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Awareness of Farmers Towards Pesticide Use in the Gaza Strip.

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Abstract

Various aspects of awareness of farmers toward pesticide use in the Gaza Strip has been investigated. Two hundred and twenty five farmers were included in this survey. Data were collected through a questionnaire with relevant information. The majority of the interviewed farmers 195 (86.7%) reported that they purchase pesticides from the local markets which are not well governmentally supervised and controlled. Overuse and/or misuse of pesticides is obvious in the improper estimation of the timing and frequency of application. Most of farmers 169 (75.1%) were found not to read labels on pesticide containers and few farmers 4 (1.8%) smell pesticides to assess their effectiveness. A substantial number of farmers 156 (69.3%) admitted that they returned to sprayed fields within 12 hours of applying pesticides. More than half of the farmers 123 (54.7%) reported that they harvested their crops within three days of pesticides application. A horrible negligence was found among farmers 176 (78.2%) with respect to wearing protective gear. Some farmers 35 (15.5%) stored pesticide containers in the house and many farmers 103 (45.8%) throw these containers anywhere. Manifestation of health hazards of pesticides were recorded through the farmers' experience of poisoning and/or death cases among humans, domestic animals and wildlife. Increase of awareness of farmers toward pesticide use through educational and training courses would be valuable.

Introduction

The Gaza Strip, a narrow strip with high population density, depends largely on the agriculture sector. The warm climate in this region favors cultivation of many crops including citrus fruits, olives, almonds, grapes, other subtropical fruits, vegetables and flowers (Safi, 1995). To meet the growing demand of population increase and to improve the deteriorating economy, farmers overuse a wide variety of pesticides to increase the agricultural production. Some of these pesticides have been internationally suspended, banned or canceled because of their mutagenicity, teratogenicity or carcinogenicity (Safi et al., 1993 and Safi, 2002). Pesticide impact on humans and environment has been studied in neighboring countries as well as in Gaza Strip (El-Sebae, 1983; Forget, 1991; El-Sebae, 1993 and Safi, 1998). Several studies on various awareness aspects associated with pesticide use have been conducted among farmer populations worldwide including the developing countries (Jeyaratnam et al., 1987; McDougall et al., 1993; Sivayoganathan et al., 1995; Guo et al., 1996; Iorizzo et al., 1996; Parron et al., 1996; Clarke et al., 1997; Wesseling et al., 1997 and Perry et al., 2000). However, these sort of studies in the Gaza Strip are limited. Abu Middain (1994) reported indiscriminate use and improper application of pesticides in the Gaza

Strip. Safi (1995) stated that inadequate legislation, regulations and guidelines, testing, handling, quality control of specifications and disposal of pesticides are one of the main special problems associated with pesticide use and its management in Gaza Strip. Abd Rabou and Al-Agha (1998) addressed that the majority of farmers in Rafah Governorate, one of the five Governorate of the Gaza Strip, do not wear protective clothes during handling and application of pesticides. Recently, Yassin et al., 2002 investigate knowledge, attitude and practice associated with pesticide use among farm workers in the Gaza Strip. Despite the high level of knowledge reported by Gazans farm workers about the adverse health impact of pesticides, the use of protective measures was poor. The majority of farm workers admitted that they mixed two or more pesticides hoping to produce more effective one before they applied them. The current study is aimed to provide further information on the awareness aspects of farmers towards pesticides use in the Gaza Strip and to show the hazards of pesticides not only to humans but also to animals.

Subject and Methods

The present work is a cross sectional study. The target group was agricultural farmers in the Gaza Strip who were applying pesticides during the summer of 1998. Two hundred and twenty five farmers were included in this survey. The farmers were individually interviewed and their responses were recorded in questionnaires specially designed to conduct this work. The validity of the questionnaire was tested by four specialists in agricultural and environmental sciences. The questionnaire was piloted. All interviews were conducted face to face by only one investigator who had a Master degree of environmental science and is familiar with farmers. This will build trust between the interviewer and farmers and will minimize the source of error or bias. Most questions were yes/no and multiple choice questions (Backestrom and Hursh-Cesar, 1981). During the survey the interviewer explained to the farmers any of the questions not clear to them. The questionnaire included relevant information on personal profile of farmers, experience period in farming, pesticide source, frequency and time of pesticides application, activities of farmers with potential for pesticide exposure, protective measures in use, dealing with pesticide containers and health impact of pesticide exposure, The re-entry period (defined as the time which must elapse after pesticide treatment of a crop or an area before it is advisable for people to re-enter the treated area) according to GIFAP (1989) and Pre-harvesting interval (defined as the period of time which must elapse between the application of a pesticide and the harvesting of a crop to ensure that pesticide residues on the crop are within acceptable limits)accoriding to GIFAP (1989).

