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FARMERS' PERSPECTIVES ON PESTICIDE USAGE IN VEGETABLE PRODUCTION IN SELECTED AGRICULTURAL ZONES IN LAGOS STATE, NIGERIA

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ABSTRACT

Pesticide usage is an essential part of modern farming and its indiscriminate use poses a significant health risk to humans and the environment. This study aimed to investigate the perspectives of vegetable farmers on pesticide usage, attitude in handling, storage, use of personal protective equipment, and health symptoms they experienced. This investigation was conducted in some selected areas of the three agricultural zones of Lagos State (Far Eastern, Eastern and Western zones) using structured questionnaire. A total of 350 farmers provided adequate information needed for this study. Descriptive statistics was used for data analysis. Most of the farmers have some level of formal education (85.4 %) while 14.29 % have no education. The majority (96.86%) of farmers agreed to the use of various pesticides ranging from chemical to botanical. Most of the respondents stored their pesticides in their tool shed while 14 % stored their pesticides in their homes of residence. The respondents adopted unsafe practices such as littering their farm sites (11.14%), and burning of empty containers on-farm (14.29 %), while 3.43% reused empty pesticide containers. The majority of the farmers used personal protective equipment (81.70 %), though not appropriately. As a result, 13.14 % of the farmers experienced more than one health symptoms after pesticide application. Despite the level of the respondents' formal education, 38.57 % were not trained. To limit the risk associated with the use of pesticides, it is important that adequate and comprehensive training on safe farm practices be given to farmers by the government.

Key words: safety, personal protective equipment, storage, training, health symptoms

INTRODUCTION

Agricultural practice is a source of income, food for living forms and development of a nation. It is the main occupation of the majority of rural dwellers (Ivande, 2014; Osabohien *et al*., 2019). However, there has been a lot of human migration from rural areas in search of economic prosperity thus an exponential increase in the population of urban areas (Adedayo and Tunde, 2012; Ayeni, 2017; Alade *et al*., 2022). The associated high demand for food causes food shortages, hence the need for increased food production in the urban areas to meet the food needs of the urban populace. This has thus given rise to urban farming to augment the food production.

Pesticides are defined as any chemical substance or mixture of substances used to prevent, destroy, repel, or mitigate the effects of plant and animal pests (Riyaz *et al*., 2021). They include insecticides, herbicides, rodenticides, fungicides, molluscicides, nematicides, avicides, and acaricides (Tudi *et al*., 2021). They have become an essential part of modern farming, and play a significant role in increasing agricultural productivity (Alalade *et al*., 2017; Njoku *et al*., 2017; Tudi *et al*., 2021).

Lagos State is one of the most urbanized areas of Nigeria (Olugbenga and Adejumo, 2011; Faisal Koko *et al*., 2021). The majority of the population spend 50-80% of their incomes on feeding and are faced with food scarcity and poverty (Olalekan, 2016). To address the challenges of food scarcity and poverty, urban farming is important (Olalekan, 2016). There is evidence of increase in urban farmers' population (Alade *et al*., 2022), but data on urban farming in Lagos is scanty (Olugbenga and Adejumo, 2011). Generally, urban farming in Lagos State includes artisan fishing in coastal villages, free-range herds on coastal grasslands in local council areas, poultry keeping, roadside horticulture, and vegetable farming at floodplains and roadsides. Majority of crop farmers in Lagos cultivate vegetables such as *Corchorus olitorius* (Ewedu), *Amaranthus hybridus* (Tete), *Celosia argentea* (Soko), *Abelmoschus esculentus* (Okra), *Telferia occidentalis* (Ugu), *Lycopersicon esculentum* (tomato), *Allium fistulosum* (Spring onions), *Murraya koenigii (*Curry leaves), *Ocimum basilicum* (Scent leaf), *Talinum triagulare*, *Cucumis sativus* and *Capsicum annum* (Pepper) due to their importance (Denloye *et al*., 2014; Oleleji and Kennedy 2016; Ofuya *et al*., 2023).

