

Pesticide Safety Practices Among Vegetable Farmers of AL-Taleaa District, Babylon Province, Iraq

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Abstract

Vegetables farmers used a large quantity of pesticides to protect their plants. Unsafe use of pesticides represents a major occupational hazard to farmers health and the environment. The study was conducted in Babylon Province, Iraq; to investigate pesticide safety practices among vegetable farmers. Three hundred vegetable farmers were randomly selected. Majority of vegetable farmers stored pesticides in special store for agricultural supplies, don't have diluted pesticides or excess unused pesticides, burn on farm the empty pesticide containers. The majority of vegetable farmers never used: coveralls; protective boots; glasses; gloves and respirator/nose mask, always talking and never drinking or eating while mixing or spraying pesticides. There is an urgent need to implement extension programs to raising awareness of farmers about the dangers of using pesticides on public health, and the correct practices for the safe use of pesticides.

Keywords: agrochemical; exposures; farm management; horticulture; occupational risk.

Introduction

Vegetables are sources of vitamins, minerals and income for those involved in production and marketing (Tadesse, 2023). In recent years, vegetables consumption has been increasing, so, vegetable production needs to be increased to meet the requirement of large population of the world.

Vegetables are among the crops most susceptible to diseases and insects (Kabote et al. 2021; Kumar et al., 2022). Vegetable farmers used a large quantity of pesticides to decreasing production losses that accrued by insects, pests, microbial diseases and weeds (Khatun et al., 2023; Wan et al., 2023). There are rules, standards and practices related to the use of agricultural pesticides, part of which relates to the safety of users of these pesticides (Sapbamrer et al., 2023; FAO, 2022; FAO,

2020a). Vegetable farmers unsafe use of pesticides represents a major occupational hazard to their health and the environment (Sheryl and Rodelyn, 2023; Shammi et al., 2020).

Studying the practices followed by vegetable farmers when dealing with pesticides provides an information base that helps in building extension programs that enable farmers to deal safely with pesticides. Pesticides use practices among vegetable farmers has been studied in different regions of the world; Nguyen et al., 2018; Balasha et al., 2019; Mubushar et al., 2019; Agmas and Adugna, 2020; Huyen et al., 2020; Aniah et al., 2021; Benaboud et al., 2021; Marete et al., 2021; Mergia et al., 2021; Sumudumali et al., 2021; Thapa et al., 2021; Yasir et al., 2021; Loha et al., 2022; Miyittah

et al., 2022; Moda et al., 2022; Raimondo et al., 2022; Shahidullah et al., 2023.

Vegetable crops are widely cultivated in Iraq, and come in second place after grain crops in terms of area cultivated and production (SCO, 2021). Pesticides are the most widely used method among vegetable farmers to control diseases, pests, insects and weeds. Very limited studies have been conducted in Iraq and study area, in particular those concerning the use of pesticides among

Materials and Methods

The study was carried out in AL-Taleaa District in Babylon Province, located in south central Iraq, between 32.7° and 33.8° N and 43.42° and 45.50° E. Babylon Province is located in the Middle of Euphrates provinces, a fourth vegetable producing province (CSO, 2021). Commonly cultivated crops in the district are okra (*Abelmoschus esculentus* L.), cucumber (*Cucumis sativa* L.), eggplant (*Solanum melongena* L.), cowpea (*Vigna unguiculata* L. Walp), melon (*Cucumis melo* L.) and onion (*Allium cepa* L.). There is no farmer specialized in the cultivation of a particular crop, but each farmer cultivate more than one crop during summer.

The population for this study consisted of 466 vegetable farmers in the district. Of these 16 were chosen for testing the questionnaire's reliability, and from the 450 remaining, 300 were randomly selected to respond to the questionnaire from 10-25 May 2023.

