaken covering aflatoxin, heavy metal and pesticide content of compound feeds which is the final product taken into the animal body.

Various aflatoxins produced by different *Aspergellus flavus* species are aflatoxin B_1, B_2, G_1, G_2, M_1 and M_2. Among them one is the most frequently existing in mouldy feeds and processed foods is B_1 while the most rare is B_2 being G_1 and G_2 somewhere between them. These toxins resistant to normal temperature and easily can affect materials such as corn,

wheat, cotton seed meal, soybean meal, sunflower meal, animal originated feeds and compound feeds.

Heavy metal pollution is a serious problem resulted by industrialization. It is proved that metals accumulated in air, soil and waters polluted almost all the world. These elements are released into the environment by industrial institutions through chimney gasses and also by mining activities (Tunçoku and Çınar, 1995). Similarly, one of the important sources of Hg which is used in many industrial branches such as electrochemistry, paint, drug, paper metallurgy at constantly increasing rates is some Hg compounds utilized as fungicide for cereals (Şanlı, 1976).

Residues in feeds and foods caused by pesticides are very important components of modern agriculture creates serious problem all over the world. Since, rate of alternative systems such as biologic and organic farming is low pesticide use very intensive in nowadays' modern agriculture. Besides, mistakes in practical application enlarge the danger.

Main objective of this study is to determine the pollutions levels and seasonal variations of pollution agents in some compound ruminant feeds produced in Turkey and also to determine whether legal tolerance levels have been exceeded or not.

MATERIAL METHOD

Sample Collection

A total of 60 compound lactating cow-cattle fattening and lamb fattening feed samples have been collected at 3-month intervals during 2005 from commercial feed compounds planted in 5 provinces at Agean, Marmara, Thrace, Eastern and Central Anatolia Regions where feed and animal productions are most intensive. Samples protected at -18 ^{0}C have been analyzed for aflatoxin (B1, B2, G1, G2 and total; heavy metals (Pb, Cd, Hg, As); organochlorine (*Trifluralin, Gamma-HCH, Quintozone, Triadimefon, Captan, Alpha Endosulfan, 4-4 DDT, Beta Endosulfan, 2-4 DDT, Endosulfan Sulfate)* and organophosphorus pesticides (*Dichlorvos, Diazinon, Chlorpyrifos Methyl, Metalaxyl, Fenitrothion, Malathion, Parathion Methyl, Chlorfenapyr, Triazophos)*.

Sample Preperation and Analysis Sistems

-Aflatoxins

125 ml methanol and water mixture (85:15) has been poured on each of the feed samples; filtered through glass microfibre filter paper, then passed at 1-2 drop/s speed through immuno affinity column. The remaining aflatoxins recovered into the vial after washed with 1 ml methanol and 1 ml ultra purified water at same speed (Vicam, 1999). The amount of aflatoxins has been determined by HPLC with ODS2 column and with Cobracell derivative of aflatoxins. Injection volume 100 µl, flow speed 1 ml/min have been taken and fluorescent detector utilized. Aflatoxin B1, B2, G1, G2 amounts were calculated according to calibrations done at 5 different concentration rates. The limits of detection (LOD) were 0.2 ppb for B1, 0.10 ppb for B2, 0.51 ppb for G1 and 0.17 ppb for G2.

-Pesticides

30 g sample feeds, aceton/hexan solvent (1/1) added with 8 100 ml of it) kept for a night. After filtrated, in a rotary evaporatory concentrated in (40 ^{0}C). Extracted oil (≤3gr) taken petrolium ether (PE) and acetonitril extraction used to separate pesticides (acetonitril

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cleaning method). Matrix and oil residues with pesticides kept in the florosil column and separated. Every 200 ml, 3 different concentration (diethyl ether of PE percentages namely 6, 15 and 50 %) added solvents straight through the same column 5 ml/min. Speed to separate pesticides with increasing polarity (florosil column clean-up) (PAM, 1994). To identify the organophosphorus residues 5 ml eluates concentrated in rotary evaporator GC-NPD (nitrogen-phosphorus selective detector) for organochlorine residues GC-ECD (electron capture detector) 1 µl injected. At the same time GC-MS (with mass selective detector gas chromatography) 2 µl injected relatively, with results of GC-MS are made confirmation and quantity of pesticides.