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Vegetables are major source of micronutrients such as minerals and vitamins and are inexpensive source of energy and other essential nutrients (Ofuya *et al*., 2023). Insects such as crickets, grasshoppers, larvae, and locusts cause damage on vegetable crops by biting and chewing the leaves, and some bugs suck plant sap from the tissues of foliage, fruits, and roots. This can impact vegetable production and accounts for 20-60% of pre-harvest losses (Sithanntham *et al*., 2003; Okunlola and Akinrinnola, 2014; Ofuya *et al*., 2023). As a result, farmers often resort to using pesticides to curb the pest infestation menace (Okonkwo and Okoye, 1996; Denloye *et al*., 2014; Philbert *et al*., 2019). Farmers use a variety of pesticides to reduce pest and disease impacts on crops. Serious concerns have been raised about the health risks posed by pesticide exposure when mixing and applying of pesticides or working on treated fields (Ugwu *et al*., 2015; Adekunle *et al*., 2017). Some unintentional work-related poisonings and severe health hazards to farmers in the short and long run have been reported, as well as degradation of the environment due to pesticide residual accumulations in environmental matrices such as air, water and soil (Ibitayo, 2006; Asogwa and Dongo, 2009; Adekunle *et al*., 2017; Sarkar *et al*., 2021).

Exposure to pesticides is known to cause a variety of negative health effects, including acute abdominal pain, excessive salivation, eye irritation, dizziness, headaches, nausea, vomiting, skin problems, restlessness, convulsions as well as chronic diseases such as cancer, reproductive, and developmental disorders (Tudi *et al*., 2022). Unregulated and unsafe use of pesticides coupled with inadequate farmers' education on pesticides use, improper storage, handling and application methods have been observed among farmers (Mergia *et al*., 2021). However, there is paucity of information on health and safety awareness of pesticide usage among vegetable farmers from the Lagos State Agricultural zones. Given the adverse health consequences of pesticides, it is therefore imperative to know the perspective of vegetable farmers in Lagos State regarding the safe use of pesticides and to assess farmers' attitudes concerning handling, storage, and the use of personal protective equipment to minimise exposure to pesticides.

MATERIALS AND METHODS

Study Area

The research was carried out in Lagos State, located in southwestern Nigeria (6°23′ N, 6°41′ N; 3°09′ E, 3°20′ E). It is bounded in the South by the Atlantic Ocean and in the East by Lagos Lagoon. The Northern boundary constitutes the landmass of Ikorodu Local Government Area and Alagbado towards Abeokuta axis in Ifako-Ijaiye Local Government Area; the Western boundary is demarcated by Badagry and the Republic of Benin (Olayiwola *et al*., 2005; Odudu, 2015; Faisal Koko *et al*., 2021).

Lagos State Agricultural Development Agency demarcated Lagos State into Far Eastern, Eastern, and Western agricultural zones based on the distribution of urban farming communities. These zones are made of different blocks, but three blocks were selected from each zone for this study as shown in Table 1 and Figure 1.

Table 1: Location and description of study stations

Zones	Blocks	Sampling Points	
		Latitude	Longitude
Far Eastern Zone (Epe)	Origanringan	6°40'13.4" N	4°04'00.7" E
	Ejirin	6°36'52.50" N	3°53'58.54" E
	Agbowa	6°38'56.1" N	3°43'27.1" E
Eastern Zone (Ikorodu)	Imota	6°40'14.36" N	3°39'59.80" E
	Gberigbe	6°36'10.74" N	3°37'57.66" E
	Laspotech	6°38'46.02" N	3°31'24.15" E
Western Zone	Ikeja	6°34'6.29" N	3°21'2.53" E
	Ojo	6°28'16.59" N	3°12'19.12" E
	Badagry	6°25'56.33" N	2°52'2.43" E

