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UNSUSTAINABLE AGRICULTURE DEVELOPMENT AND TRANSFORMATION OF ATMOSPHERE AND BIOSPHERE IN EGYPT.

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ABSTRACT

It is now recognized that the activities of mankind produce detectable and deleterious impact upon the atmosphere and biosphere. The pollution of the biosphere by our technological civilization does not just threaten the long-term survival of the man kind, animal and plant species that inhabit the earth, but also deteriorate our environment.

The natural bioata performs many essential functions for agriculture ,forestry and other aspects of human welfare such as preventing the accumulation of organic wastes,clearing water and soil of chemical pollution such as pesticides ,recycling vital chemical elements within the ecosystem, producing biotic nitrogen for fertilizers,buffering air pollutants and moderating climatic change ,conserving soil and water ,preserving genetic materials for agriculture and forestry and supplying food via the harvest of fish and some other wild life.

Agrochemicals can influence all these essential functions by reducing species diversity and modifying food chains, changing patterns of energy flow and nutrients cycling (including nitrogen) reducing soil, water and air quality and changing the stability and resilience of ecosystem.

The study of the circulation of toxic substances and other pollutants in the ecosystem shows that they do not move in identical patterns between its three compartments of atmosphere ,soil and water.

The question that faces the development community now is : What are the LESSONS to be learned from the the last decades ? and how can they be applied in the present ?

The collection of phenomena must precede the analysis of them and every new fact ,illustrative of the action and reaction between huminity and the environment is another step toward the determination of the great question,whether MAN *is of nature or above her?*

As until now no effort has been made to document and understand the interaction of human and environmental system and the transformation of the environment over the past 9000 years, the author will shed high lights about his intensive research during the last thirteen years concerning the interaction of human and environment .

Study Case
The First Lesson
The Transformation of environment over the past 7000 years

More than 3000 years ago an inventive civil servant in Egypt suggested selling air in order to balance the Treasury's deficits. He may not have known what air acutually is , but he knew that it is vital to human beings ,and may be knew that in the 21 century, the environment will be protected with the power of the Market.May be the people in the 21 century will sell the air in bottles like water now.

The ancient Egyptians knew about farming since the stone age (Neolithic Period). A lot of agricultural villages have been discovered which due to 6000 years B.C. either in Delta or in Upper Egypt. The ancient Egyptian monuments proved that farmers at that time were very well knowledgeable by the agricultural sciences and practices as well. Among these practices, was saving water for irrigation by constructing dams and various water reservoirs, measuring water devices, resigning and digging the canals for irrigation,(Now the most troublesome problem in Middle East is water shortage. The strugle for water security will have no winners until societies recognize water's natural limits and begin to bring human numbers and wants into lines with them.It is expected that the next war in Middle east will be over the water.

The ancient Egyptiens also took care of their soil as an important element in agricultural production.The fertility of the agricultural soil used to be renewed each year by the clay that was transported during the Nile flooding. The farmers were also used or apply the organic manure for increasing their soil fertility.(Now great attention is directed to Organic farms or biological farms all over the world).

Their soils were planted once a year in winter by wheat ,barley, flake , legumes ,vegetables and or orchards for fruit production. Whereas , in some areas where water was available in summer, grain, sorghum and some vegetables were grown.That means that flood irrigation method restores the soil fertility and protect it from pollution and reduce insect populations as well..

The history documented that Diodores the traveller and historian who visited Egypt in the first century B.C., mentioned that the Egyptian farmers were outstanding farmers among the other nations. They knew the detailed nature of the soil, the proper rotations of the crops,methods of tillage and irrigation.Those knowledges were achieved by their continuous sharp observation and they inherted experience from their parents whom knew when they could plant and harvest the various crops and how to treat different crops for better productivity.

Seeds preperation included the selection of best seeds that are suitable for planting, screening to avoid the undesirable seeds and what was possible infested by nematodes.They used to screen seeds through sieves , figure 1 ,which still available to be seen in the ancient Agricultural section in the Egyptian Agricultural Museum .

After producing the seeds ,the farmers used to take care of their weeds .collecting the locust and other insects to be burnt, figure 2.

One of the Royal documents (Decree) persuaded the farmers for worm control by saying that the worms invaded and ate the majority of the crops because of their careless in its control and they must do their best to reduce the damage.

The ancient Egyptian concept in soil and plant protection depended on the natural methods by avoiding the favourable conditions for pest infestation i.e. protection is better than controlling. But if the infection occured ,the control procedure used to depend on two essential alternatives. Biological control by the natural enemies and or the mechanical control such as collecting and burning the insects.The bird IBIS was one of the natural enemies of insects that is why it was hollied by the ancient Egyptians because of this benefit.

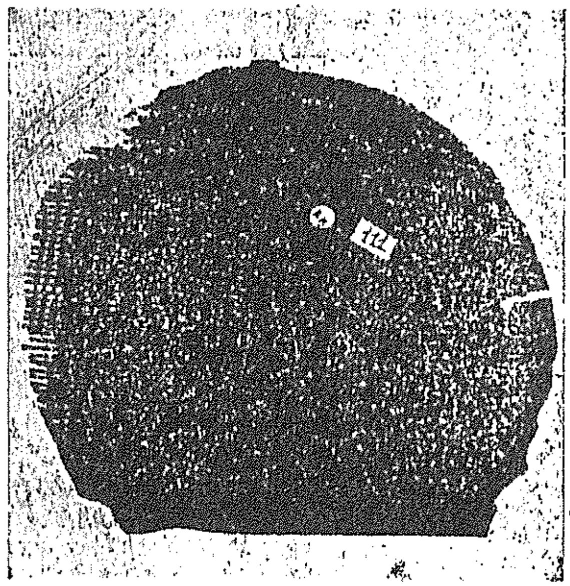


Figure 1: Circular sieve used to screen seeds.

Figure 2 : The ancient farmers used to collect locust to be burned.

About water pollution by poisonous materials, Daby et al 1977 reported " Yet other passages in the writings of the Greek and Roman travellers describe the Bird IBIS (figure 3) as a discreminating fowl" for she does not drink water if it is wholesome or tainted nor will she approach it. That means that they used this bird as bioassay animal for the first time all over the world

Throughout history , Egypt's environmental transformation has been directed to increase agricultural output.The rachet-like growth trajectory in this first 4100 years ,a dynamic equilibrium about an upward- tending trend line ,was made possible by the Nile's relatively stable replenishment of resources. For this reason, the environmental transformations of this period were directed toward the more effective capture of the resources annually pulsed through the system, Nile floodwater and its soil renewing silt.The resource base was expanded throughout the period as irrigated cultivation spread at the expense of gazering and "natural "reverine vegetation.

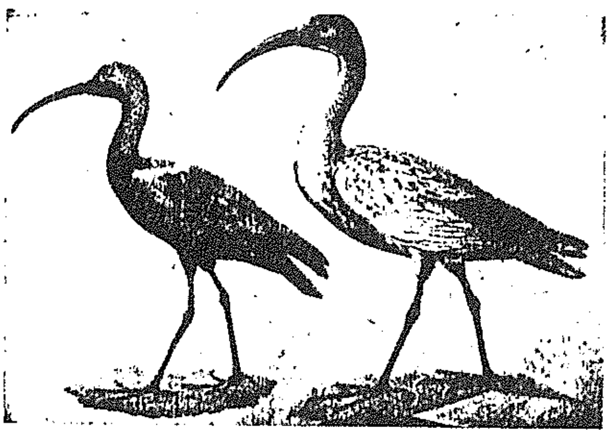


Figure 3 : The sacred Ibis bird.

This spatial expansion (internal colonization) was supplemented by technological innovation that further transformed the Valley and served to intersify output. The first of these ,artificial basin irrigation (utilizing controlled flooding and drainage in dike -constrained basins) was established by 3000 B.C, in upper Egypt.

The early Islamic period (A.D. 800) witnessed additional intensification and expansion of agriculture using new cultivations and rotations that demanded more intensive water management.

The rapid population growth (Table 1 and figure 4) was evident in the Egyptian record since A.D.The year 1850 has been associated with what are perhaps, the most significant transformations: barrages ,high dams and chemical inputs to agriculture. These innovations made possible the conversion from predominantly flood-basen irrigation to perennial , multicrop agriculture. A range of environmental impacts including salinization, nutrient replacement loss, erosion, fisheries disruption and pollution has accompanied this most recent transformation.

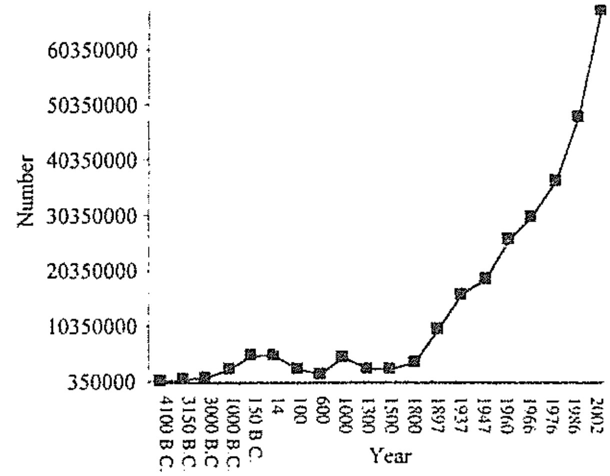


Figure 4 : population of Egypt since 4100 B.C.

The best places all over the world in which man can study the transformation of atmosphere and biosphere in the last 9000 years are:

1-**Beni Hassan (in Minia governoate)**:Its age is 3000 years B.C.The farmers were very knowledgeble by the agricultural sciences and still until now parctices as well.They are still have the habits and behaviour of the ancient Egyptian people. The effect of modern technology is still so far from them.The state of environment in this area is nearly the same as from 3000 years.

Table 1 : Basic demographic distribution of the Egyptian people by cenus year.

Year	Number	Year	Number
4100 B.C.	350000	1500	2,500000
3150 B.C.	700000	1800	3,853000
3000 B.C.	870000	1897	9,734000
1000 B.C.	2,600000	1937	15,921000
150 B.C.	4,900000	1947	18,967000
14	5,000000	1960	26,085000
100	2,600000	1966	30,075000
600	1,500000	1976	36627000
100	4,675000	1986	48,205000
1300	2,500000	2001	66,680000

2-**Fayoum A** : Its age is 7000 years B.C. The farmers were very well knowledgeble in agriculture practices and fishing and still are so until now. Their environment,habits and behaviour are nearly the same as from 7000 years.

3- **Helwan 2**: The age of this village is 7000 years B.C. .In this village we can study how greatly the people transformed the environment ? How do these transformations change their relation with nature ?, How do these transformation and changes had affected human life? . How do these transformation affected the next generation ?. What is the relation between these transformation and the increased number of death cases with cancer, kidney failure and liver failure. In this village several kinds of industries were built up. These factories inject in the Environment every year 2 million metric tons of cement dust. These factories inject the Nile river every day with 750 kgs of heavy metals.

If the Scientists all over the world are interested to have lessons from the past about the transformation of atmosphere and biosphere ,the above three villages are the best model for this study.

Overurbanization pressures

Virtually Egypt as many other developing countries have failed to ensure that rabid urban growth in Egypt is accompanied by the investment needed in the infrastructure and services.

Between 1800 and 2001 the population in Egypt increased about eighteen times in only 200 years

It is some what diffecult to provide land, services, sanitation, schools, transport and clean water to such growing population.Facing economic hardship and uncertainty, and is already hard put to meet the needs of even their present population. As a result , illegal settlements spring up, marked by primitive facilities , overcrowding and rampant disease in an unhealthy environment.

Many health problems affecting people are associated with overcrowding table 2 , they include household accidents , airborne infections, acute respiratory infections, pneumonia and tuberculosis.

Greater Cairo (including Helwan 2) as a best example for overurbanization ,the majority of residential buildings fall outside health and safety regulations ,and their siting and construction were not subjected to building or planning codes.In greater cairo 84% of building are in unplanned or uncontrolled growth,some of settlements in Greater Cairo are spontaneous or chaotic settlement or sporadic growth.

That means that 84% of the physical growth of Greater Cairo can be considered as chaotic growth, sporadical growth or squatter settlements.

Table2: Population density 1000 /square km. in several governorates in Egypt 1995.

Governorate	Mean/Km^2	Governorate	Mean/Km^2
Cairo	32470	Dakahlia	1222
Alexandria	1304	Domiat	1524
El-Behara	418	Port Saied	23129
Kafre El-Shekh	595	Ismailia	482
El-Gharbia	1811	Swees	23
El-Menofia	1250	Giza	4574
Qualibia	3096	Fayoum	1125
Sharkia	1006	Asuot	1840

Buildings constructed by formal sector in Great Cairo seem to copy the design of similar buildings in the developed countries ,little consideration being given to the climatic and cultural differences.The links between housing and health in the slums or squatter settlements in Greater Cairo are strong , showing a close association between ill-health and both quantitative and qualitative shortcomings in water supply, and sanitation.Inadequate shelter , poor ventilation , lack of facilities for solid waste disposal, air and noise pollution and overcrowding are also likely to have negative consequences for health.

In Greater Cairo between 40-60 % of the population are living in settlements with little or no infrastructure or services or in overcrowded.Many health problems affecting poorer groups are associated with over -crowding ,they include household accidents , airborne infections ,acute respiratory infections , pneumonisa and tuberulosis.In slum settlements the average number of persons per room is between 2.7 to 3.6 ; in very slum areas the number may be increased to 4 or more. Households in these areas may have less than one square metre of interior space per person,and beds are often shared in most extreme cases even small room subdivided to allow multiple occupancy.Such overcrowding ensures that diseases such as influenza,is easly transmitted from one person to another. There is good links between respiratory infections and dampness and indoor air pollution. Acute respiratory infections,the most common of all the illnesses are increasingly recognized as a major cause of mortality and morbidity.Acute bacterial and viral respiratory infection together with stomac diseases are related with the high increase of house fly populations in these areas.The environment in these squatter settlements in Greater Cairo offers an important habitat for a wide range of disease vectors , which can be divided into arthropods (including insects ,spiders and mites) and vertebrates (including dogs and cats). Arthropods can in turn be subdivided into four categories: those breeding on the body surface or in clothes , (including lice and scabies mites) , those breeding in the house (including fleas , cockroaches , bedbugs) those breeding predominantly or in containers and sewage (including, mosquetoes and flies) and those which are adventitious ,entering the house to feed (including mosquetoes, and flies and scorpions.).The impact on health of these vectors is very important in these slums and squatter settlements.The diseases they cause or carry include ,diarrhea disease,hepatitis A, relapsing fever, typhus, bacillary dysentary ...etc. A high proportion of people in these low-income settlements in Greater Cairo have intestinal worms.The author will try to find new approaches to improve the state of environment in these areas .

Good housing and a suitable physical and social environment promote good mental and physical health.Where they are absent ,phychosocial disorders can become a major cause of morbidity and death among adolescents and young adults.

Among the most serious psychosocial health problems are DEPRESSION , DRUG and ALCOHOL ABUSE, SUICIDE, CHILD AND SPOUSE ABUSE, DELINQUENCY , and TARGET VIOLENCE (i. e. RAPE , TEACHER ASSAULT) . Many social pathologies are associated with poor-quality housing , insecure tenure , or eviction from housing. VANDALISM and VIOLENCE contribute to a poor environment , also with adverse effects on health.

PERSONAl VIOLENCE,including HOMICIDE, ASSAULT , SUICIDE SUICIDE ATTEMPTS, SPONSE and CHILD ABUSE, is a growing problem throughout the squatter and slums settlement in Greater Cairo,and often primarily affects the poorer nembers of society.It is being increasingly recognized that the environment plays an important role in violent behaviour and the public health initiatives that were so effective in combating infectious disease should be utilized for combating violent behaviour.

Many of the physical characteristics of the housing and living environment have a major influence on mental disorder and social pathology through such stressful factors as noise,air ,soil or water pollution, overcrowding , inappropriate design, inadequate maintenance of the physical structure and services,poor sanitation,or a high concentration of specific toxic substances .

As most of Squatter settlement population are people with low income , previous data indicated that their is a good relation between housing quality,price, low income and prevalence of mental illness in rundown areas..

The relationship between housing and mental disorder requires an understanding not only of the availability of housing but also of many other variable such as cost,structure,space/density,facilities and location. There is a possitive correlation between three different patterns of disorders; withdrawal, agression and psychosomatic disorders..Deteriorating centres and urban villages and slums areas with declining economics are characterized by social disorganization and disintegration and creare scores of high -risk populations, migrants,children,women,the elderly,the homless ,street children.The physical and economic deterioration is also accompanied by a feeling of entrapment among particular income,age and ethnic groups which can make the problems more difficult to resolve.

Children are especially vulnerable to deficiences in the provision of space,facilities and services.For instant,children's play is known to have a central role in learning , motor and communications skills , problem-solving and logical thinking,emotional development,and social behaviour.In Greater Cairo, the public provision for safe stimulating children's play is very inadequate, especially in poorer districts..

In Greater Cairo ,where the mean population density is 32470 people/ square km.,table 3 the achievement of sustainable development is, however, particularly important. The term " sustainable development " brings together two strands of thought about the management of human activities , one

Table3: Population density 000 /square km. in different parts of Shobra El-Khema (as a part of Greater Cairo) 1986-1992.

Place	Mean / Square km .	
	1986	1992
Shobra El-Keima	11,000	12,000
Pigam	91,000	107,000
Damanhor Shobra	24,000	28,000
Bahtim	24,000	28,000
Mostrod	13,000	15,000

concentration on development goals, the other on controlling the harmful impacts of human activities on the environment. Much wastes are generated now from Greater cairo where it is the main centere of production and consumption, for that it became the major cetere for resource degredation. Specially in Greater Cairo,where the linkages between rural and urban areas are so great, man can not seperate between "Sustainable urban development and Sustainable rural development.

People are exposed to outdoor air pollution, and also to indoor air pollution associated with the burning of biomass fuels for heating and cooking ,in addition ,supplies of water are polluted and inadequate, there is excessive noise exposure, and housing is unsafe- a health- damaging social environment in which insecurity ,fear, and violence , are common place.

Case study

The Second lesson

Environmental pollution by pesticides is not a National but an International problem:

The human activities injected in the last 45 years in the Global environment 210.4 million metric tons of pesticides .

The use of pesticides involves the injection of these roxic substances into the natural systems which has but a limited capacity for adjustment to such disturbances.The register of potentially toxic chemicals operated by the International program for chemical safety lists 450 substances used in developing countries which could present a danger to the environment.

The problem of environmental pollution by pesticide residues has become one of the major problems which face both the developed and developing countries. Numerous individuals ,societies , public organisations, governmental agencies has become involved in the evaluation of the benifits and risks of the use of pesticides to increase agricultural yield and the risks which the pesticides may pose to human beings and ecosystem.In any analysis of relation between agriculture and the environment , one must take into consideration the balance between the need to feed humans and the need to protect them and their environment.

Environment knows no frontier, either air, nor rivers , canals ,seas, oceans or wild life can be divided into parts occuring within existing borders. It follows that the struggle against the environmental pollution by these highly toxic materials must be international.

Egypt can not ensure efficient environmental pollution by pesticides on its own. Pollution by pesticides not only can affect border areas but can cause serious problems at long distances within neighbouring countries via different routes:

1- Through rain fall:

Our results indicated that in the last 10 years , our farmers in the new reclaimed lands found some phytotoxic symptoms after rainfall. Samples from rain water (Table 4) . were analyzed for the detection of pesticides , acids and heavy metals.

Many authors in developed countries detect pesticides in rain water, showing the possibility of indirect pollution by rain fall. In Canada DDT residues were detected in rain water . Rain water contains pesticide residues which were not used in these countries.

Table 4: The total quantities of rain water (Million L. Km2).

location month	Ismailia	Alexandria	Qualiobia	Cairo
January	25600	35700	8800	14700
Feb.	29800	45800	4300	3100
March	9200	20100	10700	6200
April		1300	700	1400
June				1400
October		15200		
Novem.	700	33100	100	
Decem.	29300	6100	17300	11500
Total	90300	212200	41900	38300

Data indicated that all the tested samples which were collected from three different parts of cairo and from three different Governorates : Qualiobia, Alexandria and Ismaillia governorates were acidic. The pH varied between 6.8 and 5.2, (table 5). There was a good correlation between the acid content of the water and the quantities of exhaust materials produced from different factories. For that it seems that the pH of rain water in Cairo and Alexandria was somewhat acidic than the samples from other governorates, because most of industrial factories concentrated in the four mentioned governorates.

Table5: Mean quantities of calculated acid (as H_2SO_4) (Ton/ Km^2).

Location	Ismailia		Alexandria		Qualiobia		Cairo	
Month	pH	Qty	pH	Qty	pH	Qty	pH	Qty
January	5.9	1.55	6.3	0.89	6.1	0.33	5.5	1.13
Feb.	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				
Novem.	5.6	0.09	5.5	5.13	5.8	0.07		
Decem.	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

Lindane , DDT , malathion (table 6) and seven unknown organic materials were detected by GLC in the tested water rain fall samples.The concentrations of the pesticide residues varied between 10.3 to 43.2 ppb.

Table 6: Pesticide residues in rain water (ppm) (samples of December 1988).

Location	No. of samples	Lindane	DDT	Malathion
Cairo	1	ND	0.021	ND
	2	T	0.003	ND
	3	0.01	0.036	ND
Qualiobia	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	0.030	ND
	2	ND	0.016	Traces
	3	0.012	0.010	ND

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 dust (table 7) and solid materials / m^3 varied between 23.4 and 54.6 g. The heavy metals

Table 7: The quantity of dust and solid materials gram /m^3 of rain water.

Location	Ismailia	Alexandria	Qualiobia	Cairo
Month				
January	23.7	23.4	28.7	35.8
Feb.	23.2	23.6	27.0	41.2
March		23.3		32.1
April				
June				
October				
Novem.		37.2		
Decem.	23.4	23.9	39.1	54 6

(table 8) ,which were detected in most of the samples were iron, vanidium, lead and zink. Complete chemical picture for the rain water over the four governorates have been obtained including chlorides, sulphates , bicarbonates , sodium , potassium , calcium and magnesium.

Chemical analysis data showed that most of the tested samples contained chlorides, sulphate, bicarbonate, sodium, potassium, calcium and magnesium. Some samples contained iron ,vanidium , lead and zink.

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

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

Many authors all over the world indicated the presence of acids , metals , salts and pesticide residues in rain water.

Table 8: Chemical analysis of the rain water (season 1988).

Location content	Ismailia	Qualiobia	Cairo	Alexandria
pH	6.1	5.9	5.2	5.8
Cl	41	58	41	75
SO_4	21	10	90	31
CO_3	Nil	Nil	Nil	Nil
HCO_3	48	89	45	91
Na	27	37	29	55
K	3	17	12	24
Ca	10	14	23	15
Mg	3.7	3.7	10.8	5.6
Fe	0.008	0.008	0.05	0.01
Mn	Nil	Nil	Nil	Nil
V	0.01	0.09	0.07	0.09
Zn	Nil	0.05	0.10	Nil
Pb	Nil	Nil	0.015	0.05
Cu	Nil	Nil	Nil	Nil
Cl/Na	0.52	0.56	1.41	1.36
K/Na	0.11	0.46	0.41	0.44
Ca/Na	0.37	0.38	0.79	0.27
SO_4/Cl	0.29	0.17	2.20	0.41

2- Through water resources:

Data indicated that pesticide residues were detected in aquatic fauna whether they are in rivers , lakes, oceans and any surface water. Also data indicated that the bottom sediments of these water reservoirs act as main continuous sources of pesticide residues.

The Nile river previously brought a large quantities of dissolved nutrients and organic matter into the Southeastern Mediterranean sea (60- 180 million tons of sedement). Since completion of Aswan hydrocomplex , reduction in the Nile river flow has caused signifcant change in the distribution of the physico-chemical properties of the sea water as well as in the formation and distribution of the water masses in the region located north of the Nile Delta. In recent years ,changes have been recorded in the dynamics and destribution of water temperature. From 1966, the sediment run off Nile begane dropping sharply due not only to reduction in the volume of river water reaching the sea (now 2.3-1.8 milliar cu .m /year), (it was $16 x 10^6$ cu.m at 1964) but also due to a signiricant reduction in the suspended particles in the flow. The reproduction of the shrimp in the area has changed significantly and food supplies for the young shrimp have deteriorated. Schrimp catches in 1966 were half what they had been in 1963. Commercial fishes have also decreased in number . Thus all links of the trophic chain have been affected from the phytoplankton to the pelagic and benthic fishes.

Chlorinated pesticides were detected in both Nile river water and fishes . The sites elected were in order to decrease pesticide concentration in fish of each site: El-mahmoudia canal > Abo-El-Gheit canal > El-Mansoura > Assuit > Farskour > Edfinna > Cairo > Aswan. Organochlorine residues found in the fish included BHC ,lindane ,endrin,o,p DDT and its metabolites which were much higher than other organochlorine insecticides . Organophosphorous pesticide residues were not detected in the Nile water and fishes.

Data indicated that according to activities of aeroplanes in spraying the cotton fields and due to the special cannal irrigation system which is used in Egypt, all the water sources are polluted by pesticides used by direct or indirect applications ,i.e. leaching of pesticide residues ,washing hands and bodies ,washing containers and equipments ...etc.

The concentrations of pesticide residues detected in underground water or surface water varied between 3 ppb to 19 ppb. The concentration depend on the type of water sources and the time of spraying. High concentrations (19 ppb) were detected in canals and canal branches which were directly sprayed,while the lowest rates were detected in Nile river water (4-9 ppb) and traces (1-3 ppb) were detected in under ground water.

It can be calculated that between 6.9 to 53.2 tons of O.P. pesticides can be transported yearly through the Nile river to the Mediterranean sea.

3- Through the movement of air:

Data indicated that traces of pesticides were detected in air samples specially in areas where agrochemicals were not used for long time.

The movement of air from country to another can transport pesticide residues to new places . Volatilization of pesticides from plant parts and soil after crop treatments are the main source of these residues in the air. Also the drift of pesticides at the time of treatment can be considered as source of pesticide to pollute air.

4- Through imported food:

The level of pesticide residues in various imported diet samples, randomly collected from different parts of Egypt was determined. Most of the tested products contained organochlorine insecticides i.e.endrin, dieldrin, DDT , lindane and traces of some unidentifiable compounds. The level of these residues in some products were higher than the FAO/WHO maximum residue limits. Particularly, the level was higher in the case of endrin and DDT in ceareal grains, endrin in powder milk and total DDT in frozen lever. However , pesticide residues in most of the analyzed samples were within acceptable level.

Egypt imports every year enormous quantities of food stuffs, for example about 2 million tons of cereals , 265000 tons of meat and 29000 tons of powder milk.Table 6 shows insecticide residues in 10 imported food groups.

Case study

Extensive use of agrochemicals in Egypt

The Egyptian environment was injected by 690000 metric tons of pesticides (table 7) in the last 40 years. All groups of pesticides (chlorinated hydrocarbons, substituted phenols, organophosphorous compounds, carbamates ,pyrethroids ,natural organic compounds ,organic oils, organic sulphur compounds, di-nitrophenols , organothiocyanate ...etc were used. All methods of application were also used..The use of these pesticides involved the injection of these toxic substances into the natural system which has but a limited capacity for adjustment to such disturbances. The problem of the misuse of pesticides and fertilizers is repeated all over the countries in third world.

Data indicated that the total quantities of pesticides which were used in Egypt since 1952 untill now (2001) , are 690450 metric tonnes.

The quantity of pesticide used increased from 2143 metric tons in the season 1952/1953 to 23398 metric tons in the season 1960/61 followed by a slight increase to be 30699 metric tons in the season 1966/67.

The maximum quantity of pesticides used was at the season 1971/72 in which 35259 metric tons were used followed by a high decrease to be 15402 metric tons in the season 1983/84.

Now the Minstry of Agriculture succeeded to decrease this quantity to be 4000 metric ton / year due to the use of Integrated pest management programme, (IPM).

About 182 compounds were used in Egypt for pest control since 1952. The quantity used from each pesticide varied from place to place. and from field to another for several reasons.

Table 6: Insecticide residues in 10 imported food stuffs

FOOD GROUP	NO. OF SAMPLES ANALYSED	ENDRIN		DIELDRIN		pp'DDT		pp'DDE		op'DDE		HEPTACHLOR		LINDANE		NO. OF UNKNOWN PRODUCTS
		M	ND	M	ND	M	ND	M	ND	M	ND	M	ND	M	ND	
DRIED MILK	10	0.002	4	0.008	5	0.416	1	0.020	1	0.002	1	0.001	9	0.042	7	13
FROZEN MEAT	10	0.106	7	0.068	6	0.297	-	0.352	-	0.050	-	-	10	0.239	6	9
FROZEN LIVER	10	0.608	6	0.065	6	0.248	-	0404.	-	0.050	-	-	10	0.025	5	17
FROZEN POULTRY	15	0.012	9	0.616	10	0.924	-	0.082	-	0.082	-	0.006	13	0.614	3	9
FROZEN FISH	10	0.020	6	0.103	3	0.208	-	0.516	-	0.022	-	0.008	7	0.018	2	6
CANNED MEAT	10	0.102	4	0.111	8	0.318	-	0.242	-	0.120	-	0.002	6	0.180	6	15
WHEAT	15	0.086	11	0.020	10	0.104	3	0.082	3	0.040	3	0.001	15	0.252	5	2
CORN	15	0.142	8	0.038	9	0.118	2	0.120	2	0.085	2	0.006	15	0.364	7	9
WHEAT FLOUR	10	0.002	7	0.002	8	0.106	7	0.001	6	0.002	7	-	10	0.001	8	9
TOMATO PAST	12	0.146	2	0.128	3	0.289	-	0.208	-	0.096	-	0.008	7	0.605	3	15
TOTAL	117		64		68		13		12		13		102		52	

M: Mean value of pesticide concentration in the tested samples in mg/kg.

ND: Number of samples in which no pesticides were detected.

El-Garbia governorate headed all the other governorates in using pesticides, it used 68673 metric tons, followed by El-Behera and Sharkia in which 57771 and 36860 metric tons were used respectively.

The degredation products of these chemicals in soil , air and water can play a very important role in Global climate change.

Table 7: Quantities of pesticides (metric tons) used in Egypt since 1952- 2001.

Season	Quantity	Season	Quantity
1952/53	2143	1971/72	35259
1953/54	1627	1972/73	26344
1954/55	8871	1973/74	20910
1955/56	9188	1974/75	26910
1956/57	10489	1975/76	27056
1957/58	8075	1976/77	25593
1958/59	15078	1977/78	28340
1959/60	11062	1978/79	26074
1960/61	23398	1979/80	22715
1961/62	7447	1980/81	19046
1962/63	12550	1981/82	18778
1963/64	20916	1982/83	12786
1964/65	21958	1983/84	15462
1965/66	28636	1986/87	11566
1966/67	30699	1988/89	17593
1967/68	28914	1991/92	11700
1968/69	25668	1996/97	6701
1969/70	24664	2000/2001	4923
1970/71	20851		

Case study
The Third lesson
Transformation of atmoshere by agrochemicals

Pesticides are reactive ,the clay minerals and organic components of soil cause pesticide transformations such as reduction and isomeration . Soil surface may act as an inert base for light -energized reactions.However ,most of degredation are associated with soil moisture.Water reacts with many pesticides as a reactors often are strongly affected by pH. Water can also act as a reaction medium in the isomerization of organophosphorous compounds and in photodegredation. Light energized a variety of degredative reaction in solvent water, including oxidation, reduction, elimination and isomeration as well as hydrolysis. The products of non-biological degredation frequently are identical to their metabolites formed by living organisms.

The natural bioate perform many essential functon for agriculture ,forestry and other aspects of human welfare such as preventing the accumulaton of organic wastes,clearing water and soil of chemical pollution such as pesticides ,recycling vital chemical elements within the ecosystem, producing biotic nitrogen for fertilizers,buffering air pollutants and moderating climatic change ,conserving soil and water , preserving genetic materials for agriculture and forestry and supplying food via the harvest of fish and other wild life , figure 5 .

Agrochemicals can influence all these essential functions by reducing species diversity and modifying food chains, changing patterns of energy flow and nutrients cycling (including nitrogen) reducing soil, water and air quality and changing the stability and resilience of ecosystem.

Data indicated that each ton of aldicarb can produce 1.6 tons of CO_2 and 0.48 tons of NO_2 and 0.34 tons of SO_2,while each ton of aldrin produces 1.4 tons of CO_2 and 0.58 tons of chlore .Heptachlor can produce 2.4 tons of CO_2 and 0.1 ton of chlore and 0.15 ton of NO_2 .One ton of dinitroamine can produce 1.5 ,0.57 and 0.17 ton of CO_2 ,NO_2 and florine respectively.While a ton of leptophos can inject the global environment by 1.4, 0.16, 0.17 ,0.19 and 0.17 ton of CO_2 ,SO_2, P_2O_5 , brome and chlore respectively.Also 1.3 ,0.17,0.26 and 0.47 metric ton from CO_2 ,NO_2, P_2O_5 and SO_2 can be produced from only one ton of cytrolane. Man can immagine the high quantities of green house gases which were injected in the Global environment, through Agrochemicals .

If we calculate the quantities of chlorine compounds which can be produced from these agrochemicals which were injected in the Global environment, they can be more than the quantity of chlorflourocarbon materials which were injected in the environment in this period.Also the quantities of green house gases i.e. CO_2 , NO_2 and SO_2 which were injected in the environment through agrochemicals will be higher than the quantities of these gases produced through the exhausts of automobiles.

