

Low Level and Long Term Exposure to Multiple Pesticides and Clastogenic Effects in a Flower Plantation in Ecuador.

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Introduction

Mutagenic effects, including clastogenic changes are known related with some kind of pesticides. Many studies report important changes like Sister Chromatide Exchanges (SCE) and Chromosomal Aberrations (CA) associated with pesticide exposure. Also, Chromosomal Aberrations are considered as predictive indicators of cancer.

Flower plantations in Ecuador use different kind of pesticides intensively. Organophosphates, carbamates, pyrethroids and sometimes also chlorinated pesticides are used two or three times weekly, mixing different products. Application is done with centralized system or manual system but always people is exposed in cultivated areas, post-harvest, fumigation and other areas close to the workplaces. Doses used are low because if there are too many health effects it could affect the production. So, low levels but long term use of pesticides is very common, and greenhouses are workplaces with microclimate problems such as low ventilation, high temperature and humidity. Workers are not enough provided with personal protection. See Table I.

Objective

The purpose of the study was to identify low dose and long term exposure to different pesticides (organophosphates, carbamates, chlorinated and pyrethroids) of workers in a flower plantation and to look for clastogenic effects with the study of chromosomal aberrations.

Materials and Methods

Pesticides used in a flower plantation were listed and 99 workers exposed to those pesticides and 50 non exposed subjects were studied with a questionnaire, Erythrocyte Acetyl Cholinesterase test, and blood samples were taken looking for Chromosomal Aberrations. Blood samples were cultivated in RPMI 1640 medium with bovine foetal serum and phytohaemagglutinin by 72 hours and results were reported. Additionally, measurements of dust, ventilation and microclimate were taken in the workplaces. Water and soil samples were obtained from different workplaces.

Results and Discussion

Ventilation was low, temperature is around 30°C and respirable dust was high in the greenhouses specially. Water and soil samples showed the presence of some chlorinated and organophosphates.

In this population, sex and age did not show significant differences between groups. Time of residence in the area, congenital malformations in the family, cancer cases in the family, X Rays in the last three months, smoke, and alcohol intakes were analysed and no differences were found between exposed and non exposed. Only in medicine intakes it was found more consumption in the exposed groups. Table II.

Statistical significant difference between exposed and non exposed groups for most of the Chromosomal Aberrations was found. (p<0,05). Table III.

Multiple exposure to pesticides, low dose and long term, could produce mutagenic effects in the flower plantations workers. Further studies are needed to look for details about specific changes produced for each pesticide.