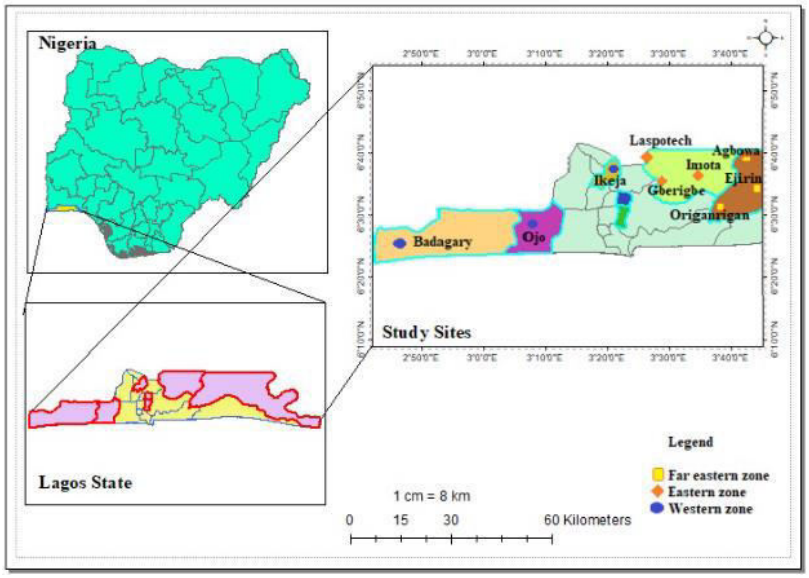

Figure 1: Map of the study areas

Sampling Technique and Data Collection

The survey was conducted between April and June of 2021. Data from vegetable farmers were collected using a three-stage sampling technique. The first stage entailed the selection of study areas based on Lagos State's agricultural zoning. The second stage involved purposive selection of three blocks from each zone. Ten cells were randomly picked from each block where vegetables are highly cultivated. The third stage involved the random selection of 100 farmers (Eastern zone), 200 farmers for the Far Eastern and Western zones respectively making a total of 500 vegetable farmers. However, only 350 farmers responded fully to the questions while the remaining 150 declined because of failed promises such as provision of agricultural incentives and grants made to them by the government. The questionnaire included both closed and open-ended questions. The closed questions were in multiple-choice format where respondents choose only the appropriate answer(s) that best described their opinion or attitude on a specific issue. The survey covered farmer demographics, pesticide types used, application methods, storing and disposing of pesticide empty containers, use of Personal Protective Equipment (PPE) and reported symptoms. Respondents were asked if they had experienced at least one health impairment immediately or after pesticide application where symptoms were reported.

Data Analysis

All the questions, both closed and open ended were coded, imputed and then the data were analyzed by descriptive statistics (percentages). Farmers' demographic characteristics, types of vegetable and farming expertise, methods pesticide purchase, storage and disposal of pesticides container, safety practices against exposure to pesticides, knowledge of health impacts of pesticides were expressed as percentages on bar charts, while knowledge and understanding of pesticides, their application equipment, frequency of pesticide application in the farmland, training on the use of pesticides and symptoms of pesticide toxicity were expressed as percentages on pie charts.

RESULTS

Demographic Characteristics of Farmers in the Study Area

The demographic characteristics of respondents showed that 66.86% of the vegetable farmers in the sampled areas were males while 33.14% were females (Figure 2). The age of the farmers was between 16-25 years (8.29%), 36-45 years (40.86%) and 56 years and above (6.29%). The percentage of farmers with no formal education was 14.29% while 85.4% of the farmers had formal education that ranged from secondary education (36.6%) and degree (9.4%) (Figure 2). Large percentage (41.42%) of the farmers planted vegetables singly as a mono-crop, while 58.58% of the farmers planted two or more varieties of vegetables on the same farm plot (Figure 3). The farmers that have been planting vegetables in their farm locations for less than 5 years were 11.4% while 36.3% have been using their farm sites for 5-10 years (Figure 3).

Farmers' Pesticides Knowledge and Understanding

The majority of respondents (96.86%) agreed that pesticides are widely used in vegetable cultivation (Figure 4). The farmers agreed to the use of various chemical and botanical pesticides. Chemical pesticides used include gammalin 20, dichlorvos, dimethoate, chlorpyrifos, cypermethrin, lambda-cyhalothrin, abamectin, bemamechin benzoate, and endosulfan, which represent all pesticide classes, while botanicals include neem oil, ginger extract, and wood ashes. About 48% used a cocktail of pesticides, Organochlorine (18%) while 5% used Avemectin and botanicals, respectively (Figure 5).