Data were computer analyzed using SPSS/PC (Statistical Package for the Social Sciences Inc, Chicago, Illinois) and Excel Version 6 for frequency and cross tabulation.

Results

The present data were collected by a questionnaire from two hundred and twenty five farmers who use pesticides in the Gaza Strip. Table 1 illustrates the personal profile of the farmers. The age frequency showed that 112 (49.8%) of the farmers were 21-40 years old. Analysis of the educational status of the farmers showed that 33 (14.7%) were highly educated, 66 (29.3%) had

finished secondary school, 44 (19.6%) had finished preparatory school, 59 (26.2%) had passed primary school and 23 (10.2%) were illiterate. A total of 172 (76.5%) were married and 50 (22.2%) were single. Only two farmers (0.9%) were widowed and one (0.4%) was divorced.

As indicated in Table 2, the cultivated area by more than half of the farmers 119 (52.9%) is less than 6 dunums. Most of the interviewed farmers 169 (75.1%) owned the farms. A substantial number of farmers 161 (71.6%) claimed that they had more than six years of experience in farming.

Source, type, frequency and time of application of pesticides are presented in Table 3. Few farmers 16 (7.1%) reported that they purchase pesticides from the legal agricultural extension stations while the majority of farmers 195 (86.7%) purchase pesticides from the local markets. The rest of farmers 14 (6.2%) were found to buy pesticides from other localities illegally. These localities include Israel and Israeli settlements scattered in the middle and southern parts of the Gaza Strip. The majority of the interviewed farmers 160 (71.1%) were found to use both preventive and cure pesticides. No one of the interviewed farmers was found to applied pesticides mid-day but a substantial number of farmers 103 (45.8%) was found to applied pesticides morning and afternoon. Regarding the frequency of pesticide application per agricultural season, it was found that a total of (169) 75.1% of farmers apply pesticides more than 21 times seasonally.

Table 4 showed the activities of farmers with potential for exposure to pesticides. Although the majority of interviewed farmers were educated, only around quarter of them 56 (24.9%) were found to read labels on pesticide containers to assess the effectiveness of pesticides. When those who not reading labels 169 (75.1%) were questioned, most of them 105 (62.1%) displayed careless and satisfaction with the seller advice, others 41 (24.3%) had language misunderstanding and others 23 (13.6%) were illiterate. Few farmers 4 (1.8%) smell pesticides but no one was found to taste them. Most farmers 165 (73.3%) assess the effectiveness of pesticides after their use.

Table 5 lists the protective measures in use as reported by farmers during pesticides application. The numbers of farmers who mentioned that they wear protective gear and not eating and/or drinking during application of pesticides were 49 (21.8%) and 203 (90.2%), respectively. In addition, 138 (61.3%) cleaned and maintain their spraying equipment and 197 (87.6%) had a water bath after applying pesticides.

Table 6 shows that 42 (18.7%) farmers stored pesticide containers in the agricultural field, 35 (15.5%) stored pesticide containers in the house and 148 (65.8%) stored them in special store (farm or farmers house). Although more than half of interviewed farmers 120 (53.3%) burned or buried empty pesticide containers, a substantial number of farmers 103 (45.8%) still throw these containers away on the garbage places, in farms, along the road-side or along the fence of their farms. Only two farmers (0.9%) were found to use the empty pesticide containers for domestic purposes.

Table 7 illustrates the health hazards of pesticides to humans, domestic animals and wildlife as reported by farmers. Although more than half of farmers 122 (54.2%) mentioned that they fell ill during or after pesticide application, some farmers 32 (14.2%) believe that these diseases are associated with pesticide application. In addition, a total of 113 (50.2%) interviewed farmers mentioned

several cases of poisoning and/or death related to pesticides among humans. For domestic animals, a total of 76 (33.8%) farmers reported that they have experienced poisoning and/or death cases in their livestock due to causal poisoning by pesticides. The poisoned animals include goats, sheep, horses, donkeys, cattle and chicken. A total of 105 (46.7%) farmers mentioned wildlife poisoning and/or death cases associated with pesticides.