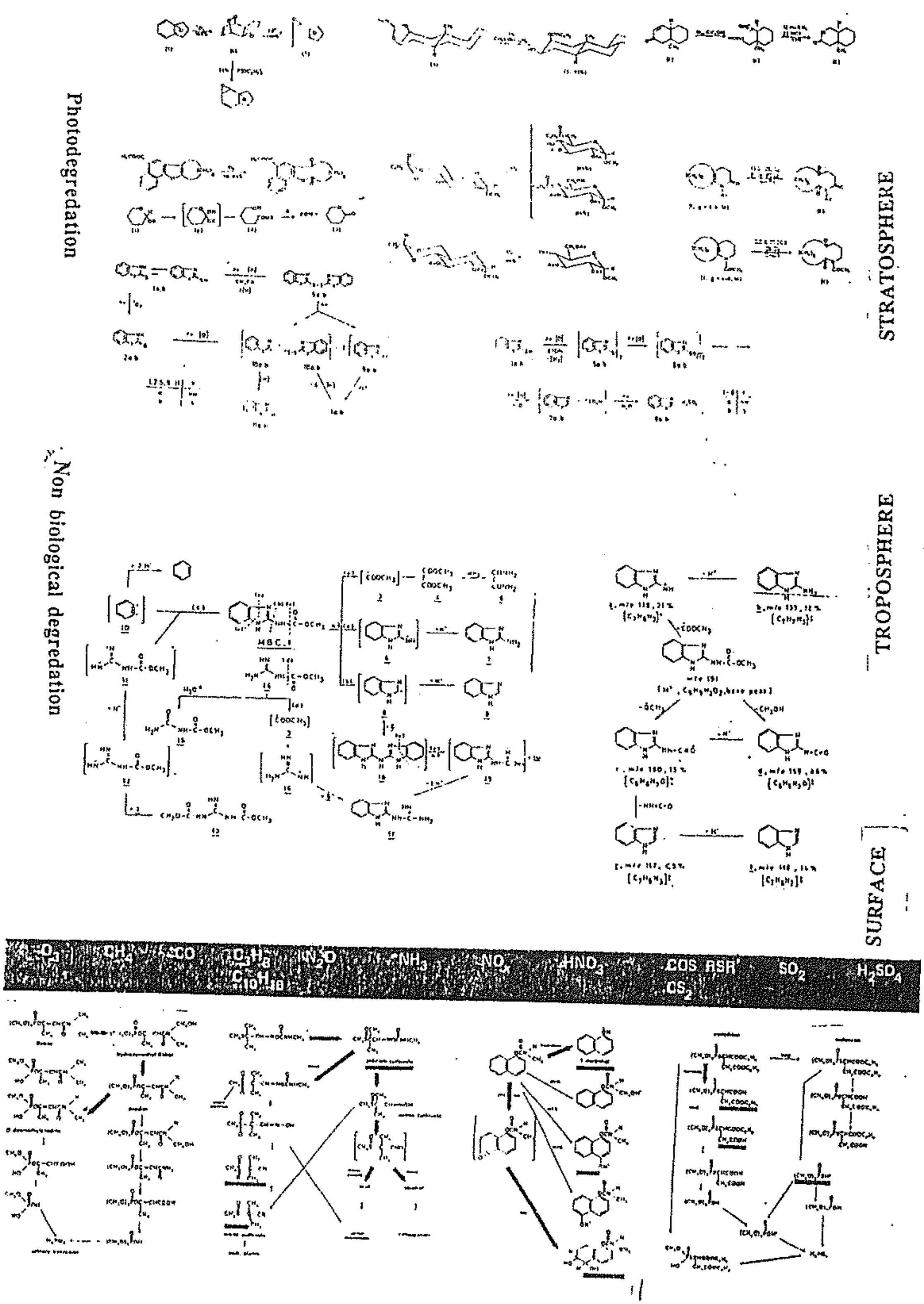


Figure 5 :Chemical and physical pathways of agrochemicals in the atmospheres and biosphere.

Man injected in the last 45 years 3024 million metric tons of nitrogen fertlizers . The global environment was injected with 1699 million tons of NO_2 , where each ton of nitrogen fertilizers can produce 0.562 ton of NO_2.In the same manner ,man has injected in the same period 1503 million metric tons of phosphorous fertilizers as superphosphate. Each ton of superphosphate can produce 0.607 ton of P_2O_5.That means that man inject every year 922 million metric ton of P_2O_5 in the Global environment.

Countries can not ensure efficient environmental protection on their own. Pollution by agrochemicals not only can affect the atmosphere, (figure 6) in the border areas but can cause serious problems at long distances within neighbouring countries via different routes, through rain fall, through water resources, through the movement in the atmospher and through imported foods.

Persistence of Pesticide Residues in the Egyptian soil :

Experiments were conducted in order to study the persistance of pesticide residues in our soils.Results indicated that many factors influencing the persistance and degredation of pesticide residues in our soil. More than 33 factors affect the persistence of these pesticides in our soil. Data indicated that some chlorinated hydrocarbon pesticides were detected in our soil after 25 years of application. other still persisted in our soil after 13 years.

For that , experiments were conducted to study the interaction between Egyptian soil clay minerals and the persistance of 25 insecticide residues.

X ray was used to test whether the insecticide molecule can enter the interlayer surfaces of the pure clay minerals. Samples of active ingredient of the tested insecticides were dissolved in acetone and water and were mixed carefully with 5 grams pure bentonite and were left to dry to give a final concentration of 100 ppm.

Results indicated that the C axis dimention of bentonite as tested by X ray differed from treatment to another.

Only temik , chlordane, roger ,novacron, cyolane ,dursban and lindane increased the C axis dimention to 17.80 , 17.17 , 17.31 ,17.05 ,16.92 ,16.17 and 16.02 angestrom, while it was 13.18 angestrom in the case of untreated clay mineral. The other tested insecticides (i.e. DDT, endrin, lannate , seven, captain, gusathion, cidial, malathion, cytrolane....etc. increased slightly the C axis dimention of bentonite.

Microorganisms in the Egyptian soil play an important factor in the breakdown of pesticides , under aerobic or nonaerobic conditions. Many micro-organisms are caple of converting pesticides by oxidation,reduction ,dehalogenation, de-alkylation, ring hydroxylation,ring cleavage, condensation or conjugate formations...etc.When oxygen is available ,the final products of degredation will be carbon dioxide ,water, sulfate, nitrate, phosphate ,chloride, ...etc.Some pesticides can be degraded in the environment to more toxic compounds than the parent materials

Our previous results indicated that from 690450 metric tons of pesticides from all groups, 345225 metric tons found their way to the Egyptian soil in the last 40 years.By monitoring pesticide residues in 21 villages in 8 centers (6 in Kalubia governorate (Benha, Kafr Shoukre, El-Khanater, Toukh, Kaluobe & Shebein) and 2 centers in El-Menofia Governorate (Shebien El-Kom and Menof),data indicated that all the tested samples contained pesticide residues . Dieldrin, DDT , endrin, and lindane were detected in all the tested samples .

About 23 compounds were detected as breakdown or unknown products. Traces of some organophosphorous compounds were also detected in more than 50% of the samples tested.The mean level of endrin residues in Moshtohor varied between (0.03-0.50 ppm), while it was (0.03-0.12), (0.02-0.14), (0.01-0.6), (0.01-0.1) ,(0.01-0.05), (0.01-0.04) , (0.01=0.6), (0.01-0.08) ,(0.01-0.06) , (0.04-0.06), (0.05-0.04) and (0.3-0.8) ppm for chlordane, lindane ,aldrin, parathion ,dursban, malathion, endosulfon, cidial ,op' DDT and pp'DDT respectively.

From the 165 samples, 95.2 % ,92.1 %,84.2 % ,87.3 % ,79.4 % ,73.3 % ,77 % ,60.6 ,54.5 ,81.8 % ,66.7 % and 90.3 % contained endrin, chlordane ,lindane ,aldrin, parathion, dursban, malathion,endosulfon,cidial, pp' DDT ,toxaphene,op'DDT and pp'DDT respectively

The level of pesticide residues depends on the quantity of pesticides used in each governorate , El-Gharbia governorate headed all the others in using pesticides . It used 70000 metric tons of pesticides followed by El-Behera and Sharkia Governorates.

Occurrence in the Egyptian atmosphere .

Our previous data was noticed only at the season of spraying cotton cultivation (Juli and August) and showed that the concentration of O.P. pesticides were very high (131.9 ng/cubic meter) at the time of spraying and still high for few days after spraying to be (21.9 ng/cubic meter) after a week.

The indoor concentration in the sprayed area varied between (69.7 ng /cm) at the time of spraying to 10.2 ng /cm) after a week of treatment.

The total solid materials (TSM) in the air of

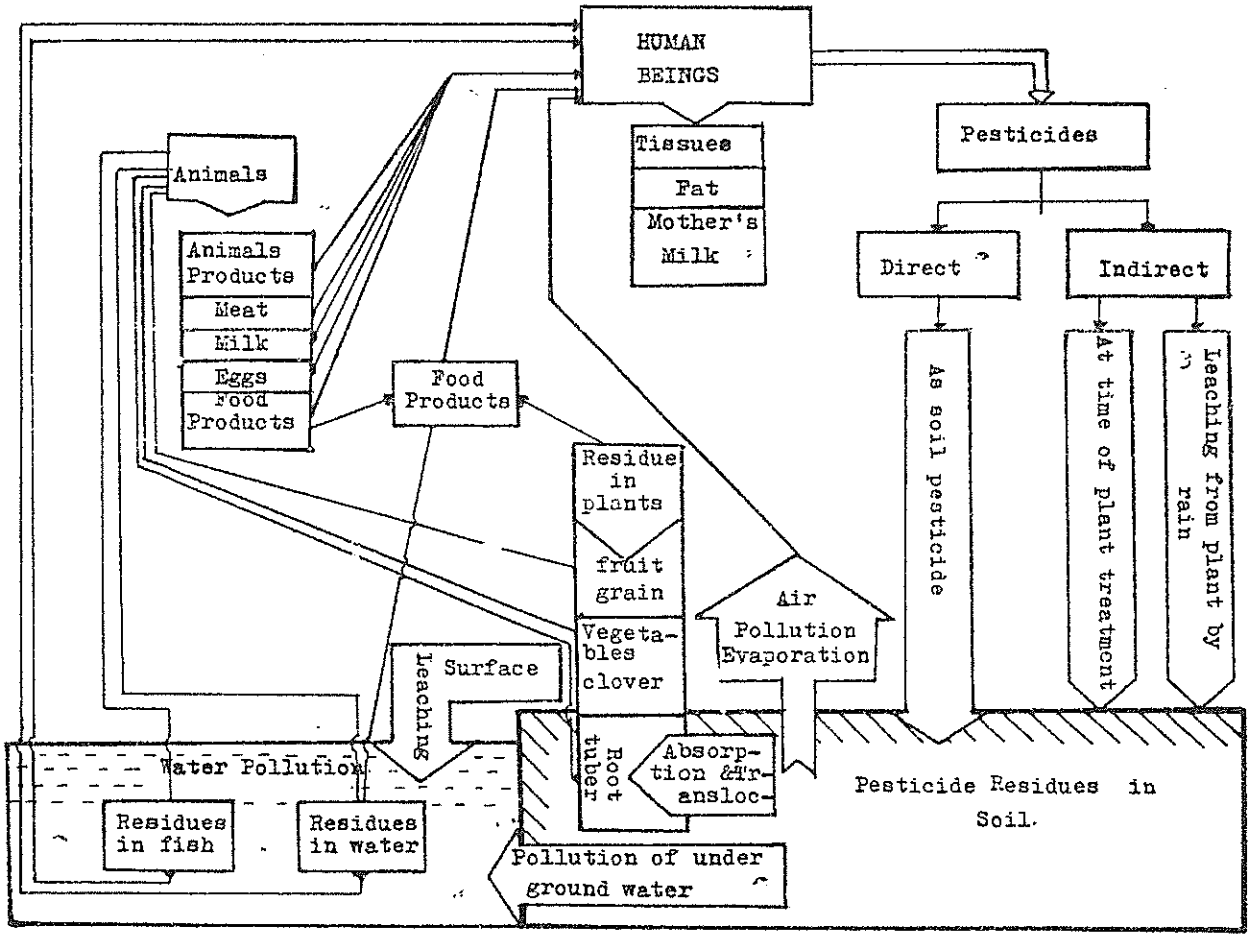


Figure 6 : Occurrence of agrochemicals in the Egyptian Atmosphere .

agriculture areas are contaminated all over the year by traces of O.P. pesticides. The concentrations of these residues in the TSM varied between 0.1 ppb to 23 ppb.

Occurrence of agrochemicals in both Nile River and Mediterranean Sea Water

The Nile river previously brought a large quantities of dissolved nutrients and organic matter into the Southeastern Mediterranean sea (60- 180 million tons of sedement). Since completion of Aswan hydrocomplex , reduction in the Nile river flow has caused significant change in the distribution of the physico-chemical properties of the sea water as well as in the formation and distribution of the water masses in the region located north of the Nile Delta. In recent years ,changes have been recorded in the dynamics and destribution of water temperature. From 1966 the sediment run off Nile begane dropping sharply due not only to reduction in the volume of river water reaching the sea (now 2.3-1.8 milliar cu .m /year), (it was 16 x 10^6 cu.m at 1964) but also due to a significant reduction in the suspended particles in the flow. The reproduction of the shrimp in the area has changed significantly and food supplies for the young shrimp have deteriorated. Schrimp catches in 1966 were half what they had been in 1963. Commercial fishes have also decreased in number . Thus all links of the trophic chain have been affected from the phytoplankton to the pelagic and benthic fishes.

Chlorinated pesticides were detected in both Nile river water and fishes . The sites elected were in order of decreasing pesticide concentration in fish of each site: El-mahmoudia canal > Abo-El-Gheit canal > El-Mansoura > Assuit > Farskour > Edfinna > Cairo > Aswan. Organochlorine residues found in the fish included BHC ,lindane ,endrin,o,p DDT and its metabolities which were much higher than other organochlorine insecticides . Organophosphorous pesticide residues were not detected in the Nile water and fishes.

Our data indicated that according to activities of aeroplanes in spraying the cotton fields and due to the special cannal irrigation system which is used in Egypt, all the water sources are polluted by pesticides used by direct or indirect applications ,i.e. leaching of pesticide

Table 10 : Pesticide residues level in the tested samples in Menofia governorate (in ppm).

Sample No.	Endrin	Chlordane	Lindane	Aldrin	parathion	Dursban	Malathion	Endosulfon	Cidial	pp'DDE	Toxaphene	op' DDT	pp' DDT	No. of Unknown compounds
167	.04	.03	.03	.03	.02	.0?	01	.01	—	. .	—	—	2	13
162	.4	.5	.6	.35	.4	.12	.25	03	.01	1.0	.8	.02	8	14
169	1.0	.'2	.08	.05	.06	.04	03	.02	.05	.3	1.2	.4	.04	13
170	0.08	.06	.08	.02	.01	.01	.03	.01	.03	.06 >	2.0	6	.04	14
171	.01	.01	.01	01	.02	.01	.01	.02	06	—	—	—	—	10
172	.6	.03	.94	.01	.01	—	.06	-	01	.	.4	.5	5	12
173	02	.02	.01	.03	.01	.01	.05	.04	02	.02	.4	.04	.6	13
174	.01	.03	.02	.04	.01	.01	.08	.06	.03	02	.3	.3	.3	14
1975	.08	.05	.06	.08	.04	.01	.5	.08	.01	.06	.2	T	.4	15
176	25	.03	.08	.01	.03	.01	.02	...	.01	.04	6	.02	.5	16

levels (at the year 1984) in the tested soils of Qualiobia and El-Monofia governorates (in ppm),

DDT, dieldrin, endrin and lindane were detected in all tested samples. About 23 compounds were detected as breakdown or unknown products . Traces of some organophosphorus compounds were also detected in more than 50% of the samples.

Data from El-Monofia governorate indicated that endrin, chlordane , lindane, aldrin, parathion and malathion were detected in all the tested samples. While 91% .83% ,92 % ,76 % ,76% ,73% and 87 % of the tested samples contained dursban, cidial, pp' DDE , toxaphene ,op' DDT and pp'DDT.

The level of endrin residues was the highest, the soil samples contained between 0.01 - 1.00 ppm of endrin. pp' DDT followed endrin in its high level , its concentration varied between 0.04-0.80 ppm. The third was lindane, 0.01-0.06 ppm.

Results from Qualiobia governorate showed that from 213 samples , only 165 samples contained pesticide residues.About 33 % of the samples were nearly free from pesticide residues or contained traces of these residues

From the 165 samples, 95.2% . 62.1%,84.2%, 87.3 %,79.4% ,72.3% ,77 % , 74.0% ,60.6% , 54.5%, 81.8%, 66.7% and 90.3% contained endrin, chlordane , lindane, aldrin, parathion. dursban, malathion, endosulfon, cidial, pp'DDT , toxaphene, op' DDT and pp'DDT respectively.

Data after 15 years (1994) showed that most of the formentioned residues were decreased in their levels except in the case of lindane , total DDT and chlordane.

Most of pesticide residues were detected in traces.

3-Absorption and translocation of agrochemicals via roots of the plants.

Our data indicated that both systemic and non-systemic pesticides can penetrate plants and can be accumulated in the roots and other parts of the plants

Both lindane and endrin were detected in all samples taken from different parts of broad bean plants cultivated in polluted soil by the two insecticides.

While the lower leaves contained a high level of endrin than in the other parts, stems were the lowest in their contents of the both insecticides, table11 .

Lindane was detected in high level in upper leaves than in lower leaves and stems. Lindane can be translocated to all parts of the plants. This may be explained on the basis of higher solubility of lindane which may facilitate its translocation to all parts of the plants than did endrin.

Although the residues in the crops do not exceed the tolerance established for human consumption in some cases, continuous feeding on crops containing minute amounts of pesticides could result in accumulation of the residues occuring in animal products in excess of the tolerances established for human consumption .

Table 11 : Lindane and endrin residues in the different parts of broad bean plants.

Plant parts	Residues in ppm. endrin	lindane
roots	3.3	4.5
stems	0.2	1.3
lower leaves	2.9	1.3
upper leaves	1.8	2.7

4-Transfer of agrochemicals in fresh water resources

Our previous results about the leaching of pesticide residues from Egyptian soils indicated that leaching these residues differed according to soil type, where 29.71 % of lindane was leached from sand soil,13.99 % was leached from loam soil and 13.33% was leached from sandy clay loam soil.Leaching also depend on the type of pesticide,thimet and temik were leached greatly than the organochlorine compounds. Many factors affecting the leaching of pesticide residues in soils : i.e. , the concentration of pesticide residues, formulation of the pesticide used, moisture content, surface area, temperature, organic matter, pH, cation exchange capacity, nature of colloid, soil porosity , soil type, soil constituents...etc. Data in table 12. show the percentage of pesticide residues leached from 7 tested soil through five irrigation.

The soil materix is interpersed with pores of great range in size and shape. These pores produces complex path ways through which water and dissolved constituents (Pesticide residues, heavy metals, salts, nitrite and nitrate) move.

In Egypt there is special canal irrigation system.The fields are flooded every period varied between 7-15 days by quantity of water (300- 500 Cu m) /feddan.By using leaching model under field conditions, our data indicated that all the tested pesticides can be leached from the soil models. The percentage of pesticide residues in the leached water varied according to the type of soil and pesticide. The percentage of pesticide residues which were leached from the tested models varied between 8.8% to 36.8 % of the added dose by the end of 5th irrigation, table 12 .

Table 12 : Insecticides (weight in g) in drainage water and percentage of pesticides leached from seven different soils.

	PP 211	Dyfonate	Endrin	Kepone
Weight of insecticide	0.5153	0.4620	0.4620	0.4620
High Institute of Cotton	0.04565 (8.8%)	0.04094 (8.9%)	0.26482 (57.3%)	0.13056 (28.1 %)
Faculty of Agriculture	0.03402 (6.6%)	0.03769 (8.2%)	0.07871 (17.0%)	0.08069 (17.4%)
Nahda (3)	0.04156 (8.7%)	0.05122 (11.9%)	0.08456 (18.3%)	—
El-Mansoura	0.02084 (4.1%)	0.02660 (5.7%)	0.06989 (15.1%)	0.00475 (1.2%)
Sacka	0.03805 (7.3%)	0.03608 (7.8%)	0.12839 (27.7%)	0.17045 (36.8%)
Nahda (2)	0.02945 (5.8%)	—	0.11601 (25.1%)	—
Etay-el-Baroud	0.01308 (2.5%)	0.01869 (4.0%)	0.12366 (26.7%)	0.07949 (17.2%)

* total figures given here are based on 5 replications

5-Side effects of soil pollution by agrochemicals on plants:

1-Effects on plant cells:

Pesticided residues not only affected the plant germination and growth , but also dissipated into cells and damage its contents or injured the cell structure or functions.

By cultivating onion bulbs in water solution contained chlordane , mephospholan, methomyl, fenvalerate and endrin at concentrations varried between 10-100 ppm.The sprouting of roots was not affected in all treatments except in fenvalerate and endrin treatments. Fenvalerate retarded the root sprouting for one day. The treated bulbs with endrin sprouted roots after 2-3 days of treatment, meanwhile , it took only one day in control. Chlordane, fenvalerate and endrin decreased the number of roots sprouting four days after treatment , figure 7. The percentage of decrease increased by the increase of concentration (table 13). Cytrolane at all tested concentrations increased the average number of sprouted roots except at high rate (100 ppm).

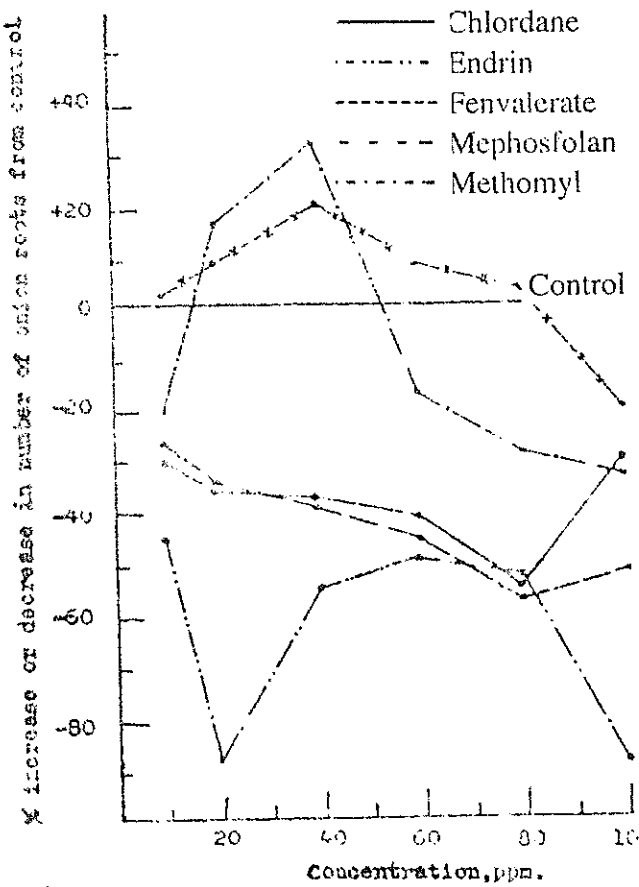


Figure 7 : Effect of insecticides on thr number of sprouted roots of onion.

Table 13 : Effect of different concentrations of insecticides on the number and length of onion roots.

Treatments		Sprouted roots		root length (cm)	
Chemical	Conc. ppm.	average number	% of control	average number	% of control
Chlordane	0	102	100	3.2	100
	10	71	69.6	2.6	81.3
	20	65	63.7	2.7	84.4
	40	63	61.8	2.8	87.5
	60	60	58.8	2.7	84.4
	80	46	45.1	2.6	87.5
	100	71	69.6	2.9	90.6
Mephosfolane	0	102	100	3.2	100
	10	104	102	2.4	75.0
	20	111	108.8	2.6	81.3
	40	122	119.6	2.3	71.9
	60	110	107.8	2.2	68.8
	80	109	102.9	2.1	65.6
	100	81	79.4	2.0	62.5
Methomyl	0	102	100	3.2	100
	10	81	79.4	3.3	103.1
	20	118	115.7	3.4	106.3
	40	134	131.4	2.9	90.6
	60	84	82.4	2.7	84.4
	80	72	70.6	2.6	81.3
	100	67	65.7	2.5	78.1
Fenvalerate	0	102	100	3.2	100
	10	74	72.5	2.3	91.9
	20	66	64.7	1.4	43.8
	40	62	60.8	1.2	37.5
	60	55	53.9	0.8	25.0
	80	43	42.2	0.7	21.9
	100	48	47.1	1.0	31.3
Endrin	0	102	100	3.2	100
	10	55	53.9	1.3	40.6
	20	12	11.8	1.7	53.1
	40	45	44.1	1.5	46.9
	60	51	50.0	1.2	37.5
	80	47	46.1	1.2	37.5
	100	11	10.86	0.3	9.4
Colchicine	0	102	100	3.2	100
	10	25	24.5	1.7	53.1

All chlorinated hydrocarbon insecticides tested decreased the dry weight of the roots, the percentage of reduction of dry weight varried between 5.21-61.46 %, table 14 .

There was no correlation between the increase of concentration and the percentage of decrease in the dry weight.

Methomyl increased the dry weight of the roots of all concentrations except that of 100 ppm. The percentage of increase varried between 11.46 - 57.29 %.

Fenvalerate decreased the dry weight of the roots at the concentrations 10 and 20 ppm, while the same insecticide increased the dry weight at high concentrations. The percentage of increase varied between 28.13 and 141.67 %

Mephosfolan was somewhat less effective than chlorinated hydrocarbon pesticides. The percentage of decrease at all concentrations varied between 15.62 - 39.96 % except at the rate of 40 ppm.

2-Cytological and cytogenetic effects:

The most dangerous effects found as a side effect of pesticide residues in plants are their cytogenetic effects on root cells. Studies were carried out to study the side effects of some pesticides residues on onion root tips.

The growing roots in solution of pesticides at different concentrations were compared with roots cultivated in distilled water and colchicine at concentration of 100 ppm.

Three thousands cells were examined from each treatment to calculate the number of cells in different stages of mitosis. The percentage of dividing cells (MI) and percentage of different mitotic phases were also estimated (figure 8) .

Results indicated that all pesticides tested (chlordane , mephospholane , methomyl and fenvalerate) at all concentrations tested decreased the mitotic index. The percentages of decrease increased by increasing of concentrations.

The percentage of prophase was very high at the case of chlordane followed by colchicine, methomyl, mephosfolan and fenvalerate.

Highest percentage of metaphase was observed at the case of mephosfolane followed by chochicine , methomyl, fenvalerate and the lowest was chlordane. Highest percentage of anaphase and telephase was recorded at the fenvalerate followed by methomyl , chlordane and mephospholan.

Table 14 : Effect of different concentrations of insecticides on the dry weight of onion roots.

Treatments Chemicals	conc. ppm	fresh weight mg.	Dry Weight mg.	% of dry weight	% of increase or decrease
Chlordane	0	350	33 6	9.6	-
	10	280	13.1	4.7	51.0
	20	268	13.6	5.1	- 46.8
	40	222	20.3	9.1	- 5.2
	60	227	15.7	6.9	-28.1
	80	295	19.6	6.7	-30.2
	100	303	20.9	6.9	-28.1
Mephosfolane	0	350	33.6	9.6	-
	10	535	42.6	9.6	-17.7
	20	384	31.3	8.1	-15.6
	40	320	35.2	11.0	+14.6
	60	550	40.2	2.3	- 23.9
	80	322	20.2	6.3	-34.4
	100	344	20.0	5.8	-39.9
Methomyl	0	350	33.6	9.6	-
	10	403	60.9	15.1	+ 57.3
	20	356	43.1	12.1	+ 26.1
	40	384	42.3	11.0	+ 14.6
	60	489	52.3	10.7	+ 11.4
	80	687	93.5	13.6	+ 41.7
	100	313	24.8	7.9	- 17.7
Fenvalerate	0	350	33.6	9.6	-
	10	325	22.1	6.8	- 29.2
	20	562	48.5	8.6	- 10.4
	40	266	32.9	12.3	+28.1
	60	175	40.8	23.2	+ 141.7
	80	216	49.7	23.0	+139.6
	100	510	74.7	14.6	+ 52.1
Endrin	0	350	33.6	9.6	-
	10	209	7.7	3.7	-61.5
	20	270	11.9	4.4	- 54.2
	40	302	16.9	5.6	-41.7
	60	273	17.8	6.5	-32.3
	80	346	21.8	6.3	-34.4
	100	124	8.9	7.8	-18.8
Colchicine	0	350	33.6	9.6	-
	100	303	8.8	2.9	-69.8

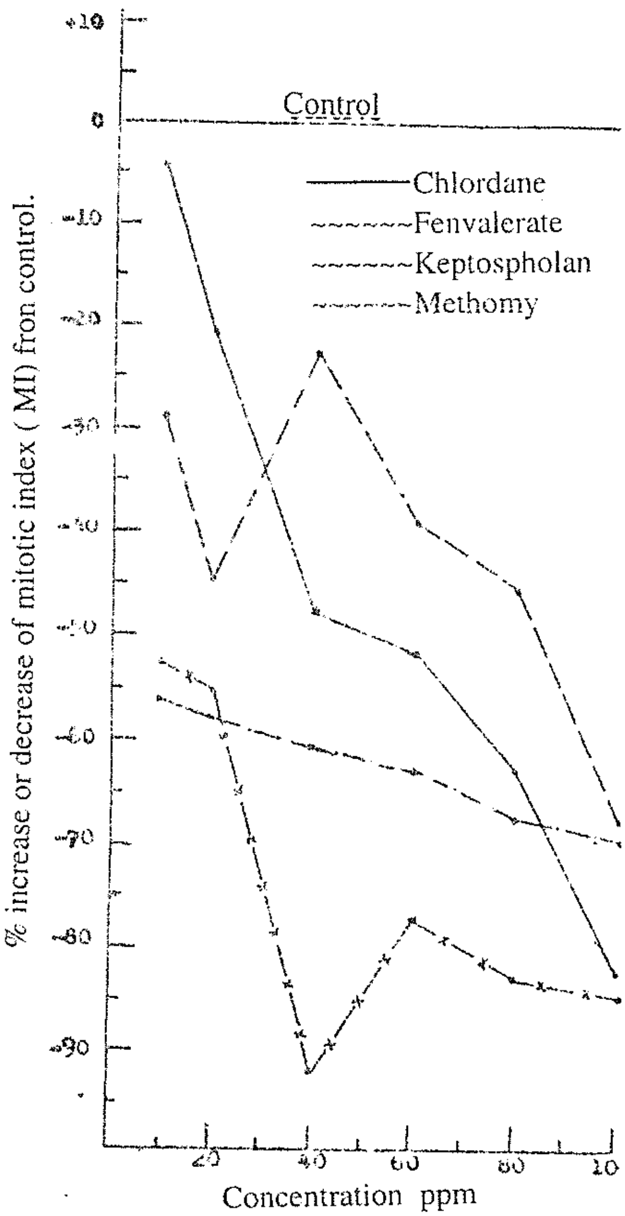


Figure 8: Effect of insecticides on mitotic index of merastematic cells of onion roots.

Figure 9: Sticky metaphase by 10 ppm Mephospholane.

Figure 10 : Two fragments by chlordane (10 ppm).

Figure 11 : Dipolidy + Bridge + lagying + fragment + gap anaphase by chlordane (10 ppm).

The different abnormalitics symptoms were observed. These structural abnormalities were : sticky chromosomes (figure 9) . fragment (figure 10) , bredge break and gaps.

The distructive movement abnormalitics were lagging chromosomes , ploidy ,which included diploidy (figure 11) or polyploidy, (figure 12) multinuclate cells which included bi-tr-and tetranuclus (figure 13) and c-metaphase (figure 14) or disturbed cell.

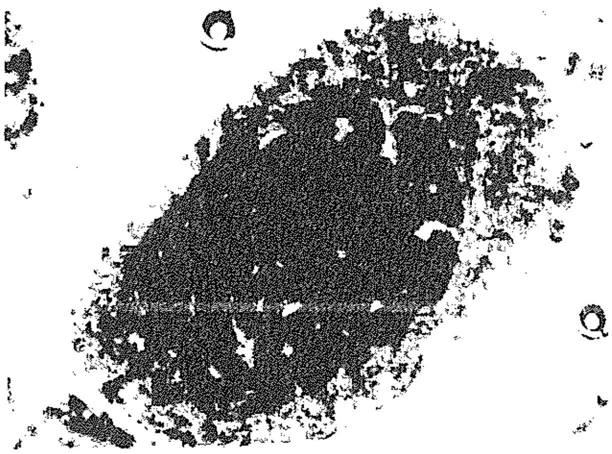


Figure 12 : Polyploidy by fenvalrate at (10 ppm).

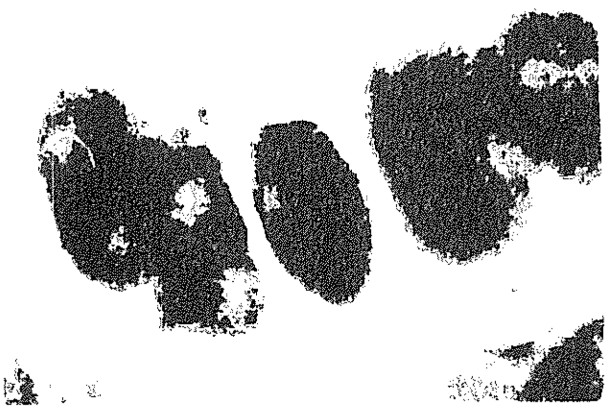


Figure 13 : Binulate and tetranulate (by 10 ppm mephosfolan.

Figure 14 : Metaphase by fenvalerate (10 ppm).

3-Effect on formation of C-tumour in onion roots:

The previous data indicated that pesticide residues in soil not only affect the contents and injure the cell structure or functions ,but also caused root tumour.

Experiments were conducted to study the side effects of some pesticide residues on the onion roots. In the case of colchicine treatments, tumours appeared at 2 to 3 mm from the tips of the roots (figure 15).

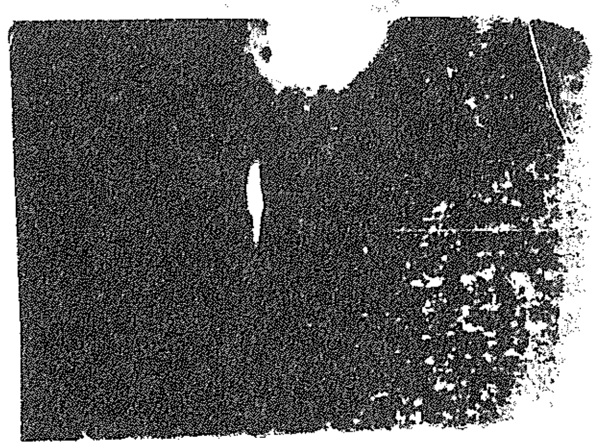


Figure 15 : Colchicine effects on onion roots at the rate of 100 ppm.

While in the case of pesticides , tumour formations appeared in two different structures:

1- Tumourous throughout ,where the swelling occured along the root in the case of fenvalerate (figure 16) and endrin treatment.

2- Terminal tumour where the swelling occured mainly immediatly after 2 mm from the terminal tip. This form of tumour was proliminant in roots treated

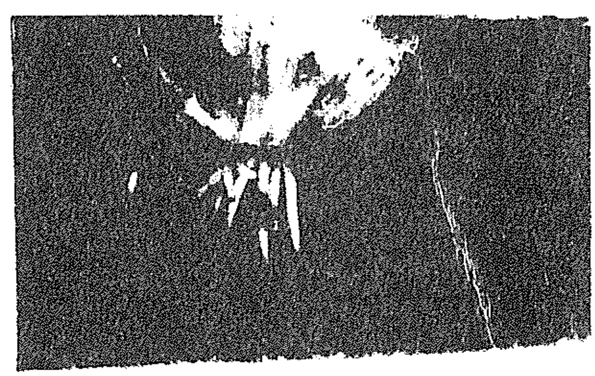


Figure 16 : Fenvalerate effect on onion roots at

with mephospholan except at rate of 10 ppm and methomyl treatment at 80 ppm,(figure 17).