The instrument used was a two-part questionnaire comprising socio-economic characteristics and pesticide safety practices

Results and Discussion

Vegetable Farmers Characteristics

Selected characteristics of the respondents have been presented in Table 1. Regarding age, majority of vegetable farmers (65%) were young with (25-50) years old. Young

vegetable farmers. Therefore, there is a need to know about pesticides used among vegetable farmers: how they manage pesticides, do they use protective equipment, what are the operational habits they follow? The study was undertaken with the following objectives: 1) investigating pesticides management among vegetable farmers; 2) investigating the personal protective equipment used; 3) investigating the operational habits that practiced.

scale. The socio-economic characteristics included age, education level, years of experience in vegetable cultivation, number of cultivated crops, area cultivated with vegetables, and annual income from summer vegetable. The pesticide safety practices scale included three areas: pesticides management (include four aspects, each aspect include four sub-aspects); personal protective equipment; operational habits (they were measured at three levels: always; sometimes; never).

Content validity of the questionnaire was established by a panel of experts in fields of agricultural protection and extension. A pilot study was conducted to establish reliability of the instrument. Cronbach's alpha (a reliability coefficient of 0.91) was established, indicating the instrument used was reliable and valid.

Data were analyzed using frequency, percentage, mean (M), standard deviation (SD), using SPSS ver. 22, (SPSS Inc., Chicago, IL).

farmers are characterized by the ability to complete work and the ability to understand and apply improved agricultural practices

(Adeyanju et al., 2023; Adzkie and Elvira, 2023).

Education is an important factor in agricultural work, especially when dealing with the agricultural technologies like pesticides (Ninh, 2021; Li et al., 2023). Educated farmers have a good ability to use pesticides and understand their effects on health and environment than less educated ones (Mubushar et al., 2019). Education level of vegetable farmers was varied, 43.3% of them within university level and 36.7% within secondary educated.

years of experience is a major factor in determining of vegetable farmers productivity (Palathingal, 2019). Acquired experience over the years will be effected in farmers activities, thus, he becomes more efficient in farm management (Oluwalana et al., 2019). The results in Table 1 showed that the majority of respondents (56%) had more than 20 years of experience in vegetable cultivation followed by 34% within (10-20) years.

Majority of respondents (45.3%) have more than (2250 \$) as an annual income, 57.7% cultivate (1.25- 4.5 ha) and cultivate 3 crops of vegetable.

Table 1: Characteristics of respondents (N=300)

Variable	Categories	%
Age M= 44.2 SD= 8.3	< 25	11.7
	25 – 50	65.0
	> 50	23.3
Education	<Secondary	20.0
	Secondary	36.7
	University	43.3
Years of experience M= 20.1 SD= 2.8	< 10	10.0
	10 – 20	34.0
	> 20	56.0
Annual income from vegetable (\$) M= 2100 SD= 128	< 1000	18.7
	1000 – 2250	36.0
	> 2250	45.3
Area cultivated with vegetable (ha) M= 1.8, SD= 0.9	< 1.25	7.3
	1.25 – 4.5	57.7
	> 4.5	35.0
number of cultivated crops M= 2.8 SD=0.78	2	12.3
	3	57.7
	4	30.0

Pesticide Management

Pesticide store

Pesticides are harmful to health and the environment. Pesticides must be kept in a secured storage away from children and animals. Result in table2 relevant that majority of vegetable farmers (60%) stored their pesticides in a special store for agricultural supplies like seeds, fertilizersitc, 10% stored it in special store for pesticides, while

Leftover dilute pesticides

All pesticides are diluted with water before being applied on the farm. Sometimes the amount of pesticides mixed with water is more than the actual need, which means that some of them remain without being sprayed on the plants.

Regarding vegetable farmers' dealing with Leftover dilute pesticides, results in Table 2,

Excess unused pesticides

There are many factors that affect the farmer's ability to determine the amount of pesticide required, such as; farmer skills, efficiency of the sprayer used, cultivation method, plant density, water purity degree. Consequently, some farmers tend to buy more pesticides than what is actually needed.

The results of the study showed that 58.3% of the respondents had no excess unused

Empty pesticide containers

Empty pesticide containers still contain pesticides residues inside it, so, it can causes a damage to the human health and environment(Marsola et al., 2021; Yakubu et al., 2023). Therefore, it must be disposed of safely and properly (Salem et al., 2019; Lwin, 2023).