When the farmers were questioned about the reception of agricultural extension services, Agricultural extension services through which the education services provided to farmers by agricultural officials (agronomists) on identification of agricultural pests and the suitable pesticide used, the effective and safe ways of applying pesticides and other advices about all agricultural processes, the majority of them 146 (64.9%) mentioned that they regularly or occasionally receive these services. Few farmers 20 (8.9%) said that they attended training courses in pesticide use.

Table 8 shows that a total number of 67 (29.8%) farmers had good knowledge of pesticide use and 158 (70.2%) farmers had poor knowledge according to their age distribution. Farmers aged 21-30 years 32 (14.2%) had the highest good knowledge of pesticide use followed by those of age 31-40 years 21 (9.4%). Regarding the education level, it was found that 51 (22.6%) farmers had good knowledge of pesticide use and 174 (77.4%) farmers had poor knowledge. Farmers who finished their secondary school or university were found to have the highest percentage of good knowledge on pesticide use.

Discussion

The current data discuss issues and trends on various aspects of awareness among farmers toward pesticide use in Gaza Strip. The high education level of farmers recorded here may be as a result of them not getting another job because of the unemployment crisis in the Gaza Strip (Abd Rabou and Al-Agha, 1998 and Yassin et al., 2002). The long experience period in farming could strengthen our results and give a wider view on the agricultural situation and awareness of farmers toward pesticide use in the Gaza Strip.

According to the present data the local markets are the main source of selling pesticides. In Gaza Strip the pesticide local markets are not well governmentally supervised and controlled (Abu Middain, 1994). Also, the traders are not qualified to advice or guide the farmers on the use of pesticides. This will promote the misuse of these chemicals and will put both farmers and crops at risk. The overuse and/or misuse of pesticides by farmers in the Gaza Strip is obvious in the improper estimation of the timing and frequency of application. Irrespective of their health and accumulation of pesticide residues on crops, farmers believe that more spraying of pesticides means more agricultural yield. Similar results were reported by Wesseling et al. (1997).

The present study revealed that the majority of farmers do not read labels on pesticide containers when they assess the effectiveness of pesticides. The reason is that many farmers are careless and they are satisfied with the seller advice, others have language misunderstanding and others are illiterate. Although few farmers test the effectiveness of pesticides by smell, such practice will constitute a real threat to farmers'

health. It is known that inhalation is an important route of pesticide exposure (World Health Organization, WHO, 1993). The recommended way to spray pesticides is cross the wind from the head of the wind to its tail (GIFAP, 1989). The other way of pesticide application may make the pesticide ineffective by blowing it away from the target and it may be hazardous if it drifts onto the farmer, other crops, water, animals or houses.

The risk of immediate re-entry to sprayed fields relies in the fact that in the first hours of spraying pesticides drift still exist in an active form in micro-environmental site whereas at late time it could be scattered, evaporated or degraded due to photochemical or thermal degradation. This result is consistent with that of other studies (WHO, 1993 and Wesseling et al., 1997). Although the pre-harvest interval of many of pesticides used in Gaza Strip is from 7 to 42 days (Haapala, 1993), most farmers harvested their crops within 3 days of spraying. These crops are often sold to customers without the consumers being aware of this risk they are taking when eating these fresh chemically treated crops (Hulshof, 1991 and Save the Children, SCF, 1991).

The finding that the majority of farmers did not wear protective gear during pesticide application is alarming and needs farmers, environmentalists, governmental officials and non-governmental organization to stop and think. Several authors demonstrated that many farmers in the developing countries were not use or partially use the protective gear (El-Sebae, 1993; Sivayoganathan et al., 1995; Clarke et al., 1997 and Yassin et al., 2002). Cleaning and maintenance of spraying device will prevent pesticides leakage and spillage onto the farmer's clothes and skin. This could be of potential harm as most occupational exposure to pesticides occur from skin absorption (Iorizzo et al., 1996).

Storage of pesticides in the home will put children and adults at risk. Empty pesticide containers are classified as hazardous wastes and special care is required before and during their disposal. Unfortunately in Gaza Strip we still do not have a special landfill for hazardous waste disposal which may encourage the farmers to throw empty pesticide containers anywhere. Mismanagement of pesticide containers is common in the developing countries (Safi, 1995 and Wesseling et al., 1997).