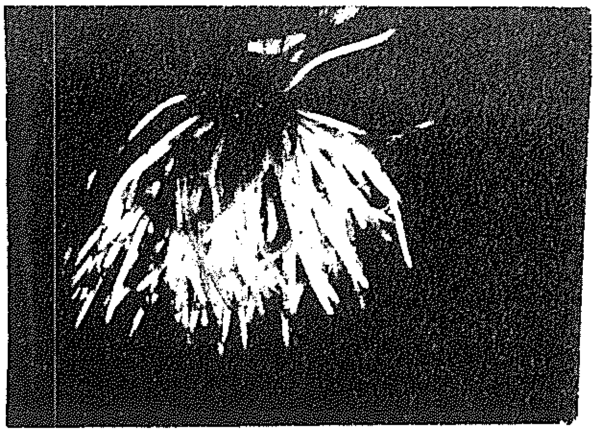


Figure 17 : Small terminal tumours formed at the rate of 80 ppm of methomyl.

4-Side effect on RNA and DNA in the root tip cells:

Histochemical studies were carried out to study the side effect of some insecticide residues on RNA and DNA synthesis .

The differentiation between the control and all treatments showed that the size of nucleus and their number were decreased. By decreasing the nucleus, the DNA was also decreased .

The area of RNA increased or decreased as a result of the side effect of different insecticides used. This effect was related to the type of insecticides and their concentrations.

Chlordane decreased both DNA and RNA , the percentage of decrease was increased by the increase of comcentrations.

Mephosfolane showed a slight decrease of RNA and DNA at the lower rates and a great decrease was noticed at high concentrations.. The numbers of nucleus were very little and area of RNA was very small.

Methomyl decreased both RNA and DNA in all treatments. The percentage of decrease was increased by the increase of concentration.

However fenvalerate has slightly decreased the RNA and DNA.

Also sumicdin has slightly decreased the RNA and DNA. It was clear that nucleus percentage and RNA area were decreased.

5-Effect on plant growth:

In the last 45 years , extensive addition of biologically active chemicals to the Egyptian environment , soon raised the problem of persistence and biodegradability of these chemicals in the Egyptian ecosystem.It became clear that many of these compounds persist for significant periods in the environment. Even the less persistant types of products are still questionable as to degree of their persistance, beside the fate of their degredation products in the ecosystem and their effects on different aspects of plant physiology.

The phytotoxic effects of insecticides on berseem (clover) showed that kepone , endrin , gusathion , PP211 and dyfonate at normal rates used up to 20 ppm .had no harmful effect on the germination, growth, yield and nodulation.

Moreover , some of the tested insecticides enhanced growth and nodulation. At high concentrations of certain tested insecticides (40 ppm or more) , decreased nodulation and affected growth and germination.

Kepone, endrin or dyfonate at 20 ppm and PP211 at 40 ppm increased the dry weight of berseem seedlings ,figure 18 .

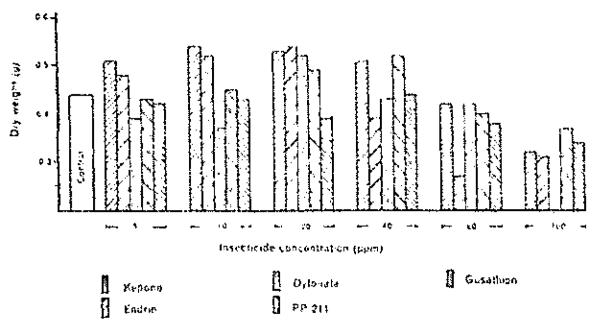


Figure 18 : Effect of pesticide residues on dry weight of berseem plants.

Concentrations more than 40 ppm of any of the tested insecticides increased the dry weight of the seedlings. PP211 caused the least injurous insecticide when applied to the soil at high concentrations.

Dyfonate and PP211 were superior to other insecticides in encouraging stem and root growth of berseem and cotton (figures 19& 20) nearly at all tested concentrations ranging from 5 ppm to 60 ppm.

Kepone and endrin had a marked injurious effect on plant growth when applied at the rate of 60 ppm.

Also application of any of the insecticides to the soil at the rate of 100 ppm, resulted in stunted seedlings.

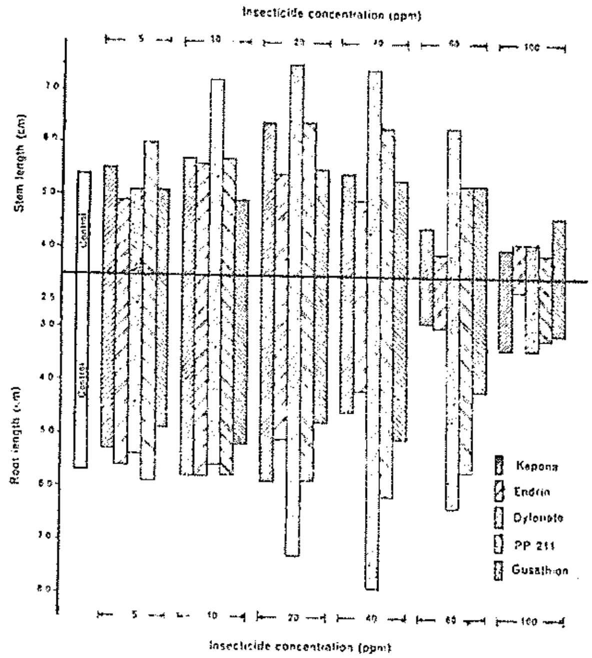


Figure 19 :Effect of pesticide residues on root and stem length of berseem seedlings.

Kepone and endrin enhanced the dry weight of cotton seedlings at rates 5 and 10 ppm (figure 20).The other 3 insecticides had no effect or had a slight opposite effect at the same concentrations.

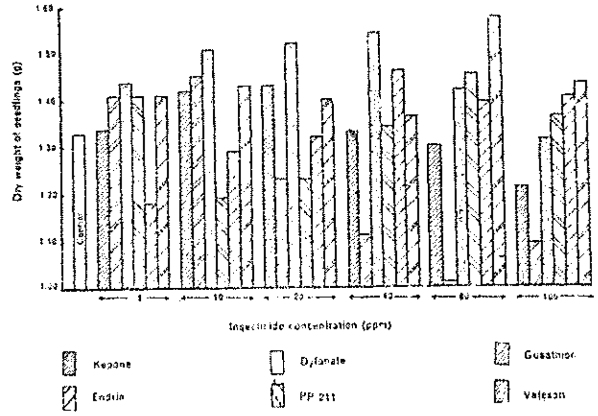


Figure 20: Effect of pesticide residues on dry weight of cotton plants.

Results also indicated that kepone , lindane PP211 . dyfonate, gusathion and valexon had nearly no effect on the germination of cotton seeds and on plant growth when applied to the soil at normal rates.table 15.

Table 15 : Side effects of pesticide residues on cotton plants : growth, germination and dry weight.

Concentration of insecticides p.p.m.	Insecticides used: Lindane — Length of root cm.	Length of stem cm.	% germination	Dry weight g.	Thimet — Length of root cm.	Length of stem cm.	% germination	Dry weight g.
1. Effect on cotton								
5	11.0	9.40	100	1.20	9.8	13.1	100	1.29
10	11.0	8.30	100	1.12	14.8	14.8	90	1.40
20	8.0	7.00	100	1.17	15.2	14.9	95	1.38
30	4.0	5.00	100	0.99	12.2	15.0	90	1.29
40	3.9	5.10	100	0.88	9.7	17.2	80	1.32
50	3.2	4.60	100	0.96	9.8	16.5	85	1.21
Control	10.8	9.10	100	1.17	19.3	19.8	100	1.60
2. Effect on corn								
5	12.9	34.7	100	3.35	27.4	39.7	100	3.49
10	17.4	34.4	100	3.33	22.0	40.0	100	3.50
20	10.6	36.4	100	3.63	24.0	38.7	100	3.51
30	6.0	34.3	100	3.19	26.6	38.2	100	3.39
40	3.9	36.0	100	3.20	26.2	40.0	100	3.37
50	3.1	30.6	100	3.20	25.8	39.4	100	3.40
Control	18.9	33.2	100	3.33	24.7	39.2	100	3.51
3. Effect on clover								
5	8.4	5.40	83	0.41	5.2	5.5	80	0.35
10	7.4	3.00	80	0.40	5.0	6.0	65	0.35
20	7.0	3.06	79	0.40	5.1	5.6	71	0.37
30	7.5	3.30	68	0.39	5.2	5.7	78	0.36
40	6.8	3.06	74	0.41	5.9	5.8	77	0.34
50	5.0	2.90	65	0.33	4.9	5.2	55	0.39
Control	12.6	12.6	87	0.49	5.1	4.4	78	0.38
4. Effect on bean								
5	15.5	22.75	100	1.81	4.0	8.5	60	1.58
10	14.0	22.66	95	1.73	9.3	10.7	70	1.51
20	8.0	21.00	100	1.57	6.1	7.7	70	1.51
30	8.5	16.25	100	1.59	8.6	10.6	70	1.46
40	4.75	15.50	85	1.48	7.0	8.5	50	1.33
50	2.75	11.25	55	1.49	4.6	7.4	45	1.43
Control	18.75	29.23	100	1.83	8.0	13.0	100	1.69

Concentration of insecticides p.p.m.	Insecticides used: DDT — Length of root cm.	Length of stem cm.	% germination	Dry weight g.	Temik — Length of root cm.	Length of stem cm.	% germination	Dry weight g.	Heptachlor — Length of root cm.	Length of stem cm.	% germination	Dry weight g.
1. Effect on cotton												
5	7.3	15.2	100	1.44	12.4	14.7	100	1.34	10.4	13.9	95	1.30
10	10.5	15.6	100	1.26	13.6	12.3	100	1.32	11.3	12.3	100	1.10
20	8.9	15.1	90	1.01	10.0	10.6	100	1.10	7.3	10.9	55	0.98
30	17.2	16.1	95	1.33	10.0	16.5	100	1.34	13.1	13.0	100	1.03
40	14.8	14.7	90	1.20	14.4	16.0	100	1.38	14.8	11.8	90	1.10
50	13.4	16.4	95	1.31	10.6	16.1	100	1.21	9.1	11.3	90	1.00
Control	15.4	15.2	100	1.53	15.4	15.2	100	1.52	15.4	15.2	100	1.31
2. Effect on corn												
5	35.1	38.2	100	3.39	24.8	38.8	100	3.21	24.0	35.5	100	3.12
10	31.0	37.0	100	3.41	26.6	35.3	100	3.20	25.5	37.3	100	3.20
20	31.5	36.8	100	3.38	24.9	30.0	100	3.29	26.6	38.8	100	3.17
30	35.2	39.6	90	3.40	28.4	38.1	100	3.30	27.3	38.0	100	3.14
40	37.3	37.5	90	3.33	30.9	38.1	100	3.31	25.1	38.7	100	3.22
50	27.8	35.1	80	3.21	26.0	37.6	100	3.29	19.7	38.7	100	3. 2
Control	25.3	37.1	100	3.43	25.8	39.0	100	3.27	25.6	39.0	100	3.35
3. Effect on clover												
5	3.50	3.00	76	0.26	4.8	5.5	77	0.34	4.9	5.2	73	0.43
10	3.75	3.60	75	0.30	4.6	5.1	75	0.35	3.2	4.2	79	0.30
20	7.30	4.60	73	0.33	6.8	6.0	79	0.43	5.1	6.1	76	0.33
30	6.40	4.10	74	0.37	6.1	5.8	75	0.37	5.3	6.3	77	0.41
40	6.10	6.70	75	0.37	5.4	5.0	68	0.31	4.3	5.0	65	0.38
50	3.70	4.70	66	0.35	3.8	5.2	65	0.41	4.0	3.7	54	0.28
Control	5.10	4.40	78	0.38	5.1	4.4	78	0.38	5.1	4.4	78	0.38
4. Effect on bean												
5	5.00	8.1	85	1.61	8.1	8.3	100	1.90	7.5	9.0	95	1.81
10	5.20	9.2	55	1.60	7.4	7.4	100	1.50	6.0	10.0	100	1.69
20	5.40	10.7	75	1.59	8.9	10.1	80	1.53	9.6	12.9	100	1.73
30	7.40	10.1	65	1.58	7.0	9.6	80	1.50	9.8	12.3	95	1.80
40	10.5	11.0	55	1.60	7.3	10.8	70	1.49	6.7	12.8	85	1.72
50	6.5	7.2	55	1.42	4.0	10.0	60	1.61	8.4	9.4	85	1.51
Control	8.0	13.0	100	1.69	8.0	13.0	100	1.69	8.0	23.0	100	1.96

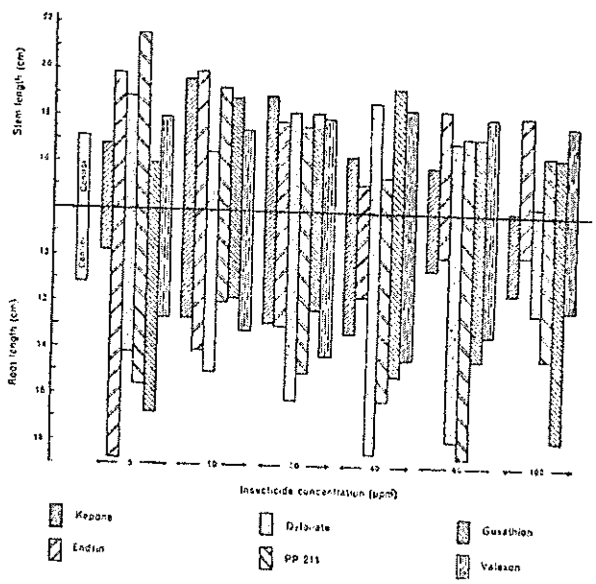


Figure 21 : Effect of pesticide residues on root and stem length of cotton seedlings.

Organophosphorous compounds , PP211 , dyfonate , gusathion and valexon increased yield. but extremely high concentrations decreased it. Tested chlorinated hydrocarbons insecticides increased the strength and fineness of cotton staple, table 16.But organophosphorous compounds decreased the staple strength and increased its length and fineness.

Experiments were conducted to study the side effects of pesticide residues on germination , plant growth and flowering of both broad bean and cowpea. Clay soil samples were treated with 12 insecticides (decamethrin, cypermethrin, fenvalerate , triazophos, dimethoate , profenofos, mephospholan, disulfoton, lindane, endrin, DDT and methomyl at several concentrations (10, 20 ,40 ,60 ,80 and 100 ppm as active ingredient). Results indicated that these residues affeced the germination , (figure 22). of both broad bean and cowpea at concentrations more than 30 ppm at all cases . All insecticides tested decreased the length of root. (figure 23), at concentrations more than 20 ppm. Some of them reduced the length of stem (figure 24) and some had nearly no effect specially at low concentrations .

The phytotoxic symptoms which appeared in most cases were dwarfing , swollen roots , twisted leaves , discoloration and burnt edges of the leaflets. The tested insecticides decreased the number of flowers per plant at all concentrations tested.

Lindane was highly toxic to clover and broad bean seedlings at all concentrations tested.It depressed growth , germination and dry weight of the plants. The critical dose at which corn and cotton seedlings were

Table 16 : Effect of some pesticides on lint quality :
a) Concentration effect (mean over sites).

Insecticide	*Concentration*	*Pressley*	*Micronaire value*	*Effective length*	*Mean length*	*Percentage short fibre*
Kepone	10	9·24	3·28	37·3	33·6	19·3
	20	9·36	3·36	38·3	34·4	22·0
	40	9·69	3·42	36·7	32·8	19·7
	60	9·60	3·42	37·7	33·7	19·7
	Mean	9·47	3·37	37·5	33·6	20·2
Endrin	10	9·47	3·22	36·2	32·4	18·6
	20	9·50	3·45	37·0	32·8	19·1
	40	9·22	3·50	36·9	32·8	19·5
	60	8·53	3·23	37·3	33·0	19·2
	Mean	9·18	3·35	36·8	32·8	19·1
Lindane	10	9·71	3·43	38·4	34·2	21·0
	20	9·98	3·22	37·5	35·5	20·5
	40	9·87	3·59	37·0	34·2	20·9
	60	9·64	3·18	36·7	34·3	20·3
	Mean	9·80	3·35	37·4	34·4	20·7
Mean of 3 insecticides		9·48	3·36	37·3	33·6	20·0
Dyfonate	5	9·89	3·50	37·6	33·2	21·1
PP211	5	9·69	3·43	37·0	32·8	19·8
Gusathion	5	9·79	3·43	37·1	32·9	21·4
Control		10·09	3·27	36·8	33·3	21·4

(*b*) *Site* means*

	Pressley 1	2	3	*Mean*	*Micronaire value* 1	2	3	*Mean*	*Effective length* 1	2	3	*Mean*	*Mean length* 1	2	3	*Mean*	*Percentage short fibre* 1	2	3	*Mean*
Kepone	10·32	8·87	9·22	9·47	3·06	4·08	2·97	3·37	36·9	38·6	36·9	37·5	33·0	34·6	33·3	33·6	21·0	19·6	19·9	20·2
Endrin	10·87	7·84	8·82	9·18	3·09	3·96	3·00	3·35	37·4	37·4	35·8	36·8	33·8	32·9	31·6	32·8	20·7	19·1	17·5	19·1
Lindane	10·67	9·79	8·92	9·80	3·07	3·94	3·07	3·35	37·4	37·3	37·4	37·4	33·6	36·4	32·8	34·4	21·6	21·0	19·5	20·7
Mean of three	10·62	8·83	8·99	9·48	3·07	3·99	3·01	3·36	37·2	37·8	36·8	37·3	33·5	34·6	32·8	33·6	21·1	19·9	19·0	20·0
Dyfonate	10·24	10·38	8·95	9·89	3·25	4·28	2·98	3·50	37·5	38·6	36·8	37·6	34·0	34·0	31·5	33·2	18·6	25·0	19·7	21·1
PP211	9·98	9·85	9·20	9·68	3·25	4·10	2·85	3·43	37·0	39·0	35·0	37·0	32·5	35·0	30·8	32·8	20·2	23·5	15·8	19·8
Gusathion	9·86	10·28	9·32	9·79	3·25	4·08	2·95	3·43	35·5	39·0	36·8	37·1	31·0	35·5	32·3	32·9	23·4	22·0	18·8	21·4
Control	10·33	10·51	9·44	10·09	3·10	3·55	3·15	3·27	35·5	39·5	35·5	36·8	31·0	36·0	32·8	33·3	22·0	20·8	21·5	21·4

* 1—Etay; 2—Sakha; 3—Gimmeza.

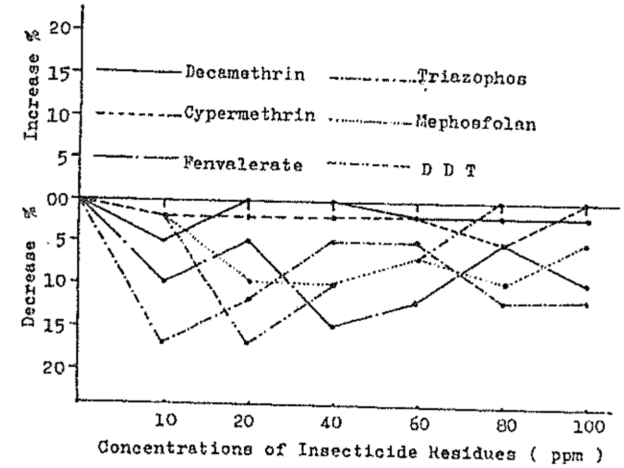


Figure 22: Effect of pesticide residues on germination of broad bean seeds .

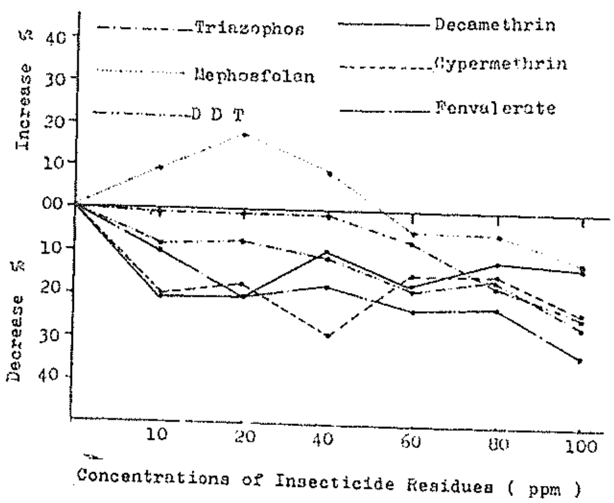


Figure 23: Effect of pesticide residues on root length of broad bean plants.

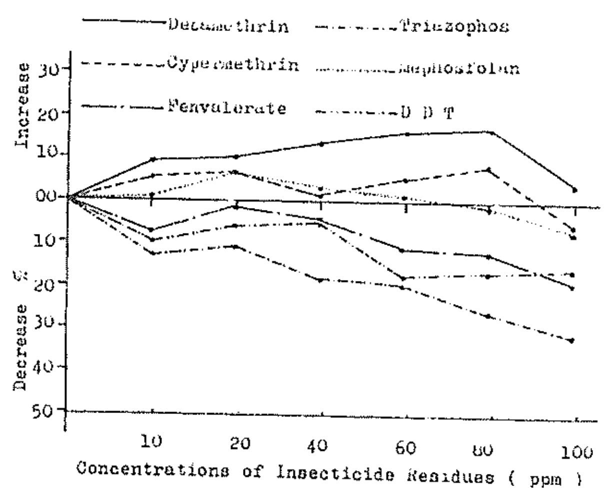


Figure 24: Effect of pesticide residues on stem length of broad bean .plants

affected was 10 ppm.Lindane at high concentrations caused severe damage to all plants tested. Dwarfism and irregulat growth of the roots were observed on plants growth in the treated soils.

The following hystological symptoms were observed : hypertrophy of cells, presence of vacuoles , tearing of epiderms and cortex layer and spreaded necrotic flecks in the endodermis and pericycle layers especially at high comcentration (50 ppm), figures 25 to 26 .

Figure 25: Transection in a root of cotton grown in soil treated with 50 ppm of lindane.

Other chlorinated hydrocarbons ,DDT and heptachlor slightly affected growth, germination and dry weight of plants.

Figure 26: Transection in a root of cotton grown in soil treated with 50 ppm of thimet.

Thimet affected germination of clover and bean at all concentrations but did not affect germination of cotton and corn. Thimet caused gaps in cortex layer and hypertrophy of the cells at 30 ppm and caused destruction of root tissues if applied at rates of 40 ppm.

Figure 27: Transection in a root of corn grown in soil treated with 50 ppm of lindane.

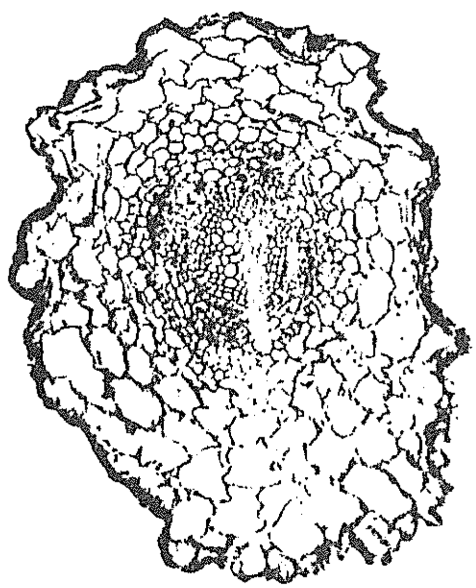


Figure 28 : Transection in a root of clover grown in soil treated with 50 ppm of lindane.

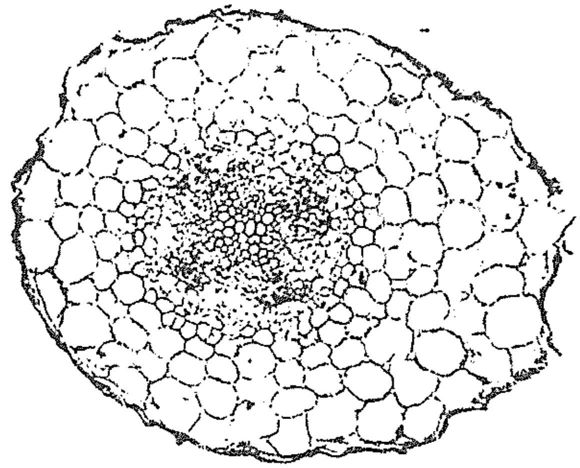


Figure 29 : Transection in a root of clover grown in soil treated with 50 ppm of thimet.

Figure 30 : Transection in a root of bean grown in soil treated with 50 ppm of lindane.

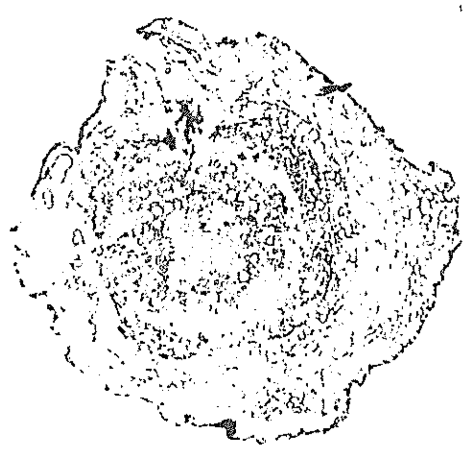


Figure 31 : Transection in corn root grown in soil treated with 40 ppm of thimet.

The seventh lesson

Side effects of agrochemicals on soil fertility.

1-Side effect on cation exchange capacity.

Previous results indicated that pesticide residues affected soil fertility . It clearly affected soil microorganisms and their activity . Cation exchange capacity is also related to soil fertilty and it affects by direct or indirect ways, the plant nutrition.

Twenty two insecticides which were used in Egypt to control cotton pests were tested to study their side effects on the cation exchange capacity. Data in table 17 indicate that insecticides tested can be divided to the following groups: a- Gusathion, oxidiazon, endrin and DDT had nearly no effect on cation exchange capacity at all concentrations tested.

Table17 : Cation exchange capacity of untreated and treated soil with 22 pesticides.

Treatment	10 ppm	50 ppm	100 ppm
Parathion	52.9	53.0	63.4
Temik	52.0	54.1	55.0
Tamaron	51.6	50.7	60.4
Di-syston	53.4	52.3	70.5
Gusathion	48.9	53.4	50.4
Metaisosystox	50.5	63.8	52.3
Cyolane	50.6	51.2	54.6
Cytrolane	54.4	54.3	54.3
Dursban	62.5	56.9	48.5
Cidial	47.3	56.3	49.6
Curacron	49.6	53.2	64.3
Nuvacron	51.6	63.0	50.5
Roger	47.5	58.9	46.6
Oxidiazon	68.8	49.6	50.8
Chlordane	52.3	44.8	56.1
Dipterex	45.0	57.7	58.9
Captan	62.9	59.9	60.6
Carbaryl	56.2	63.5	54.1
Lannate	51.3	44.6	74.3
Lindane	44.8	49.8	61.6
Endrin	52.3	56.1	47.0
DDT	46.6	49.5	51.8

b- Temik , cyolane and dipterex increased slightly cation exchange capacity. c- Parathion, tamaron, di-syston, curacron and lindane increased cation exchange capacity by the increase of insecticide concentrations. d- Dursban decreased cation exchange capacity by the increase of insecticide concentrations. e- Both high concentrations (100 ppm) and low concentration (10 ppm) of chlordane and lannate increased cation exchange capacity while it was decreased at concentration 50 ppm. f- Metaisosystox, cidial, nuvacron, sevin and roger decreased cation exchange capacity at high and low concentration, while it was increased at concentration 50 ppm. g- Cytrolane and captan increases cation exchange capacity to the same level at all concentrations tested.

2-The loss of some elements through leached water.

Previous data indicated that pesticides in soil increased or decreased cation exchange capacity. Chemical analysis of leached water by using atomic absorption indicated that lindane decreased to great extent the following cations K, Na ,Ca. and Mn by the increase of insecticide residues in treated soils,table 18.

Also Fe and Zn were decreased slightly by the increase of insecticide concentration. While Cd concentration was not affected.

Pb was increased by the increase of the concentration to about 10 times .Cu was increased by the increase of insecticide concentration.

K concentration in leached water decreased by the increase of DDT concentration, while Na ,Ca.Mg. Mn and Cu increased only at low concentration of DDT. Zn concentration was not affected at all concentrations of DDT. Zn concentrations was not affected at all concentrations tested. Cd disappeared completely in the leached water at all concentrations tested, while Pb was increased to very high level by the increase of DDT concentration.

Tamaron at low concentration (10 ppm) and high concentration (100 ppm) decreased the concentration of K ,Na,Ca,Mg and Mn while at 50 ppm. the above cations were increased in leached water. The concentration of Fe was highly increased by the increase of tamaron concentration. Cu concentration was slightly decreased by the increase of insecticide concentration . Zn, Cd and Pb followed the same as in the case of DDT.

Both cyolane and cytrolane decreased K,Na, Mg, Mn, Fe and Zn concentrations, while Cu concentration was not affected . Pb disappeared in both treatments. Cd also disappeared in the case of cyolane and cytrolane treatments except at low concentration of

Table 18 : Concentration of elements in the leached water (ppm).

Treatment	conc.	K	Na	Ca	Mg	Mn	Fe	Cu	Zn	Cd	Pb
Lindane	10	27	540	710	240	0.02	1.1	0.089	0.08	0.0	0.0
	50	11	340	321	135	0.02	1.1	0.090	0.08	0.0009	0.051
	100	11.5	310	301	130	0.02	1.0	0.140	0.07	0.0009	0.01
DDT	10	21	750	820	265	0.06	1.2	0.10	0.10	0.0009	0.058
	50	15	320	360	130	0.04	1.10	0.14	0.09	0.0	0.085
	100	12	390	390	95	0.06	0.9	0.10	0.10	0.0	0.110
Tamaron	10	25	620	680	215	0.04	19.6	0.07	0.04	0.001	0.210
	50	31	890	740	215	0.07	15.0	0.08	0.05	0.0	0.218
	100	22	570	590	205	0.03	0.4	0.08	0.08	0.0	0.010
Cyolane	10	21	740	40	235	0.02	0.4	0.08	0.0	0.0	0.0
	50	5	90	31	15	0.01	0.4	0.10	0.03	0.0	0.0
	100	4	80	16	15	0.01	1.0	0.08	0.01	0.0	0.0
Cytrolane	10	21.5	700	640	245	0.03	0.4	0.10	0.08	0.0009	0.0
	50	5.5	100	34	20	0.03	0.3	0.08	0.02	0.0	0.0
	100	3.5	65	17	17.5	0.01	0.1	0.09	0.02	0.0	0.0
Novacron	10	21.6	750	640	240	0.02	0.2	0.10	0.06	0.0	0.0
	50	6	110	44	20	0.01	0.2	0.12	0.01	0.0	0.0
	100	4	60	19	15	0.02	4.6	0.06	0.02	0.0	0.0
Seven	10	24.5	760	660	245	0.01	0.3	0.06	0.06	0.0	0.0
	50	7	140	52	25	0.01	0.3	0.08	0.02	0.0	0.0
	100	4	65	19	15	0.00	3.40	0.04	0.02	0.0	0.0
Endrin	10	22	700	610	235	0.01	0.3	0.02	0.06	0.0	0.0
	50	4.5	90	280	15	0.05	0.2	0.06	0.02	0.0	0.0
	100	4	55	15	22.5	0.02	4.2	0.04	0.01	0.0	0.0
Control	0	29	72.	730	245	0.04	1.3	0.09	0.10	0.0009	0.005

cytrolane ,where its level was nearly as in control.

3-Side effects on soil biodiversity (microorganisms and their activities):

The natural bioate perform many essential function for agriculture ,forestry and other aspects of human welfare such as preventing the accumulaton of organic wastes,clearing water and soil of chemical pollution such as pesticides ,recycling vital chemical elements within the ecosystem, producing biotic nitrogen for fertilizers,buffering air pollutants and moderating climatic change ,conserving soil and water,preserving genetic materials for agriculture and forestry and supplying food via the harvest of fish and other wild life.

Agrochemicals can influence all these essential functions by reducing species diversity and modifying food chains, changing patterns of energy flow and nutrients cycling (including nitrogen) reducing soil, water and air quality and changing the stability and resilience of ecosystem.

As it is well known , soil fertility is always closely related to the activity of soil microorganisms. Attention has therefore been directed to study the effect of these residues on soil microorganisms and their function i.e. decomposition of organic matter , ammonification, nitrification ...etc.

Previous studies showed considerable interest in persistence of pesticide residues in soil after the wide spread use of pesticides over the past 30 years. Questions arise as to where these pesticide residues persist in our soil ? and what their side effect on soil fertility ?.

Our data indicated that in the first two weeks after soil treatment by chloropyrifos and phosfolan, the total number of microorganisms decreased, figures (32 and 33) , followed by a great increase for a period varied 2-6 weeks.

Then the total number fluctuated near the control.

Data indicated that the two insecticides at the two rates tested decreased the total number of fungi, for only one week followed by a great increase in fungi counts for 7-9 weeks , figures (34 & 35).

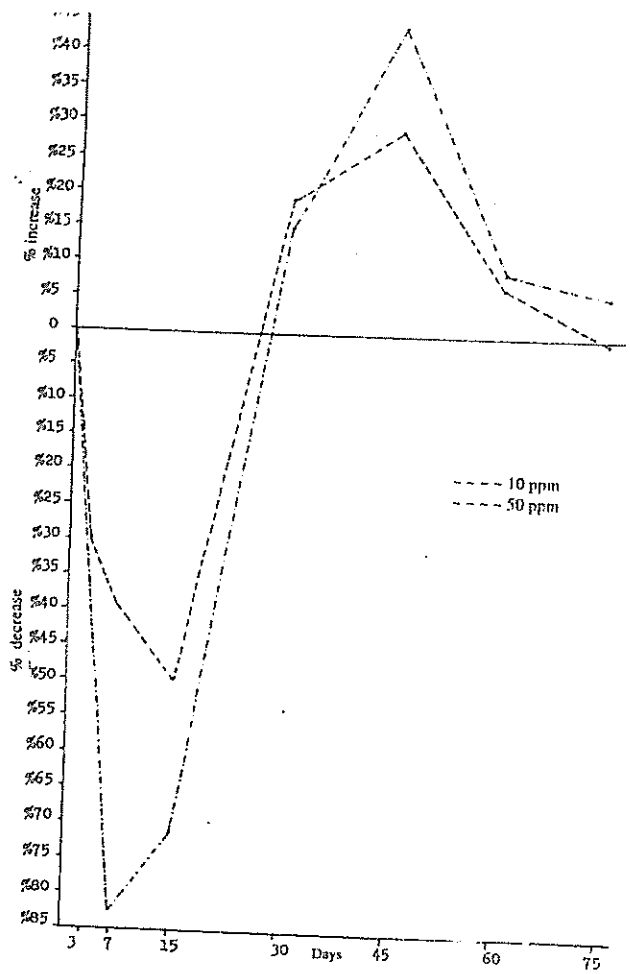


Figure 32 : Effect of chloropyrifos on the total number of microorganisms

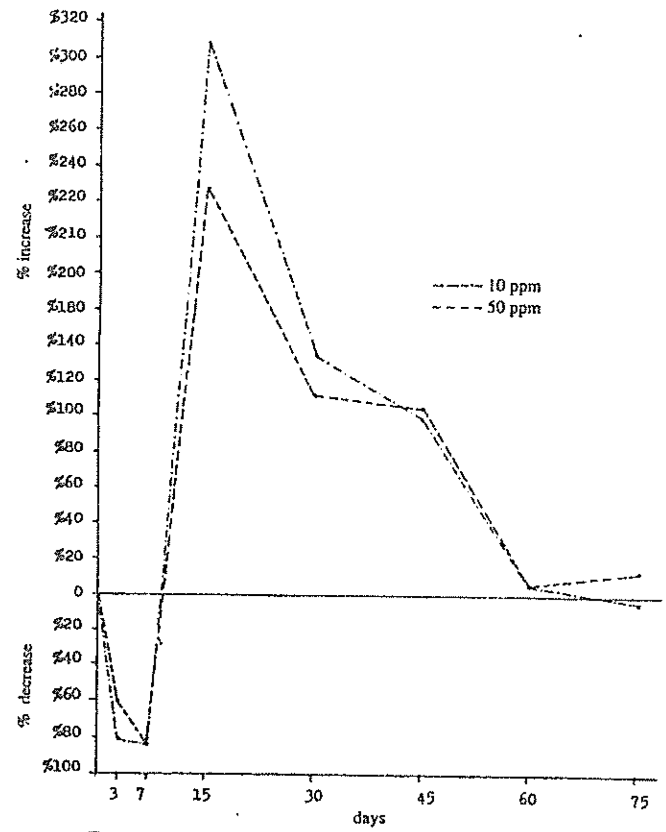


Figure 34 : Effect of chloropyrifos on the total number of fungi.