To calculation that out prepared chart, 6 in concentration organochlorine and organophosphorus pesticides (25, 50, 100, 250, 500, 1000 ppb) standards injected GC-MASS and calibration line is made. For every pesticide valuation 1 target 3 quantify ion is used (table, 2 and 2).

Different concentration of prepared pesticides standards (10, 25, 50, 100, 250 ppb) are given GC-MS at SIM (selective ion mode), LOD value of pesticides (table 1 and 2).

Table 1. GC-MS valuation of organophosphorus pesticides

Pesticides	**LOD (ppm)**	**Target ion (m/z)**	**Quantitative ions (m/z)**
Dichlorvos	0.01	109	185, 145, 79
Diazinon	0.01	179	199, 276, 304
Chlorpyrifos-methyl	0.01	125	286, 287, 289
Parathion-methyl	0.01	125	109, 263, 79
Metalaxyl	0.01	206	220, 249, 279
Fenitrothion	0.01	125	109, 277, 260
Malathion	0.01	125	173, 158, 256
Chlorptrifos ethyl	0.01	197	257, 314, 201
Chlorfenapyr	0.01	59	247, 408, 406
Triazophos	0.01	161	257, 285, 313

Table 2. GC-MS valuation of organochlorine pesticides

Pesticides	**LOD (ppm)**	**Target ion (m/z)**	**Quantitatve ions(m/z)**
Trifluralin	0.01	306	264, 290, 335
Lindane	0.025	183	219, 111, 51
Quintozone	0.025	237	248, 294, 213
Triadimefon	0.01	57	208, 85, 128
Captan	0.25	79	149, 107, 116
Alpha-endosulfan	0.25	237	195, 241, 339
4-4’ DDT	0.01	235	237, 165, 199
Beta-endosulfan	0.25	195	237, 265, 339
2-4’DDT	0.05	235	236, 264, 338
Endosulfan sulfate	0.25	272	237, 165, 199

The feeds were found clean, with **spike** *diazinon* (insecticide) and *quintozone* (fungicide) standards added to recovery proceedings (500 ppb) completed. Therefore *quintozone* recovery value is 62.30 % for dairy feed 64.16 % for cattle feed, for 61.64 % lamb fat feed. *Diazinon* value is 69.19 % for lamb fat feed.

-Heavy Metals

The feed samples which weighs 0.5 g added 8 ml nitric acid and 1 ml hydrogen peroxide kept about 30 min. and afterwards burned in pressured microwave oven (MARS 5),

sample cups washed with ionized water, filled in baloon joje up to 20 ml (Jorhem and Skurikhin 1993). Afterwards with AAS's Graphite Furnace system Pb, Cd and with Hidrur system As and Hg valuations found. For the certified reference material (CRM) standard used in analysis and for LOD and for Pb 0.0003, for Cd 0.02, for As 0.004 and for Hg 0.000006 ppm observed.

-Statistical Analyses

Some of the analysis reports never met for the criterias. Therefore end results were not applied.

RESULTS AND DISCUSSION

-Aflatoxins

Aflatoxin analysis results for the mix feeds presented on the table 3. In these feeds 60 % B1, 36.6 % B2, 1.6 % G1, 3.4 % G2 found aflatoxin. In over all 63.3 % aflatoxin counted (nearest valuation B1). But these valuations never exceeded MRL valuations. The Ministry of Agriculture, Protection and Control branch published (unwanted animal feed and the things you should know about it) the news in the national newspaper in the year 2005. The maximum aflatoxin B1in dairy cows acceptable level should not be over 0.05, cows and lamb feed 0.02 ppm. All the feeds valued at these standards (Anonymous, 2005).