Hazards of pesticides to humans and animals are usually of acute nature and may be fatal (Jeyaratnam et al., 1987; Osorio et al., 1991 and Mineau et al., 2001). As claimed by farmers, the causes of poisoning and/or death cases among humans were ingestion or inhalation of pesticides, eating or drinking and not wearing the protective clothing while handling and/or applying pesticides. For animals, farmers mentioned that ingestion of instantly pesticides sprayed crops, drinking of pesticide contaminated water and lapping up of empty pesticide contaminated containers are the main causes of poisoning and/or death.

Reagarding to the comparison between the farmers of poor and those of good knowledg ,the highest good knowledge was recorded for farmers aged 21-40 years compared to the other age intervals. This could be attributed to their chance in attending training courses on pesticide use and dealing with new applicable pesticides in terms of their effectiveness and safety measures. The level of education reflected the knowledge of pesticide use (Yassin et al., 2002). This was apparent for farmers finished secondary and higher level of education who showed the highest percentages of good

knowledge. Most of them attended training courses on pesticide use and having good communication capabilities with agricultural officials and other agricultural and environmental institutions. Moreover, the highly educated farmers have the ability to fully read the instructions of pesticide use. Also, those farmers have the well to read about scientific issues of public concern including pesticide use in different media

Although agricultural extension services are of vital importance to farmers to increase their awareness and crop yield, still a considerable number of farmers did not receive these services. It is important to urge farmers to attend training courses in pesticide use.

In conclusion, results presented here display a lack in awareness of Gazan farmers toward pesticide use. This is represented in overuse and/or misuse of pesticides through the improper estimation of the timing and frequency of application, not reading labels on pesticide containers, immediate re-entry of sprayed fields, disrespect of the pre-harvesting interval, not wearing protective gear, storage of pesticide containers in home and disposal of empty pesticide containers anywhere. Launch of educational and training programs for farmers to improve their safety and awareness of pesticides would be useful. Also, improvement of agriculture extension services is essential and further studies are needed to investigate the specific health hazards of pesticides to humans, domestic animals and wildlife.

Finally, a multi-effort from different professional groups, different sectors of the government and non-governmental organizations is highly recommended.

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Table (1): Personal profile of farmers (n=225).

Personal profile	Farmers	
	No.	%
Age distribution (year)		
0-20	26	11.6
21-30	62	27.6
31-40	50	22.2
41-50	42	18.6
>50	45	20.0
Education level		
Illiterate	23	10.2
Primary school	59	26.2
Preparatory school	44	19.6
Secondary school	66	29.3
Higher education*	33	14.7
Marital status		
Married	172	76.5
Single	50	22.2
Widowed	2	0.9
Divorced	1	0.4

* Higher education means diploma or university degree.

Table (2): Area of cultivated farm, relation of farmers (n=225) to the farm and experience period in farming.

Item	Farmers	
	No.	%
Area of cultivated farm (dunums)		
0-5	119	52.9
6-10	51	22.6
11-15	18	8.0
16-20	20	8.9
>20	17	7.6
Relation to farm		
Owner	169	75.1
Partner	28	12.4
Renter	11	4.9
Labor	17	7.6
Experience period in farming (years)		
0-5	64	28.4
6-10	56	24.9
11-15	34	15.1
16-20	31	13.8
>20	40	17.8

Table (3): Source, type, frequency and time of application of pesticides used by farmers (n=225).

Variable	Farmers	
	No.	%
Pesticide source		
Agricultural stations	16	7.1
Local markets	195	86.7
Other localities*	14	6.2
Type of Pesticide used		
Preventive	19	8.5
Cure	46	20.4
Both	160	71.1
Time of pesticide application		
Morning	27	12.0
Mid-day	0	0.0
Afternoon	80	35.5
No specific time	15	6.7
Morning and afternoon	103	45.8
Frequency of pesticide application/agricultural season		
0-20	56	24.9
21-40	60	26.7
41-60	48	21.3
>60	61	27.1

* Other localities include Israeli settlements in Gaza Strip and also from Israel.