Vegetable farmers management of empty pesticide containers, as fellows, the majority (

6.7% stored their pesticides in a general store inside the house. This clearly shows the majority of respondents' commitment to instructions related to storing pesticides away from humans and animals. Some respondents (23.3%) don't stored their pesticides, they use it immediately after purchasing it.

showed that 20% of them apply it on other crops, 13.3% disposed on the field, while 3.3% stored it in container to be reused. Majority of respondents (63.4%) have no remaining diluted pesticides, because, they mix only needed pesticides. They use small backpack sprayers, thus controlling the amounts diluted with water.

pesticides, while the rest home had excess unused pesticides, they deal with it as follows: 28.7% store for next time use, 9.7% dispose on the field, in both cases, there is damage to humans and animals due to storage, soil and other plants due to the random disposal of excess quantities. While 3.3% return the excess unused pesticides to seller.

70%) burn on farm. There are special conditions for burning empty containers and caveats to this process (Rostami et al., 2019; Garbounis et al., 2022). Some of respondents (20%) Bury empty pesticide containers on-farm, 6.7% dump them on the farm, while 3.3% reuse for other purposes.

Table 2. pesticides management among vegetable farmers (n=300)

Aspects of pesticide management	Sub- aspects	%
Pesticide's store	Special store for agricultural supplies	60.0
	Don't store pesticides	23.3
	Special store for pesticides	10.0
	General store inside the house	6.7
leftover diluted pesticides	Mix only needed pesticides	63.4
	Apply on other crops	20.0
	Disposed on the field	13.3
	Stored in container to be reused	3.3
Excess unused pesticides	Buy what is needed	58.3
	Store for next time use	28.7
	Dispose on the field	9.7
	Return to seller	3.3
Empty pesticide containers	Burn on farm	70.0
	Bury on-farm	20.0
	Dump them on the farm	6.7
	Reuse for other purposes	3.3

Use Personal Protective Equipment

Pesticides are toxic substances that have a direct and indirect effect on humans (Terziev and Petkova ,2019). Therefore it must be handled with extreme caution (Iqbal et al., 2020). There is a set of protective equipment that is recommended to be used while mixing or spraying pesticides (Sapbamrer and Thammachai, 2020; Lari et al., 2023).

Coveralls is one of the personal protective equipment that farmers wear when mixing or spraying pesticides. It covers human body from wrist to ankles, and helps to cut down the exposure of skin to pesticides(Sharma and Babel, 2022). Result in table 3 illustrate that half of respondents never wear coveralls, 36.7% wear it sometimes, while few of them (13.3%) always wear coveralls.

Pants can protect the farmer's leg while spraying pesticides,26.7% of vegetable farmers always wear pants, 43.3% sometimes , while 30% never wear it.

vegetable farmers must wear a protective boots while spraying pesticides, majority of respondents (80%) never wear protective boots, 16.7% sometimes and the less(3.3%) always wear it.

Eyes are very sensitive to the chemical materials in the pesticides, therefore, we must work to prevent eye exposure to pesticides, this is possible through the farmer's use of glasses. Result of study showed that majority of vegetable farmers (63.3%) never use glasses, 26.7% sometimes and the less(10%) always uses it.

Vegetable farmers wear the gloves to protect their hands when mixed and spraying pesticides, 43.3% of respondents never wear gloves, 40% sometimes and 16.7% were always wear it.

Gases, fumes, and odors emitted from pesticides cause harm to human, this harm can be avoided by wearing masks. Result in table

2 showed that majority of vegetable farmers (76.7%) never wear respirator/nose mask, 20% sometimes and the less(3.3%) always wear it.

Iraqi farmers generally tend to use traditional head covering, 43.3% of respondents wear hat/hair dress, 33.3% sometimes, while 23.3% never wear it.