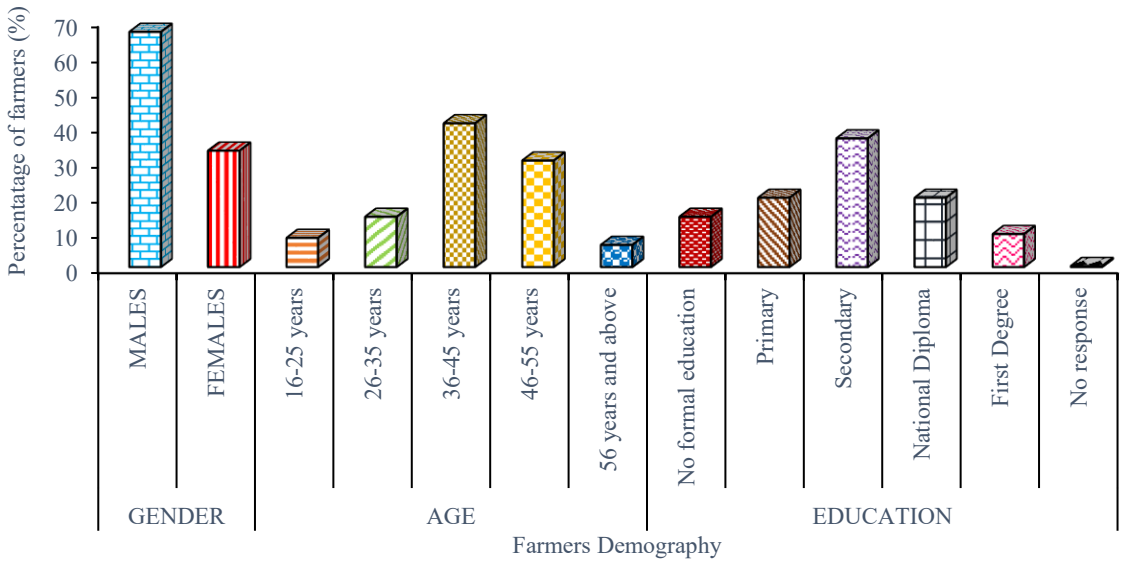

Figure 2: Demographic characteristics of the respondents in the study area

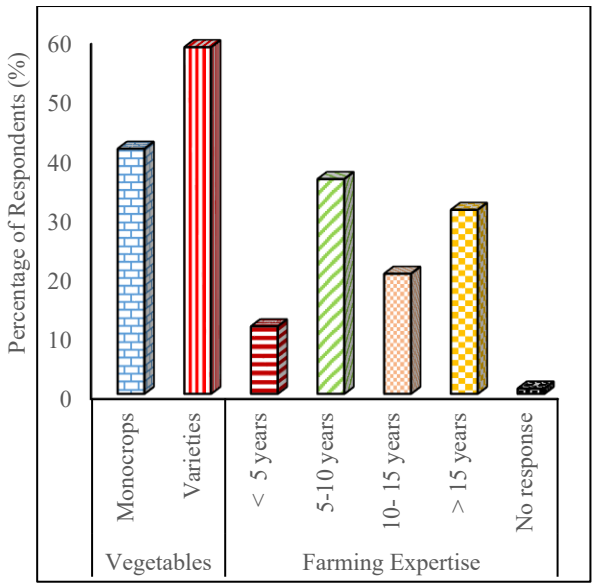

Figure 3: Types of vegetable cultivated and farming expertise

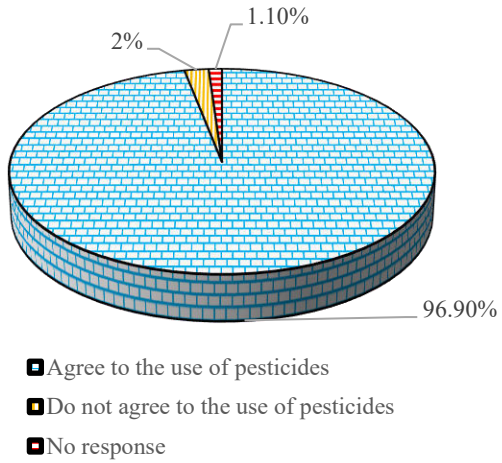

Figure 4: Pesticides usage by respondents

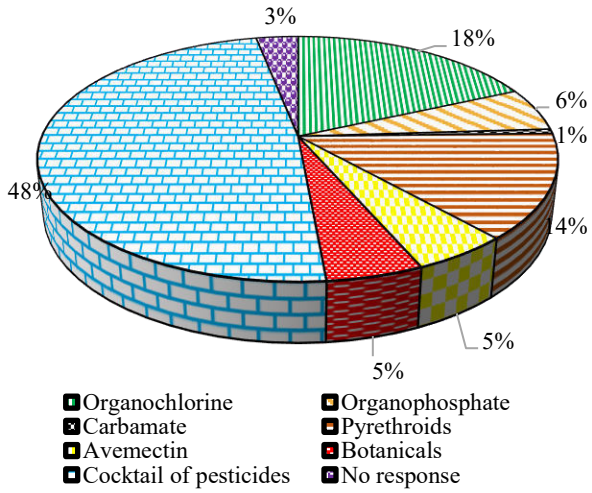

Figure 5: Pesticide types used by respondents

Farmers' Methods of Purchase of Pesticide, Storage, and Disposal of Pesticides Container

