البحث رقم ٣

غير مستخلص من أى رسائل علمية .

Pesticide Residues and Acids in Rain Water.

A.A.Abdel-Gawaad, Ali Shams EL-Dine and M.M.Ali.

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متبقيات المبيدات والأحماض فى مياه الأمطار .

تم فى هذا البحث تحليل عينات من مياه الأمطار الساقطة على محافظات القاهرة والقليوبية والاسكندرية والاسماعلية خلال عام ١٩٨٨ لمعرفة مدى تلوثها بالمبيدات الحشرية والمعادن الثقيلة ودرجة الحموضة ، حيث كان قد لوحظ بعض مظاهر الضرر لبعض النباتات خاصة نباتات الخضر وأشجار الفاكهة عقب سقوط الأمطار .

وأوضحت النتائج أن درجة الحموضة كانت تتراوح بين ٦ر٨ - ٢ر٥ ، بينما وجد أن مياه الأمطار تحتوى على أثار لبعض المبيدات مثل الليندين والد.د.ت وكذلك الملاثيون .

واشارت النتائج الى أن المتر المكعب من مياه الامطار يحتوى على ٤ر٢٣ الى ٦ر٥٤ جرام من الاتربة والمواد الصلبة. كذلك وجدت تركيزات متفاوتة من الحديد والفانيوبم والرصاص والزنك والصوديوم والبوتاسيوم والكالسيوم والمغنيسيوم.

كذلك تحتوى مياه الأمطار على انيونات الكلوريد والسلفات والبيكربونات .

وتشير الدراسة الى أن بعض مظاهر الضرر للنبات التى تعقب هبوط الأمطار يمكن ارجاعها الى التلوث الكيميائى لمياه الأمطار ، وينصح برى النباتات اثناء هبوط الامطار أو عقب ذلك مباشرة مما يؤدى الى تقليل الضرر .

PESTICIDE RESIDUES AND ACIDS IN RAIN WATER

A.A. Abdel-Gawaad[1], Ali-Shams El-Din[1], and M.M. Ali[2]

In the last three years the farmes in the new reclaimed lands found some phytotoxic symptoms after rainfall. Samples from rain water were analyzed for the detection of pesticides, acids and heavy metals.

Primary results indicated that all tested samples which were collected from three different parts of Cairo and from Kalubia, Alexanderia and Ismaillia governorates were acidic. The pH varied between 6.8 and 5.2.

Lindane, DDT, malathion and about seven unknown organic materials were detected by GLC in the tested water. The concentration of pesticide residues varied between 10.3 and 43.2 ppb.

The quantity of dust and solid materials/m^3 varied between 23.4 and 54.6 g. The heavy metals which were detected in most of the samples were iron, vanadium, lead and zinc. Complete chemical picture for the rain water over the four governorates have been obtained including chlorides, sulphates, bicarbonates, sodium,

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1. Faculty of Agric, Moshtohor, Kalubia.

2. Nuclear Materials Authority, Egypt.

potassium, calcium and magnesium. Some indicative rations have been calculated and discussed.

The phytotoxic symptoms which were observed in orange fields were: death of the terminal parts of the green branches, limited wilt and chloriosis in the tip and edges of the leaves. While the symptoms of phytoxicity in broad bean fields were wilt and chlorosis in the edges of the leaflets. Death of the terminal green parts of the plants and decrease in the broad bean yields.

From an economic point of view, the farmers were obliged to reirrigate the plants after rainfall to decrease the damage to a large extent.

REVIEW OF LITERATURE

It is estimated that the time constant for DDT in air is 4-3 year, before it returned to the continents and oceans in rain, *Wood Well et al., (1971)*. During this time, it is exposed to ultraviolet light at wavelengths that have proved capable of photodegradating it to DDE.

English rain contained DDT at 3 ng/L (p.p.t) in the countryside and 400 ng/L DDT plus 70 ng/L DDE in central London. The average DDT content for three areas in Ohio at this time was 187 ng/L, and 18 ng/L of which DDE. *Tarrant et al., (1968)* found BHC and deildrin as well as DDT on the Shetland Islands.