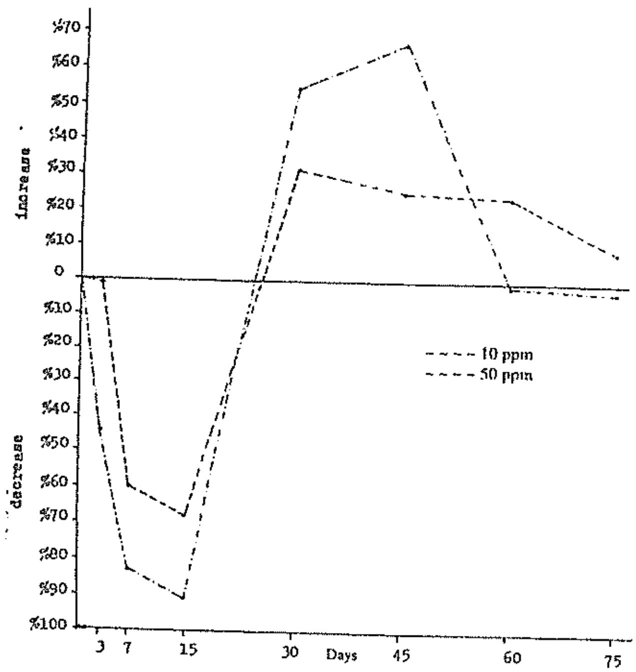


Figure 33 : Effect of phosfolan on the number of microorganisms

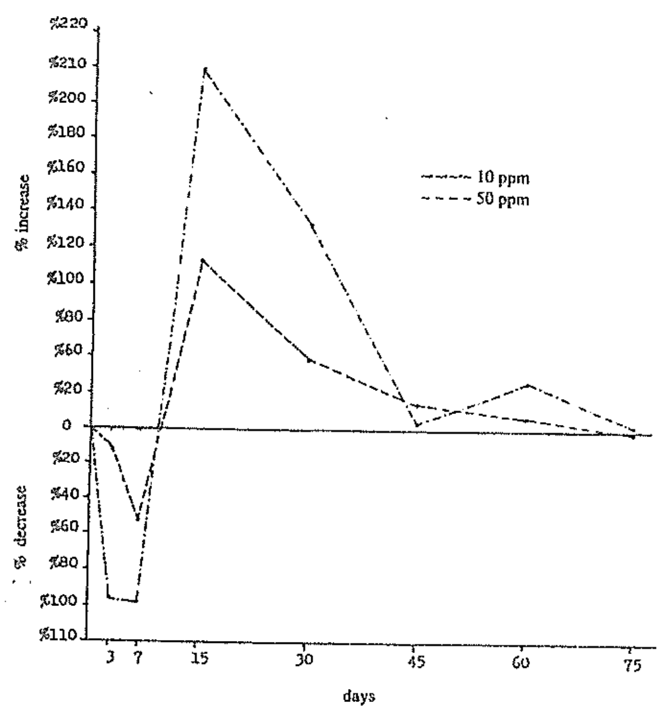


Figure 35 : Effect of phosfolan on the number of fungi.

While in the case of actinomycetes. The total number was decreased for two weeks followed by an increase for 6 weeks (figure 36 & 37).

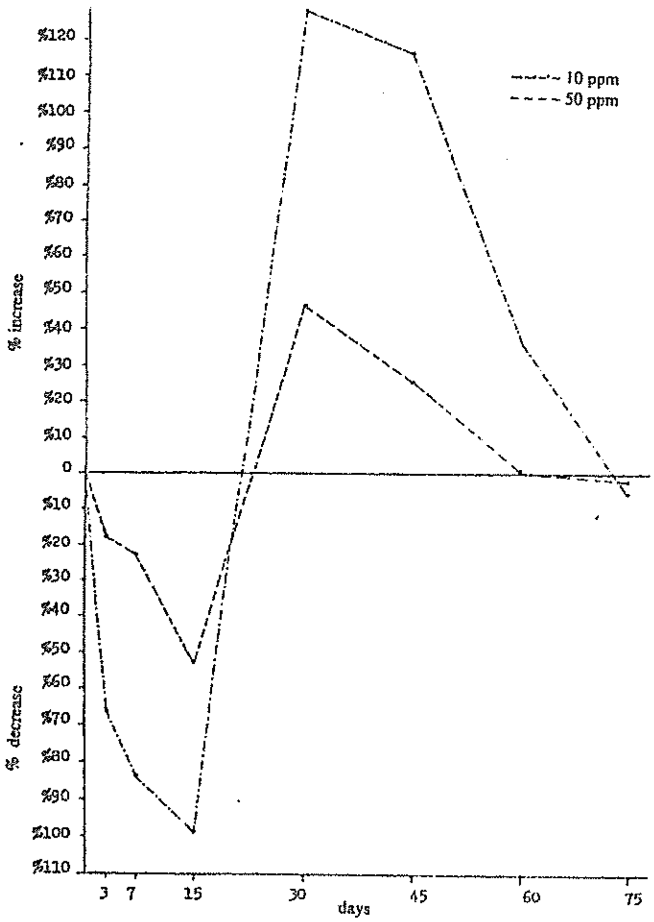


Figure 36 : Effect of chloropyrifos on the total number of actinomycetes

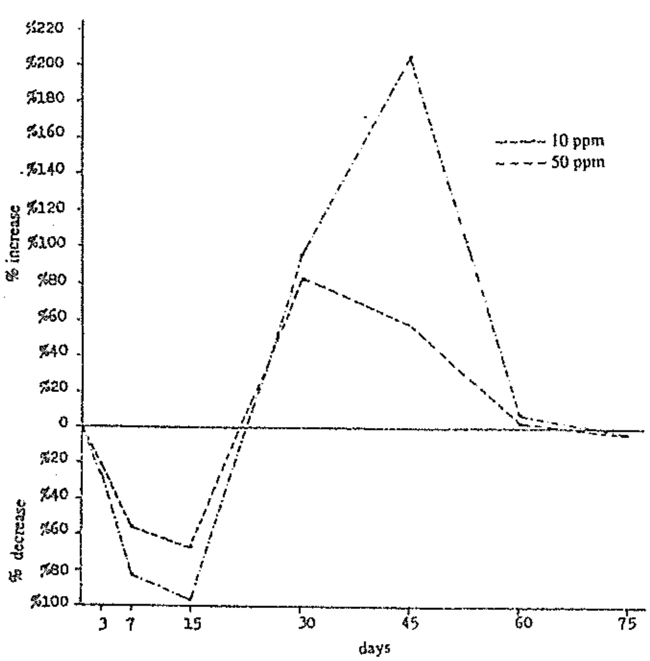


Figure 37 : Effect of phosfolan on the total number of actinomycetes

The effect on amonifiers , figure 38 & 39 , followed nearly the same manner as total microorganisms.

High rates of the two insecticides tested (chlorpyrifos and phosfolane) (50 ppm) decreased sharply the total number of nitrifiers all over the first 9 weeks (figure 40 & 41). While the effect of these insecticides at the low dose (10 ppm) was somewhat tha same as the effect of ammonifiers.

CO_2 production (as an indicator for microorganisms activity) showd a reduction in the activity of the microorganisms during the first three weeks after treatment followed by a rise which reached the maximum at the fourth or the fifth week. Seventy five days after treatment CO_2 production was nearly normal (figure 42 & 43).

Results also indicated that chloropyrifos and phosfolan decreased the production of ammonia all over the period of experiment (figure 44) , while nitrite was accumulated at the first week followed by great decrease in nitrite production. (figure45)

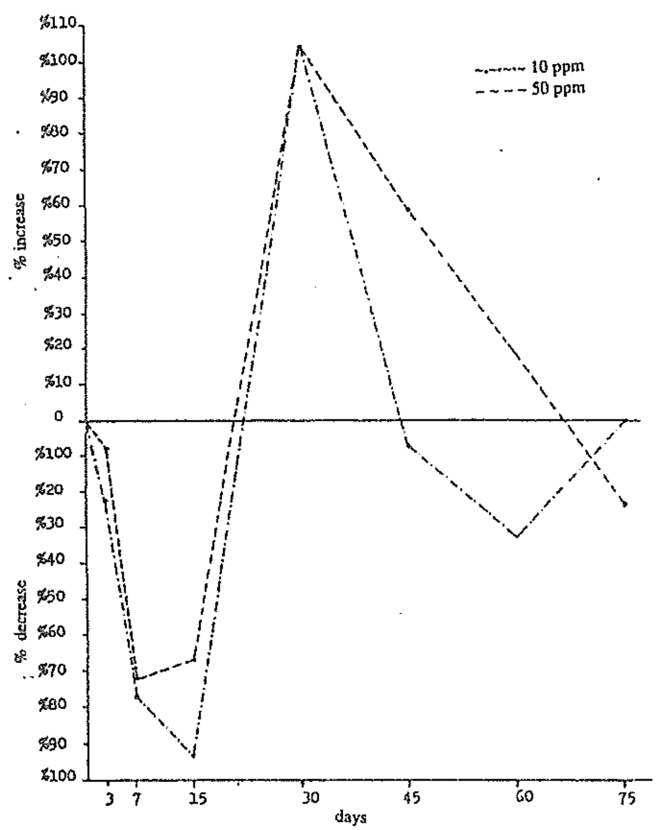


Figure 38 : Effect of phosfolan on the total number of ammonofiers.

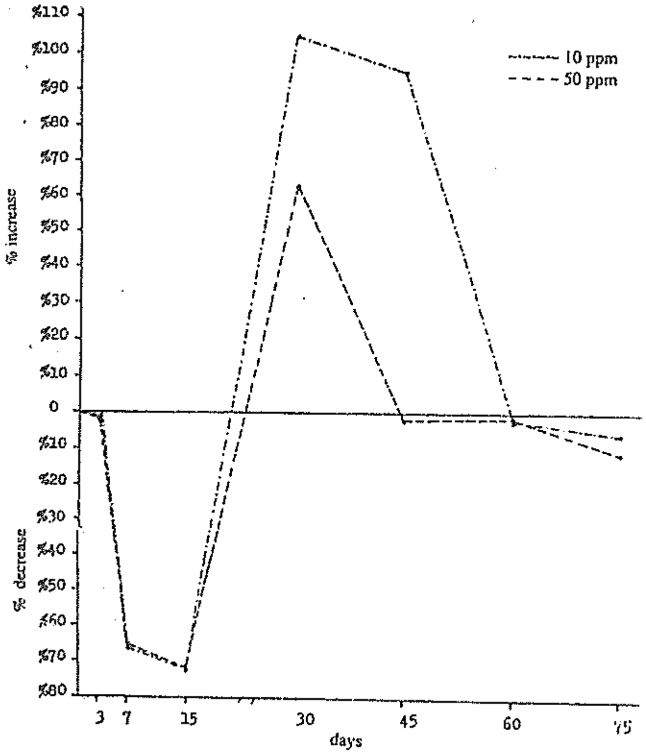


Figure 39 : Effect of chloropyrifos on the total number of ammonofiers.

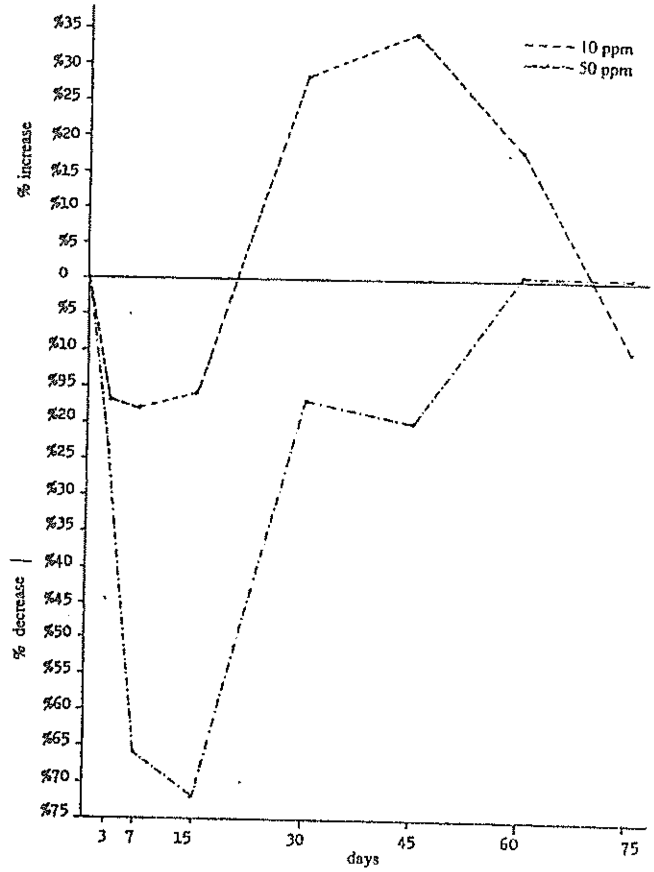


Figure 41 : Effect of chloropyrifos on the total number of nitrifiers.

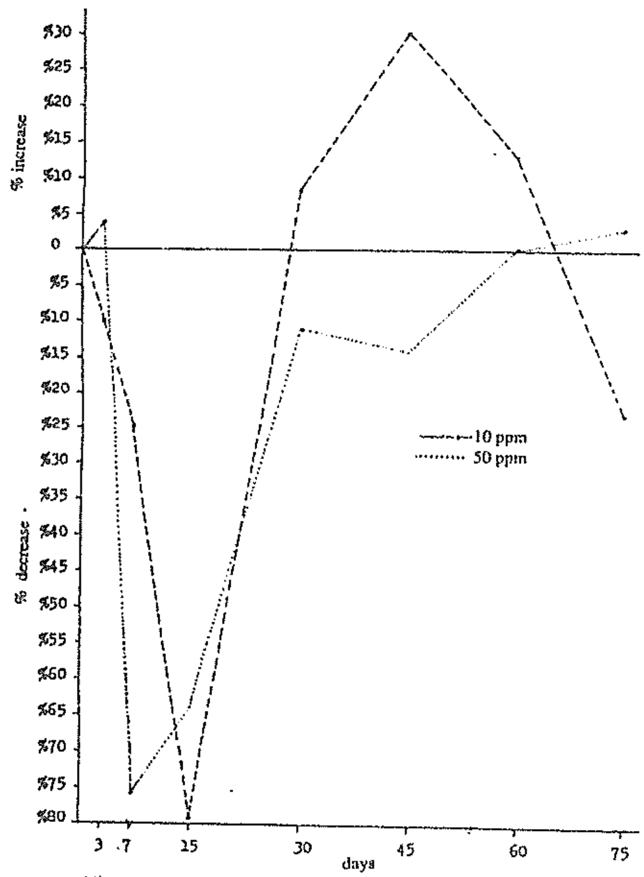


Figure 40 : Effect of phospholan on the total number ofnitrifiers.

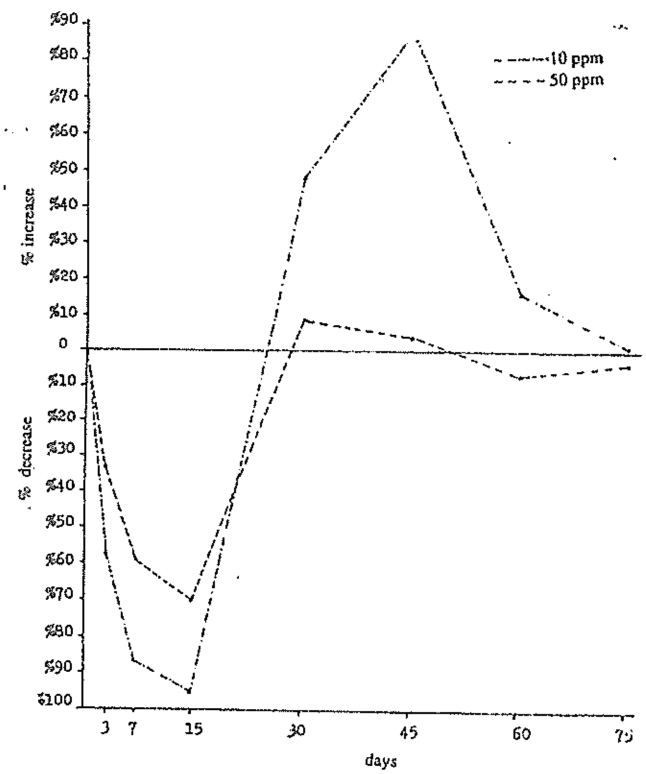


Figure 42 : Effect of phosfolan on the total production of carbon dioxide

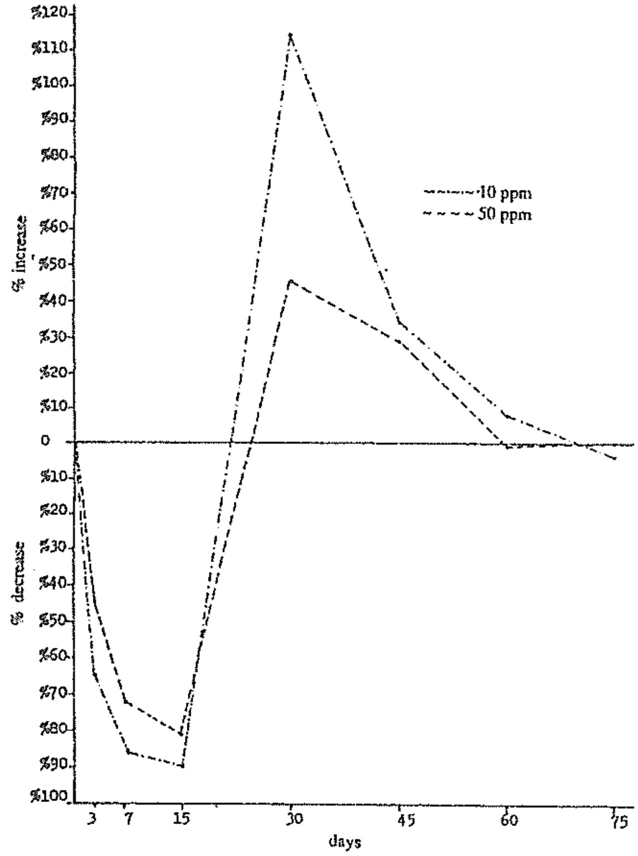


Figure 43 : Effect of chloropyrifos on the total production of carbon dioxide

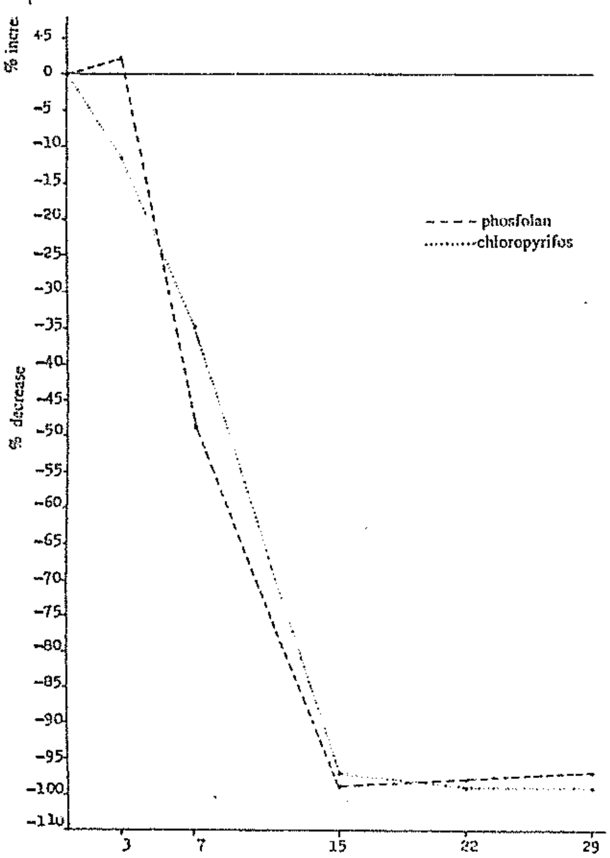


Figure 44 : Effect of phosfolan and chloropyrifos on ammonification of pepton .

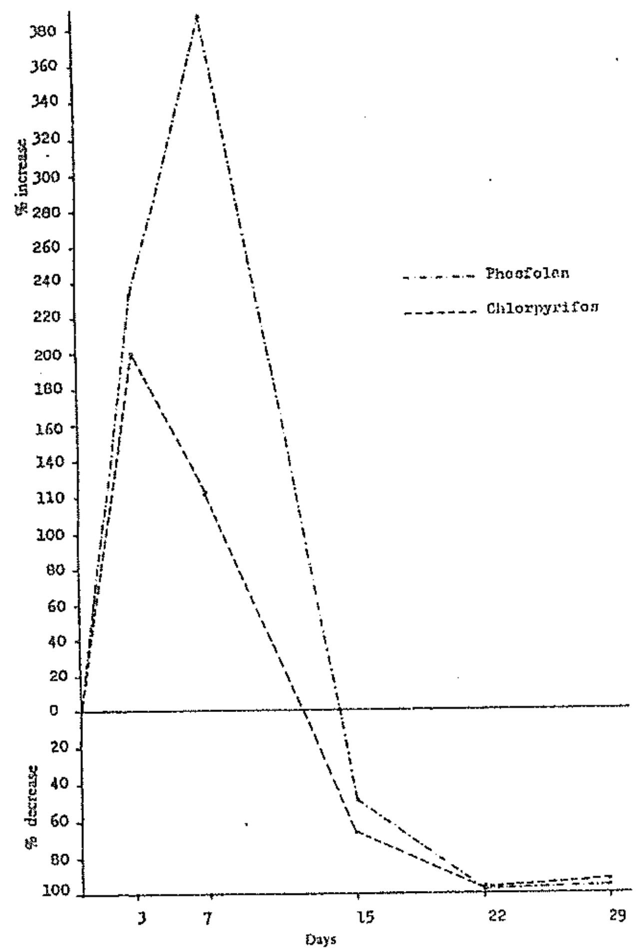


Figure 45 : Effect of phosfolan and chloropyrifos on nitrite production .

Nitrate production decreased for 3-7 days followed by an increase for about 3 weeks after treatment. (figure 46).

Generally , although certain of the microbial relations and their activities in the soil are disturbed by extremely high application of insecticides .the effect from normal usage is not great enough to cause a marked reduction in the soil fertility but in some cases after several accumulation to soil year by year, may result a decrease in soil fertility.

Experiments were conducted to study the side effects of 24 pesticides which were used in Egypt for plant protection, on soil microorganisms and their activities. Results indicated that these pesticides residues generally varied in their side effects.

Some pesticides increased ammonification for few days followed by great decrease (figure 47 and 48), while the other group deceased ammonium prodction as soon as soil treatment and for four weeks (figure 49 and 50). All pesticides decreased the nitrite production for few days after treatment followed by an increase of nitrite for four weaks.

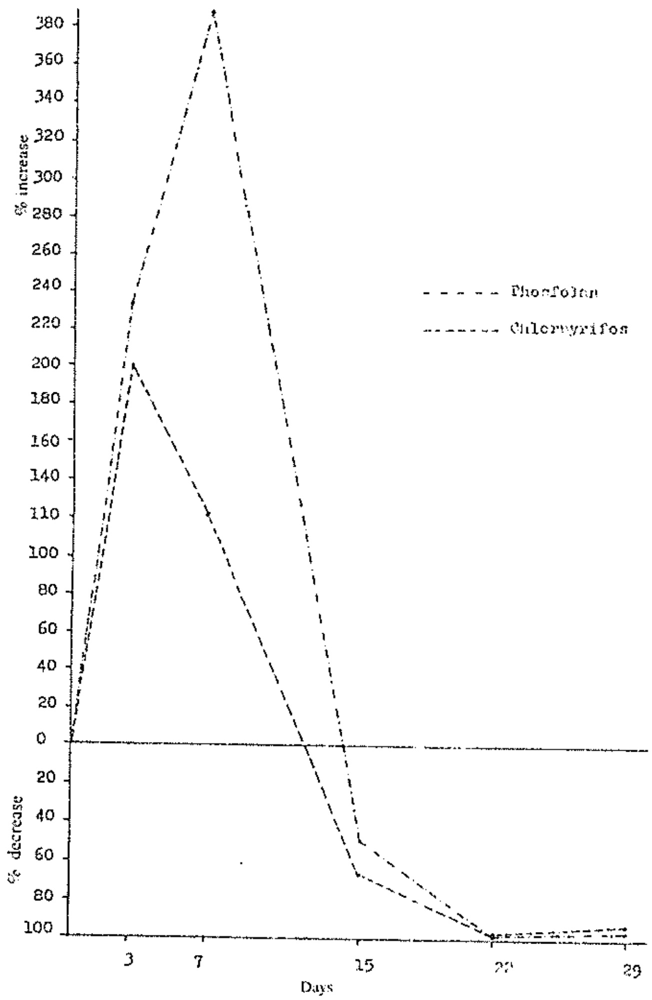


Figure 46 : Effect of chloropyrifos and phosfolan on the production of nitrate.

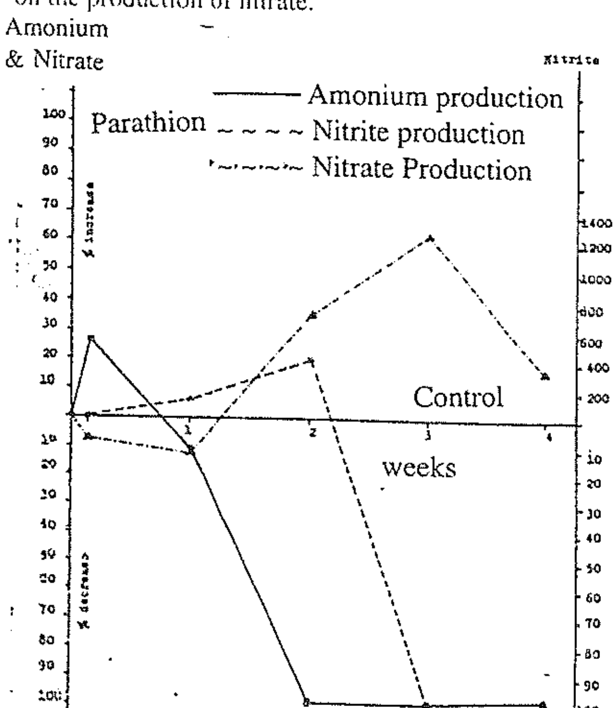


Figure 47 : Effect of parathion on amonia, nitrite and nitrate production.

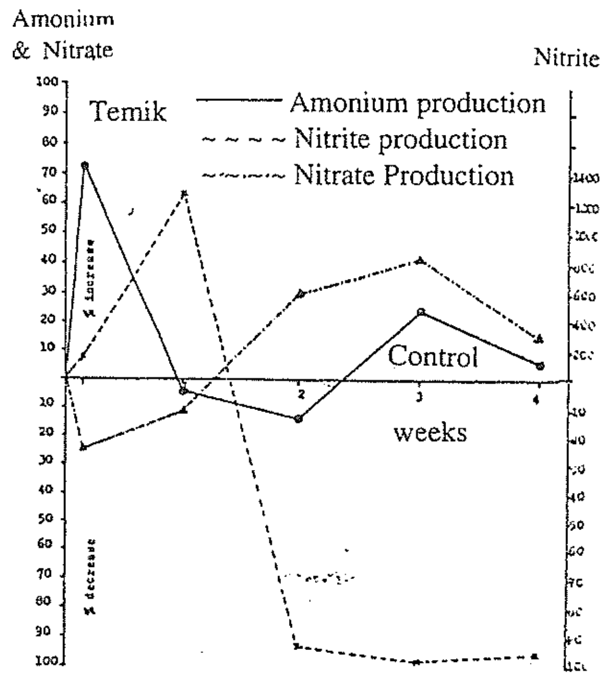


Figure 48 : Effect of temik on amonia, nitrite and nitrate production.

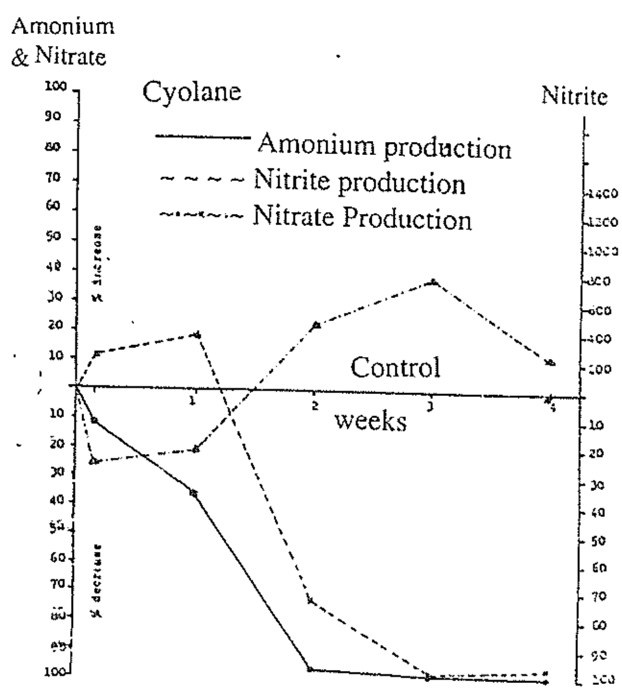


Figure 49 : Effect of cyolane on amonia, nitrite and nitrate production.

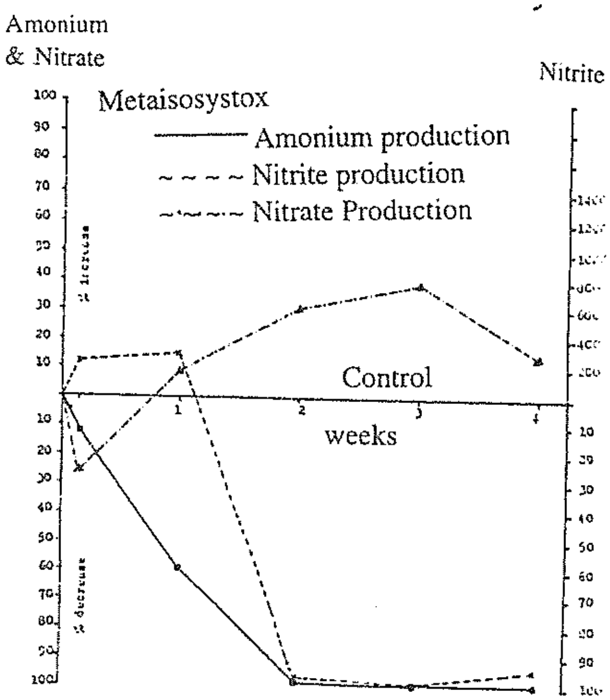


Figure 50 : Effect of metaisosystox on amonia, nitrite and nitrate production.

Nitrate production increased for only several days followed by hard decrease in nitrate production for 3 weaks.

The gaseous nitrogen of the atmospher represents a vast store of potential fertility, which while not directly available to plants , may be brought into the cell protein by nitrogen- fixing organisms.These fall into 2 groups : the free living nonsymbiotic organisms such as the aerobic genera *Achrobacter. Aerobacter, Azotomonas, Beijenckia sp.*,blue green algae , photo-synthetic bacteria , the anaerobic genus *Chlostridium sp.* and the symbiotic bacteria , *Rhizobium sp.* which live primarily in root nodules of certain plant species where fixation is affected. Symbiosis represents the ultimate in bilateral dependency .

The two disimilar organisms are dependent exclusively on one another and their co-existence is obligate for certain reactions or for the very existence of particular ecosystem of one or both of the symbionts.

Experiments were directed to study the side effect of thimet ,lindane , DDT , heptachlore and temik on broad beans and Egyptian clover nodule forming bacteria.

Data in figure (51 & 52) show that all the tested pesticides tested, generaly decreased nodulation except in the case of thimet .

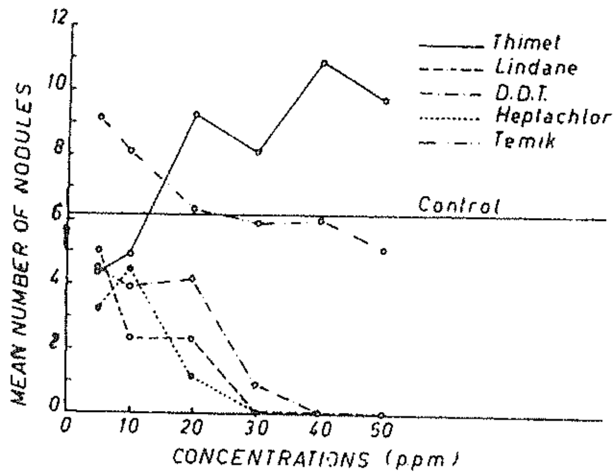


Figure 51 : Relation between the concentration of pesticides and mean number of nodules of broad bean.

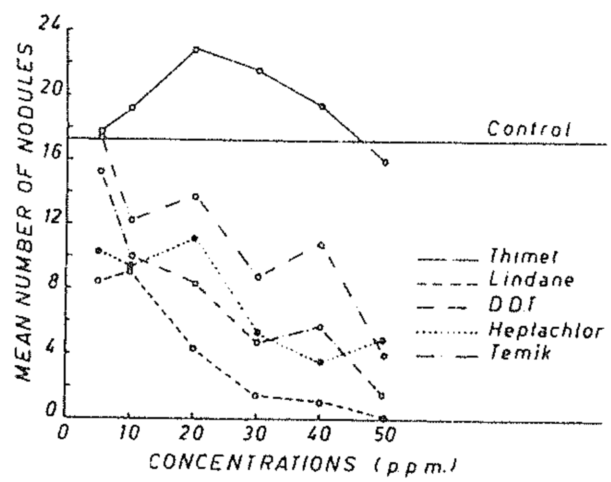


Figure 51 : Relation between the concentration of pesticides and mean number of nodules of clover

The side effect of 6 insecticides : Decamethrin, cypermethrin, fenvalerate, triazophos, mephospholan and DDT on the nodulation of broad bean *Vicia faba*, and the cowpea *Vigna sinenses*, was recorded

Results indicated that decamethrin and cypermethrin increased the number of nodules at all concentrations tested.

