International Journal of Advanced Chemistry Research
www.chemistryjournals.net
Online ISSN: 2664-679X; Print ISSN: 2664-6781
Received: 03-05-2019; Accepted: 04-06-2019; Published: 11-06-2019
Volume 1; Issue 2; 2019; Page No. 09-13

Survey on handling and application of chemical pesticides at farmers level in anseba region, Eritrea

Saphan Anode[1*], Elikta Yemane[2], Filmon Tesfalem[3], Meron Mengisteab[4], Soliana Yemaneab[5]
[1] Department of Allied Sciences, Hamelmalo Agricultural College, Eritrea
[2-5] Department of Plant Protection, Hamelmalo Agricultural College, Eritrea

DOI: https://doi.org/10.33545/26646781.2019.v1.i2a.9

Abstract
Significant loss in agricultural produce is caused by pests and diseases which can be controlled by use of pesticides. However, pesticides possess inherent toxicities that endanger the health of the farmers, consumers and the environment. This survey was conducted between March and April 2019 on randomly selected horticultural farmers in three subzones of Elabered, Keren and Hamelmalo in larger Anseba region of Eritrea. Most famers reported growing more than one type of crops on their land. The most common crops grown were tomatoes (45%), Pepper (60%) potatoes, (46) okra (22%), Jute mallow (12%) cabbages (52%), Lettuce (23%) and onions (47%). The survey found out that the main pesticides used by the farmers in this region was malathion (68%), indoxacarb (33%), dimetox (17%), perimethrin (3%) and immidacloprid (1%). Fungicide Sulphur was used by 23% of farmers. Farmers were using these pesticides to control mostly white fly, aphids, mango fruit fly, African bolt worm, thrips and scale insects. The study also found out that most of the farmers (72%) do not follow instructions labelled on the pesticide container and instead they seek information from experts (26%), sellers (57%), friends (5%), while others guess the instructions (4%). The farmers reportedly stores pesticides at home (56%), in the farm fields (32.7%) and in separate store (11.3%). Disposal of empty containers after pesticide application was also studied. 51.8% of the respondent farmers simply throw away the empty containers, 29% of the farmers burry them underground, 9% of the farmers store them at home, 4.5% of the respondents destroy them and throw them away, 3% of the farmers wash and reuse them while 2.7% of the farmers burn them. Majority of the respondents (63%) claimed that they were using PPEs during pesticide application. Findings of this study clearly suggest that it is necessary to reduce possible health hazards and environmental risks associated with pesticide use by documenting risk perceptions and developing ways to address them through farmers training and awareness. The Ministry of Agriculture should intensify training to farmers regarding safe use of pesticide, storage and disposal.

Keywords: health hazards, horticultural crops, pesticides, personal protective equipment

1. Introduction

The Food and Agricultural Organization is concerned about the impact of pesticide use on environment and health of farmers and even the consumers of crops usually sprayed by such chemicals [1]. The World Health Organization (WHO) estimated that about one million people were being poisoned annually with about 20,000 cases resulting in deaths [2]. Much of these deaths were attributed to toxicity of pesticides used by small scale farmers without adequate knowledge to wear Personal Protective Equipment (PPEs) [3, 4]. Health hazards associated with chemical pesticides and other agrochemicals are usually blamed on those pesticides without considering how they are applied or measures taken to train farmers on hazards associated with such chemicals [5]. Expressed the concern of the design of some sprayers especially lever operated sprayers and listed specific features that was increasing the risks of direct physical harm and other health hazards due to exposure to chemical pesticides during spraying. Some of these risks factors include sharp edges on the spray tank, narrow straps on unsuitable materials, tank weight, and size of filter opening, leakages and design of spray lance. Hands are very much exposed both during chemical preparation and during actual spraying in the field. According to [6], laborers in large plantations have estimated to spend over 1400hours per year spraying pesticides on the farms.