The average DDT content of rain following on the Hawaiian Islands was only 4 ng/L. *Pearce et al., (1978)* detected the residues of DDT in 76 from 101 samples of rain water collected during spring and summer.

The annual report of the United Nations Environment Programme in 1987 showed that acidic precipitation occurs in Japan, India, China, U.S.A., Europe and some developing countries in Asia and Africa.

Many authors, *Zhao and Sun (1986), Middleton and Rhodes, (1984), Brady and Selle, (1985) and Schnidler, (1988)* indicated the presence of acid rains. Recently, concern has been expressed over the impact of acidic deposition on drinking water quality. Acidified water may leach toxic metals from watersheds and water distribution systems and the presence of these metals in drinking water can result in a number of serious human health impacts, [*Middleton and Rhodes, 1984 and McDonald, 1985*].

Blank, (1985) reported that it was estimated that about 50% of the total forest area of the Federal Republic of Germany (3.7 million ha) was damaged to varying degree about 33% was slightly damaged, 16% damaged and 1.5% severely damaged and dead.

Acidic deposition can affect forests either directly, by acting on the foliage or indirectly by changing the properties of the soil supporting plant growth [*Blank, 1985*].

MATERIALS AND METHODS

Twenty four samples of rain water were collected from four governorates, Ismalia, Alexanderia, Kalubia and Cairo. From each sample, 500 ml was extracted with 25 ml of benzene in a single extraction by shorting in a separatory funnel for 2 minutes. The separated extract was concentrated to 1 ml by blowing a stream of air over the the benzene extract.

Pesticide residues were detected by using Py-Unicam G.L.C equiped by electron capture detector. The pH of each sample was also determined. The quantity of solid materials in each sample was determined and the total quantities of these materials were calculated in cubic meter.

Complete chemical picture for the rain water have been obtained through the Nuclear Materials Authority Laboratory in which atomic absorption was used for the detection of heavy metals.

RESULTS AND DISCUSSION

Results indicate in table 1 that the acidity of rain water varied between 5.2-6.8 depending on the time of rain fall at the early or at the end of the winter season and also about the quantity of water. The pH of the water varied between 5.2 to 6.1 in Cairo. The acidity of water was higher in the beginning of the winter season (December).

The acidity of water in Alexanderia varied between 5.3 to 6.7. The acidity was higher in October.

The acidity of water in both Ismailia and Kalubia was some what lower than in the other cases.

TABLE 1: Mean quantities of calculated acid (as H_2SO_4) (Ton/Km^2).

Location / Month	El-Ismailia		Alexandria		Kalubia		Cairo	
	pH	Qty	pH	Qty	pH	Qty	pH	Qty
January	5.9	1.56	6.3	0.89	6.1	0.33	5.8	1.13
February	6.1	1.12	6.7	0.41	6.3	0.11	6.1	0.12
March	6.7	0.08	6.6	0.24	6.3	0.26	5.9	0.38
April			6.7	0.01	6.7	0.06	5.8	0.11
June							5.8	0.11
October			5.3	3.72				
November	5.6	0.09	5.5	5.13	5.8	0.07		
December	6.1	0.96	5.8	0.47	5.9	1.05	5.2	3.55
Total		3.81		10.87		1.88		5.40

The first rain fall in winter season, in all governorates was higher in acidity than the other rain falls. In the first rain fall the atmosphere was washed from the pollutants.

The total quantity of water varried from governorate to another. Alexanderia headed all the other governorates in the quantity of rain fall (212200 L/Km^2) followed by Ismailia, Kalubia and Cairo respectively (table 2).

TABLE 2: The total quantities of rain water (Million L/Km^2).