The percentage of increase ranged between (31.50% and 88.3 %) in the case of decamethrin and (12.3 % to 92.5 %) in the case of cypermethrin (figures 52 and 53).

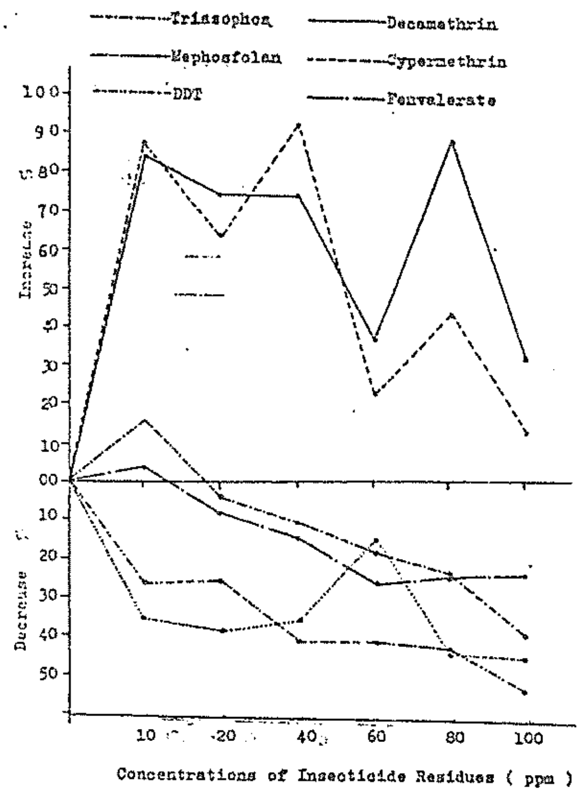


Figure 52 : Effect of some insecticide residues on nodulation in broad bean.

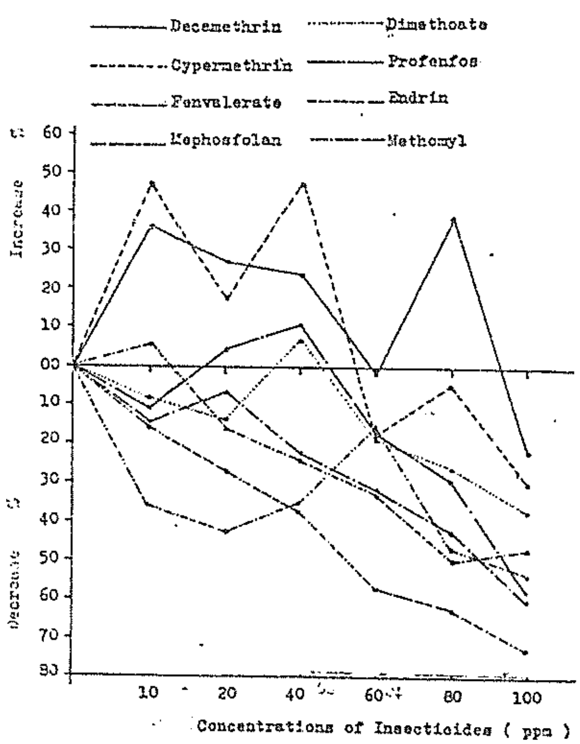


Figure 53 : Effect of some insecticide residues on nodulation in cowpea .

While on the other hand , fenvalerate . triazophos, mephosfolan and DDT inhibited nodulation in the roots of boad beans. At all concentrations, the number of nodules were decreased except at concentration 10 ppm in the case of triazophos and fenvalerate.

The percentage of decrease , varied between (8.5 % to 26.1 % , 404 % to 39.8 % ,14.3 % to 46.3 and 25.9 to 54.2 %) in the case of fenvalerate , triazophos. mephosfolan and DDT respectively.

4-Side effects on soil fauna:

Soil biological system consists of micro- and macroflora , macro- and macroorganisms.

Macroorganisms which inhibit soil consist of several species of animals , i.e collembolla , mites, nematodes, earth worms and several species of insects...etc. There is a natural balance between all those living organisms which is responsible by direct or indirect ways about soil fertility.

Can these pesticides residues disturb the balance beteen these organisms and affect their populations in soil?. To answer this qcuesion, series of experiments were conducted under field conditions .

Data indicated that the total number of animals fauna , figure 54 .fluctuated in the check plots and decreased nearly the half by the increase of weeks after treatment in the case of cotton cultivation.

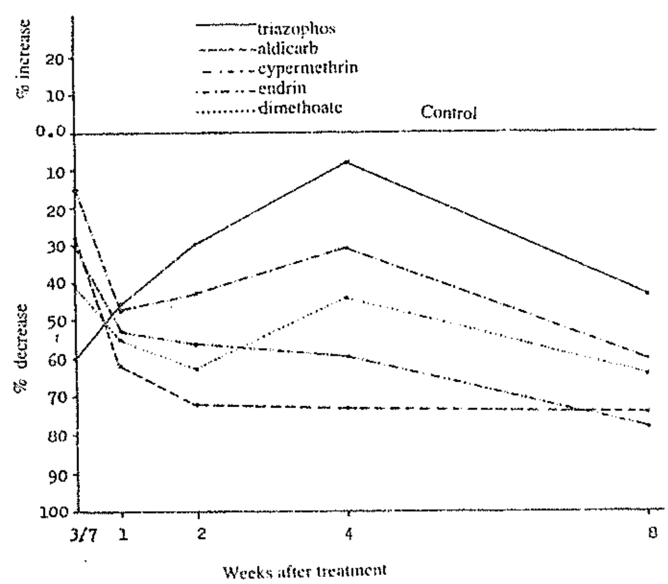


Figure 54 : Effect of some insecticide residues on total soil fauna in soil cultivated with broad bean.

While in the case of broad bean cultivation, the total number of animals in check fluctuated around a mean from week to week.

All insecticides tested lowered the counts of *Collembola* in all treatments (figure 55). The percentage of decrease varied between 73.2 -78.3 % during the 8 weeks in the case of triazophos ,while it was between (56.2 -71.7%) , (53.8-73.7 %) , (0.0-9.0%) and (30.9-78.3%) in the case of dimethoate , aldicarb ,endrin and cypermethrin res[ectively.

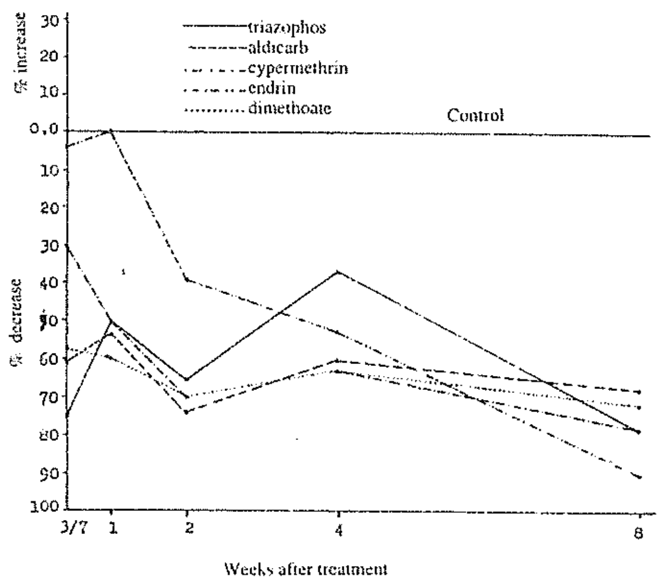


Figure 55 : Effect of some insecticide residues on the total number of collembola .

Triazophos , dimethoate and aldicarb decreased the number of collembola more than 50% after the first weak of treatment and for 8 weaks , while the percentage of decrease in cypermethrin treated plots reached 50 % only after the second week. Endrin lessened the number of *Collembola* to more than 50% after the fourth weak. All insecticides tested decreased the number of insects, (figure 56) in all treatment . Cypermethrin and endrin seem to eradicate the dipterious insects from treated soils.

For that entomologists showed considerable interest in the persistence of pesticide residues in soil.

The question of accumulation of these residues and their harmful effect on soil biological system can not be neglected.

Also experiments were conducted to study the side effects of pesticide residues on mites which are the most numerous arthropodes in our soil.

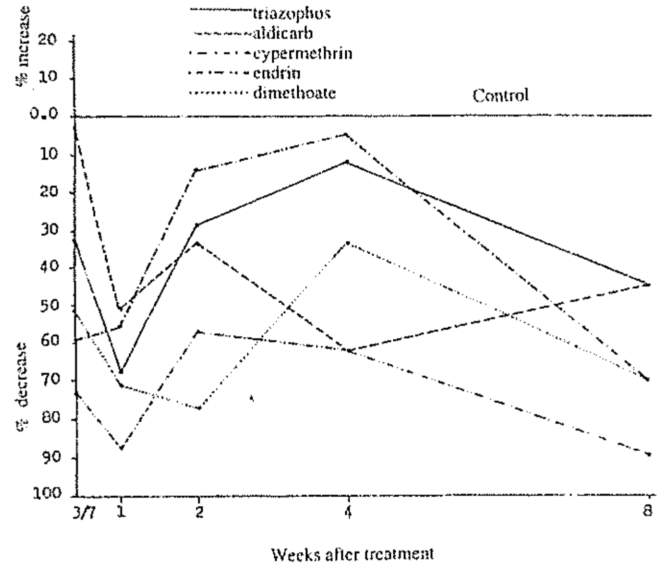


Figure 56 : Effect of some insecticide residues on the total number of soil insects .

Dimethoate , aldicarb and endrin decreased the total number of oribated mites (figure 57). The percentage of decrease varied between 11.63 to 48.55 % after 8 weeks in the case of dimethoate, while it varied between 12.62 to 90.65% and 47.66 to 76.58 % in the case of aldicarb and endrin respectively.

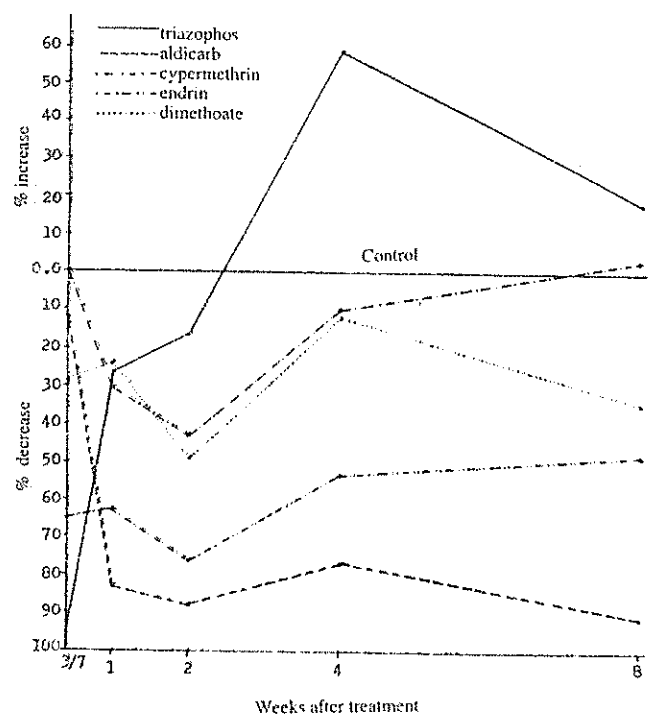


Figure 57 : Effect of some insecticide residues on the total number of oribated mites in soil cultivated with broad bean..

As their number show great seasonal fluctuation, two experiments were conducted in two different seasons, summer season in which the area was cultivated with cotton, while in winter ,the area was cultivated with broad bean.The soil was treated with nine insecticides (mephosfolan, profenofos, triazophos, dimethoate, fenvalerate , cypermethrin , methomyl , aldicarb and endrin) at rates equal to 5 times the recommended dose.

Results indicated that all insecticides tested decreased the predaceous mites (figure 58) at all treatments in both experiments . Some of these insecticides eradicated completely the predaceous mites after few weeks i.e. methomyl,mephosfolan, triazophos , dimethoate, and endrin.

Other insecticides tested decreased their number to more than 80 % for several weeks.

All insecticides tested also decreased total mites (figure 59) except fenvalerate which increased the population of mites only after the fourth week until the 8 th week in the case of cotton cultivation.

All insecticides tested decreased the oribated mites (figure 60) except in the case of fenvalerate and triazophos in both cotton and broad bean cultivations. The populations of these types of mites increased in the period between the fourth and 12th week after treatment and between fourth week and 8th week in both cotton and broad bean cultivations respectively.

5-Side effects on animals :

The nucleic acids namely RNA and DNA play a conspicuous role in the growth and metabolism which are basic morphogenetic happening in the tissue and organs differentiation. A considerable attention has been given to these aspects in plants and animals studies. Among the nucleic acids, the role played by RNA appears to be of fundamental importance , as it is reported to be concerned with the synthesis of proteins.

The interaction between chlordane and the synthesis of RNA was manifested in the fragmentation as well as the partial inhibition of the bodies containing the RNA. The bodies showed less affinity to the stain in contrast with the normal ones.

Chlordane was found to affect also the DNA content in the nucleus of rat liver, kidney and testes. The Feulgen reaction was approximately negative except for a few stained masses of DNA.

Such a reduction of DNA synthesis may partially account for the inhibition of mitotic in the cell. It has long been known that inhibition of nuclear DNA synthesis by certain chemicals invariably blocks mitosis.

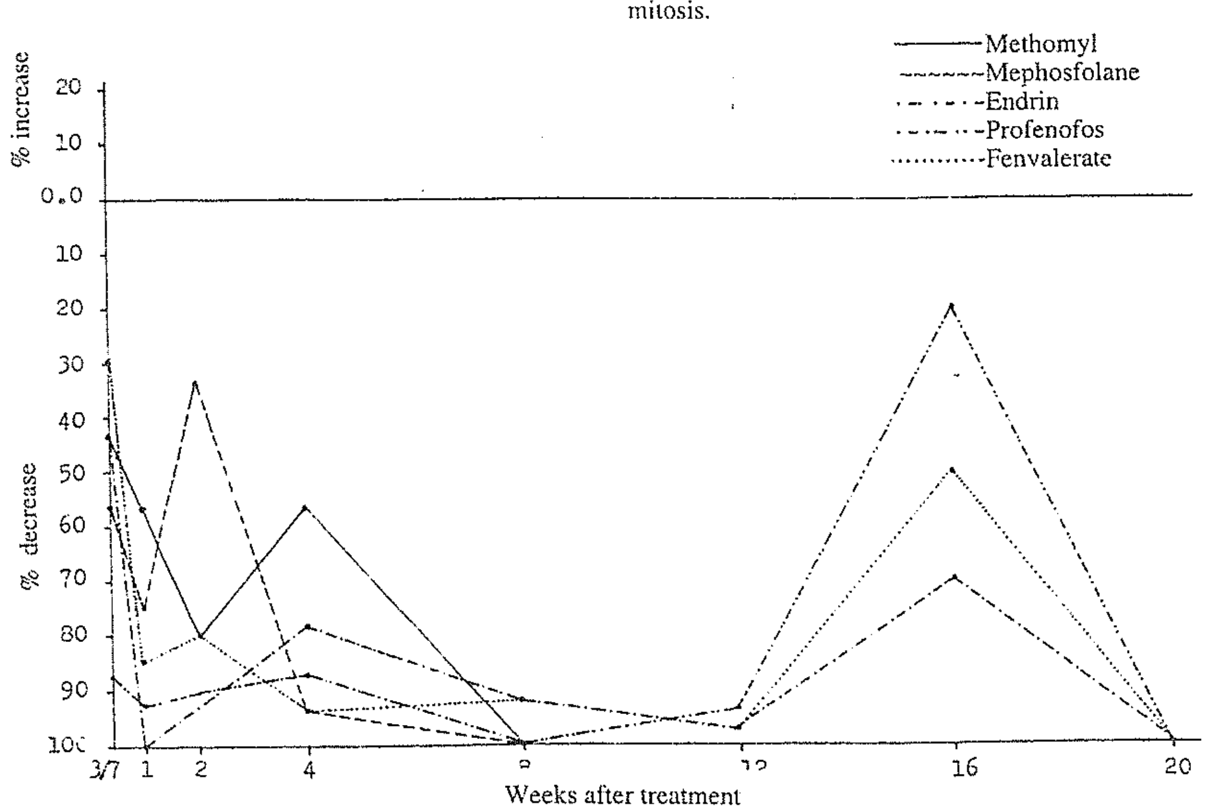


Figure 58 : Side effect of pesticide residues on predaceous mites in soil cultivated with cotton.

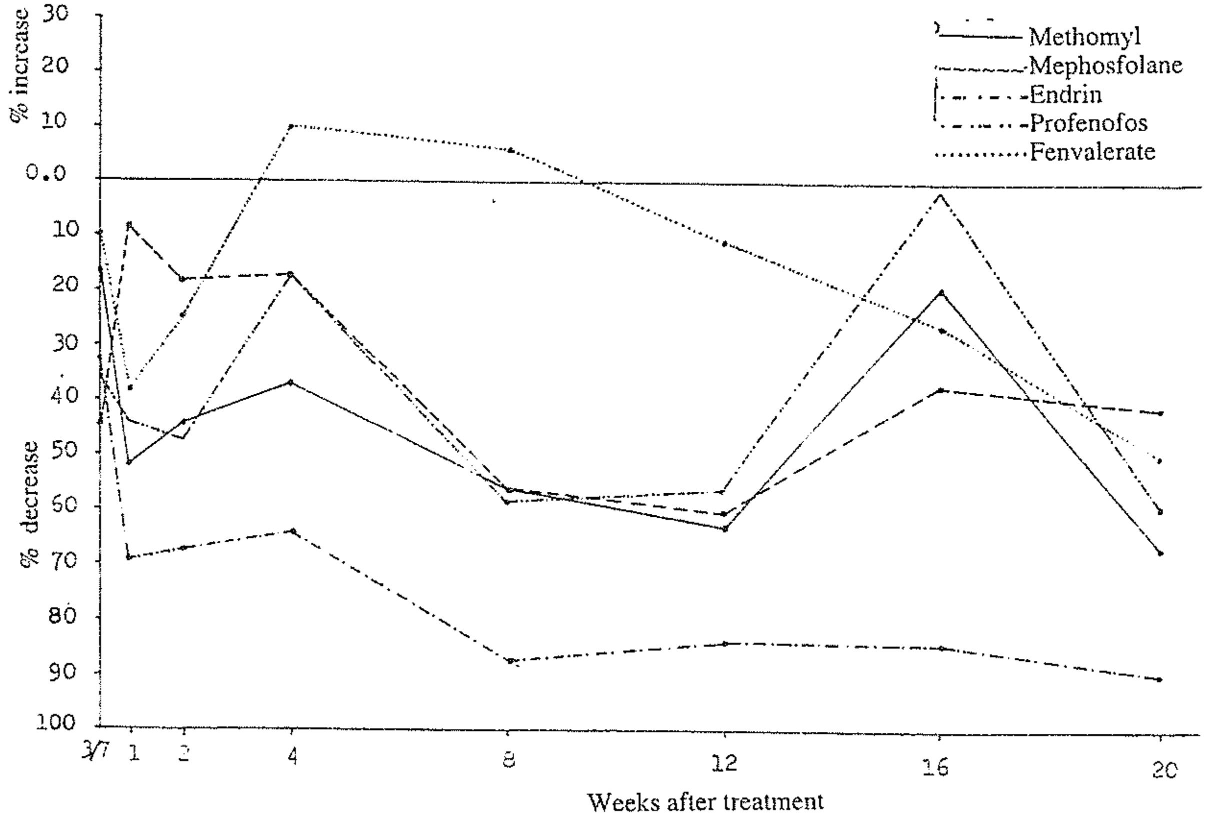


Figure 59 : Side effect of pesticide residues on total acarina in soil cultivated with cotton.

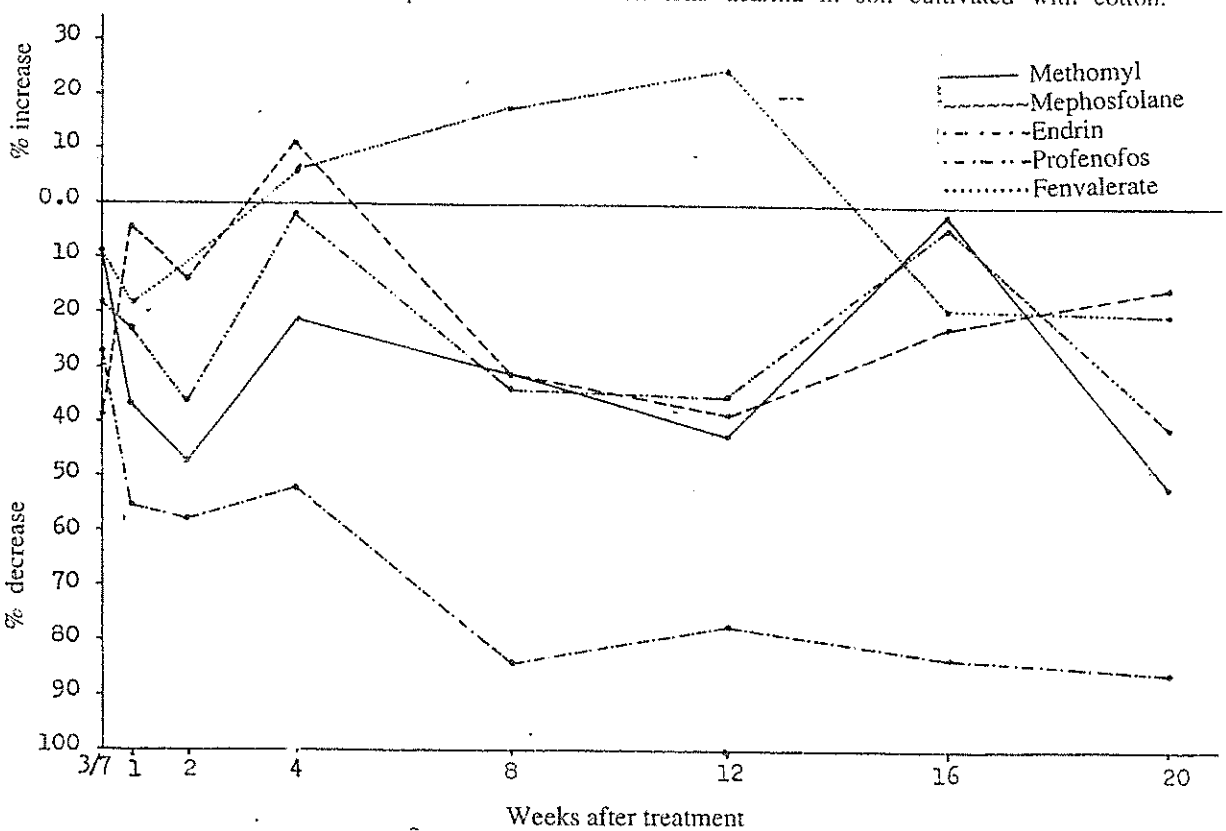


Figure 60 : Side effect of pesticide residues on oribated mites in soil cultivated with cotton.

Mephospholan was administered orally to male rats (*Rottus morvegious*), while the controls recieved saline Tween 80 only. This effect was comcerned with the content of deoxyribonucleic acid (DNA) and Ribnucleic acid (RNA) of rat testes ,liver and kidney at a dose of 20 ug/100 gm body weight , the period of adminstration was 150 days. Mephospholan caused variable changes in morphological and distribution of the neutral RNA and the inhibition of feulgen staining was more complete in nuclei from 150 days of treatment. The changes in DNA content could be attributed , not only to differences in the chromatid number, but also to physiological changes. Chlordane caused a decrease in DNA and RNA content at a dose of 20 ug/100 gm body weight for 150 days of treatment. Methomy caused a decrease in DNA and RNA contents of liver ,kidney and testes of male rats.

Case study

The eighth lesson

Side effects of agrochemicals on the Egyptian people

The problem of environmental pollution by pesticide residues has become one of the major problems which face both the developed and developing countries . Numerous individuals, societies , public organizations , governmental agencies , has become involved in the evaluation of the benifits and risks of the use of pesticides to increase agricultural yield and the risks which the pesticides may pose to human beings and ecosystem.

In Egypt it is necessary to take into consideration, the balance between the need to feed humans and the need to protect man and his environment. But practicaly, most of the attention is directed to increase food production with very little or no attention to the hazards to the environment.

1-Pesticide residues in food stuffs :

Measurable amounts of pesticide residues in our food present a variety of problem. More than 1000 samples from food stuffs were collected in 1984 from 11 governorates (Alexandria , Behera , Gharbia , Dakahlia , Sharkia, Kafr El-Sheikh, Kalubia ,Menofia , Cairo, Giza and El-Fayum) . to be analyzed for pesticide residues. Unacceptable residue levels of pesticide residues were detected in 100% ,58,7 % ,81.8%,80.0% ,66.6 % ,63.0%,60.0%,50.0% ,50.5 %36.3 % and 24.6 % of the samples from Cairo, Behera ,Gharbia, Kafre El-Sheikh, Dakahlia ,Giza,El-Fayoum, Alexandria, Monofia and Kalubia respectively.

After 10 years (1994) samples from the same governorates were collected and analyzed for pesticide residues. Data showed that unacceptable residue levels of pesticide residues were detected in 18 .3% ,5.7 % ,7.8%,9.0% ,7.3 % ,6.8%,6.9%,4.8% ,12.1 %3.7 % and 2.1% of the samples from Cairo, Behera ,Gharbia, Kafre El-Sheikh, Dakahlia ,Giza,El-Fayoum, Alexandria , Monofia and Kalubia respectively.

After 17 years (2001) samples from the same governorated were collected and analyzed for pesticide residues. Data showed that unacceptable residue levels of pesticide residues were detected in 0.3% ,0.1 % ,0.8%,0.08% ,0.5 % ,1.0%,0.1%,0.0% ,0.3 %0.2 % and 0.06% of the samples from Cairo, Behera ,Gharbia, Kafre El-Sheikh , Dakahlia ,Giza ,El-Fayoum, Alexandria , Monofia and Kalubia respectively.

2-Pesticide residues in imported food :

The level of pesticide residues in various imported diet samples, randomly collected from different parts of Egypt were determined . Most of the tested products contained organochlorine insecticides. i.e. endrin ,dieldrin, DDT, lindane and traces of some unidentified compounds, The levels of these residues in some products were higher than the FAO/WHO maximum residue limits. Particularly, the level was higher in the case of endrin and DDT in cereal grains, endrin in dried milk and DDT in frozen liver. However, pesticide residues in most of the analized samples were within accaptable level.

Data in table 19 show that about 89 % of the tested samples were contaminated with residues of pp' DDT. pp' DDE and op' DDE.48% of the imported food. Some samples contained lindane residues. Also 46 % , 42 % and 13 % of the analysed samples were polluted with endrin, dieldrin and heptachlor residues respectively.

DDT and its metabolities were detected in the imported frozen meat, liver, poultry and fish in higher levels than the acceptable International levels.While endrin , heptachlor ,dieldrin and lindane were generally detected within the acceptable limits.Heptachlor was detected in poultry and fish sample . While meat and liver samples were free from heptachlor residues.

Wheat and corn samples contained residues of DDT and endrin more than the acceptable limits.

Dieldrin residue in corn was also higher than the codex value, wheat flour contained much lower residues of pesticides comparing to grains . This must be due to the elimination of the fatty portion. while all the organochlorine pesticides are lipophilic. Many years after stopping the use of organochlorine pesticides from several years , still traces of these pesticide residues were deteced in human diet

Table 19 : Pesticide residues in 10 imported food groups.

FOOD GROUP	NO. OF SAMPLES ANALYSED	ENDRIN		DIELDRIN		pp'DDT		pp'DDE		op'DDE		HEPTACHLOR		LINDANE		NO. OF UNKNOWN PRODUCTS
		M	ND	M	ND	M	ND	M	ND	M	ND	M	ND	M	ND	
DRIED MILK	10	0.002	4	0.008	5	0.416	1	0.020	1	0.002	1	0.001	9	0.042	7	13
FROZEN MEAT	10	0.106	7	0.068	6	0.297	-	0.352	-	0.050	-	-	10	0.239	6	9
FROZEN LIVER	10	0.608	6	0.065	6	0.248	-	0404.	-	0.050	-	-	10	0.025	5	17
FROZEN POULTRY	15	0.012	9	0.616	10	0.924	-	0.082	-	0.082	-	0.006	13	0.614	3	9
FROZEN FISH	10	0.020	6	0.103	3	0.208	-	0.516	-	0.022	-	0.008	7	0.018	2	6
CANNED MEAT	10	0.102	4	0.111	8	0.318	-	0.242	-	0.120	-	0.002	6	0.'80	6	15
WHEAT	15	0.086	11	0.020	10	0.104	3	0.082	3	0.040	3	0.001	15	0.292	5	2
CORN	15	0.142	8	0.038	9	0.118	2	0.120	2	0.085	2	0.006	15	0.364	7	9
WHEAT FLOUR	10	0.002	7	0.002	8	0.106	7	0.001	6	0.002	7	-	10	0.001	8	9
TOMATO PAST	12	0.146	2	0.128	3	0.289	-	0.208	-	0.096	-	0.008	7	0.605	3	15
TOTAL	117		64		68		13		12		13		102		52	

M: Mean value of pesticide concentration in the tested samples in mg/kg.
ND: Number of samples in which no pesticides were detected.

3-Pesticide residues in total diet samples :

The average diet / person / day is tabulated in table 20 .

Pesticide residues were detected in total diet samples randomly collected from Cairo table 21.

Table 20 : Average composition of the Egyptian person's total daily diet.

Food group	Average weight(g/day)
drinking water	2810
whole milk	83.3
milk products	16.7
meat, fish or poultry	33.3
bread (cerial grains)	480.0
potatoes	100.0
vegetables	116.7
fruits and fruit juices	73.3
oils and fats	13.3
sugar and adjuncts	86.7

Table 21:Organochlorine insecticide residues in individual food groups of the total diet (ppm).

	endrin	dieldrin	lindane	ΣDDT
Drinking Water	min. 0.001	0.00	0.001	0.030
	mean 0.01	0.003	0.004	0.043
	max. 0.015	0.004	0.005	0.054
Whole Milk	min. 0.001	0.00	0.002	0.040
	mean 0.028	0.016	0.022	0.334
	max. 0.035	0.021	0.032	0.391
Dairy Products	min. 0.00	0.000	0.003	0.061
	mean 0.03	0.050	0.061	0.925
	max. 0.05	0.065	0.068	1.200
Meat,Fish,Poultry	min. 0.030	0.002	0.004	0.062
	mean 0.119	0.011	0.092	0.616
	max. 0.390	0.035	0.130	0.688
Bread (cereal grains)	min. 0.02	0.07	0.03	0.060
	mean 0.20	0.130	1.1	1.20
	max. 0.36	0.270	2.30	2.18
Potatoes	min. 0.03	0.08	0.001	0.03
	mean 0.21	0.134	0.30	1.10
	max. 0.63	0.230	0.65	2.13
Vegetables (tomatoes)	min. 0.00	0.02	0.03	0.20
	mean 0.01	0.12	0.21	0.70
	max. 0.21	0.30	0.45	0.29
Fruits and Fruit Juices	min. 0.00	0.00	0.00	0.00
	mean 0.003	0.001	0.002	0.05
	max. 0.010	0.050	0.045	0.16
Oil and Fats	min. 0.20	0.08	0.06	0.80
	mean 1.02	0.13	0.14	1.402
	max. 2.50	1.70	3.08	3.20
Sugar and Adjuncts	min. 0.00	---	0.00	0.000
	mean 0.002	---	0.003	0.001
	max. 0.03	---	0.010	0.020

More than 23 pesticide residues and their degredation products were detected by GLC. Endrin, dieldrin ,lindane and total DDT were the main residues detected in most samples.

The amount of pesticide residues consumed by the average person in the average diet was calculated. Results indicated that the feeding habits and behaviour of the Egyptian people play an important role in their daily intake of pesticide residues .

High quantities of drinking water and bread are consumed daily and these would be the main sources of intake.In fact bread was the source of more than 50% of the pesticide daily intake.The daily intake of endrin, dieldrin, lindane and total DDT from bread was 0.096 , 0.0624, 0.5280 and 0.5760 mg/ person, table 22 .

The total daily intake of pesticide residues was 0.1671 , 0.0955 . 0.7018 and 0.9578 mg endrin, dieldrin, lindane and total DDT/ person respectively, while the acceptable daily intake for the fore-mentioned insecticides is 0.14 ,0.007 ,0.7 and 1.4 mg/person respectively.

Table 22 : Pesticide residues daily intake (mg) for an Egyptian person.

Food group	endrin	dieldrin	lindane	DDT
drinking water	0.0028	0.0008	0.0112	0.1208
whole milk	0.0023	0.0013	0.0018	0.0278
milk products	0.0005	0.0008	0.0010	0.0154
meat. fish . poultry	0.0040	0.0004	0.0031	0.0205
bread (cerial grains)	0.0960	0.0624	0.5280	0.5760
potatoes	0.0210	0.0134	0.0300	0.1100
vegetables	0.0012	0.0140	0.0245	0.0816
fruits and fruit juice	0.0002	0.0007	0.0001	0.0037
oils and fats	0.0136	0.0017	0.0018	0.0019
sugar and adjuncts	0.0002	0.0000	0.0003	0.0001
Total	0.1671	0.0955	o.7018	0.9578
Acceptable daily intake for a person of 70kg,	0.014	o.oo7	0.7	1.4

Average daily intake of some pesticide residues for milk fed Egyptian infants :

The Egyptian infant is basically breast fed as the ratio of breast milk to formula milk is 3.69 : 1 . An amount of 120 gm/kg B.W. was used as an average for the daily diet for milk fed infant.

The average daily intake of some pesticide residues for milk fed Egyptian infants (first three months of life) was estimated on the average daily intake of milks as was assessed in a previous survey and the detected residue levels of some organochlorine insecticides in samples of both human milk and powder milk formulas (table 23).

Table 23 : Estimated pesticide residues in human milk and powder milk formula .

Pesticide detected	Pesticide residues human milk (mg/ kg)	powder milk formula (mg/kg powder)	NRL (mg/kg)
DDT	0.05690	0.43800	0.05000
Dieldrin	0.01513	0.00800	0.00600
Endrin	0.01170	0.00200	0.00080
Heptachlor	0.00086	0.00100	0.00600
Lindane	0.00080	0.04209	0.0.1000

The results show that the estimated daily intake for dieldrin and endrin were 0.0014311 and 0.0011053 mg/kg B.W. respectively, table 24 .

While the DDT residues were the largest quantities of residues in both human and powder milk but the estimated daily intake (0.0055124 mg /kg B.W) was less than the estimated ADI.

The estimated daily intake for heptachlor and lindane were also accepted compared with the ADI, table 25.

Table 24 : Estimated daily intake of pesticide residues from human milk and powder formulas.