Majority of the farmers purchased their pesticides from open market (68.86%), while 8.29% claimed they prepared their pesticides themselves (Figure 6). Most of the respondents stored their pesticides in their tool shed located on the farm sites (49.14%) while 17.14% do not store their pesticides, they only bought the quantity that will be needed at a time (Figure 6). Results of pesticide container disposal methods showed that 70% of the farmers put their containers to be disposed off in landfills while 3.43% used the empty containers as storage containers for other things (Figure 6).

Pesticides Application Equipment

Most farmers in this study used the Knapsack sprayer to apply pesticides to their vegetable crops (95.71%) while 1.14% farmers improvised (Figure 7).

Safety Practices against Exposure to Pesticides

A total of 81.70% farmers used personal protective equipment (PPE), though not appropriately, 18% used coverall only, 10.0% used both nose mask and booth while 23.43% used hand gloves and nose mask during pesticide application. Only 2% of the respondents used their PPE appropriately (Figure 8).

Pesticide Application Frequency in the Farmland

The frequency of pesticide application in the farmland showed that 52.86% of the farmers applied pesticides as the need arose, while 6.71% applied pesticides once from planting to harvesting their vegetables (Figure 9).

Farmers' Training on the Use of Pesticides

The percentage of farmers that have undergone training on the use of pesticides was 45.71%, while 38.57% did not receive any form of training (Figure 10). In addition, 36.86% of the farmers noted that their trainer came from the State Ministry of Agriculture while 9.43% claimed that they trained themselves (Figure 10).

Health Knowledge and Symptoms of Pesticide Toxicity

A large percentage of the respondents (74%) admitted that they are aware that pesticide usage has some health effects on humans and the environment, while 12% of the respondents did not agree that there are adverse health effects from pesticide exposure (Figure 11). The results of symptoms of pesticides toxicity were based on reported health effects experienced by the farmers after pesticide application. Some of the respondents (48%) could not link any illness symptoms to pesticide toxicity after application, 21.14% complained of headache after application of pesticides, while 13.14% complained of more than one pesticide toxicity symptom after application (Figure 12).