Samples of feedstuffs (15), milk (40) and cheese (30) coming from sheep and dairy farms (23) or market in Western Sicily were analyzed for their respective content of aflatoxin B1 and M1. Results of analysis using HPLC Aflatoxin B1 was detected in the feed ranged from < 10 to 769 ppb. None of the contaminated samples exceed the legal limits set down by European Union for feed (5 ppb) (Surai and et al., 2004).

100 feed samples, of which 40 single feeds, 20 mixed feeds, 20 dairy feeds and 20 feed species, were examined ELISA for aflatoxin B1 contents. Aflatoxin was found at less than 10 ppb in 62 % of samples. But these levels are too low to adversely affect the health of cattle given these feeds (Dogan, and Bayezit, 1999).

Adversely, Çelik and Öztürkcan (2000) in Çanakkale region 64 different feed and it's contents, (each one 8 pieces wheat, cottonseed meal, maize, dried alfalfa forage, wheat cracked, broiler feed, dairy feed and processed monkey nut) was doing his own research about the aflatoxin pollution. He found aflatoxin B1 in 20.3 % of these feeds. However his founding were never in the legal limits of the risk factors of FDA (1977 and 1979).

On the other hand research was carried out in 2003 by Yıldız results showed the maize, wheat, barley, row and processed soybean, sorghum, wheat bran, razmol, maize bran, sunflower meal, cottonseed meal, soybean meal, peanut meal and samples indication of micotoxin for total aflatoxin was found 69.3 %, for zearalenon 51.4, ocratoxin-A 42.4 %. The chance of finding aflatoxin level higher than 20 ppb 8.7 %, zearalenon 60 ppb 22 %, ocratoxin-A 50 ppb 9.3 %. The high pollution level was which exceeded the limits was primerely, maize, wheat, soybean, sunflower meal and cottonseed meal.

Cespedes and Diaz (1997) research showed that in Columbia 1995-96 varies harvested maize, sorghum, processed soybean, rice flour, cottonseed meal collected for poultry and pig feed samples. 11 in 50 sorghum samples, 4 in 33 maize, 15 in 17 cottonseed meal, 12 in 30 poultry feed, 7 in 16 pig feed aflatoxin B1 was found. 9 out of 58 feeds were which contaminated with aflatoxin in Columbia well exceeded the tolerated levels.

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Table 3. Levels of aflatoxin in samples feeds from varies regions of Turkey (ppb)

REGİONS	FEEDS	1. PERİOD (January-March)					2. PERİOD (April-June)					3. PERİOD (July-September)					4. PERİOD (October-December)				
		B1	B2	G1	G2	TAFL	B1	B2	G1	G2	TAFL	B1	B2	G1	G2	TAFL	B1	B2	G1	G2	TAFL
Marmara	Cattle	*ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Dairy	0.33	ND	ND	ND	0.33	1.78	0.15	1.67	ND	3.60	0.69	ND	ND	ND	0.69	ND	ND	ND	ND	ND
	Lamb fat	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Central Anatolia	Cattle	0.81	0.19	ND	ND	0.90	16.0	1.88	ND	ND	17.88	0.57	ND	ND	ND	0.57	ND	ND	ND	ND	ND
	Dairy	0.88	0.13	ND	ND	1.01	0.45	ND	ND	ND	0.45	0.45	ND	ND	ND	0.45	ND	ND	ND	ND	ND
	Lamb fat	0.98	0.12	ND	ND	1.10	2.04	0.25	ND	ND	2.29	0.85	ND	ND	ND	0.85	0.35	ND	ND	ND	0.35
Egean	Cattle	ND	ND	ND	0.33	0.33	1.50	ND	ND	ND	1.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Dairy	ND	ND	ND	ND	ND	0.43	0.05	ND	ND	0.48	ND	ND	ND	ND	ND	0.90	ND	ND	ND	0.90
	Lamb fat	ND	ND	ND	0.23	0.23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Eastern Anatolia	Cattle	1.12	0.12	ND	ND	1.24	1.48	0.19	ND	ND	1.67	1.99	0.30	ND	ND	2.29	ND	ND	ND	ND	ND
	Dairy	2.81	0.31	ND	ND	3.12	0.77	ND	ND	ND	0.77	1.77	0.23	ND	ND	2.00	0.54	ND	ND	ND	0.54
	Lamb fat	1.57	0.20	ND	ND	1.77	0.93	0.13	ND	ND	1.06	2.84	0.42	ND	ND	3.26	ND	ND	ND	ND	ND
Trachea	Cattle	ND	ND	ND	ND	ND	0.39	ND	ND	ND	0.39	0.75	ND	ND	ND	0.75	0.83	0.12	ND	ND	0.95
	Dairy	0.48	ND	ND	ND	0.48	0.98	0.13	ND	ND	1.11	1.48	0.23	ND	ND	1.71	1.38	0.15	ND	ND	1.53
	Lamb fat	0.91	0.1	ND	ND	1.01	1.22	0.14	ND	ND	1.36	1.76	0.25	ND	ND	2.01	0.73	ND	ND	ND	0.73