Pesticide detected	Pesticide residues in mg/kg body weight human milk	powder milk formula	ADI
DDT	0.0068280	0.006570	0.020000
Dieldrin	0.0018156	0.000120	0.000100
Endrin	0.0014040	0.000030	0.000200
heptachlor	0.0001032	0.000015	0.000100
lindane	0.0000960	0.000630	0.008000

The avarage of estimated residues in powder milk samples appeared that residues of DDT , dieldrin, endrin and lindane were over the MRL , but the residues of heptachlor was less than the MRL

Table 25 : Average estimated daily intake of pesticide residues for milk fed Egyptian infants.

Pesticide detected	Pesticide residues in mg/kg body weight average estimated	ADI
DDT	0.0055124	0.020000
Dieldrin	0.0014311	0.000100
Endrin	0.0011053	0.000200
Heptachlor	0.0000815	0.000100
Lindane	0.0000889	0.008000

Egyptian infant average daily intake of some pesticide residues during his first year of life.

Data were collected from a survey conducted by the Egyptian Nutrition Institute of the Ministry of Public Health regarding the average amount and types of food given to Egyptian infants in the first year of their life as well as their average weight during such period. Table 26 shows the average diet / infant / day.

Table 26 : Average composition of the total daily diet of an Egyptian infant in the first year of life in grams.

Type of food	Average daily consumption
Human milk	287.775
Powder milk	64.775
Fresh milk	125.000
Eggs and meat	22.200
Beans	4.000
Rice	9.725
Cereals	14.250
Coocked vegetables	24.925
Raw vegetables	24.950
Potatoes	25.800
Fruits	28.300
Water	900.00

The average daily intake of some pesticide residues for the Egyptian infant in his first year was estimated based on the infants's average daily intake of different foods . Also residue levels of some organochlorine insecticides in these groups of foods and the average weight for Egyptian infants during the first year of life were detected., table 27.

Results indicated that the estimated daily intake (EDI) for dieldrin and endrin were 0.002187 mg/kg B.W. and 0.000626 mg/kg B.W. which exceeded the acceptable daily intake (ADI) established by the FAO/WHO.

The EDI of total DDT and lindane residues were below the ADI being 0.02 and 0.008 mg /kg B.W. respectively as established by the FOA/WHO.

Furthermore , the main bulk of pesticide residues intake is obtained from the different types of milk.

Table27: Pesticide residues in daily diet of Egyptian infants.

Type of Food \ Detected Residues		DDT	Dieldrin	Endrin	Lindane
Human milk:	ADR	0,056900	0,015130	0,011700	0,000860
	TEDI	0,016374	0,004345	0,003367	0,000247
Powder milk:	ADR	0,438000	0,008000	0,002000	0,042000
	TEDI	0,003546	0,000065	0,000016	0,000340
Fresh Milk:	ADR	0,316500	0,069500	0,002800	0,118000
	TEDI	0,039563	0,008688	0,000350	0,014750
Eggs & Meats:	ADR	0,000616	0,000011	0,000119	0,000092
	TEDI	0,000014	>0,000001	0,000003	0,000002
Beans:	ADR	N.D.	N.D	N.D	0,000001
	TEDI	—	—	—	>0,000001*
Rice:	ADR	0,000001	N.D	N.D	0,000019
	TEDI	>0,000001	—	—	>0,000001*
Cereals:	ADR	1.000200	0,000130	0,000200	0,001100
	TEDI	0,000017	0,000002	0,000003	0,000016
Cooked Vegetables:	ADR	0,000700	0,000120	0,000010	0,000210
	TEDI	0,000017	0,000003	>0,000001*	0,000005
Raw Vegetables:	ADR	0,000700	0,000120	0,000010	0,000210
	TEDI	0,000017	0,000003	>0,000001*	0,000005
Potatoes:	ADR	0,001100	0,000134	0,000210	0,000300
	TEDI	0,000028	0,000003	0,000005	0,000008
Fruits:	ADR	0,000050	0,000002	0,000003	0,000002
	TEDI	0,000001	>0,000001*	>0,000001*	>0,000001*
Water:	ADR	0,000043	0,000003	0,000010	0,000004
	TEDI	0,000039	0,000003	0,000009	0,000004

N.D. = Not detected.
* = Residue less than 0,000001, neglected in ADI calculation
ADR = Average Detected Residues (mg/kg).
TEDI = Total Estimated Daily Intake (mg).

The comparison of the estimated daily intake (EDI) of pesticide residues in Egypt with the ADI established by FAO/WHO shows that Egyptian infants intake was higher than what was accepted by

FAO/WHO.For dieldrin the estimated daily intake was 21.87 folds of the ADI , while for endrin it was 3.13. The estimated daily intake of total DDT and lindane was less than ADI , table 28.

Table 28 :Total and average daily intake of pesticide residues during the first year of infant life.

Detected Pesticide	Average estimated residues in total diet (mg)	Estimated daily intake (EDI) mg/kg	ADI* mg/kg	EDI/ADI Ratio
DDT	0.059616	0.002936	0.020000	0.4968
Dieldrin	0.013121	0.002187	0.000100	21.8700
Endrin	0.003753	0.000626	0.000200	3.1300
Lindane	0.015397	0.00266	0.008000	0.3206

4 - Monitoring of pesticide residues in drinking water :

Twenty eight water samples were collected from two governorates in Egypt and were analyzed for pesticide residues . The samples were selected to cover a range of exposure to pesticide usage and a variety of water sources (Nile river and underground water)

Results in table 29. indicate that 18 samples contained DDT and its metabolites at levels varied between 0.021 and 0.054 ppm. Fourteen samples contained dieldrin at levels varied between traces and 0.004 ppm. while 13 samples contained lindane at levels varied between 0.001 to 0.006 ppm. Endrin was detected in only 12 samples at level varied between 0.001 and 0.015 ppm, table 29. Results also indicated that more than 13 unknown compounds were detected.

Data show that most of the tested samples were from rural areas contained levels of pesticide residues higher than samples from urban areas.

The level of pesticides residues depends on the source of water. Underground water from depth more than 30 m. contained traces of pesticides. The highest levels of pesticides were detected in underground water from depth less than 14 m. Water samples from Nile river water sources contained from traces to 0.001 ppm of pesticide residues.

5 - Monitoring of pesticide residues in milk :

Chemical constituents of human , cow and buffaloes milk indicated that the percentage of fat in human milk varied between 3.67- 3.79 % , while it was 3.89-4.12 and 7.58-7.98 % for cow and buffaloes samples respectively,(table30).

Buffaloes milk samples headed all the tested milk samples in their content of protein followed by cow milk and human milk ,. Human milk headed all the other milk in its content of sugar.

Milk and its products are a main constituent of the daily diet , especially for vulnerable groups such as

Table 29 : Estimated pesticide residues in drinking water samples.

Samples	Pesticide Residues level (µg/Litre)										
	α-HCH	B-HCH	Lindane	Hepta-chlor	Aldrin	Dieldrin	o,p-DDT	p,p`-DDT	DDD	DDE	Σ DDT
Tapwater (Shibrachit)	0.079	0.016	0.013	-	0.021	0.103	-	-	-	0.121	0.121
Tapwater (Damanhour)	0.013	0.017	-	-	0.014	-	-	-	-	-	-
Tapwater (Desok)	0.018	0.014	-	-	-	0.084	-	-	-	-	-
Tapwater (Itay El-Baroud)	-	0.009	-	0.031	-	0.046	-	-	-	-	-
Tapwater (Mahmodia)	0.044	0.129	0.028	0.060	-	-	-	0.086	0 043	-	0.129
Under ground water (30 m depth)	0.034	0.094	-	0.019	-	-	0 056	-	0.053	0.123	0.234
Ground water (14 m depth)	-	-	-	0.030	0.063	0.16	0.052	-	0.032	-	0.084
Ground water (27 m depth)	-	-	-	0.014	0.048	-	-	-	-	0.096	0.096
Tapwater (Alexandria)	0.056	0.156	-	0.096	0.048	0.025	0.058	-	-	0.082	0.140

Table 30 : Chemical constituents of different types of milk.

Type of milk	Mean percentage			
	Ash	Fat	Protein	Lactose
Cow	0.67	3.65	3.39	5.04
Buffalo	0.86	7.51	4.79	4.60
Human	o.32	3.69	2.25	6.33

infants , school age childrin, pregnant, lactating women and old age.

A total of 125 samples were collected at random from different sources and sites in Egypt. Seven samples were mother's milk. 67 were cows milk and the rest were buffaloes milk.

All the tested samples of buffaloes and cow milk contained DDT and/or it's metabolites , lindane , endrin ,dieldrin, while 85% of the tested human samples contained one or more of the investigated pesticide.

The presence of these residues varied between traces to 11.9 ppm , in buffaloes (table 31) and cow milk (table 32), while the maximum residue level was 1.26 in the case of mother's milk (table 33). The level of pesticide residues was related to the fat content of the tested milk .Buffaloes milk (7.51 % fat) headed Cow (3.65 % fat) and mothers milk (3.69 % fat), in its content of pesticide residues followed by cow and finally mother's milk.

Table31: Average estimated chlorinated hydrocarbon insecticides in buffaloes milk.

Residues	Mean ± S.E. ppm	Residues range (ppm)	incidence %	MRL. or ERL mg/kg
Aldrin	0.032±0.0291	0.0 - 0.1138	44	0.006*
Chlordane	0.041±0.0385	Traces -1.4275	65	0.002
Dieldrin	traces	0.0 -Traces	10	0.006
Total DDT	0.371±0.6011	Traces -4.3753	32	0.050
Endrin	traces	0.0 -Traces	8	0.008
Heptachlor	0.398±0.2793	0.0 -0:8898	25	0.006
Lindane	0.005±0.0046	Traces -0.0300	54	0.010

Table 32: Average estimated chlorinated hydrocarbon insecticides in cow milk.

Residues	Mean ± S.E ppm (ug/kg)	Residues range (ppm)	Incidence %	MRL or ERL mg/kg
Aldrin	0.023±0.0189	0.00-0.1138	56	0.006*
Chlordane	0.098 ±0.0325	0.00-1.2357	67	0.002
Dieldrin	ND	-	0	0.006*
Total DDT	0.312±0.5027	0.00-3.6721	24	0.050
Endrin	ND	-	0	0.008
Heptachlor	0.107±0.0652	0.00-0.9753	31	0.006
Lindane	0.004±0.0031	0.00-0.0214	47	0.010

Table 33: Average estimated chlorinated hydrocarbon insecticides in human milk.

Residues	Mean ± S.E. ppm	Residues range (ppm)	incider %	
Aldrin	0.003 ± 0.0017	0.00-000112	28	0.006
Chlordane	0.003 ± 0.0023	0.00-0.0143	14	0.002
Dieldrin	Traces	0.00- Traces	14	0.006
Total DDT	0.056± 0.0096	Traces-0.5107	100	0.050
Endrin	0.011± 0.0027	0.00-0.0340	28	0.008
Heptachlor	0.008± 0.0012	0.00-0.0340	85	0.006
Lindane	0.008± 0.0309	0.00-0.0309	71	0.010

A total of 525 samples were collected from greater Cairo (Cairo, Giza and Kaluobia governorates) during the autumn season as it follows the summer period during which the maxmum use of pesticides takes place for controlling cotton pests.Results indicated (table 34),that aldrin residues were detected in 28.6 and 86.7 % of packed and bulk milk respectively. Residues levels ranged from 0 to 0.1024 mg/ L and from 0 to 0.1049 mg/ L in both packed and bulk milk.

Dieldrin residues were detected only in packed milk. The residue levels ranged from 0 to 0.0184 m/L. Only 14.3 % of the packed milk samples contained dieldrin, table 34 . Chlordane was detected in 85.71 and 93.3 % of both packed and bulk milk samples respectively. The residue levels ranged from 0 to 0.11 and 0 to 1.27 mg/L respectively.Only 14.29 % and 26.67 % of the packed and bulk milk samples respectively contained DDT . Residues levels ranged

Table 34 : Percentage of incidence of different chlorinated hydrocarbon insecticides contaminated the packed and bulk milk samples within specific concentration.

Detected residues	Rind of Milk sample	Residues range in ppm	Percent incidence	Average Mean ± S.D in ppm
Aldrin	Packed	0.0 - 0.1024	28.57	0.0309 ± 0.0383
	bulk	0.0 - 0.1049	86.67	0.0247 ± 0.0293
Chlordane	Packed	0.0 - 0.1155	85.71	0.0259 ± 0.0403
	bulk	0.0 - 1.2710	93.33	0.0214 ± 0.0347
Dieldrin	Packed	0.0 -0.0484	14.29	0.0069 ± 0.0183
	bulk	N.D*	00.00	N.D*
ΣDDT	Packed	0.0 - 11.9950	14.29	1.7071 ± 4.5167
	bulk	0.0 - 3.786	26.67	0.3337 ± 0.9706
Endrin	Packed	0.0 - 0.3644	14.29	0.0521 ± 0.1377
	bulk	N.D*	00.00	N.D*
Heptachlor	Packed	0.0308 - 2.1312	100.00	0.5650 ± 0.7288
	bulk	0.0 - 1.0143	23.33	0.4276 ± 0.3553
Lindane	Packed	0.0 - 0.0098	85.70	0.003 ± 0.0035
	bulk	0.0 - 0.0111	80.00	0.0051 ± 0.0039

from 0 to 11.9 9 and 0 to 3.78 mg/L were detected respectively.Packed milk contained endrin in 14.29 % of samples at levels ranged from 0 to 0.36 mg/L ,while no residues were detected in bulk milk samples. Heptachlor residue levels ranged from 0.03 to 2.13 and from 0 to 1.014 mg/L in both packed and bulk milk samples. Hundred percent of packed milk and 73.3 % of bulk milk were contaminated with heptachlor residues. Lindane residues were detected in 85.77 % and 80% of both backed and bulk milk respectively. The residues varied between 0 to 0.009 mg/L and 0 to 0.11 mg/L respectively .

Results in table 35 , show the average detected residues (ADR) as calculated from all samples and the maximum residue level (MRL).

Table 35 : Average detected residues (ADR) , MRI and ADR / MRL of insecticides in the trested milk samples.

Insecticide	ADR ppm	MRL* mg/L	ADR/MRL ratio
Aldrin	0.0267	0.0060	4.45
Chlordane	0.0228	0.0020	11.40
Dieldrin	0.0022	0.0060	0.37
ΣDDT	0.7707	0.0500	15.41
Endrin	0.0166	0.0008	20.75
Heptachlor	0.4713	0.0060	78.55
Lindane	0.0046	0.0100	0.46

* *MRL = maximum residue level*

These results indicated that aldrin, chlordane, DDT and heptachlor residues were exceeded the MRL. The highest ratio was shown in heptachlor, it was 78.55 folds more than the MRI.

Data also indicated that all the bulk and packed milk samples tested were free from 5 PCB's residues (Archlor 1016 , archlor 1221 , archlor 1242 .archlor 1248 and archlor 1254).

Results also show that no malathion residues were detected in all samples tested . Dimethoate residues were detected in 14.3 % of packed milk samples. while bulk milk samples were free from dimethoate.

6 - Pesticide residues in milk and milk products :

It has been well demonstrated that pesticide residues can be adsorped or translocated in many crops

Clover can translocate or adsorp these residues from soil to enter the food chain through using these plants as cattle feed. The presence of these residues lead to residues in their milk and meat.

Our previous results indicated the presence of several pesticide residues in cow and buffaloes milk.A sample of cow milk was polluted by lindane or endrin at the rate of 10 ppm active ingredient.

Treated milk was manufactured to several products : cream, butter, cheese, youghort and samna under laboratory conditions. Pesticide residues were detected in all the products

Residues concentrated in samna (pure heated fat), followed by cream. The concentrations of these residues were 32.5, 23.25 ,21.25 ,18.5 ,7.5 ,5.5 and 0.525 ppm in samna , cream, murta , butter, cheese , youghort and skim milk respectively.

Data in table 36 show that lindane was detected in all products except whey and butter milk .The cheese contained 7.0 ppm. The corresponding figure when this expressed as ppm/g fat was 0.333. The percentage retention of lindane in cheese was 30.2 %.

The youghort contained 5.5 ppm of lindane with a percentage retention of 66.0 .

In the case of endrin treatment , table 37 , the concentrations were 23.5 , 17.2 , 15.2 and 14.1 ppm in samna , murta, cream and butter respectively.

The cream and samna contained 23.25 , and 32.5 ppm. These gave a corresponding figures of 0.275 and 0.326 on the fat bases . The retention was 34.0 and 29.6 % in cream and samna respectively.It is a fact that the insecticide concentration in milk product (on fat bases) in skim, butter milk and whey are higher than the product from which these by-products were seperated

Table 36 : Fate of lindane during processing of milk into some dairy products.

Product	Fat %	lindane/ ppm	ppm/ g/fat	retebtion %
untreated milk	7.3	0.03	-	-
treated milk				
with 10 ppm	7.3	8.05	1.103	80.3
cheese	2.1	7.00	0.303	30.2
yoghurt	7.6	5.50	0.726	66.0
cream	62.0	23.25	0.375	34.0
samna	99.6	32.5	0.326	29.6
skim milk	0.1	0.53	5.3	-
whey	0.2	0.175	0.675	-
murta	50.0	21.2	0.424	-

Neary same results were clear in the case of endrin ,table 37 . The chease from contaminated buffaloes milk contained 5.13 ppm endrin. The corresponding figure on the fat basis was 0.244 which means a retention of endrin at 22.1%.

The concentration of endrin in creana and samna were 15.2 and 23.52 ppm . Expressing these values on the fat bases, they were 0.245 and 0.236 ppm /g fat respectively.

The above results indicated that the concentration of both lindane and endrin increased with the increase of the fat in the produced product.

Table 37: Fate of endrin during processing of milk into some dairy products.

Product	Fat %	endrin/ ppm	ppm/ g/fat	retebtion %
untreated milk	7.3	0.02	-	-
treated milk				
with 10 ppm	7.3	8.60	1.103	85.8
cheese	2.1	5.13	0.244	22.1
yoghurt	7.6	2.66	0.342	31.0
cream	62.0	15.20	0.245	22.2
samna	99.6	23.52	0236	21.4
skim milk	0.1	0.04	0.4	-
whey	0.2	0.10	0.5	-
murta	50.0	17.18	0.344	-

7-Average daily intake of pesticide residues by Egyptian person:

The amount of pesticide residues consumed by the average person in the average diet was calculated . Results indicated that feeding habits and behaviour of the Egyptian people play an important role in their daily intake of pesticide residues.

High quantities of drinking water and bread are consumed daily and these would be the main sources of intake.

In fact ,bread was the main source of more than 50% of the pesticide daily intake.

The daily intake of endrin, dieldrin, lindane and total DDT from bread was 0.0960 , 0.0624 ,0.5280 and 0.5760 mg / person.

The total daily intake of pesticide residues was 0.1671 , 0.0955 ,0.7018 and 0.9578 mg endrin, dieldrin, lindane and total DDT/ person respectively, (table 22) , while the acceptable daily intake for the fore-mentioned insecticides is 0.0140, 0.0007, 0.7 and 104 mg/ person.

8-Side effect on the next generations :

The average daily intake of some pesticide residues for milk fed Egyptian infants (first three months of life) was estimated based on the average daily intake of milk as was assessed in a previous survey and the detected residues levels of some organochlorine insecticides in samples of both human milk and powder milk formulas.

The results show that the estimated daily intake for dieldrin and endrin were 0.0014311 and 0.0011053 mg/kg B.W. respectively. While the DDT residues were the largest quantities of residues in both human and powder milk but the estimated daily intake of (0.0055124 mg/kg B.W) was less than the established ADI.

The average daily intake of some insecticide residues for the Egyptian infant in his first year was estimated based on the infant's average daily intake of different foods as assessed in a pevious survey.

The detected residue levels of some organochlorine insecticides in these groups of food, and the average weight for Egyptian infants during the first year of life was estimated. Results indicated that the estimated daily intake (EDI) for dieldrin and Endrin were 0.002187 mg/kg B.W. and 0.000626 mg/kg B.W., which exceeded the acceptable daily intake (ADI) established by FAO/WHO.

The EDI of DDT and lindane residues were below the ADI being 0.02 and 0.008 mg/kg B.W. respectively as established by the FAO/WHO. Furthermore ,the main bulk of pesticide residues intake is obtained from the different types of milk.

The average daily intake of some pesticide residues for the Egyptian persons and for infants during his first year of life (6 kg) was estimated based on the average daily intake of milk.

The estimated daily intake of Aldrin, dieldrin , chlordane, DDT, endrin, heptachlor, lindane and dimethoate in all milk samples for Egyptians were 0.000041, 0.000032, 0.001079, 0.000023, 0.0000660, 0.000006 and 0.00019 mg / kg B.W. respectively.

Also, the estimated daily intake of the same residues in milk for Egyptian infants were 0.000601 mg/kg for aldrin and dieldrin, 0.000474 mg/kg for chlordane ,0.016031 mg/kg for DDT , 0.000345 mg/kg for endrin, 0.009803 mg/kg for heptachlor, 0.000096 mg/kg for lindane and 0.000243 mg/kg for dimethoate . While the acceptable daily intake for these pesticides are 0.0001,0.0005, 0.02,0.0002,0.0001,0.008 and 0.01 respectively.

Case Study

The ninth lesson

Fresh water pollution by agrochemical

Due to the extensive use of agrochemicals in the last fifty years, Egyptian fresh water was polluted by pesticide residues , nitrate, nitrite and heavy metals.

Out of 50 fresh water samples , 41 samples contained insecticide residues. Nine samples were free from endrin, dieldrin, lindane and total DDT. The minimum and maximum residues levels of endrin, dieldrin, lindane and total DDT were (0.001-0.015) , (0.000-0.004), (0.001-0.005) and (0.030-0.054) ppm respectively.

Tap water samples which were taken from 8 Governorates in Egypt were analyzed by using atomic absorption of Fe ,Cu.Li ,Mn, K and Na. Data indicate that the maximum levels which were detected in water samples for Fe ,Cu ,Li, Mn, K and Na were 0.184 ,0.356,2.518,0.884,11.016,11.71, and 13.98 mg/l. respectively, while the minimum levels for the same elements were 0 ,0 ,0, 0, 0.024, and 2.42 mg/L respectively.

Data indicate that the maximum levels which were detected for Fe, Cu, Mn, and Zn were well below the accaptable levels recommended by Egypt.

While the level of Mn was more than the acceptable levels in only 6.9 % of the samples tested.

The guideline value of 0.05 mg/L has been recommended for lead in drinking water as reported by WHO 1984 . while the Egyptian guidline value is 0.1 mg/L.

Monitoring of lead in tap water was conducted in 8 Governorates in Egypt to throw high lights about the interaction between the level of lead in drinking water and the public health taking in consideration that the Egyptian people drink daily 2.8 litres of water. Data indicate that all the samples contained concentrations of lead varied between 0.118 mg/L to maximum level of 0.945 mg/L exceeding the Egyptian and WHO levels. The variation of water contents from lead varied according to the age of tube lines. the absence of water tanks on buildings and the source of water (Nile water or underground water). The main source of lead in tap water may be attributed to several reasons .i.e. the contents of water tubes from lead, the lead part of tube which is normaly connected in each house between the water meter and the main net of tubes in houses, the high content of water from chlore compounds and due to the insertions of water pumps which is normally made from lead in Egypt.

The daily intake of the Egyptian people of lead through respiration is varied greatly according to rural or urban areas. While the daily intake of Egyptian person in middle Cairo through respiration is 0.043 mg/person. It was 0.009 ,0.02 and 0.0003 mg / person in Dokki , Shobra El-khema and Moshtohor village.The daily intake of the Egyptian person from water is 1.316 mg/ person where the Egyptian person drink 2.81 litre/ day. The daily intake of lead through meal diet was estimated to be 0.592 mg/person. That means that the daily intake of the Egyptian person from lead is varied between 2.911 and 2.246 mg / person. Data show that daily intake of the Egyptian person is below the acceptable daily intake which is recommended by WHO. WHO established a PTWT of lead of 50 ug/kg B.W. (= 3.5 mg/person 70 kg).

Because of the special concern for infant and children .WHO later evaluated the health risks of lead to this group and established a PTWT 0.025 ug/kg B.W. This level refers to lead from all sources.

Case Atudy

The tenth lesson

Carcinogenic risk of pesticides in Egypt

Epidemiological studies in humans exposed to chemicals have indicated the possible existance of some relations between exposure to certain chemicals and the ividence of cancer in Man.The extensive used of pesticides in the last 50 years has raised much concern with respect to their possible carcinogenic risk.

Experimental animals work has indicated such possibility in specific instance. In Egypt , the risk is more prominent because of the huge amounts of pesticides used (690000 metric tons since 1952), the lake of proper protective measures during handling and application and the loose control on the residue of such pesticides in food and feed, added to that, is the continued use of some highly persistant pesticides whose use has been prohibited in most other countries, and are reputed to have cancer producing potential.

This study is an attempt to explore the possible carcinogenic risk of the excessive use of pesticides in Egypt. The amount of pesticides used in each governorate in Egypt since 1952 and cancer deaths since 1964 were collected from the archives of the central Agency for Public Mobilization and Statistics.

Data indicated that most of the pesticides used still the mid sixties were chlorinated hydrocarbons. There was a steady increase in the cancer deaths in Egypt which followed the increase of use of pesticides . Such increase was more prominant in the governorates where the use of pesticides was more than others.

In these cases the cancer death rate was more among villagers than among dewellers, figure 61, 62 , 63 and 64 and in both cases, the cancer death rate was more among males than among females. These data could point out to the fact that the cancer death rate was higher among those who are ocupationally exposed to pesticides namely male villagers.

The increase in the number of death cases by kidney and liver failure is clear now in Egypt and

Figure 61 : The quantity of pesticides (p), population and cancer death rate in towns (T) and villages (v) in Qualiobia Governorate.

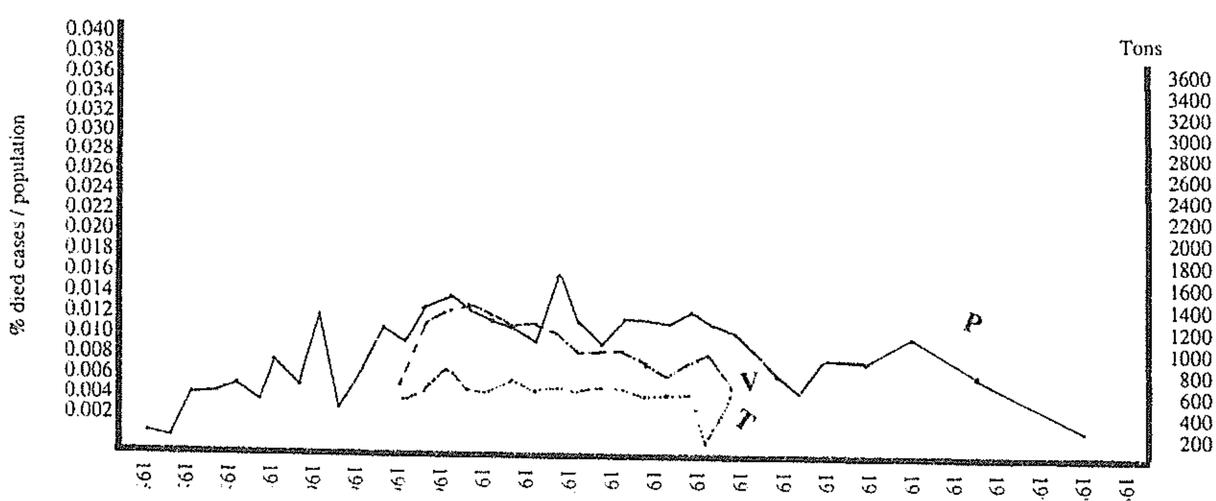


Figure 61 : The quantity of pesticides (p), population and cancer death rate in towns (T) and villages (v) in El-Behera Governorate.

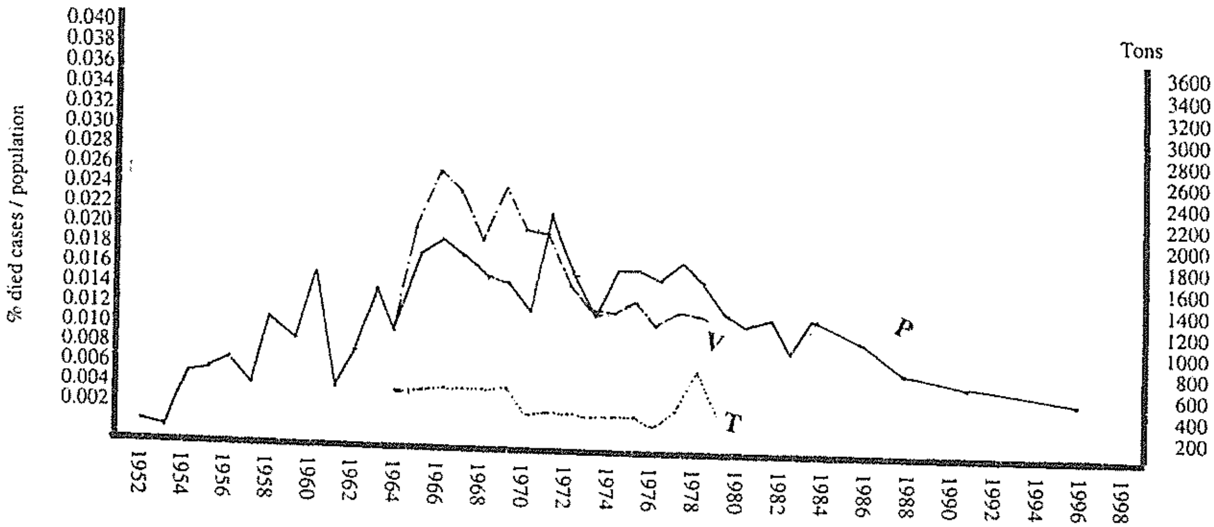


Figure 61 : The quantity of pesticides (p), population and cancer death rate in towns (T) and villages (v) in El Sharkia Governorate.

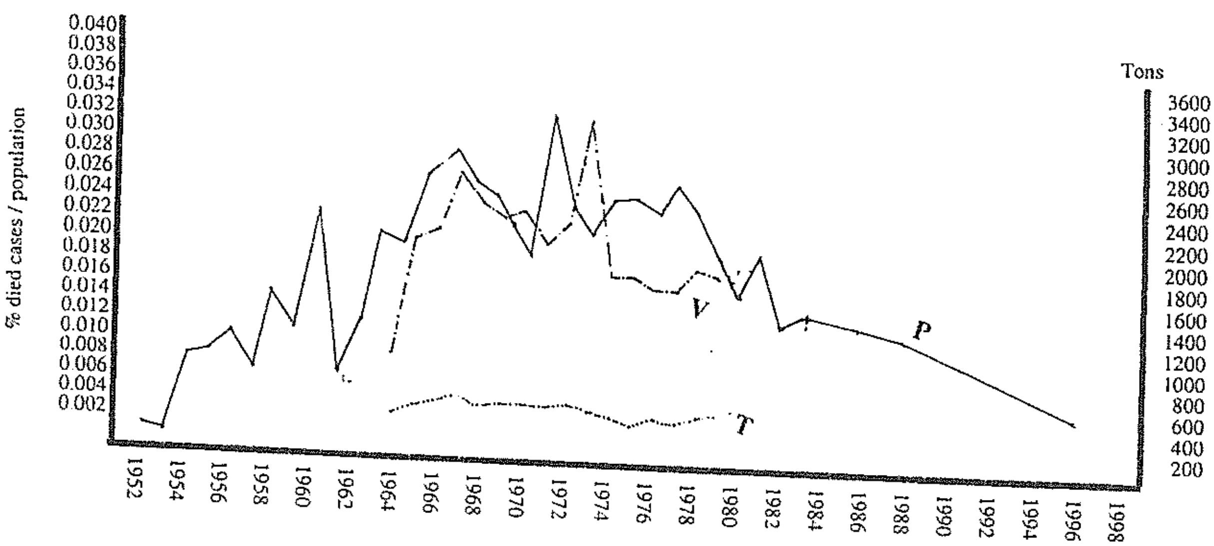
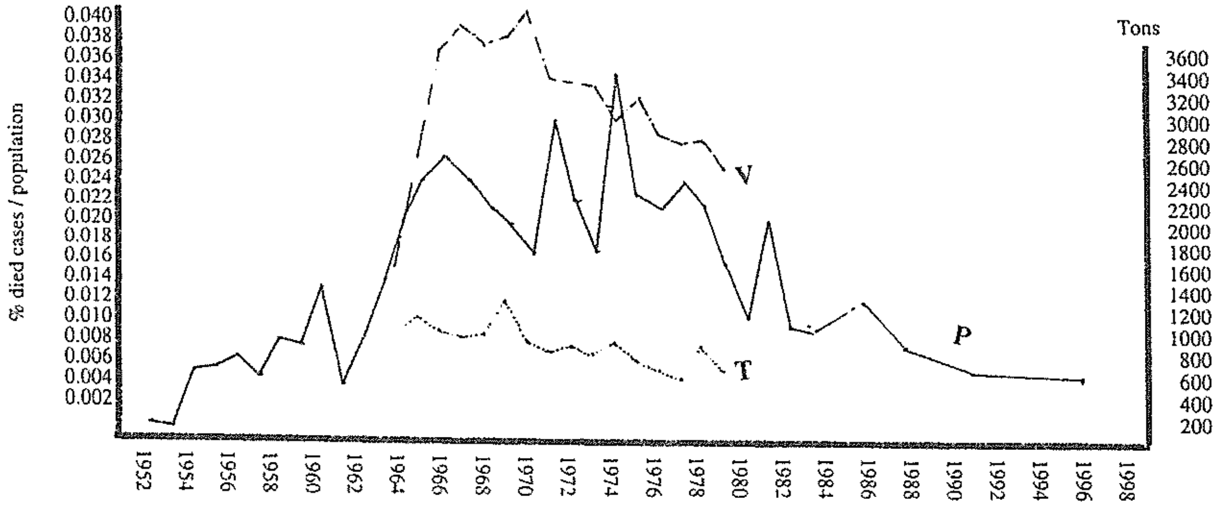


Figure 61 : The quantity of pesticides (p), population and cancer death rate in towns (T) and villages (v) in El-fayoum Governorate.



Hair as a bioindicator for the daily intake of lead by Egyptian people

Two hundreds and thirty four samples of Egyptian hair from both adults and children (less than 15 years old) were analyzed for lead. Samples were taken from four locations (Moshtohor village) , High polluted area in Cairo (Ramsis and Tahrir Squares), semi polluted area (El-Maadi) and an area nearly free from pollution (El-Salhia).

The daily intake of the Egyptian people of lead through respiration is varied greatly according to rural or urban areas and according to the density of trafics and the numbers of factories.While the daily intake of each person in the highly polluted area in cairo through respiration is 0.034 mg /person.it is 0.007 , 0.003 and 0.0001 in El-Maadi. Moshtohor and El-Salhia.