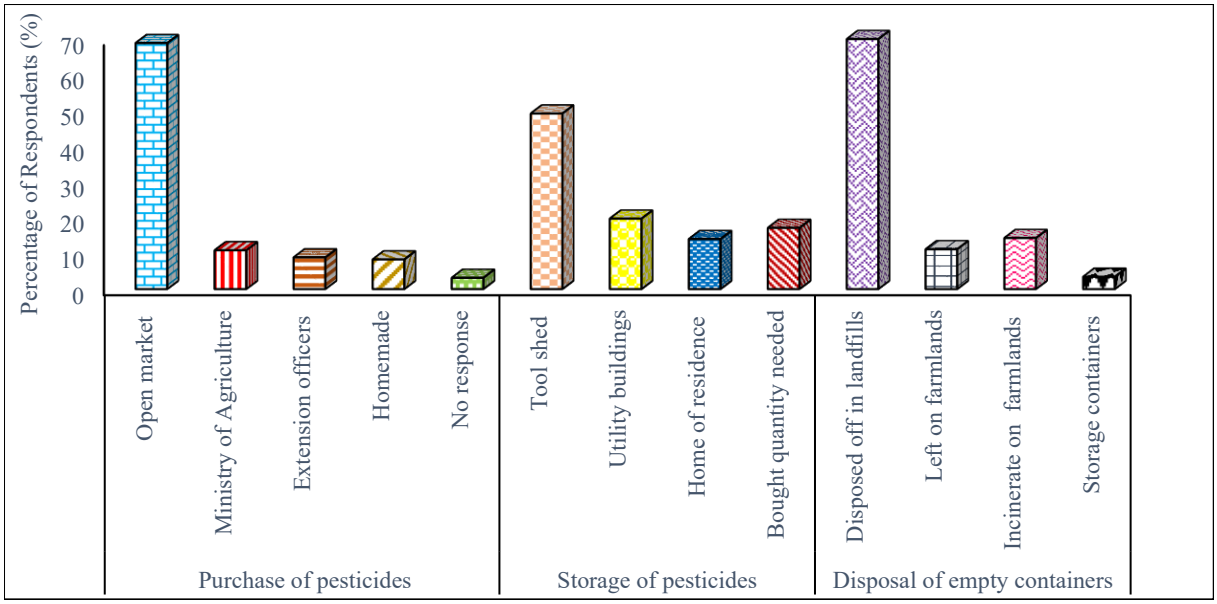

Figure 6: Farmers' methods of purchase, storage, and disposal of pesticide container

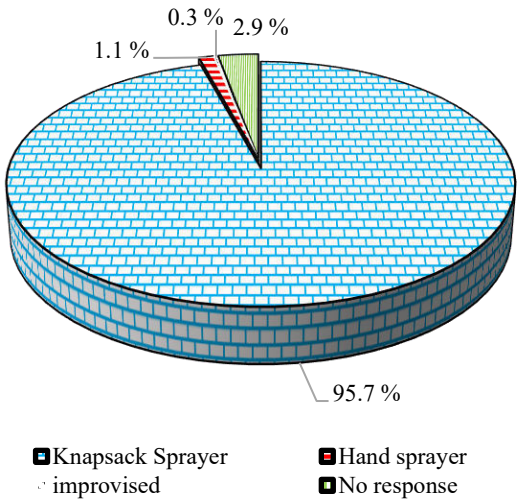

Figure 7: Pesticides application equipment

DISCUSSION

Farmers use a variety of pesticides to reduce the impact of pests and diseases on their crops. Serious concerns have been raised about the health risks posed by exposure to pesticides when mixing and applying pesticides or working on treated fields. As a result, this study investigated vegetable farmers' perspectives on pesticide usage, attitude in handling, storage, use of personal protective equipment, and health symptoms experienced by these farmers In this study, the observed males- dominated vegetable farming in Lagos State could be ascribed to the discrepancy women are frequently faced in accessing key agricultural inputs such as land, labour, knowledge, improved seeds and agrochemicals (Joshi and Kalauni 2018).The male-to-female ratio in this study corroborates an earlier report by Adekalu *et al*. (2020).

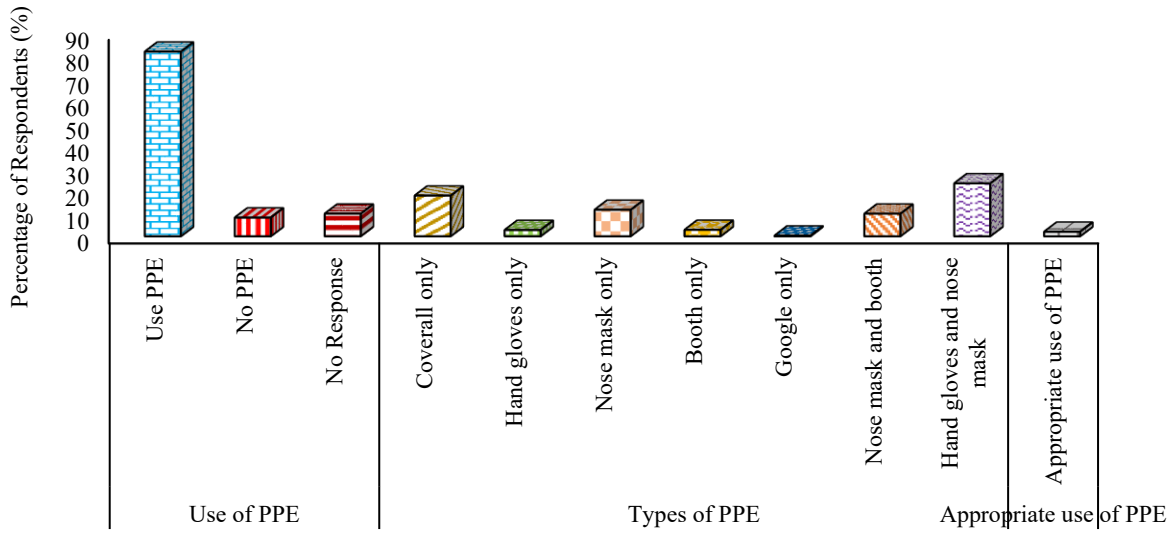

Figure 8: Use and types of personal protective equipment (PPE) used by respondents