*ND: Not dedected; below the LOD

Altuğ and Beklevik (2003) research carried out in 1900-2000 at the fish farms, feed factories and overseas based fish food mixed feeds.85 mixed feed samples showed that after analysis on 20 samples 21.2-42.4 ppb various levels of aflatoxin was found. But in 43 samples nothing were found. Samples were taken from the farms directly contained more aflatoxin then the samples were brought from the factories and overseas suppliers. That shows us that aflatoxin levels changes with humidity and storage conditions. For the safe storage humidity shouldn't be exceeding 12.5% and never under the 10 %. Safely stored feds should be used in 1 week or dried immedietly if humidity level ever exceeded 12.5 % (Growda et al. 2003).

-Pesticides

During pesticide analysis in January-March period, Eastern Anatolia region dairy 2.21, cattle feed 2.51, lamb fat feed 2.60 ppm organochlorine quintozone and in the April-June period central Anatolia region samples for lamb fat feed 0.1 ppm organophosphorus diazinon found. But on the other samples no pesticide residues were found. The ministry of Agriculture and village affairs gave the evaluations for nonprocessed food materials MRL, but there are no evaluations for the mixed feeds. Therefore no comment can be made for the legality of the whole situation.

During fiscal years 1989-1994, the U.S. Food and Drug Administration (FDA) collected and analyzed 545 domestic surveillance samples of mixed feed rations. Of the 545 samples, 88 (16.1%) did not contain detectable pesticide residues. In the 457 samples with detectable pesticide levels, 804 residues (654 quantitable and 150 trace) were found. None of these 804 residues exceeded regulatory guidance. Malathion, chlorpyrifos-methyl, diazinon, chlorpyrifos and pirimiphos-methyl were the most commonly detected organophosphosus pesticides. The most commonly detected organohalogen compounds were methoxychlor, DDE, PCB, dieldrin, pentachloronitrobenzene and lindane (Randall et al., 1996).

In another study, tolerance levels of organochlorine pesticide in stock feed have been set by legislation in Queensland, Australia. This review derives accumulation ratios from trials have involved feeding organochlorine pesticides to cattle, poultry and pigs. The rations can be used with the maximum residue limits already established for food products from these animals to calculate maximum permissible residue levels in fed. It was concluded that the levels for aldrin and dieldrin should be reduced from 0.05 to 0.01 mg/kg and that a level benzene hexachloride, other than the gamma izomer, of 0.01 mg/kg be included. In all other cases where information was available the levels set by legislation are already below those calculated from trial results (Noble, 1990).

Prasad et. al (2001) feed resources, viz. cereal grains, oilseed cakes, bans, legume and non legume forages and crop residues for ruminants investigated contaminated organochlorine pesticides. The order of contamination in concentrates and roughages was BHC (HCH) > endosulfan > heptachlor > DDT > aldrin. BHC content was highest in concentrate mixture .