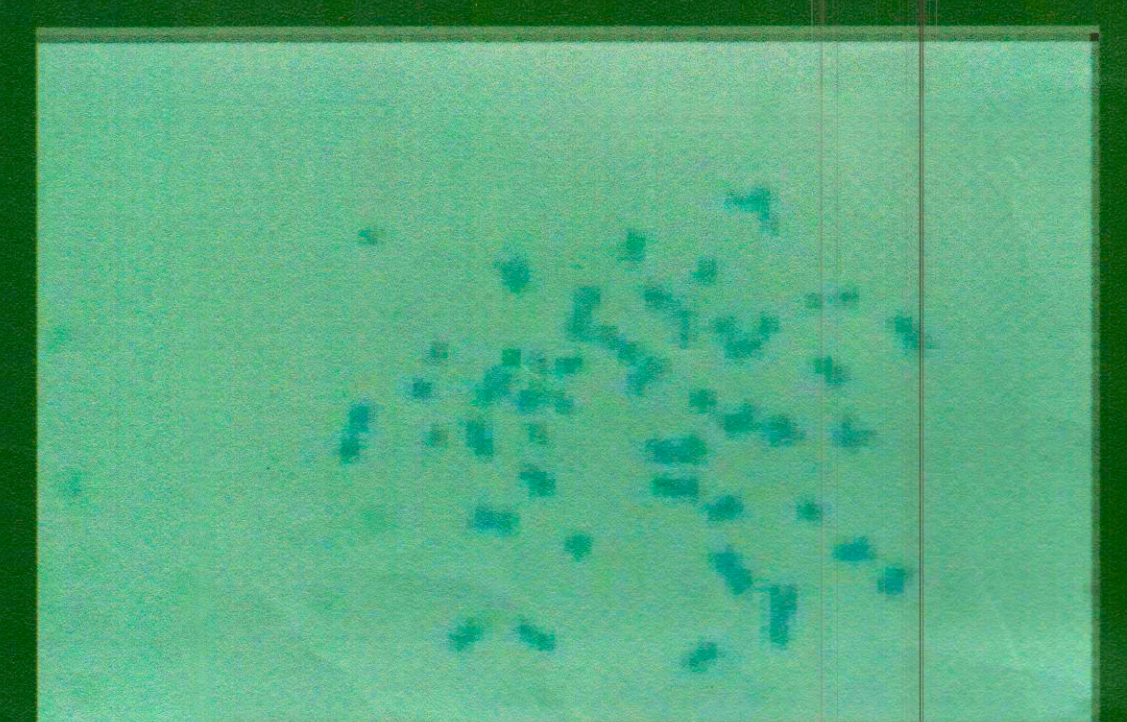
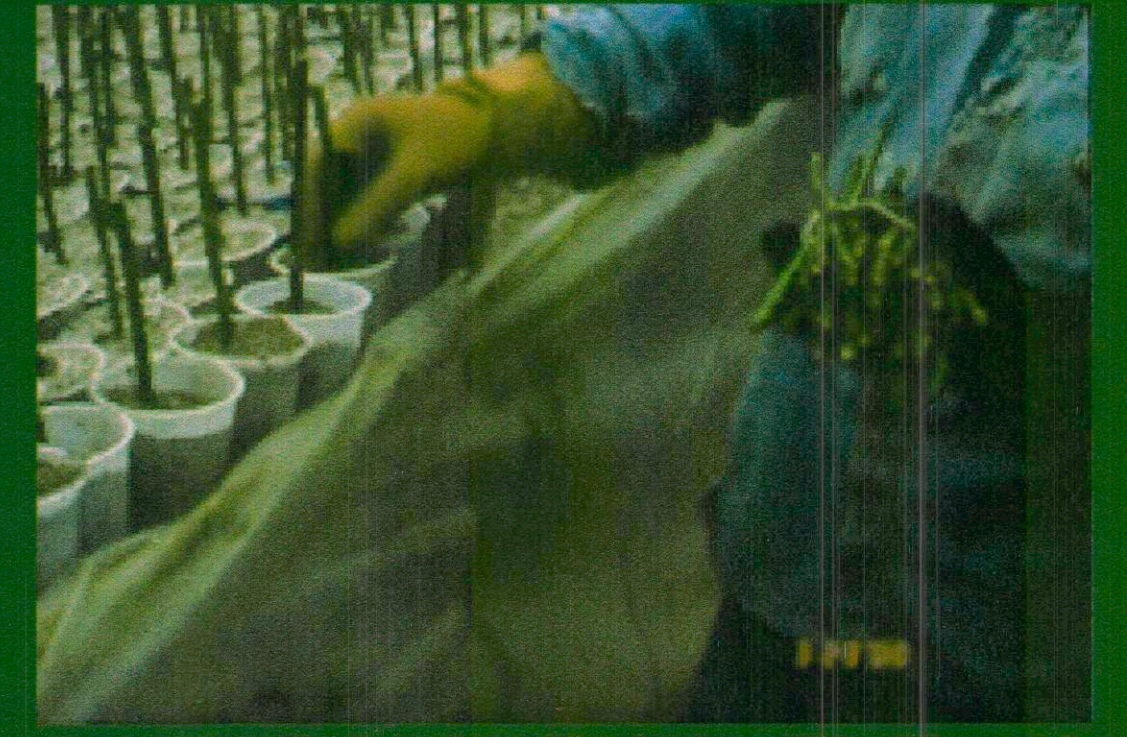


Table I.