The daily intake of the Egyptian person from water is 1.316 mg/person where the Egyptian person drink 2.810 litre/day. The daily intake of lead through meal diet was estimated to be 0.592 mg / person. That means that the daily intake of the Egyptian person from lead varied between 2.891 and 2.246 mg /person

Results indicated a marked variation of the hair-Pb concentrations which were detected in the different samples from the four localities.The mean level of lead which was detected in adult hair was 95.3 ppm in adults of highly polluted area,while it was, 59.3 ,35.7 and 23.7 ppm in El-Maadi ,Moshtohor,Salhia respectively

While the levels were 83.3 ,52.0,31.0 and 11.4 for children in the same tested areas respectively.

Results indicated that there was a correlation between the daily intake and the level of lead in Egyptian hair.While the correlation between air pollution and the level of lead in hair was very clear.

The relation between the daily intake of heavy metals and their levels in the Egyptians teeth.

It is well known that 94-95 % of the total body lead (body burden) is accumulated in bones. Teeth have been used in this study as indicator of integrated long-term exposure and have the advantage that samples are easy to be analyzed.

One hundred and thirty five samples of teeth were collected from Rural (Moshtohor village) and Urban (Shobra El-Khema) areas.The daily intake of the Egyptan people of lead through respiration,drinking water and through meal diet was estimated for the people in both areas.

Data indicate that the daily intake of lead through respiration for the adult was 0.003 and 0.02 mg/ person in both Moshtohor and Shobra El-Khema respectively. While the daily intake of lead through drinking water for both was 1.316 mg / person.The daily intake of lead through meal diet was estimated to be 0.592 mg / person..

Results indicate that the mean daily intake of the Egyptian person from lead varied between 1.928 mg /person in Shobra El-Khema and 1.911 ppm /person in Moshtohor village.

The level of lead and heavy metals varied greatly in the teeth of persons in both tested areas.While the mean level of lead in adult persons was 55.52 ppm in Shobra El-Khema ,it was 28.72 in Moshtohor.Same trends were clear in the other tested heavy metals ,(Cu.,and Zn).

For that the level of lead and heavy metals in human teeth can be considered as bioindicator for their daily intake.

The daily intake of the Egyptian people of lead through respiration is varied greatly according to rural or urban areas.While the daily intake of the Egyptian person in middle Cairo through respiration is 0.034 mg/person,it was 0.009 .0.02 and 0.003 mg/person in Dokki,Shobra El-Khema and Moshtohor village. The daily intake of the Egyptian person from water is 1.316 mg/person where the Egyptian person drink 2.810 litre/daily . The daily intake of lead through meal diet was estimated to be 0.592 mg/person. This means that the daily intake of the Egyptian person from lead is varied between 2.911 and 2.246 mg/person as reported by Abdel-Gawaad et al 1993.Data show that daily intake of the Egytian person is below the acceptable daily intake which is recommended by WHO 1977.

On a population wide basis tooth lead levels appear to vary according to housing status and presumably lead exposure . Results tabulated in table 38 . show that there was a great variation in the level of lead in the tested samples. The range varied between 21.4 to 78.48 ppm . The level depends on the location and the age of the person.The age of the adults teeth samples varied between 20 and 65 years. The highest level was detected in one sample (78.48 ppm) This special case was sample from a man living in Shobra El-Kema 65 years old. While the level of lead in most of the adult samples varied between 29.88 ppm to 64.12 ppm.

In the case of children ,this level did not exceed 37.56 ppm and the minimum was 21.4 ppm.,table 39 .

Samples from the highly polluted area in Cairo (Shobra El-Khema) indicate that the samples from this location contained higher level of lead in both children and adults when compared with the samples of the rural area in Moshtohor.

Table 38: Pb level in the teeth of the Egyptian peoples.

Location	Level of Pb ppm mean	range
Shobra El-Khema	55.52	29.88 - 78.48
Moshtohor	28.72	21.04 - 57.80

Table 39: Pb level in the teeth of the Egyptian peoples according to age

Age	range ppm
Adult	31.04 - 78.48
Childrin	21.40 - 37.56

Results in table 40 show the relationship between the daily intake of the Egyptian people from lead in relation to teeth content of lead.

Data indicate clearly that there is a marked variation of the teeth-Pb concentrations measured in the two locations.Such variation have been noticed in rural and urban areas,reflecting differences in environmental gradients in these locations.

Table 40: The relationship between daily intake of lead and its level in the teeth of the Egyptian people .

Location	Mean level ppm	Daily intake mg/ person
Shobra El-Khema	55.52	2.891
Moshtohor	28.72	2.246

WHO 1977 reported that the body burden of lead can be subdivided into a large slow-turnover compartment and a smaller more rapidly-exchanging compartment. Anatomically ,the larger compartment is mainly located in bones. The amount of lead in this compartment increases throughout life. The smaller compartment consists of the soft tissues and in blood continue to increase up to early adult hood and then change little. Elimination of lead from the body is mainly by way of urine (about 76%) and the gastrointestinal tract (about 16 %).The other 8% is excreted by miscellaneous routes (sweat ,exfoliation of the skin and loss of hair).

The major sources of lead in the environment that are significance for the health of man arise from the industrial sources.From a mass balance point of view, the transport and distribution of lead from stationary or mobile sources is mainly via air. Although large amounts are probably also discharged into soil and water .Human beings acquire lead both by surface deposition and by secondry transfer from soil to plant and from plants to animals and Human beings.

Our data indicate that the accumulation of lead in bones and teeth can be used as a good indicator for the assessment of lead level in the environment.

Lead level increased by the increase of the accumulation of this metal in teeth and also due to the increase of air ,water and food contamination by lead.For that there is a good correlation between the level of lead in the tested environment and the level of Pb in the teeth of the Egyptian people

Toward Sustainable Agriculture Development in Egypt

Egypt succeded to direct most of agriculture activities towards sustainable agriculture systems.

The author believes that he succeeded through his extensive research work, through his news media (84 television series program " Dearst audiances ... Attention" . a twenty minutes scientific program on environmental pollution presented weekly), (1841 Dialy radio program series (Dearst Audiaences ... attention) , and another program " Hiaty " .a daily scientific progam on environmental pollution), and more than 42 National and International symposium and congress on environmental pollution , to make numerous individuals, societes , public organisations , governamental agencies involved in the evaluation of the benifits and risks of the unsustainable agriculture, and the risks which may pose to Egyptian peoples and their ecosystem.

1-The first organic farm in Arab countries.

The author succeded to cultivate the first private organic farm, or farm without chemicals , or biological farm, or regenerative farm,or clean production farm, or sustainable farm in 1982 in Egypt.

The author tried all over this time to protect his cultivated soil from degredation in quality and structure. Available water resources was managed in a way that assures the crops needs are satisfied without any drainage water.Through management of plant and animal genetic resources,crop pests, nutrient cycles and animal health. Preserved the biological and ecological integrity of the system .

By using sustainable agriculture systems the author suceeded to:

*work with natural system.

*maintain and increase long-term fertility of soils.

*avoid all forms of pollution.

*work as much as possible within a closed system.

*consider the wider social and ecological impact of the farming system.

*encourage and enhance biological system.

*maintain the genetic diversity.

*produce food of high nutritional quality and in sufficient quantity.

2-Private sector and sustainable agriculture development.

The ancient Egyptian people since 9000 years used sustainable development practices.The ancient Egyptians knew about organic farming since the stone age (Neolithic Period). The ancient Egyptian monuments proved that farmers at that time were very well knowledgeable by the organic agricultural sciences and practices as well. Among these practices, was saving water for irrigation, good concern about living soil , about crop nutrition , rotation ,weed management, and pest control by mechanical and biological methods .

The private sector began to change the industrial agriculture farms to organic agriculture farms by the end of eighteenth , the total cultivated area with organic method increased from 6401 feddan at 1996 to 8293 at 1997 to be 9597 feddan at 1998,table 41.

Table 41 : Cultivated areas with organic crops in Egypt at the period between 1996-1997.

Crops	Cultivated areas 1996	1997	1998	% of increase in 11 years
field crops	2436	4228	4931	26%
Vegetable crops	1748	2029	2810	13 %
Medicine and aromatic crops	1646	1462	1305	9%
fruit crops	534	541	595	31%
others	37	33	26	
total	6401	8293	9597	18%

3-Governamental sector and sustainable agriculture development.

The agriculture policy now is directed towards sustainable agriculture .

Many legislations were conducted in order to stop using pesticides and chemical fertilizers in the new reclaimed areas specially in Toshka , Sewees and other new reclaimed areas . It is planned that the production of these areas must be used for transport as a clean products to other countries.

Strategies and tools for sustainable agriculture in Egypt

1-By using Integrated pest management.

Egypt succeeded to use the theories of Integrated Pest management (IPM) in practice since more than twenty years. All methods for pest control were used...i.e. biological control. agriculture control, biopesticides, natural methods , pheromones , growth regulators , mechanical methods , resistant strains of plants , rotation...etc.

By using IPM practices, the Ministry of Agriculture succeeded to decrease the quantities of pesticides from 37000 metric tons in 1971 to be only 4000 tons by the year 2001.

2-By using a modified spray lance.

A new spraying lance desighned to give through coverage to both sides of the plant leaf was tested and calibrated for practicle use. The modified lance figure 62, attached to hand operated knapsack sprayer was tested alongside with a mist blower, an ordinary knapsack and a power operated sprayer. Results indicated more effficiency of the new lance and the mist blower in comparison of the two machines. Thus empasizing the importance of the coverage of both sides of the leaves. The main advantage of this new equipment is to increase the efficiency of the insecticide used and to minimize the quantity of pesticides used.

The efficiency of different sprayers tested was carried out on biological bases, expresses in terms of percentage control of larvae obtained by the use of different sprayers, using the same amount of active ingredient of valexon / feddan.

Results in table 42 show differencees in insect control by using the different sprayers. While the engine driven mist blower and knapsack hand sprayer with the modifies lance gave more or less the same good control results, the ordinary knapsack hand sprayer gave less control., the least control being associated with the power operated spryer.

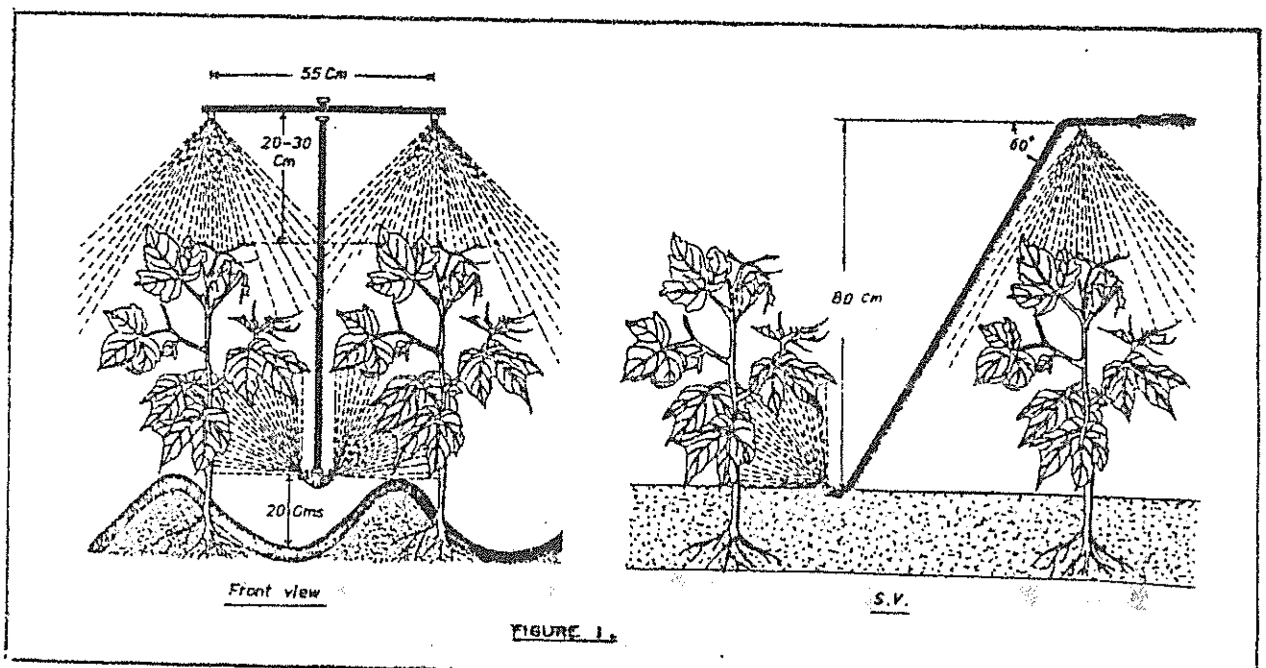


Figure 62 : a modified spray lance.

Table 42 : Comparison efficiency of different sprayers in controlling the cotton leaf worm.

method of	2 days after treat.			4 days after treat.		
	mean No. of larvae / treated plots	mean No. of larvae /un treat. plots	% con.	mean No. of larvae / treated plots	mean No. of larvae /un treat. plot	% con.
Hand K.S.	215	823	73.8	162	796	80.9
Engin K. Sprayer	44	829	95.1	13	663	98.0
Power O.S.	381	975	59.9	312	1007	69.3
Modified K.S.M.L.	17	813	97.9	29	877	96.6

3- By using a hot fogging machine.

A commercially available fog generator was modified for use in cotton fields, figure 63 . Insecticides recommended by Egyptian Ministry of Agriculture were applied to establish their biological effeciency compared to control obtained with aerial and high volume ground sprayer applications. Laboratory and field trials were carried out. The fog generator provided good pest control when used in claim air conditions between 3.00 and 8.00 a.m. and when EC or ULV insecticide formulations were mixed with 30% heavy oil and 10 % emulsifier. Stages controlled included egg masses , larvae and adults. With calm air conditions and the presence of dew , fogs generated with this equipment remained among plants for 15-45 min. Control results compared favorably with aerial application and with high volume power spray.

Mortalities of egg masses, fourth and fifth instar larvae obtained by aerial application, ground application using high volume power sprayers, and a hot fog generator were compared (table 43). The hot fogging treatment gave supperior control of all instars.

Table 43 : Comparison between the efficiency of D.C.702 when applied by three different methods.

Method of application	% mortality egg masses	third instar	fourth instar
Aeroplane	88	81.9	71.7
high volume	86	89.4	66.7
hot fog	99.5	100	84.8

Figure 63 : The modified fog generator.

Hot fogging with suitable formulation gave evenly distributed small droplets (4-5ug) with a highly toxic effect on insects, When such a fog was allowed to remain for a period of time before dispersal, such as in still air conditions in the early hours of the morning, it left effective residues on the plants. When dispersal took place, the fog lifted upwards, presumably minimizing to some extent soil pollution.

4-By using remote sensing techniques.

Thermal IR imagery techniques was used for the detection of various stages of the following economic insects : The cotton leaf worm: *Spodoptera littoralis*, the boll worms ,*Pectinophora gossypiella* and *Earias insulana* , aphid ,*Aphis gossypii*, locus, *Schistocerca gregaria* and *Icerya purchasi*. All the tested insects were detectable from both sides of plant leaves,Thermal contours obtained by ACA thermovision camera revealed presence of all the stages on both sides of plant leaves (adult, eggs, larvae and nymphs) . Thermal contours obtained by the same camera indicated the variation between the infested bolls by both boll worms. The infested bolls radiated higher temperature than the control. There was a relation between the number of larvae in the boll and temperature readiation.

Same results were obtained when diffferent trials were detected by the same camera in the case of *Icerya purshasi* and *Aphis gossypii* . The density of radiation was related with the number of insects in each trial.

Thermal contours obtained revealed the presence of resting and active adults of locust. Active adults were detectable than resting ones.Data indicated that all the stages of cotton leaf worm , egg masses (figure 64) , larvae and adults, figure 65 & 66 except pupae were detected from both sides of the leaf.

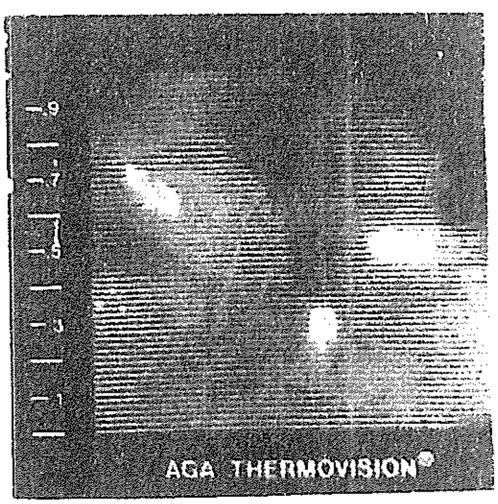


Figure 64 : Thermal contour of the cotton leaf worm moths from the upper surface of a castor oil leaf.

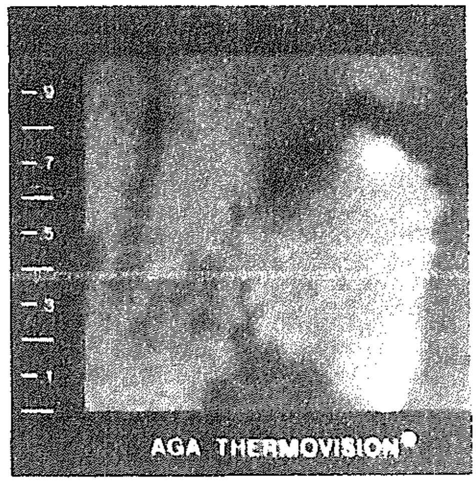


Figure 65 : Thermal contour of the cotton leaf worm moths from the lower surface of a castor oil leaf.

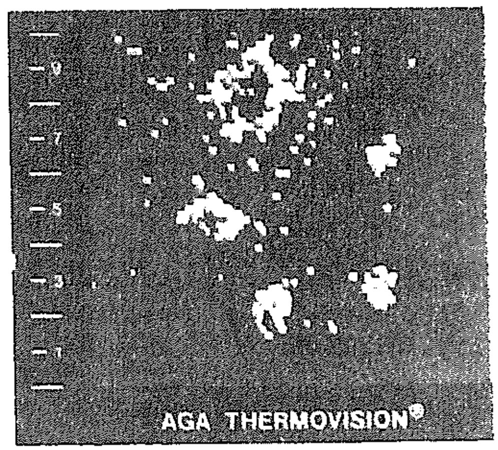


Figure 66 : Thermal contour of the cotton leaf worm egg masses from the lower surface of a castor oil leaf.

The temperature radiated from the infested leaves were correlated by the number of larvae on each leaf and the ages of these larvae.

Temperature radiation was higher at the 6th larbval instars than the 5th and 4th larval instar, while the lowest radiation was for the 1 st larval instar

Data also indicated that the infested cotton bolls radiated more temperature than did the uninfested bolls.The rediation from each boll was correlated by the number of warms in each boll. Nearly same results were obtained for the other tested insects.

It is noticeable from the results that we can put in our pest control programme , the use of remote sensing techniques in order to avoid treating area which is not infested by pests to minimize the use of pesticides and to avoid soil pollution.

The use of remote sensing technique in pest control programme will have the following advantages:

1- A rapid method to detect pat infestation.

2- A rapid and correct method to estimate the population density of these pests.

3- An economic method to avoid the use of many workers or assistants to estimaate population of insects.

4- to decrease the quantity of pesticide used to a large extent.

5- to avoid the side effects of these pesticides on human and environment health.

6- To fix exactly the time of pest control.

5-By using biological control and biopesticides.

Hormones, anti-hormones, pheromones, anti-pheremones , parisitic insects , predaceous insects, resistant plants, antifeeding materials can replace now the use of pesticides to control pests.

Experiments were conducted under laboratory, semi field and field condition to evaluate the possibility to use a large number of growth regulators, anti feedants, anti pheromones , anti hormones and several methods of biological control to study the possibility of their use to minimize the use of pesticides in pest control , but according to the lack of news media , the efficiency of all these methods failed to be lighted.

Three juvenile hormone analogues (JHAS) ZR-777 (5E (prop-2-ynyl 3,7,11 trimethyl-(2E,4E) -dodecadienoate), Hydroprene or ZR -512 (ethyl (E,E) - 3,7,11 -trimethyl -2,4-dode- cadienoate), and ZR -520 ,4 E (ethyl 11-methoxy -3,7,11 trimethyl-(2E, +4E- dodecadienoate) were tested against the following insects : *Periplaneta americana* (Orthoptera), *Galleria mellonella* (Lepidoptera) table 44 , *Tenebrio molitor* (Coleoptera) ,table 45 & 46, and meat fly *Sarcophaga cergyrostoma* (Diptera) table 47 under laboratory conditions.

There were morphological abnormalities in all insects, with the exception of the nymphs of *Periplaneta*. High doses of ZR-777 and ZR -512 (10% and 1 %) killed all tested larvae and pupae of *Tenebrio* and *Galleria*.

While the other doses increased the percentage of population by the decrease of concentration.

A correlation was found between the concentration and the weight of pupae in the case of Tenebrio , this weight decreased with the increase of the concentration.

Only very low concentration tested (0.001 %) increased the weight of pupae than the control.

Table 44 :Effect of JHAS on pupae of *Galleria mellonella*.

JHA	Conc. %	Mean percent of mortality	Longevity of pupal stage (days)	% Juvenilization	Category of juvenilization
ZR 777	10	100		0	
	5	100		0	
	1	80	6.9	80	A1
	0.1	50	8.2	50	A2
	0.01	10	8.0	10	A2
	0.001		7.8	0	
ZR 512	10	100			
	5	100	7.0	10	A1
	1	90	7.5	30	A1
	0.1	90	7.1	60	A2
	0.01	70	7.2	20	A2
	0.001	70	7.0	30	A2
Control			5.5		

Table 45 :Effect of JHAS on larvae of *Tenebrio molitor*.

JHA	Conc. %	% Pupation	Mean longevity of larval stage	Mean percent. of mortality	Mean weight of pupae (gr.)	% Juvenili-zation	Category of juvenili-zation
ZR 777	10	0		100		0	
	1	10	37.6	90	0.135	50	A2
	0.1	0	25.2	100	0.166	100	A2
	0.01	30	20.2	70	0.156	70	A2
	0.001	60	20 6	40	0.220	40	A1
ZR 512	10	0		100		0	
	1	10	29.0	90	0.145	60	A2
	0.1	20	27.0	80	0.173	80	A2
	0.01	40	25.4	60	0.181	60	A1
	0.001	90	21.8	10	0.237	10	A1
Control		90	20.4	10	0.199		N

Table 46 :Effect of JHAS on pupae of *Tenebrio molitor*.

JHA	Conc. %	Mean percent of mortality	Longevity of pupal stage (days)	% Juvenilization	Category of juvenilization
ZR 777	10	100			
	1	100	6.3	40	A
	0.1	20	7.7	20	A
	0.01	10	7.5	10	A
	0.001	0	8.4	0	N
ZR 512	10	100			
	1	100	3.8	100	A
	0.1	80	7.0	80	A
	0.01	20	9.0	20	A
	0.001	0	8.3	0	N
Control	0	0	10.0	0	N

A = abnormal, N = normal.

Table 47 :Effect of JHAS on *Sarcophaga cergyrostoma* .

JHA	Conc. %	% pupation	Mean longevity of larval stage (days)	Mean weight of pupae (gr)	Mean percentage of emerged adults
ZR 777	0.5	100	3.3	0.1400	0
	1.0	100	3.2	0.1380	0
	1.5	100	3.4	0.1250	0
	2.0	15.0	2.5	0.1240	0
	2.5	6.0	2.0	0.1160	0
	3.0	0			
	3.5	0			
ZR 512	0.5	100	3.2	0.1450	0
	1.0	100	3.05	0.1430	0
	1.5	100	2.85	0.1340	0
	2.0	100	2.67	0.1330	0
	2.5	100	2.45	0.1250	0
	3.0	15.0	2.0	0.1030	0
	3.5	0			
Control		100	3.7	0.1486	90

No correlation was found in the case of Galleria between weight of pupae and concentrationWhile JHA tested decreased the longevity of pupal stage in Tenebrio, they increased the longevity of tested larvae of *Periplaneta, Galleria and Sarcophaga* and the longevity of pupae in the case of Galleria. In the case of Sarcophaga, there was correlation between the weight of pupae and the concentration, the weight decreased with the increase of the concentration. No adult was emerged from treated larvae at all concentrations tested.

The effect of different concentration of JHA . Altozar (ZR -512) on the juvenilization percentage of *G. mellonella* and *S. cretica* showed that abnormalities (Figues 67 and 68) occured at all concentrations and increased by the increase of concentrations.

Figure 66 : High mannification of the wing-buds in *G.mellonella* superlarva from both mesothorax and metathorax .

Figure 67: Wing- buds and tumers in the thoracic region of *S. cretica* superlarva.

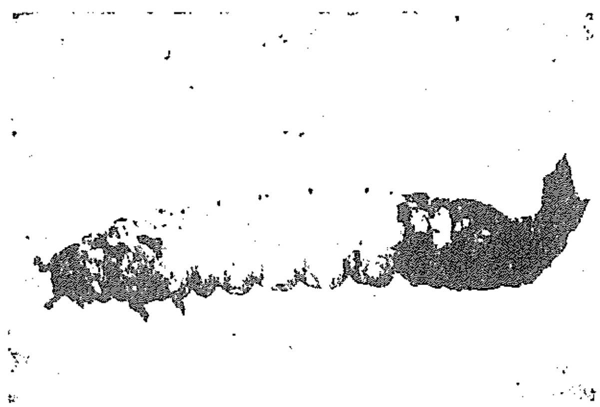


Figure 68 : Inability of *S. cretica* superlarva to shed larval cuticle during metamorphosis, the old cuticle shrinked and remained attached to posterior region of abdomen, notice disformatin in antenna.

6-By using news media

Through a large numbers of National and International congress and symposiums about the ecotoxicological impact of pesticide residues on the Egyptian environment , through extensive use of mass media (a weekly television programme , a daily radio program and a weekly scientific article, through an environmental data bank free of charge and available for any person all over Egypt ,I succeeded to involve, numerous individuals, societies, public organisation, governmental agencies...etc in the evaluation of the benifits and risks of the use of pesticides to increase agricultural yied and the risks which the pesticides may pose to Egyptian peoples, and ecosystem.In Egypt where illiteracy rates are high, radio and television predominate.

7-By using sustainable agricul -ture systems.

We succeded to minimize the use of pesticides from 37000 metric ton in the year 1973 to be only 4000 metric tons in the year 2001 . Many farmers in Egypt now are interested to use sustainable agriculture systems under several names i.e. clean food production, organic farming, biological agriculture....etc. Our evaluation improved that Egypt can share in this field if the uses of agrochemicals are restricted and the pesticide regulations take their enforcement in the new reclaimed areas. Samples of wheat produced in the old vally where extensive use of pesticides and chemical fertilizers are evidents , and another samples of wheat which were produced through the biological cultivation were analyzed to determine their contents from pesticide residues. Results indicated that soil samples , green parts of the plants and grains produced from old vally still contained traces of some pesticides which were used since 20 years. The major residues were endrin, dieldrin, lindane and DDT metabolites. Level of these residues varied from traces to 0.25 ppm while the same samples from biological or organic cultivations were neerly free from pesticide resdues. The non-point source of pesticide residues in biological cultivation could be attributed to be from irrigated water or from rain fall.

8- Recycling agriculture wastes as a tool for sustainable development.

A study on large scale was conducted by the author to study the posibility of recycling agriculture wastes (animal wastes and crop residues) in all the Arab countries.

Data in table 47 indicate that the total quantity of animal wastes in all arab counties is 2231 million metric tons . Arab countries produced 1354 million metric tons of cow manure, 93 million tons of buffaloes manure.124 million tons of sheep manure.183 million tons of Kamel wastes . 100 million tons of horse manure, 249 million metric tons of goats manures and 9 million tons of poultry wastes.

Table 47 : Quantities of animal wastes produced all over Arab world./ year.

Waste	quantity (1000 tons)
Cow manure	1.353.995
Bufaloes manure	9.333
Sheep wastes	133.915
Kamel wastes	182.700
Horse wastes	100.252
Goats wastes	248.770
Poultry wastes	9.219
Total	2.231.185

While data about Egypt indicated that the following quantities of animal wastes were produced in Egypt ,table 48 .

The total quantity of animal wastes produced in Egypt is 278.8 million tons/ year.Egypt produces every year 116.7 , 88.4 . 21.3. 2.1, 23.8, 23.5 and 1.9 milliom metric tons of cow , buffaloes ,sheep ,kamel, horse, goate and poultry wastes respectively.

Our laboratory and semi field experiments indicated the possibility to produce biofertilizers and very good organic fertilizers from these wastes. Also it is possible to produce liquid organic fertilizers and biogas as clean fuel from these wastes.

Table 48 : Quantities of animal wastes produced in Egypt/ year.

Waste	quantity (1000 tons)
Cow manure	116.721
Bufaloes manure	88.445
Sheep wastes	21.350
Kamel wastes	2.120
Horse wastes	23.805
Goats wastes	23.485
Poultry wastes	1.890
Total	278.816

About the quantities of crop residues, our data indicated that the total quantity of crop residues produced in Egypt is 20.7 million metric tons / year.

Data in table 49 show the quantity of each crop residue in Egypt.

Data in table 50 show that arab countries produced high quantity of crop residues about 169 million metic tons.

Production of food from crop residues:

Through our extensive work about recycling all types of crop residues, the author succeeded to produce from these residues food for human beings.

Laboratory data showed the possibility to recycle most of these crop residues except coton residues to produce mushroom., The wastes of mushroom production were recycled again to give good organic fertilizers.

Production of milk and red meat from crop residues:

Semi-field application indicated the possibility to produce red meat from all crop residues , by adding to these residues ammonia , mollas , urea , water and some microoganisms for several days. The residues after treatment was used as a feed for cows , buffaloes, sheep and goates to produce red meet and milk.

In the same time crop residues were transfered to very good organic fertilizer by indirect method.

Our results to reuse the animal manure as feed for these animal were not succesful.

Table 49 : Quantities of crops residues (1000 tons) produced in Egypt/ year.

Crop residue	quantity (1000 tons)
Wheat straw	4586.5
Barley straw	268.5
Maize stalke	2821.2
Maize cobe	555.8
Rice straw	2671.9
Rice husks	628.7
Rice bran	254.2
shorghum	1135.3
Cotton residue	1286.7
Sugar cane green	3050.9
Sugar cane tops	1459.1
Suger cane dry leaves	265.3
Broad bean residue	387.5
Cow bean residue	23.8
Chickpea residue	19.2
Lentile residue	4.5
Peanut residue	36.5
Sesame residue	76.6
Sunflower residue	105.8
Soybean residue	101.8
Total	20.740

Production of organic fertilizers from crop residues:

By aerobic biological process , it was possible to produce compost from all sources of crop residues. Some like ,broad bean residue , cow bean residue chickpea residue ,lentile residue , peanut residue, sesame residues ,sunflower residue, and soybean residue were easy to be compost, while cotton and rice husks residues are difficult to be composted. These residues need a long time for fermintation.

By using a mixture of these residues and animal manure, compositing was better and faster than when using only crop residues.

Table 50 : Quantities of crops residues (1000 tons) produced in all arab countries/ year.

Crop residue	quantity (1000 tons)
Wheat straw	57.582.3
Barley straw	40.274.1
Maize stalke	7.033.0
Maize cobe	1.022.9
Rice straw	3.375.7
Rice husks	794.2
Rice bran	321.2
shorghum	39.460.8
Cotton residue	2.629.2
Sugar cane green	5.885.7
Sugar cane tops	2.914.9
Suger cane dry leaves	511.8
Broad bean residue	1330.4
Cow bean residue	190.2
Chickpea residue	1.063.5
Lentile residue	149.9
Peanut residue	843.2
Sesame residue	2.066.3
Sunflower residue	2.14.7
Soybean residue	115.0
Total	169.479.0

Production of fuel from crop residues:

By anaerobic biological process , under field condition,biogas was generated from the fermentation of both animal and crop residues.Fermentation of crop residues to generate methane , rather than their direct use as fuel or fertilizers ,yielded number of benefits including :

1- Producing a continuous energy resource that can be stored and used more efficiently in many application. 2- producing a very good liquid fertilizer. 3-improving public health , 4- reducing transfer of plant pathogens and economic pests to the next year.

Production of ethanol and methanol from crop residues:

By biotechnological process , it was possible to produce ethanol and methanol from a number of cellulose, starch and sugar-containing wastes under laboratory conditions.

9-Recycling domestic wastes as a tool for sustainable development.

A large scale study covered Egypt and Arab countries for 6 years was conducted by the author to study the economics of recycling garbage.

Egypt produces every year 20.329.648 metric tons of domestic wastes ,table 51. By recycling we can produce 9.779.901 metric tons of organic fertilizers .

It is estimated that Egypt can gain 993.3 million Egyptian pound from recycling domestic wastes.

Plus many unviewed advantages for example, decreasing population of house flies which transmit about 42 diseases to Egyptian people. The estimated cost for medical treatement is about 600 million Egyptian pound.

Table 51 : Materials which can be produced by recycling the domestic wastes all over Egypt.

Material	quantity (tons)
Domestic wastes	20.329.648
Organic fertilizer produced	9.779.9.1
Papers produced	2.877.754
Glaas	398.263
Iorn	386.592
Plastic	159.977
Clothes	479.911

Data in table 52 show that arab world produces every year 89631150 metric tons of domestic wastes . By recycling this high quantity of domestic solid wastes Arab world can produce 43 million metric tons of organic fertilizers to be used for organic farming.

Recycling of waste will help to conserve natural resources, save energy in production and transport of goods and materials, reduce the risk of pollution, reduce the demand of landfill and produce organic fertilizers for organic farming.

Table 52 : Materials which can be produced by recycling the domestic wastes in Arab World.

Material	quantity (tons)
Domestic wastes	89.631.150
Organic fertilizer produced	43.155.375
Papers produced	14.340.984
Glaas	1.702.989
Iorn	1.792.620
Plastic	557.789
Clothes	2.151.144

REFERENCES

Abdel-Gawaad, A.A. and A.Y. El-Shazli, 1969. A comparison of two methods for counting *Thrips tabaci* L. on cotton plants together with field experiments on control. Bull. Ent. Soc. Egypt. Econ. Ser. III, 81-84.

Abdel-Gawaad, A.A. and A.Y. El-Shazli, 1969. A new method of rearing *Thrips tabaci* L. and bionomics of its egg and adult stages. Bull. Ent. Soc. Egypt, Econ. Ser. LIII, 443-447.

Abdel-Gawaad, A.A. and A.Y. El-Shazli, 1970. Studies on *Thrips tabaci* L. V-Attraction of different varieties of cotton to *Thrips tabaci* L. Z. Ang Ent., 66(4): 391-394.

Abdel-Gawaad, A.A. and A.Y. El-Shazli, 1970. Studies on *Thrips tabaci* L.VI-New stage in the life cycle. Z. Ang. Ent., 66(4): 395-398.

Abdel-Gawaad, A.A. and A.Y. El-Shazli, 1970. Studies on *Thrips tabac* L.: VII-Effect of food on the life cycle. Z. Ang. Ent., 67(2): 150-153.

Abdel-Gawaad, A.A.; F.H.El-Gayar and A.Y. El-Shazli, 1970. STUDIES ON SOIL INSECTICIDES: VI-Evaluation of some soil insecticides for controlling *Spodoptera littoralis* B. in bersim *Trifolium alexandrinum*. A. Zng. Ent., 67(1): 19-26.