Over a 2-year period (date not given) compound feeds and feed ingredients from Bangalore were analyzed fort he organochlorine pesticides, HCH, DDT and endosulfan. In the compound feed, content of HCH ranged from 7,6 to 119,7 ppb, DDT from trace to 49,1 ppb and endosulfan from trace to 10,0 ppb. In the majority of groundnut cake samples analyzed, predominant residue was DDT (Unnikrishan et. al, 1998).

-Heavy Metals

The feeds which was worked on Pb, Cd, Hg and As contents shown on the table 4. 60 feeds also analyzed 3.3 % Hg, 3.3 % As, 1.6 % Pb contents have exceeded the MRL. Other feeds Hg, Pb, Cd and As levels are generally well below the legal limits. Majority of the feed showed no signs of As. According to The Ministry f Agriculture and village affairs acceptable
highest contents for Pb 5, As 2, Hg 0.1, Cd 0.5 ppm. Accordingly valuated feeds Cd levels have not exceeded MRL. From the Egean region in 3th period samples of lamb fat feed, from Eastern Anatolia 3th period samples of dairy feed Hg. Contents (0.15 and 0.16>0.1 ppm) with Eastern Anatolian samples in

Table4. Levels of Pb, Cd, Hg As in samples feeds from varies regions of Turkey (ppm)

REGİONS	FEEDS	1. PERİOD (January-March)				2. PERİOD (April-June)				3. PERİOD (July-September)				4. PERİOD (October-December)			
		Pb	Cd	Hg	As	Pb	Cd	Hg	As	Pb	Cd	Hg	As	Pb	Cd	Hg	As
Marmara	**Cattle**	0.016	0.004	0.007	ND	1.16	0.16	ND	ND	2.16	0.13	ND	ND	0.46	0.08	ND	ND
	Dairy	0.008	0.004	0.006	0.040	0.67	0.12	0.08	ND	2.32	0.14	ND	ND	0.45	0.09	ND	ND
	Lamb fat	0.005	0.008	0.005	0.025	0.74	0.18	ND	ND	2.21	0.17	ND	ND	0.66	0.15	0.03	ND
Central Anatolia	**Cattle**	0.006	0.006	0.002	0.006	0.32	0.11	ND	ND	2.15	0.15	ND	ND	0.07	0.07	0.02	ND
	Dairy	0.007	0.006	0.0007	0.045	0.27	0.11	ND	ND	2.08	0.13	0.01	ND	0.12	0.12	0.03	ND
	Lamb fat	0.009	0.004	ND	0.008	0.51	0.12	ND	ND	1.93	0.15	ND	ND	0.21	0.21	ND	ND
Egean	**Cattle**	0.017	0.005	0.003	0.004	0.66	0.18	0.01	ND	0.75	0.14	ND	ND	0.92	0.14	ND	ND
	Dairy	0.019	0.009	*ND	ND	1.52	0.15	ND	ND	0.88	0.21	0.09	ND	**5.59**	0.15	0.04	ND
	Lamb fat	0.002	0.007	0.008	0.011	0.45	0.17	0.01	ND	2.21	0.18	**0.15**	ND	0.87	0.11	0.02	ND
Eastern Anatolia	**Cattle**	0.014	0.006	0.004	0.026	0.29	0.13	0.03	ND	3.04	0.27	**0.16**	ND	0.11	0.03	ND	ND
	Dairy	0.025	0.008	0.005	ND	0.47	0.10	ND	ND	3.11	0.21	0.08	**2.45**	0.09	ND	ND	ND
	Lamb fat	0.009	0.006	0.008	ND	0.91	0.17	ND	ND	1.99	0.11	ND	**2.98**	ND	ND	ND	ND
Trachea	**Cattle**	0.017	0.006	0.003	0.009	1.48	0.17	ND	ND	2.35	0.15	ND	ND	0.86	0.16	ND	ND
	Dairy	0.016	0.007	0.006	0.004	0.49	0.15	0.01	ND	2.39	ND	ND	ND	0.70	0.17	0.01	ND
	Lamb fat	0.014	0.003	0.006	ND	0.30	0.14	0.01	ND	2.29	ND	ND	ND	1.01	0.20	ND	ND

*ND: Not dedected; below the LOD
Dark numbers indicats the exceeds MRL

3th period dairy and lamb fat feeds As contents (2.45 and 2.98 ppm>2 ppm). Egean region 4th period of collected dairy feed Pb (5.59>5 ppm) exceeded MRL (table 4).