Pesticides	CAS No.	Toxicological Class
Temik (Aldicarb)	116-06-3	I
Bravo 500 (Chloro thalonyl)	1897-45-6	I
Captan	133-06-2	I
Furadán (carbofuran)	1563-66-2	I
Nuvan (DDVP)	62-73-7	I
Difonathe	944-22-9	I
Mavrik (Fluvalinate)	102851-06-9	I
Roundup - Glyfosanate	1071-83-6	I
Cobox (Copper Oxyclohexide)	8012-69-9	II
Rubigan	60168-88-9	II
Bayleton	43121-43-3	II
Anthiomix (Anthio)	2540-82-1	II
Bulldok (Beta-cyfluthrin)	68359-37-5	II
Cymbush (Cypermethrin)	52315-07-8	II
Decis (Deltamethrin)	52918-63-5	II
Goal	42874-03-3	II
Toril (loxynil)	1689-85-5	II
Fongarit	57646-30-7	III
Mertec - thiaabendazole	148-79-8	III
Plantvax	5259-88-1	III
Aviso DF (Cymoxanil metiram)	57966-6-95-7	III
Mirage (Prochloraz)	67747-09-5	III
Sandofan (oxadixyl)	77732-09-3	III
Mitac (Amitraz)	33089-61-1	III
Diuron	330-54-1	III
Allete (fosetyl-aluminum)	39148-24-8	III
Avit (Abamectin)	717511-41-2	IV
Euparem	1885-98-9	IV
Anvil	79983-71-4	IV
Mancoceb	8018-01-7	IV
Bavistin (Carbendazim)	10605-21-7	IV
Kumulos (sulfur)	7704-34-9	IV
Benomyl	17804-35-2	IV

Table II.

Distribution of Subjects by Different Variables. Ecuador. 2004			
Population		Exposed	Non Exposed
SEX	Male	37,4	41,1
	Female	62,61	58,9
AGE	>20 years	0,0	7,1
	20 - 29	63,6	66,9
	30 - 39	29,3	19,6
	40 or + years	7,1	14,3
Congenital Malformations in the family			
YES		2,0	3,6
NO		98	96,4
Cancer on members of their families			
YES		16,2	17,9
NO		83,8	81,1
X Rays in the last 3 months			
YES		10,1	3,6
NO		89,9	96,4
Smoke			
YES		26,3	32,1
NO		73,7	67,9
Alcohol Intake			
YES		33,3	30,4
NO		66,7	69,6
Medicines Intake last Week*			
YES		50,5	32,1
NO		49,5	67,9

* Differences

Table III.

DAMAGE	EXPOSED		NON EXPOSED	
	Normal	Abnormal	Normal	Abnormal
Chromatide Aberrations				
Gap (gct)	40,4	59,6	75	25 *
Breaks (bct)	43,4	56,6	62,5	37,5 *
Exchanges (Inv)	88,9	11,1	98,2	1,8
Chromosomal Aberrations				
Gap (acs)	51,5	48,5	58,9	41,1
Break (bct)	60,6	39,4	80,4	19,6 *
Rings	96	4,0	98,2	1,8
Dicentric (dic)	92,9	7,1	100	0 *
Acentric fragments (ace)	64,6	35,4	85,7	14,3 *
Other Aberration				
Satellite Aberrations (asosat)	31,3	68,7	69,6	30,4 *
Open Chromatides (opct)	36,4	63,6	48,2	51,8
Chromosomal Instability (desp)	76,8	23,2	98,2	1,8 *
High Staining Regions (hsrs)	83,8	16,2	94,6	5,4
Polyploidy	65,7	34,3	71,4	28,6
Pulverization (pvz)	59,6	41,4	58,9	41,1

* Differences

Conclusions

Safety and hygienic measures must be taken immediately to control exposure and biological monitoring of the workers should be done, to avoid chronic diseases and in particular carcinogenic impacts in this population.

References:

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