Agriculture has been the mainstay of the Eritrean economy and employs up to 80 per cent of the population [7]. Most are crop producers and pastoralists and some run mixed farming operations. Commercial and semi-commercial farmers produce and market vegetable and fruit crops. The types of agriculture practiced include pastoralism, agro-pastoralism and sedentary agriculture [7, 8]. Various types of field crops such as cereals, legumes, and fiber and oil crops are cultivated extensively using modern techniques including heavy machinery, fertilizers, improved seeds, and pesticides. In spite of growing potato round the year, the other vegetables were cultivated from July to April [9, 10, 11]. For the land preparation farmers usually plough twice in all the three subzones. The majority of farmers use oxen for ripping the soil and others use tractor for land preparation. The seedlings of tomato, pepper, onion, okra, cabbage were raised in all the subzones in seedling bed up to month old and then transplanted [11, 12]. There has never been any previously published reports regarding the actual behavior of farmers in handling and use of pesticide at homes and in the field, on how they dispose of used pesticide containers in the environment in the agricultural regions of Anseba and Gash-Barka in Eritrea, and hence the need for this study. This study will be important to the Ministry of Agriculture (MoA) and Ministry of Land, Water and

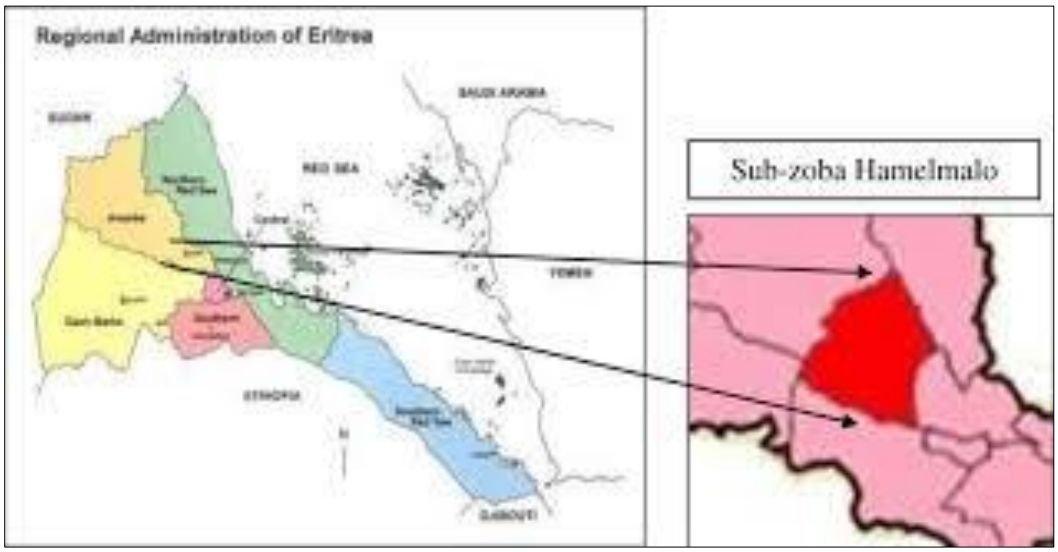
Environment (MoLWE) of the State of Eritrea (SoE) in developing training program with emphasis on improving sprayer quality and conditions and thus ultimately improve rural farmer and family health, environment protection and crop production efficiency.

2. Materials and Methods

2.1 Study Area

Anseba region is one of the six administrative regions, located in the Northern Eritrea. The region is named after Anseba River which passes through most parts of the region. The altitude of the area is about 1280 m above the mean sea level and latitude 16º, 01'N, and longitude 38º, 20'E with an average rainfall and temperature of 479.2 mm and 24ºC respectively. The hottest month is May (30ºC), while the coldest month is between December to February.

The study was conducted in selected horticultural crop farms in three subzones of Anseba zone namely Elabered (15º 41' 25.41″ N and 38º 34' 21.41″ E), Hamelmalo (15º 52' 21″ N and 38º 27' 58.1″ E) and Keren (15º 46' 40.51″ N and 38º 27' 40.3.81″ E) subzones. The three subzones have average annual rainfall of 508mm. The majority of farm produce from these areas are sold at the local markets. The survey sites selected were based on the proportion of full-time farm populations, cooperation from local leaders, and the willingness of farmers to participate.