El-Shazli, A.Y. and A.A. Abdel-Gawaad. 1970. Effect of 2, 4, 5- trichlorophenoxy acetic acid on *Thrips* eggs. Experentia, 26, 1316.

Abdel-Gawaad, A.A. and A.Y. El-Shazli, 1971. STUDIES ON THRIPS TABACI L. IV- Field studies to evaluate some soil insecticides on controlling cotton thrips. Z. Ang. Ent., 68(1): 90 - 94.

Abdel-Gawaad, A.A. and A.Y. El-Shazli, 1971. STUDIES ON THRIPS TABACI L. VIII- Effect of some soil insecticides on controlling pupae under laboratory conditions. Z. Ang. Ent., 68 (2): 150 - 153.

Abdel-Gawaad, A.A.; M.A. Hammad and F.H. El-Gayar, 1971. Effect of canal irrigation systems used in U.A.R. on the persistence of soil insecticides. Int. Pest. Control. July - August, 8-28.

Abdel-Gawaad, A.A.; M.A. Hammad and F.H. El-Gayar, 1971. STUDIES ON SOIL INSECTICIDES: V- Control of the cotton leaf worm *Prodenia litura* F. by soil insecticides. Z. ang. Ent. 68 (2), 142-146.

Abdel-Gawad, A.A. and F.H. El-Gayar, 1971. STUDIES ON SOIL INSECTICIDES: VII- Controlling *Spodoptera littoralis* by using soil insecticides. Z. ang. Ent., 67(3): 246-255.

Abdel-Gawaad, A.A. and F.H. El-Gayar, 1971. STUDIES ON SOIL INSECTICIDES: IX- Screening soil insecticides against prepupae and pupae of cotton leaf worm *Prodenia litura* F.Z. ang. Ent., 69 (4): 416-421.

Abdel-Gawaad, A.A. and F.H. El-Gayar, 1971. STUDIES ON THE COMMON CUTWORM AGROTIS YPSILON ROTT: Life cycle and habits. Z. ang. Ent., 68 (4): 409-412.

Abdel-Gawaad, A.A. and F.H. El-Gayar, 1971. STUDIES ON THE COMMON CUTWORM AGROTIS YPSILON ROTT: II- Effect of some soil insecticides on controlling 3rd instar larvae under laboratory conditions. Z. ang. Ent., 68 (4): 413-419.

Abdel-Gawaad, A.A. 1971. Effect of supracide / ultracide Ciba - Giegy and supracide combi on cotton pests. ITE Geigy Report.

Abdel-Gawaad, A.A. 1971. Basudin applied to the soil against S. Littorallis B.. ITE Geigy Report.

Abdel-Gawaad, A.A.; A.M. El-Minshawy and M. Zeid 1972. STUDIES ON SOIL INSECTICIDES: VIII- Effect of some soil insecticides on broad beans and Egyptian clover nodule forming bacteria. Z. Bakter.Parasit., 127(2): 172-177.

Abdel-Gawaad, A.A., M.A. Hammad and F.H. El-Gayar, 1972. STUDIES ON SOIL INSECTICIDES: X- Effect of some soil insecticides on soil microorganisms. Z. Bakteriologie Parasitenkunde: 127(3): 290 - 295.

Abdel Gawaad, A.A., M.A. Hammad and F.H. El-Gayar, 1972. STUDIES ON SOIL INSECTICIDES: XI - Effect of some soil insecticides on the nitrogen transformation and soil respiration. Z. Bakteriologie Parasitenkunde, 127(3): 296-300.

Abdel Gawaad, A.A.; F.H. El-Gayar, A. Soliman; F.I Rahab and A.M. Ali, 1972. EFFECT OF SOME SOIL INSECTICIDES ON PLANTS: I- On cotton, clover, corn, and bean. Phytopath. Z., 73, 189 - 200.

Abdel Gawaad, A.A. and F.H. El-Gayar, 1972. Experiments for serving the problem of controlling the house fly in Alexandria City. Z. ang. Ent., 70(2): 203 - 208.

Abdel-Gawaad, A.A. and F.H. El-Gayar, 1972. House fly control in Alexandria City and its effect on the prevalence of certain summer diseases. Z. ang. Ent., 71(1): 44-52.

Soliman, A.S.; F.I. Rehab and A.A. Abdel-Gawaad, 1972. Comparison of some American and Russian cottons with Egyptian cultivars. Egyptian Cotton Gazzette, 59: 89-95.

Abdel Gawaad, A.A.; F.H. El-Gayar,m A.S. Soliman and O.A. Zaghlol, 1973. STUDIES ON THRIPS TABACI L. X- Mechanism of resistance to *Thrips tabaci* L. in cotton varieties. Z. ang. Ent. 73: 251-255.

Abdel Gawaad, A.A.; A. El-Berry, E. Abdel-Karim and F.A. Ellakwah, 1974. STUDIES ON SOIL INSECTICIDES: XII- Sensitivity of both prepupal and pupal stages on the cotton leaf worm to soil insectiedies. Beitrage Trop. Landwirtsch, Veterimarmed 12 Jg. (4): 381 - 385.

Abdel Gawaad, A.A. and F.H. El-Gayar, 1974. The habits and behavior of cotton leaf worms and their importance for control measures. Z. ang. Ent., 75(3): 295 - 300.

Abdel Gawaad, A.A.; E. El-Dafrawi and O.A. Zaghlol, 1974. STUDIES ON THRIPS TABACI L.: XI- Resistance of nineteen varieties of cotton to thrips in relation to their nutritive compounds contents, pH and total gossypol content. Beitrage, Trop. Landwirtsch. Veterimarmed 12. Jg. (4): 387 - 392.

Abdel Gawaad, A.A.; E. Abdel-Karim, F.A. El-Lakwah and A. El-Berry, 1974. Some effects of the juvenile hormone analogues on the cotton leaf worm *Spodoptera littoralis* B. Z. ang. Ent., 76(3): 321 - 325.

El-Berry, A.; A. Abdel-Gawaad; M.A. Mostafa and S.E.L. Bialy, 1974. Pollinators other than hony bees visiting certain medicinal plants in Egypt Z. ang. Ent.: 115-119.

El-Berry, A.; A. Abdel-gawaad, M.A. Mostafa and S.E.L. Bialy, 1974. Pollinators other than hony bees visiting certain vegetable plants. Z. ang., Ent., 77(1) 106-110.

Ahmed, S.M. and A.A. Abdel-Gawaad, 1975. Laboratory and Semi - field trials with two synthetic Juvenile hormone analogues on four aphid sp. Anz. Schadlingskde. Pflanzenschutsz, Umweitschutz 48, 148 - 150.

Mostafa, M.A.; S. El-Bialy, A.; El-Berry and A.A. Abdel Gawaad, 1975. Fluctuations of populations of certain predators on flowers of cotton. Z.ang. Ent., 80, 225-228.

El-Bialy, S.; M.A. Mostafa,, A. El-Berry and A.A. Abdel-Gawaad, 1975. Population dynamics of certain dipterous and neuropterous predators on Egyptian clover flowers in Egypt. Z. ang. Ent., 80(1): 72-75.

Abdel Gawaad, A.A.; S.M. Ahmed, A. El-Berry and F.H. El-Gayar, 1976. The suppressing effect of three predactors of the immature stages of the house fly *Musca domestica* L. on its population in a breeding site in Alexandria, Z., Ang. Ent., 80(1): 1-6.

Abdel Gawaad, A.A. 1976. Effect of three juvenile hormone analogues on insects from several orders. Z. ang Ent., 80, 346-355.

Abdel Gawaad, A.A. 1976. Effect of some juvenile hormone analogues on the RNA synthesis in prothoracic glands of the American cockroach, *Periplaneta americana*, and the great wax moth *Galleria mellonella*. Z. ang. Ent. (under publication).

Abdel Gawaad, A.A. 1976. Effect of some juvenile hormone analogues on the ultra-structure of the prothoracic glands and other tissues of Periplaneta americana. Z. ang. Ent. (under publication).

Abdel Gawaad, A.A. and M. Stein, 1976. Evaluation of a bait with sex attractant used to control blow and house flies under laboratory and field conditions..

Abdel Gawaad, A.A.; B. Heins and W. Stein, 1977. Untersuchungen uber die attraktiwirkung von lebens mitteln fur fliegen (Dipt., Calliphoridae, Dropsophilidae, Muuacidae), Alimenta 16, 49-52.

Abdel Gawaad, A.A. 1977. Die Mulldeponie als Brustatte fur fliegens. Umachau 77, Heft 16: 548-549.

Abdel Gawaad, A.A.; S.M. Ahmed, G.W. Amerhom and M.K. El-Khishin, 1978. A combined foliar through coverage using a modified spray lance and soil application of an insecticide for the control of the Egyptian cotton leaf worm *Spodoptera littoralis*. Annals of Agric. Sc. Moshtohor, vol. 9, 207 - 213.

Abdel Gawaad, A.A. and W. Stein, 1978. Untersuchungen uber die insectenfauna von Mulldeponien II- Die rottedeponie als Bruinattatte von synanthropen Fliegen. Z. fur Agw. Zoologie, 357-365.

Abdel Gawaad, A.A. and H. Brune, 1979. Insect protein as a possible source of protein to poultry. Z. fur Tierphisiologie. Tierenahrun and Futtermittelkunde, 42(4): 216-222.

Abdel Gawaad, A.A. 1978. Proteinbedarft aus Insekten gedeckt. Medial Tribune, No. 52, Dec., 1978

Abdel Gawaad, A.A. 1978. Werden wir uns im Jahr 2000 von Insekten ernahren. Umachau, 79: 642

Abdel Gawaad, A.A.; M. K. El-Khishin and S.M. Ahmed 1979. Efficiency of some organophosphorous insecticides on the control of house fly larvae. Annals of Agric. Sci. Moshtohor, V: LL

Ahmed, S.M. M.K. El-Khishin and A.A. Abdel

Gawaad, 1979. Effect of sublethal doses of pyrethroids on the cotton leaf worm *Spodoptera littoralis*. Annals of Agric. Sci. Moshtohor, V: II.

Ahmed, S.M.; A.A. Abdel Gawaad and M.K. El-Khishin, 1979. Evaluation of a bait with sex attractant against house flies under laboratory and field conditions. Annals of Agric. Sci. Moshtohor. V: II.

El-Khishin, M.K.; A.A. Abdel Gawaad and S.M. Ahmed, 1979: Efficiency of some insecticides applied by different methods in the control of adult house flies. Annals of Agric. Sci. Moshtohor. V: II.

Abdel Gawaad, A.A. and P.S. Callahan, 1981. The Exoskeleton of the cotton leal worm *Spodoptera littoralis* with special reference to sensillae as polytubular dielectric arrays .

Abdel Gawaad, A.A 1981. SOIL POLLUTION BY PESTICIDE RESIDUES : 22- Side effect on nitrification. Ist International Cong. for Soil Polution and Protection from Pesticide Residues. August, 1981, Part II: 624-629.

Abdou, S.M.; A.A. Abdel Gawaad, S.A. Mekheimer, E. Abo-El-Amaiem and M.B. El-Alfy, 1981. Organochlorine pesticide residues in buffalo's milk in Kaliobia province and the effect of the presence of insecticides on coagulation time. Ist International Cong. For Soil Poll, and Prot, from Pest. Residues. August, 1981, Part III, 672-687.

El-Makkawi, H.K.; A.A. Abdel-Gawaad and H.A. Makkawy, 1981. Chronic effect of methomyl (Lannate) administration on the Deoxiribonucleic acid (DNA) and Ribonucleic acid (RNA) of rats. Ist international Cong, for Soil Poll, and Prot, from Pest. Residues. August, 1981. Part II, 495-49.

Abdel Gawaad, A.A.; S.M. Ahmed, T. Hosieny and O.M. Khaled, 1981. SOIL POLLUTION BY PESTICIDE RESIDUES: 1-Side effect on Soil microogranisms. Ist International Congress for Soil Pollution and Protection from Pesticide Residues. August, 1981, Egypt Part II, 168-195.

Abdel Gawaad, A.A.; S.M. Ahmed, T. Hosieny and O.M. Khaled, 1981. SOIL POLLUTION BY PESTICIDE RESIDUES: 2-Side effect on Soil Fertility. Ist International Congress for Soil Pollution and Protection, from Pesticide Residues. August., 1981, Egypt, Part II, 196-219.

Abdel Gawaad, A.A.; M. El-Khishin and M.S.H. Hefney, 1981. SOIL POLLUTION BY PESTICIDE RESIDUES: Side effect on germination, growth and crop yied, Ist International Congress on Soil Pollution and Protection from Pesticide Residues, Aug., 1981, Egypt., part II, 289-320.

Abdel - Gawaad, A.A.; M. El-Khishin and M.S.H. Hefney, 1981. SOIL POLLUTION BY PESTICIDE RESIDUES: 4-Absorption and translocation of pesticide residues. Ist International Congress on Soil Pollution and Protection from Pesticide Residues, Aug., 1981, Egypt. Part II, 385-397.

Abdel - Gawaad, A.A.; M. El-Khishin and M.S.H. Hefney, 1981. SOIL POLLUTION BY PESTICIDE RESIDUES: 5- Side effect on nodulation in legume crops, 1st Int. Cong. for Soil Poll. and Prot. from Pest. Residues, Aug., 1981, Egypt. Part II, 276-288.

Abdel Gawaad, A.A.; E. Abdel-Karim, S.H. Metwali and S.M.M. Ismail, 1981, SOIL POLLUTION BY PESTICIDE RESIDUES: 7- Side effect on soil mites, 1st Int. Cong. for Soil Poll. and Prot. from Pest. Residues, Aug., 1981, Egypt, Part II, 220 - 249.

Abdel Gawaad, A.A., 1981. SOIL POLLUTION BY PESTICIDE RESIDUES: 8-Side effect on pollution of water sources. 1st Int. Cong. for Soil Poll. and Prot. from Pest. Residues, Aug., 1981, Egypt. Part II, 435-453.

Abdel Gawaad, A.A., S.M. Abdou and M. El-Alfy, 1981. SOIL POLLUTION BY PESTICIDE RESIDUES: 9-Pesticide residues in milk and milk products. 1st International, Cong. for Soil Poll. and Prot. from Pest. Residues, Aug., 1981, Egypt, Part II, 454-466.

Abdel-Gawaad, A.A. 1981. SOIL POLLUTION BY PESTICIDE RESIDUES: 10-Side effects on the cation exchange capacity of soil. 1st Int. Cong. for Soil Poll. and Prot. from Pest. Residues, Aug., 1981, Egypt. Part II, 407-420.

Abdel Gawaad, A.A. 1981. SOIL POLLUTION BY PESTICIDE RESIDUES: II-Persistence of pesticide residues in relation to soil clay minerals. 1st Int. Cong. for Soil Poll. and Prot. from Pest. Residues. Aug., 1981, Egypt Part II, 748-769.

Abdel Gawaad, A.A. 1981. SOIL POLLUTION BY

PESTICIDE RESIDUES: 12- The loss of some elements through leached water. 1st Int. Cong. for Soil Poll. and Prot. from Pest. Residues, Aug., 1981, Egypt. Part II.

Abdel Gawaad, A.A.; M. Abdel-Hadey, M. Khodair and A Ayoub, 1981. SOIL POLLUTION BY PESTICIDE RESIDUES: 13- The possibility to use remote sensing technique for the detection of pest infestation with view to minimize the use of insecticides and soil pollution. 1st Int. Cong. for Soil Poll. and Prot. from Pest. Residues, Aug., 1981, Egypt. Part II, 108 - 110.

Abdel Gawaad, A.A.; S.M. Ahmed and M.K. El-Khishin, 1981. SOIL POLLUTION BY PESTICIDE RESIDUES: 14- Hot fogging for control of *Spodopters littoralis* in Egypt with view minimize soil pollution. 1st Int. Cong. for Soil Poll. and Prot. from Pest. Residues, Aug., 1981, Egypt, Part II, 119-134.

Abdel Gawaad, A.A.; M.K. El-Kishin; H.R. Nazzem and Zakaria Seleim, 1981. SOIL POLLUTION BY PESTICIDE RESIDUES: 15- Effect on formation of C-Tumour on onion roots, 1st Int. Cong. for Soil Poll. and Prot. from Pest. Residues, Aug., 1981, Egypt. Part II, 338-348.

Abdel Gawaad, A.A.; M.K. El-Khishin; H.A. El-Khishin; H.R. Nazeem; A.M. Hassan and Zakaria Seleim, 1981. SOIL POLLUTION BY PESTICIDE RESIDUES: 16 Cytological and cytogenic effects. 1st Int. Cong. for Soil Poll. and Prot. from Pet. Residues, Aug., 1981, Egypt, Part II, 362-384.

Abdel Gawaad, A.A.; M.K. El-Khishin; H.A. El-Mekkawi and Zakaria Seleim, 1981. SOIL POLLUTION BY PESTICIDE RESIDUES: 17- Side effects on RNA and DNA in the root tip cells. 1st Int. Cong. for Soil Poll. and Prot. from Pest. Residues, Aug., 1981, Egypt, Part II, 327-337.

Abdel Gawaad, A.A.; M.K. El-Khishin, and Zakaria Seleim, 1981. SOIL POLLUTION BY PESTICIDE RESIDUES: 18- Effects on sprouted onion roots. 1st Int. Cong. for Soil Poll. and Prot. from Pest. Residues, Aug., 1981, Egypt. Part II, 348-361.

El-Makkawi, H.K.; A.A. Abdel Gawaad and A.F. El-Laithy, 1981. Histochemical studies on the effect of deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) in male rats, 1st Int. Cong. for Soil Poll. and Prot. from Pest.; Aug., 1981, Egypt. Part III, 640-658.

Salwa, D.; A.A. Abdel Gawaad, M.K. El-Khishin and N.G. Eskander, 1982. SOIL POLLUTION BY PESTICIDE RESIDUES: 23- Factors affecting persistence of pesticide residues.

Salwa, D.; A.A. Abdel Gawaad, M.K. El-Khishin and N.G. Eskander, 1982. SOIL POLLUTION BY PESTICIDE RESIDUES: 24- Persistance of pesticide resiudes in soil.

Abdel Gawaad, A.A.; S.M. Ahmed and D. El-Shaarawy, 1982. SOIL POLLUTION BY PESTICIDE RESIDUES: 25- Effect on the growth of Kenaf.

Abdel Gawaad, A.A.; S.M. Ahmed and D. El-Shaarawy, 1982. Side effect on plant physiology.

Abdel Gawaad, A.A.; S.H. Metwali; S.E. Abdel Karim and S.M. Ismail, 1982. Soil mites of Moshtohor, Res. Bull. No. 751, July, 1982 (Zagazig Univ. Fac. of Agric.)

Abdel Gawaad, A.A. 1983. Types of pollution and methods of control in Cairo Governorate. The first national congress about the Protection of Cairo from Environmental Pollution. Cairo. page 34.

Abdel Gawaad, A.A. 1983. The national strategy to control the environmental pollution in Cairo. The first national congress about the Protection of cairo from Environmental Pollution. Cairo, page 78.

Abdel Gawaad, A.A. and Naglaa M. Waly, 1985. Economic studies about the methods used to spray cotton by pesticides in Kalubia Governorate, Institute for Research and Statistical Studies.

E.Z. Esmatt and A.A. Abdel Gawaad, 1985. Possible carcinogenic risk of pesticides in Egypt, 2nd International Congress for Soil Pollution and Protection from Pesticide Residues. Cairo, Vol. II. 109-146.

Abdel Gawaad, A.A.; Eglal Helal; F.F. Shalaby and A.M. Mahmoud, 1985. Communication between *Spodoptera littoralis* B. and some host plants. 2nd Int. Cong. for Soil Poll. and Port, from Pest. Residues. Cairo, Vol. II, pp. 201-214.

Abdel Gawaad, A.A. 1984. Soil Pollution by Pesticide residues: The Possibility to use remote sensing technique for the detection of economic insects with view to minimize the use of insecticides: IInd international colloquium spectral signatures of objects in remote sensing, Bordeaux, France September 1983, 527-534.

Abdel Gawaad, A.A.; Eglal Helal, A.A. El-Berry and A.K. Mahmoud, 1985. The oviposition of the cotton leaf worm *Spodopetera littoraalis* B. influenced by antennectomy and coating of antennae to investigate its role in insect communiction. 2nd Inter. Cong. for Soil Poll, and Prot. from Pest. Rest. Residues, Cairo, Vol, II, pp. 551-558.

Abdel Gawaad, A.A. 1985. Pesticides residues levels in soils and crops. 2nd Int. Cong. for Soil Poll. and Prot. from Pest. Residues. Cairo, Vol. II. p. 87-108.

Abdel Gawaad, A.A. 1985. Survey of pesticides used in Egypt, 2nd Int. Cong. for Soil Poll. and Prot., from Pest. Residues. Cairo, Vol. II, pp. 33-86.

Abdel Gawaad, A.A. and H. Khatab. 1985. Soil and plant protection in ncient Egypt., 2nd Int. Cong. for Soil Poll. and Prot. from Pest. Residues. Cairo, Vol. II, pp. 19-32.

Abdel Gawaad, A.A.; Nagla M. Waly and S.A. Shams, 1985. Economics of pesticides uses in Agriculture in Egypt, 2nd Int. Cong. for Soil Poll. and Prot. from Pest. Residues. Cairo, Vol;., II, pp. 147-156.

Abdel Gawaad, A.A. 1985. Environmental pollution is not a national but an international problem, 3rd International Symposium on Environmental Pollution and its impact in the Mediterranean Region. Istanbul, Turkey, Sept. 1-4, 1985.

Abdel Gawaad, A.A. and A. Shams El-Dine 1989. Insecticide residues in total diet samples, Journal of the Egyptian Society of Toxicology, Vol. 4, pp. 79-84.

Abdel Gawaad, A.A. and A. Shams El-Dine 1990. Pesticide residues in food stuffs: 1-In imported food. J. Egypt. Soc. Toxicology, Vol. 5, 49-52.

Abdel Gawaad, A.A. 1990: Environmental Pollution and the African Security, Pugwash Conferences on Sciences and World Affairs. The Sixth PAP Regional Conference, Cairo 21-26 March, 1990.

Abdel Gawaad, A.A. 1989. New pesticide residue limits for the third world countries in view to their feeding habits and behaviour. The third world Conference on environmental and health hazards of pesticides. Cairo, 11-15 December 1989.

Abdel Gawaad, A.A.; Shams El-Dine and M. Ali 1989. Pesticide residues and acids in rain water. The third world Conference on Environmental and health hazards of pesticides, Cairo, 11-15 December, 1989.

Abdel Gawaad, A.A. 1989. Pesticide residue levels in foodsuffs produced from old vally and new reclaimed area in Egypt. Third world Conference on Environmental and health hazards of pesticides. Cairo, 11-15 December 1989.

Abdel Gawaad, A.A. 1989. Brief account on inclusive study on the hazardous effect of cement dust on human beings, animals, plants and vegitation (in press).

Abdel Gawaad, A.A. 1989: Pesticides Hazards in the Ecosystem of the third world.(Special report).

Abdel Gawaad, A.A. 1990. The manufactories use the Egyptian sky as a hazardous waste dump. Al-Ahram 11, 12 1990 p 11.

Abdel Gawaad, A.A. 1991. Gulf war and the Environment Disaster: Al-Ahram 5, 2, 1991, p. 11.

Abdel Gawaad, A.A. 1991. A new approach for economic development and integrated environment control in the Egyptian villages .(Special report) pp. 1231.

Abdel Gawaad, A.A. 1991. The state of environment in Egypt .(Special report) pp. 787.

Abdel Gawaad, A.A. 1991. Safe Disposal of Hazardous wastes in Egypt .(Special report) pp. 639.

Abdel Gawaad, A.A. 1991. Egyptian environment protection form pollutants produced by cement plants .(Special report) pp. 603.

Abdel Gawaad, A.A. 1991. Waste recycling schemes in Egypt .(Special report)) pp. 856.

Abdel Gawaad, A.A. 1991. New approaches to produce clean agricultural production free from pesticides and chemical fertilizers in Egypt .(Special report) pp. 777.

Abdel Gawaad, A.A. 1991. Towards a national strategy to increase the efficiency of women role in development and environment .(Special report) pp. 580.

Abdel Gawaad. A.A. 1991. Environmental protection of the new industrial communides in Egypt. .(Special report) pp. 392.

Abdel Gawaad, A.A. 1991. The strategy of environment protection in Egypt .(Special report) pp. 1248.

Abdel Gawaad, A.A. 1991. The role of Universities to build up a National strategy for Agriculture development and environment protection. Egyptian Universities conference October 19, 22, 1991, Cairo.

Abdel Gawaad, A.A. 1990. The state of Environment in Egypt (930 pages, 233 references) (Special publication).

Abdel Gawaad, A.A. 1991. The state of environment in Cairo (Special publication).

Abdel-Gawaad,A.A .1989: Pesticide residue limits for the third world countries in view to their feeding habits and behaviour. The the Third World Conference on environmental and health hazards of pesticides , Cairo.11- 11-15 December 1989.

Abdel-Gawaad,A.A.,A.Shams El-Dine and M .Ali.1989: Pesticide residues and acids in rain water. The third world Conference on Environmental and Health hazards of Pesticides.,Cairo,11-15 December 1989.

Abdel-Gawaad,A.A.1989:Pesticide residues levels in foodstuffs produced from old valley and new reclaimed area in Egypt . Third world conference on Environmental and health hazards of pesticides , Cairo,11-15 December 1989.

Abdel-Gawaad,A.A.1989:Brief account on inclusive study on the hazardous effect of cement dust on human beings,animals ,plants and vegitation.(Special report).

Abdel-Gawaad,A.A.1989:Pesticides hazards in the ecosystem of the third world (Special report).

Abdel-Gawaad,A.A.1991:Gulf ware and the Environment disaster.Al-Ahram 5.2.1991 p 11.

Abdel-Gawaad,A.A.1991:A new approach for economic development and integrated environment control in the Egyptian villages (in press) pp 1231.

Abdel-Gawaad,A.A.1991:The state of environment in Egypt (Special report), pp 787.

Abdel-Gawaad,A.A. 1991: Safe disposal of hazardous wastes in Egypt (Special report), pp 639.

Abdel-Gawaad,A.A. 1991: Egyptian environment protection from pollutants produced by cement plants (Special report) pp.603.

Abdel-Gawaad,A.A. 1991:National data bank about development and environment .(Special report) pp 239.

Abdel-Gawaad,A.A.1991: Waste recycling schemes in Egypt (Special report), pp 856.

Abdel-Gawaad,A.A. 1991:New approaches to produce clean agricultural production free from pesticides and chemical fertilizers in Egypt (Special report) pp 777.

Abdel-Gawaad,A.A.1991: Towards a national strategy to increase the efficiency of women role in development and environment (Special report) pp. 580.

Abdel-Gawaad,A.A.1991: Environmental protection of the new industrial communities in Egypt (Special report). pp 392.

Abdel-Gawaad,A.A.1991: The strategy of environment protection in Egypt. (Special report) pp 12.

Abdel-Gawaad,A.A. 1991:The role of the Universities to build up a National strategy for Agriculture development and environment protection. Egyptian Universities Conference, october,1991,Cairo.

Abdel-Gawaad,A.A. 1992:Ecotoxicological impact of organophosphorous Pesticides in Egypt part II. Scientific report.

Abdel-Gawaad,A.A. 1994:Ranking Environmental Health risks in Greater Cairo. Scientific report for Environomics. (Special report) 568 pages.

Abdel-Gawaad,A.A. 1994: The transformation of environment over the past 9000 years (Scientific report).

Abdel-Gawaad,A.A.1994: Atmospheric chemistry of Agrochemicals and the Global Climatic Changes,(Scientific report).

Abdel-Gawaad,A .A .1994 : Transformation of atmosphere and biosphere by agrochemicals in Egypt. (Scientific report.)

Abdel-Gawaad ,A.A.and A. Shams El-Dine 1989 :Insecticide residues in total diet samples . J.Egypt. Soc. Toxicol 4 : 79-84.

Abdel-Gawaad ,A.A.and A. Shams El-Dine 1990 :Insecticide residues in food stuffs : 1-in imported food . J.Egypt. Soc. Toxicol 5 : 49-52.

Abdel-Gawaad ,A.A.1991 :Ecotoxicological impact of Gulf war crisis. J.Egypt. Soc. Toxicol 7 : 103-106.

Abdel-Gawaad ,A.A.and A. Shams El-Dine 1989 :Insecticide residues in total diet samples . J.Egypt. Soc. Toxicol 4 : 79-84.

Ezz, A.E. , Z.M. Seleim and A.A.Abdel-Gawaad1991 :Average daily intake of some pesticide residues for milk fed egyptian infants. J.Egypt. Soc. Toxicol 7 : 115-124.

Ezz, A.E. , Z.M. Seleim and A.A.Abdel-Gawaad 1991Egyptian infant average daily intake of some pesticide residues during his first year of life. J.Egypt. Soc. Toxicol 7 :125- 134 .

El-Mousallamy .A.H.D. , Seleim Z.M. and Abdel-Gawaad A.A. 1991 : Determination of pesticide residues in crops produced by biological methods : 1-Cereal crops.. J.Egypt. Soc. Toxicol 7 :135- 142 .

Abdel-Fatah , M. ,N.A. Labib ,Z.M.Seleim, A.El-Mousallamy , A.E.A. Ezz and A.A.Abdel-Gawaad 1992 : Monitoring of PCB's and organophosphorous pesticides residues in milk.J.Egypt. Soc. Toxicol 9 :15- 18 .

Abdel-Gawaad ,A.A., F.I. Zahran ,Z.M.Seleim, and A.El-Mousallamy 1992 :Monitoring of heavy matals except lead in the tap water . J.Egypt. Soc. Toxicol 9 : 33-36.

Zahran F.I. .A .El-Mousallamy N. A. Soliman, Z.M.Seleim, and Abdel-Gawaad ,A.A. 1992 Toxicity and monitoring of lead in the tap water. J.Egypt. Soc. Toxicol 9 : 55-58.

Abdel-Fatah , M. ,N.A. Labib ,Z.M.Seleim, A.El-Mousallamy , A.E.A. Ezz and A.A.Abdel-Gawaad 1993 : Monitoring of organochlorine pesticides residues in both fresh and packed milk.J.Egypt. Soc. Toxicol 10 :1- 4.

Abdel-Gawaad A.A. ,N.A. Soliman , F.I. Zahran , Z.M.Selaim and A. El-Mousallamy 1993: The daily intake of lead by the Egyptian people. J.Egypt. Soc. Toxicol 10 :33- 36.

Abdel-Gawaad A.A. , A. El-Mousallamy ,M.A. Fatah , N.A. Labib, Z.M.Selaim and A. Ezz 1993: The average daily intake of of pesticide residues through milk for the Egyptian people. J.Egypt. Soc. Toxicol 10 :53- 58.

Shams El-Din A. ,Zakaria M. Seleim ,Amani El-Mousallamy and A.A. Abdel-Gawaad 1996 : Monitoring of pesticide residues in drinking water.J.Egypt. Soc. Toxicol 16 :111- 114.

El-Mousallamy A. ,Zakaria M. Seleim Shams El-Din A. and A.A. Abdel-Gawaad 1996 : Chemical constituents and pesticide residues levels in human, cow and buffaloes milk ..J.Egypt. Soc. Toxicol 16 :115- 118.

بحوث منشورة باللغة العربية

عبد الجواد (احمد عبد الوهاب) ١٩٩٦ : جرائم البحث العلمي . مجلة علوم وتكنولوجيا العدد٣٢ صفحة ٤٨–٤٩ .

عبد الجواد (احمد عبد الوهاب) ١٩٩٦ : فك شفرة التخاطب بين الحشرات وبين الحشرات والنبات . محلة علوم وتكنولوجيا . العدد ٢٥ صفحة من ٤٩–٥١ .

عبد الجواد (احمد عبد الوهاب) ١٩٩٦ : الجهاز الخفي للمحافظة علي مياه الكرة الارضية :محلة علوم وتكنولوجيا ، العدد ٣٢ صفحة من ٤٦–٤٩ .

عبد الجواد (احمد عبد الوهاب) ١٩٩٧ : القنبلة الحيوية العربية : محلة علوم وتكنولوجيا ، العدد ٤٩ صفحة من ٤٦–٤٨ .

عبد الجواد (احمد عبد الوهاب) ١٩٩٦ : تشريعات الامان الحيوي: محلة علوم وتكنولوجيا ، العدد ٢٨ صفحة من ٥٢–٥٥ .

عبد الجواد (احمد عبد الوهاب) ١٩٩٨ : سلامة الغذاء المنتج بالهندسة الوراثية : محلة علوم وتكنولوجيا ، العدد ٥٤ صفحة من ٤٧–٤٩ .

عبد الجواد (احمد عبد الوهاب) ١٩٩٦ : محميات الانسان الطبيعية: محلة علوم وتكنولوجيا ، العدد ٣٧ صفحة من ٥٠ –٥١ .

عبد الجواد (احمد عبد الوهاب) ١٩٩٦ : النمو السكاني في العالم. البيئة والتنمية العدد ١ صفحة من ٥١ – ٥٥ .

عبد الجواد (احمد عبد الوهاب) ١٩٩٥ : المنظمة العالمية الخفية لتنظيف الكرة الارضية · محلةعلوم وتكنولوجيا ، العدد ٢١

، العدد ٨١ صفحة من ٥٠-٥٣ .

عبد الجواد (احمد عبد الوهاب) ٢٠٠٠ : المبيدات الجينية مبيدات القرن الحادي والعشرين: محلة علوم وتكنولوجيا ، العدد ٨٢ صفحة من ٣٦-٣٨ .

عبد الجواد (احمد عبد الوهاب) ٢٠٠١ : الغذاء المنتج بالهندسة الوراثية ومدي سلامته علي الصحة العامة: محلة علوم وتكنولوجيا ، العدد ٨٣ صفحة من ٣٧ - ٤٠ .

عبد الجواد (احمد عبد الوهاب) ٢٠٠١ : الزراعة العضوية انتاج زراعي أمن في العصر الحديث: محلة علوم وتكنولوجيا ، العدد ٩٠ صفحة من ٣٠ - ٣٧ .

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عبد الجواد (احمد عبد الوهاب) ١٩٩٥ : كيف نخفض درجة حرارة دولة الكويت : محلة علوموتكنولوجيا ، العدد ٢٢ صفحة من ٥٣ - ٥٥ .

عبد الجواد (احمد عبد الوهاب) ١٩٩٥ : الغذاء الميت : محلة علوم وتكنولوجيا ، العدد ١٦ صفحة من ٥٠-٥١

عبد الجواد (احمد عبد الوهاب) ١٩٩٧ : المخزون الوراثي في العالم العربي: محلة علوم وتكنولوجيا ، العدد ٣٩ صفحة من ٤٨-٥٢ .

عبد الجواد (احمد عبد الوهاب) ٢٠٠٠ : التصحر ومخاطره علي المخزون الوراثي في العالم العربي : محلة علوم وتكنولوجيا