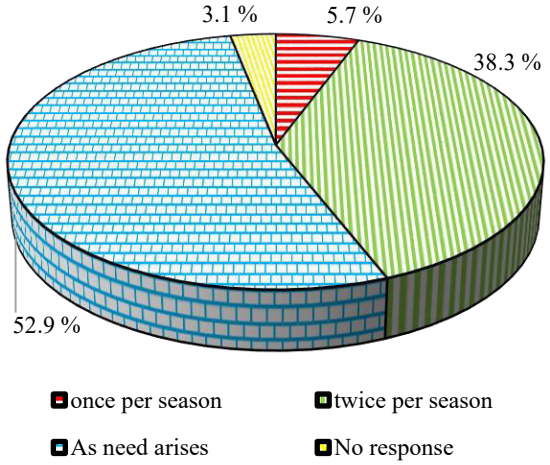

Figure 9: Frequency of pesticide application in the farmland

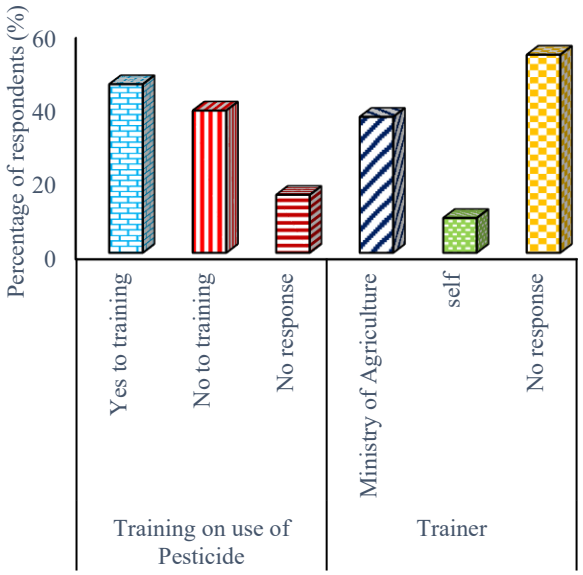

Figure 10: Training on the use of pesticides

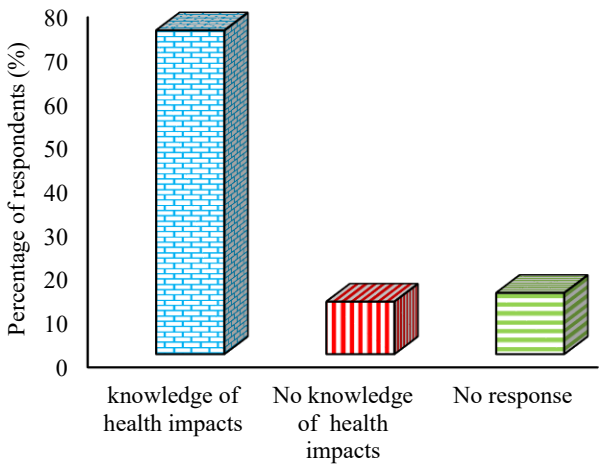

Figure 11: Response to health effects of pesticides

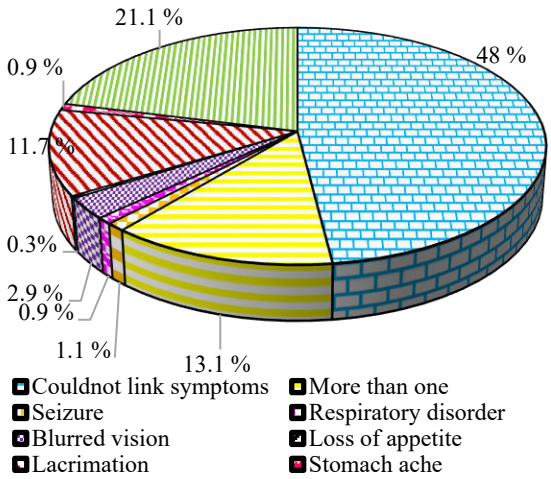

Figure 12: Symptoms of toxicity experienced by respondents

A farmer's ability to perform some tasks that require a higher level of education can be hampered by a lack of education. This was ascertained by Kemobonta *et al*. (2014) and Okoffo *et al*. (2016), they reported that education has a significant impact on overall behaviour and individual dispositions toward adopting agricultural-related innovation. Education enables people to be more aware of the dangers of pesticide exposure and take more precautions to protect themselves and the environment. Farmers with a higher level of education might likely follow pesticide use guidelines. This agrees with the study of Adeyusi *et al*. (2018), they stated that majority of the farmers in their study area had some levels of education which enabled them to adopt agricultural-related innovations such as pesticide use.