***Source*:** researchgate.net

Fig 1: Map showing Regional Administration of Eritrea and Hamelmalo Subzone

2.2 Data Collection and Analysis

The data was collected by means of a structured questionnaire, interview and observations for information on farming systems, pesticide use and practices, applicator precautions/averting behavior and health/ environmental effects. The questioner dealt with knowledge, attitude and practice (KAP) among farmers that usually use pesticides in their farms. The survey was conducted during (March-April 2019) dry season when most of sprayings were taking place just after flowering of most horticultural crops grown in this region. The survey was conducted under agreement that the team would not reveal the identity or any personal details of the farmers surveyed. Data were collected using questionnaires, by visiting farmer's fields in selected villages with representative farmers. Five villages were randomly selected from each subzone, and five to seven farmers interviewed in each village. Interview with some MoA officials were also conducted to be more acquainted with policies and practices of the ministry. Data was presented in tables, graphs, charts and analyzed using descriptive statistics, ANOVA, L.S.D and Chi-square tests.

2.3 The Questioner

The questioner was constructed into three main sections. The first Section dealt with general information about the farmer like number of family members, level of education and other cultural practices. The second section focused on farming practices especially types of crops grown, types of farming being practiced and mode of land preparations. The third section dealt with pesticide use and applications focusing mainly on the source of pesticides being used, instructions of pesticide use, use of protective equipment, pests and disease identification and health status of the farmers.

2.4 Interviews

The interviews were conducted with MoA extension officers and the farmers. The interview focused on the types of training, contents, frequency and attitude of farmers towards such trainings.

2.5 Observations

The observation focused on the types of pesticide sprayers and their maintenance, types of PPE being used and storage and disposal of pesticides by farmers. Photographs were taken for better demonstration and documentation.

3. Results and Discussion

3.1 Farmers Background

A total of one hundred and ten (110) farmers participated in this study, 35 farmers from Elabered subzone, 37 farmers from Keren subzone and 38 farmers from Hamelmalo subzone. 80% were males while 20% were females. All the participating farmers were small scale farmers. The respondents were aged between

20-70 years with average age of 56 years and standard deviation 12.45 years. Only 2% had college education, while 11% had high school education, 25% had junior school education, while 32% had elementary education and 30% had informal religious education (fig 1 below). Most famers reported growing more than one type of crops on their land. The most common crops grown were tomatoes (45%), Pepper (60%) potatoes, (46) okra (22%), Jute mallow (12%) cabbages (52%), Lettuce (23%) and onions (47%).

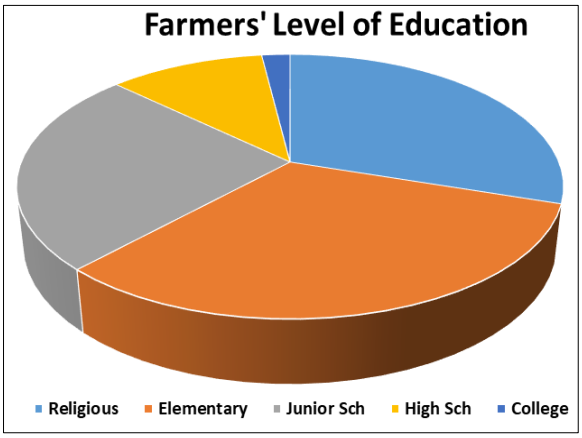


Fig 1: Respondents' Level of Education

3.2 Pesticide Handling and Applications

3.2.1 Common Pesticides used by Farmers

All the farmers who participated in the study were directly using pesticides as crop pest control measure but most of the farmers only knows the trade names of the pesticides. Insecticides were the most commonly used. Malathion, Indoxacarb, Dimetox, perimethrin and Immidacloprid were used by 68%, 33%, 17%, 3% and 1% of farmers respectively. Fungicide Sulphur was used by 23% of farmers. Farmers were using these pesticides to control mostly white fly, aphids, mango fruit fly, African bolt worm, thrips and scale insects. These findings disagreed with [13] previous study that reported that insecticides such as Callisufan (70%) and Endosulfan (50%) were the most commonly used insecticide the region. Farmers were sourcing the pesticides from private shops (50%), Ministry of Agriculture (41%) and contrabands (9%).