Table (4): Activities of farmers (n=225) with potential for exposure to pesticides

Activities with potential for exposure	Farmers	
	No.	%
Assesment of effectivness of pesticides		
Reading of lable	56	24.9
Tasting by mouth	0	0.0
Smelling by nose	4	1.8
Assesment after use	165	73.3
Wind direction during pesticide application		
No spraying in the wind	29	12.9
With wind direction	115	51.1
Never mind	60	26.7
Spraying in green house	21	9.3
Re-entry period (hr)		
0-12	156	69.3
13-24	60	26.7
>24	9	4.0
Pre-harvesting interval (day)		
0-3	123	54.7
4-7	70	31.1
8-12	21	9.3
>12	11	4.9

Table (5): Protective measures in use as reported by farmers (n=225) during pesticide application.

Protective measures in use	Farmers	
	No.	%
Wearing protective gear during application	49	21.8
Not eating and/or during application	203	90.2
Taking water bath after application	197	87.6
Cleaning of spraying equipment	138	61.3

Table (6): Storage of pesticides and fate of empty containers as reported by farmers (n=225).

Variable	Farmers	
	No.	%
Site of pesticide Storage		
Agricultural field	42	18.7
House	35	15.5
Special store*	148	65.8
Fate of empty containers		
Thrown away	103	45.8
Burying or burning	120	53.3
Domestic use	2	0.9

* Special store may found either in the farm or in the farmer house.

Table (7): Health hazards of pesticides to humans, domestic animals and wildlife as reported by farmers (n=225).

Hazards of pesticides	Farmers	
	No.	%
To humans		
Felling ill during or after pesticide application	122	54.2
Suffering from disease associated with pesticide application	32	14.2
Experience of poisoning and/or death cases	113	50.2
To domestic animals		
Experience of poisoning and/or death cases	76	33.8
To wildlife		
Experience of poisoning and/or death cases	105	46.7

Table (8): Comparison of farmers (n=225) of poor and good knowledge of pesticide use regarding personal characteristics.

Personal characteristics	Farmers kowledge of pesticide use			
	Poor knowledge		Good knowledge	
	No.	%	No.	%
Age distribution (year)				
0-20	23	10.2	3	1.3
21-30	30	13.3	32	14.2
31-40	29	12.9	21	9.4
41-50	35	15.6	7	3.1
>50	41	18.2	4	1.8
Total	158	70.2	67	29.8
Education level				
Illiterate	22	9.8	1	0.4
Primary school	54	24.0	5	2.2
Preparatory school	40	17.8	4	1.8
Secondary school	45	20.0	21	9.3
Higher education	13	5.8	20	8.9
Total	174	77.4	51	22.6

وعى المزارعين تجاه استخدام المبيدات في قطاع غزة

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الخلاصة

بحثت هذه الدراسة الجوانب المختلفة من وعى المزارعين تجاه استخدام المبيدات في قطاع غزة. تم اختيار 225 مزارعا لإجراء هذه الدراسة. جمعت البيانات في استبانه تحتوى على معلومات مناسبة لهذا الغرض. أظهرت الدراسة أن معظم المزارعين التي أجريت معهم المقابلة يشترون المبيدات من الأسواق المحلية التي لا يتم الإشراف والسيطرة عليها من قبل السلطة. زيادة و/أو سوء استخدام المبيدات كان واضحا في هذه الدراسة من خلال التقدير الخاطئ لوقت وعدد مرات الاستعمال. وجد أن معظم المزارعين لا يقرؤون التعليمات على ديباجة عبوات المبيدات وقليل من المزارعين يشم المبيدات لتقدير مدى فاعليتها. أقر عدد لابأس به من المزارعين أنهم يعودون إلى الحقول المرشوشة خلال 12 ساعة من رش المبيدات، وأقر أكثر من نصف عدد المزارعين بجني محاصيلهم خلال 3 أيام من رش المبيدات. وجد إهمال مريع بين المزارعين فيما يتعلق بارتداء اللباس الواقي. وجد أن بعض المزارعين يخزن عبوات المبيدات في المنزل والعديد من المزارعين يرمى هذه العبوات في أي مكان. سجلت هذه الدراسة أعراض المخاطر الصحية للمبيدات من خلال ذكر المزارعين لحالات تسمم و/أو وفاة للإنسان، الحيوانات المستأنسة والحيوانات البرية. إنه لمن الأهمية العمل على زيادة وعى المزارعين تجاه استخدام المبيدات من خلال المناهج التعليمية والتدريبية.