-Heavy Metals

The feeds which was worked on Pb, Cd, Hg and As contents shown on the table 4. 60 feeds also analyzed 3.3 % Hg, 3.3 % As, 1.6 % Pb contents have exceeded the MRL. Other feeds Hg, Pb, Cd and As levels are generally well below the legal limits. Majority of the feed showed no signs of As. According to The Ministry f Agriculture and village affairs acceptable highest contents for Pb 5, As 2, Hg 0.1, Cd 0.5 ppm. Accordingly valuated feeds Cd levels have not exceeded MRL. From the Egean region in 3th period samples of lamb fat feed, from Eastern Anatolia 3th period samples of dairy feed Hg. Contents (0.15 and 0.16>0.1 ppm) with Eastern Anatolian samples in 3th period dairy and lamb fat feeds As contents (2.45 and 2.98 ppm>2 ppm). Egean region 4th period of collected dairy feed Pb (5.59>5 ppm) exceeded MRL (table 4).

Data from Minnesota Diagnostic Laboratory between 1994 and 2000 showed 2, 19, 17, 15, 10, 2 and 18 positive cases of Pb toxicity were reported for each of the years, respectively. Lead poisoning accounted for 0.5 to 8 % of all the cases submitted to the Diagnostic Laboratory during those years. This survey was conducted to profile the heavy metal concentrations existing on Minnesota dairy farms. Lead concentrations in feedstuffs were below the levels of detection. No correlation between the concentration of heavy metals in soil, feed and liver tissue was found (Olson et al., 2004)

Pb is often found in crops, dust and the rain helps it to accumulate on the skin. Therefore feeds, mixed with dried skins and crop residues contains high level of lead (Ocker and Brüggeman 1991) that level goes higher in near by areas which are near the traffic and industrial factories (Mert et al., 1993). In this research, high contamination of lead in dairy food indicates polluted atmosphere in the winter months.

Industrial waste, electrochemical, paint, medicine, paper, metalurgy and other heavy industry products sector uses Hg and other heavy metal mixtures, also fungicide which is widely used in farming increases the contamination (Şanlı, 1976).

Human consumption of Cd mostly found in crops such as wheat and other products 5 % to 20 % of it. Tietz et al. (1993) research carried out on 939 brown wheat and wheat samples showed that most of the samples for the Cd and Pb 0.005 ppm expectations were not even found.

Polluted soil and water affects the near by crops with the varies level of contamination of As. In cult crops 0.1 to 10 ppm (varies) for example clover 1.9, bulb vegetation 0.3 to 1.3 corn saps 0.7 to 2.7, wheat 0.3 ppm. Acceptable level of As for humans was 3.5 ppm (Kurtoğlu and Coşkun, 2001).

ADVICES

Here are the research results.

1.From the samples of the 5 different regions of Turkey for the analyses aflatoxin contamination results shows us that carefully controlled products are safe to use.

2.In the feed analyses some countries still DDT presence, was not found in our analyses which were carried out in this research.

3.During the analyses of 60 feeds 6.6 % showed only 2 pesticides residue found out 4. This result shows us that mixed feed products are not facing any serious contamination.

4.In this research analyzed feeds only 8.3 % (5 samples) showed heavy metal pollution. Therefore use can comfortably say that heavy metal contamination of feeds in

Turkey remarkable low. “Warning of the unwanted substances in feeds” circular of The Ministry of Culture is not adequately prepared. Circular should be amended to cover wider areas of protection and cauntionery measures before the unprocessed materials enter the mixed feed for animal consumption.

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