Location Month	El-Ismailia	Alexandria El-Nosha	Kalubia Bahtim	Cairo
January	25600	35700	8800	14700
February	29500	45800	4300	3100
March	9200	20100	10700	6200
April		1300	700	1400
June				1400
October		15200		
November	700	33100	100	
December	25300	6100	17300	11500
Total	90300	212200	41900	38300

Chemical analysis data showed that most of the tested samples contained chlorides, sulphate, bicarbonate, sodium, postassium, calcium and magnesium (table 3). Some samples contained iron, vanadium, lead and zinc.

It is clear also from the results in (table 4) that pesticide residues can be detected in rain water.

TABLE 3: Chemical analysis of the rain water (Season 1988).

Location	Ismailia	Kalubia	Cairo				Alexandria			
Sample Content	1	2	3	4	5	6	7	8	9	10
pH	6.1	5.9	5.2	5.8	6.1	5.9	5.8	6.3	6.7	6.6
Cl	41	58	41	24	92	75	75	75	75	75
SO_4	21	10	90	25	73	27	31	36	12	36
CO_3	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
HCO3	48	89	45	33	117	114	91	60	57	77
Na	27	37	29	13	70	49	55	46	45	46
K	3	17	12	7	9	20	24	20	25	25
Ca	10	14	23	7	25	17	15	13	13	14
Mg	3.7	3.7	10.8	1.9	5.4	4.3	5.4	3.7	4.0	5.1
Fe	0.008	0.008	0.05	0.004	0.03	0.01	0.01	0.01	0.01	0.01
Mn	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
V	0.01	0.09	0.07	0.04	0.05	0.08	0.09	0.07	0.06	0.06
Zn	Nil	0.05	0.10	0.06	0.01	Nil	Nil	0.01	Nil	Nil
pb	Nil	Nil	0.015	0.01	0.04	0.05	0.05	0.04	0.03	0.02
Cu	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Cl/NA	1.52	1.56	1.41	1.85	1.31	1.53	1.36	1.63	1.67	1.63
K/Na	0.11	0.46	0.41	0.54	0.13	0.41	0.44	0.44	0.56	0.54
Ca/Na	0.37	0.38	0.79	0.54	0.36	0.37	0.27	0.28	0.29	0.30
SO_4/Cl	0.29	0.17	2.20	1.04	0.79	0.36	0.41	0.48	0.16	0.48

Lindane was detected in rain water in levels varied between traces and 36 ppb, while DDT was detected in levels varied between 10 and 43.2 ppb.

The quantity of dusts and solid materials varied between 23.4- 54.6 g/cubic meter (table 5). Some authors reported that the quantity of dusts in Cairo was 145 tons /mil^2 /month at 1967 while it was 377 tons /mil^2 /month 1978, *Abdel Gawaad 1989.*

TABLE 4: Pesticide residues in rain water (ppm) (Samples of December 1988).

Location	No. of Sample	Lindane	DDT	Malathion
Cairo	1	ND	0.021	ND
	2	T[a]	0.003	ND
	3	0.01	0.036	ND
Kalubia	1	ND	ND	ND
	2	0.030	0.043	ND
	3	ND	0.021	ND
Alexandria	1	0.036	0.019	ND
	2	0.012	ND	ND
	3	ND	0.030	ND
Ismailia	1	ND	0.031	ND
	2	ND	0.016	T
	3	0.012	0.010	ND

T = traces

The farmers in the new reclaimed area (in Salhia) remarked some phytotoxic symptoms after rain fall specially in Orange and broad bean fields. These symptoms are: the death of the terminal parts of the green branches, limited wilt and chlorosis in the tip and the edges of the leaves, chlorosis in the edges of the leaflets.

Farmers found that the best methods to avoid this side effects is to re-irrigate the fields after rain fall to decrease the damage to a large extent.

TABLE 5: The quantity of dust and solid materials/m^3 of rain water.

Location / Month	El-Ismailia	Alexandria	Kalubia	Cairo
January	23.7	23.4	28.7	35.8
February	24.2	23.6	27.0	41.2
March		23.3		32.1
April				
June				
October				
November		37.2		
December	23.4	23.9	39.1	54.6

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