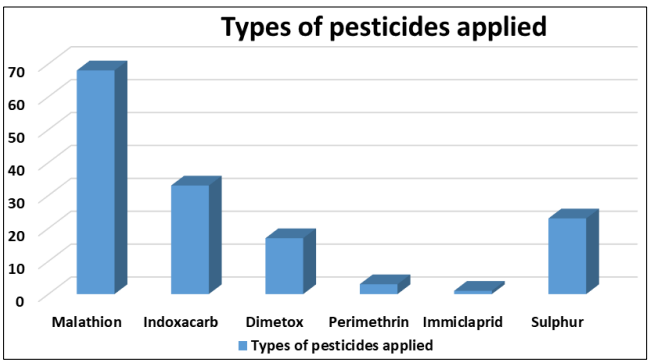


Fig 2: Types of pesticides applied by respondent farmers

3.2.2 Frequencies of Pesticides use

Most of the farmers (72%) do not follow instructions labelled on the pesticide container and instead they seek information from experts (26%), sellers (57%), friends (5%), while others guess the instructions (4%).[14] also reported that in Ethiopia, written information on pesticide containers were not read by sprayers. The study also reported that 94% of the respondents do not drink or smoke during spraying. Almost all the respondents (97%) selected the best time for pesticide applications (during early morning and at the end of the day) and observed the direction of the wind (96%) during the spray. 20% of the respondent farmers were applying pesticides once a week, 45.5% were spraying once in two weeks, while 32.7% applied once a month, and 1.8% applied once in a season. The results are shown in table 1 below.

Table 1: Frequency of pesticide spraying by respondent farmers

Frequency of spraying	% of Respondent farmers
Weekly	20
Once in two weeks	45.5
Once per month	32.7
Once in a season	1.8

3.2.3 Disposal and Storage of pesticides

The farmers reportedly stores pesticides at home (56%), in the farm fields (32.7%) and in separate store (11.3%). Disposal of empty containers after pesticide application was also studied. 51.8% of the respondent farmers simply throw away the empty containers, 29% of the farmers burry them underground, 9% of the farmers store them at home, 4.5% of the respondents destroy them and throw them away, 3% of the farmers wash and reuse them while 2.7% of the farmers burn them [15, 16, 17]. also reported similar unsafe disposal methods. Table 2 below shows methods of disposal and storage of pesticides by respondent farmers in the three subzones studied.

Table 2: Storage and disposal methods of pesticides used by respondent farmers

Storage/Disposal method		% of Respondents
Storage method	At home	56.0
	Farm field	32.7
	Separate stores	11.3
Disposal method	Throw away	51.8
	Burry underground	29.0
	Store at home	9.0
	Destroy and throw	4.5
	Reuse containers	3.0
	Burn containers	2.7

3.2.4 Personal Protective Equipment (PPE) used by Farmers

Majority of the respondents (63%) claimed that they were using PPEs during pesticide application. The PPEs reportedly used by the farmers were gloves (3%), boots (4%), masks (5%), and aprons (55%) (Table 3). However, during our study observation, no farmer used respiratory protective gears, face/dust masks or ocular protection (safety goggles) [18]. Reported that 65% of the farmers do not use any PPEs during pesticide applications.

Furthermore, during the course of our study, no farmer was observed to be using overall which contradicted what the

respondents was claiming to have been using during pesticide applications. Some farmers also claimed that the use of protective gloves was not necessary during application of pesticides close to the ground. Some farmers indicated that they drink milk before and after pesticide applications, and washing their hands with soaps and lemons after applications.

3.2.5 Farmers' hygiene practices

Some farmers were observed to have poor quality spraying equipment some of which were leaking. Some farmers were using cotton wool dipped in the pesticide solution as spraying method. These poor spraying equipment leads to more exposure to pesticides especially those that did not have proper PPEs. However most farmers were aware of basic hygiene practices like washing sprayer after application (83.6%), changing and washing of PPEs after application (76.4%) and taking off boots and shoes before entering home (36%).