Table3. used of personal protective equipment (n= 300)

equipment used	Always %	Sometimes %	Never %
Coveralls	13.3	36.7	50
Pants	26.7	43.3	30
Protective boots	3.3	16.7	80
Glasses/goggles	10	26.7	63.3
Gloves	16.7	40	43.3
Respirator/nose mask	3.3	20	76.7
Hat/hair dress	43.3	33.3	23.3

Operational Habits

There are many habits that people follow when performing their work, some of which are good and others are bad. Bad work habits can affect the efficiency of work completion, or the safety of workers. When mixing and spraying pesticides, there are some bad habits that farmers should avoid.

Result in table 4 showed the operational habits practiced by vegetable farmers during mixing and spraying of pesticides. The majority of respondents (76.7%) always talking while mixing or spraying, while 23.3% sometimes do that. Moda et al., 2022, found that majority of farmers will talking while mixing or spraying pesticides.

Workers always tend to singing while working , because, it gives them a feeling of enthusiasm for work and rest (FAO, 2020b; Olczak et al., 2023; Panapitiya and Mahaliyanarachchi, 2023). Singing while applying pesticides is considered a bad work habit, however, 30% of vegetable farmers were always singing while mixing or spraying pesticides, 40% sometimes, and 30% never sing.

There are cautions regarding eating food while mixing or spraying pesticides (Loar et al., 2019; Evaristo et al., 2022; Moreira and da Silva, 2023; Fizulmi and Agustina, 2024). The study result indicate that most of respondents (86.7%) never eating while mixing or spraying pesticides, while 13.3% sometimes eating.

The farmer does not have to avoid drinking water while mixing or spraying pesticides; rather, he must not drink water after spraying pesticides within 10 min(Yukalang et al., 2022). Vegetable farmers implement this recommendation, whereas 90% of them never drinking water while mixing or spraying pesticides, while 10% sometimes drinking.

Mixing and spraying pesticides often produces gases or vapors (Tarmure et al., 2020), these can enter the human body through smoking(Istriningsih et al., 2022). Study result (table 4) indicate that 40% of respondents were smoking while mixing or spraying pesticides, 43.3% sometimes, and 16.7% never do that.

Farmers should avoid stirring pesticides while mixing with hands (Moda et al., 2022). pesticides mixture should be stirred with a long stick and never by hand(Sule et al., 2020). Most of respondents (90%) never stirring pesticides while mixing with hands, and 10% sometimes do that.

Pesticides turn into a mist while spraying (Xun et al., 2023). Pesticides spraying greatly

affected by the speed and direction of the wind (Desmarteau et al., 2019; Bahrouni et al., 2021; Kasner et al., 2021). Spraying pesticides should be in the direction of the wind, not against it (Puspitasari et al., 2019). Most of vegetable farmers (00%) never sprayed pesticides against wind direction, while 20% sometimes do that.

Table 4 - operational habits practiced by vegetable farmers during mixing and spraying of pesticides.(n= 300)

operational habits	Always %	Sometimes %	Never %
Talking while mixing or spraying	76.7	23.3	0
Singing while mixing or spraying	30	40	30
Eating while mixing or spraying	0	13.3	86.7
Drinking water while mixing or spraying	0	10	90
Smoking while mixing or spraying	40	43.3	16.7
Stirring pesticides while mixing with hands	0	10	90
Sprayed pesticides against wind direction	0	20	80

Conclusion and Recommendation

Majority of vegetable farmers were young, have a university education, high years of experience in vegetable cultivation, and good annual income from vegetable cultivation. Vegetable farmers showed good pesticide management by storing pesticides in special store for agricultural supplies, a good estimate of the amount of pesticide needed to be purchased or needed to be mixed and sufficient to carry out control. On the other hand, vegetable farmers showed no

commitment to wearing coveralls, protective boots, glasses, gloves and respirator/nose mask. In addition, they talking, singing and smoking while mixing or spraying pesticides. An effective agricultural extension programs are needed to raising awareness of farmers about the dangers of using pesticides on public health, and the correct practices for the safe use of pesticides.

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DOI:10.26655/JMCHEMSCI.2022.4.1

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