The years of experience in vegetable cultivation detected in this study will enable the farmers to adopt technologies such as pesticide use. This agrees with the findings of Adeyusi *et al*. (2018). The use of pesticides observed in this study is an indication that the farmers need to be educated about alternative cropping systems and should be encouraged to adopt integrated pest management practices in order to reduce over reliance on pesticide. This agreed with the study conducted by Jallow *et al*. (2017). The banned pesticide usage detected in this study could be attributed to Nigeria porous borders and non-stringent government policies on pesticide usage.

Open market is majorly dominated by non-certified marketers who engage in pesticides business. The open market pesticide sales outlets detected in this study could be attributed to the non-stringent government policies and Nigeria porous border. The finding in this study is in agreement with Issa (2016), who reported farmers perception of the quality and accessibility of agrochemicals in Kaduna and Ondo States of Nigeria. The results showed that some of these farmers purchased their pesticide from the open market. A worrisome percentage of farmers as observed in this study still store their pesticides in

their homes of residence. This can be a source of exposure to other members of their families, especially children. Also, as found in this study, the reuse of empty pesticide containers could be a source of non-occupational exposure as traces of the pesticides can still be in the containers. This supports the findings of Okoffo *et al*. (2016) and Jallow *et al*. (2017).

The appropriate use of personal protective equipment is one of the good practices to reduce occupational exposure to pesticides (Mathews *et al*., 2008). According to Jallow *et al*. (2017), the probability of pesticide poisoning is decreased by 44 % to 80 % when PPE is appropriately used. However, as observed in this study, farmers used PPE but not appropriately and this could lead to serious health effects. The use of PPE observed in this study is higher when compared with the result obtained by Adesuyi *et al*. (2018) and far better than that of Negatu *et al*. (2016) where none of the farmers used PPE during the application of pesticides.

The cultivation of vegetables is disturbed by pest infestation. As a result, the majority of farmers always rely on pesticides to curb the menace of pests. The frequency of pesticide application as observed in this study indicated that the farmers probably might not have to spray their farms if there is no pest infestation. This contradicts the results of the study carried out by Adekalu *et al*. (2020) where all the farmers applied pesticides in the morning and evening.

Training of farmers on pesticide application is very important. Poor pesticide training may be linked to their extensive misuse and wastage. The percentage of untrained farmers observed in this study could be as a result of the neglect of the agricultural sector and this could lead to mishandling and extensive use of the pesticides. This is in agreement with the study of Adekalu *et al*. (2020).

Incessant exposure to pesticides can cause different health effects, depending on their toxicity and the dose absorbed by the body (Ritter and Arbuckle, 2007). In this study, the actions of the farmers suggested that they did not strictly follow the usage instructions despite their knowledge about the health risks of pesticides. This may be attributed to the different health symptoms reported by the farmers. This is in agreement with the study of Williamson *et al*. (2008) and Adekunle *et al*. (2017).

CONCLUSION

Pesticides' negative effects have been widely documented. However, farmers and other applicators are still unaware or in denial of the importance of protecting themselves and the environment from pesticide-related hazards. This study established the fact that farmers adopt unsafe practices in the storage, application, and disposal of pesticide empty containers. Also, most of the farmers used personal protective equipment but not appropriately, which may be due to a lack of adequate training. This may lead to health symptoms experienced and reported by some of the respondents.

RECOMMENDATION

To limit the risk associated with the use of pesticides, it is imperative that adequate training be given to farmers which will address the use of personal protective equipment appropriately. The training must also address the health and environmental effects of pesticide exposure. In addition, organic farming and integrated pest management strategy should be adopted by vegetable farmers to reduce over-reliance on pesticides. Finally, the government should make stringent laws and ensure enforcement by regularly monitoring compliance at the farm level and restricting the importation of banned pesticides by strengthening our porous borders.

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