Table 3: PPE and Farmers hygiene practices

Storage/Disposal method		% of Respondents
PPE used by farmers	Gloves	3.0
	Boots	4.0
	Masks	5.0
	Aprons	55.0
Farmers hygiene practices	Washing sprayer after application	51.8
	Changing and washing PPE after application	29.0
	Taking off boots before entering home	9.0
	Destroy and throw	4.5
	Reuse containers	3.0
	Burn containers	2.7

3.2.6 Symptoms experienced by farmers during pesticide applications

Most of the respondents did not know the health and environmental impacts of pesticides. They however revealed that they usually experience several symptoms like vomiting, skin irritation, headache, tiredness and breathing difficulties, as shown in Fig 3 below. The farmers stated that these symptoms are not severe enough for them to consult or visit hospitals or other health facilities, and therefore stay at home to have a rest hoping to feel better. According to [2, 17], exposure to pesticides can results in several health hazards in form of acute and chronic illnesses and therefore pesticides users and handlers must be able to recognize these symptoms and illnesses and seek medical treatment immediately.

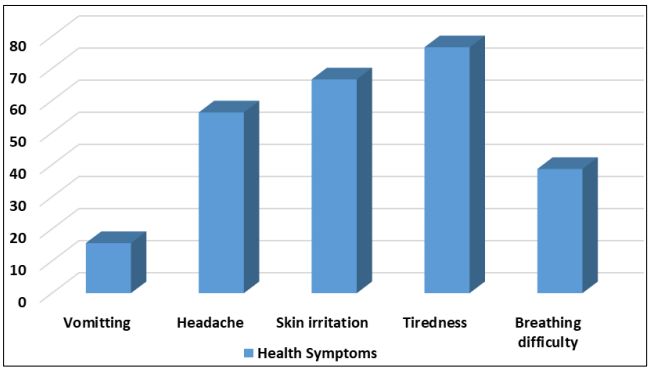


Fig 3: Symptoms experienced by farmers during pesticide application

3.2.7 Pests and Diseases identification

Majority of the respondent farmers (77.3%) made decisions on farm pests and diseases identifications through their own personal experience, while 14.5% of the respondents were reported to have been taking samples to Ministry of Agriculture (MoA) for analysis, 6.4% of the farmers would call and ask the information from friends, and only 1.8% of the respondents would ask the experts like Agricultural field extension officers (Table 5 below). This result is in agreement with [16] that showed that most of the farmers were not trained by the MoA on diseases and pests' identifications and best method of pests and diseases control using pesticides.

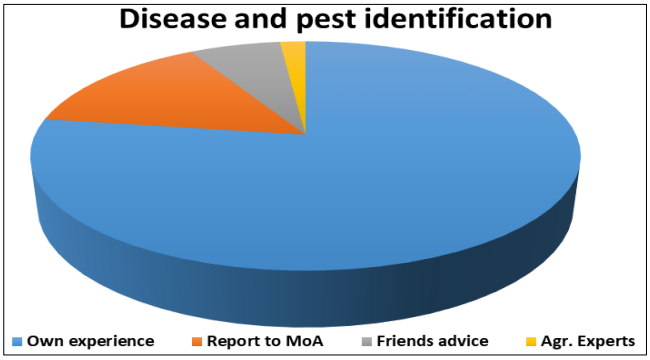


Fig 4: Methods used by farmers to identify diseases and pests by respondent farmers

4. Conclusion and Recommendations

The present study indicates pesticide use in selected horticultural Crop farms among farmers in three subzones of the larger Anseba region. Findings of this study clearly suggest that it is necessary to reduce possible health and environmental risks associated with pesticide use by documenting risk perceptions and developing ways to address them. A major problem concerning unawareness of farmers and members of their families involved in pesticide spraying regarding pesticide toxicity should be seriously addressed by the State departments concerned. These spraying operators, usually non-targeted by extension staff as well as pesticide retailers require particular attention and must be reached by safe use training focusing mainly on the use of PPE and storage and disposal methods. Further studies are warranted to generate appropriate data on which to base policies.

Acknowledgements

Administration of zoba Anseba, and the administration of subzones of Elabered, Keren and Hamelmalo for authorizing the study and for mobilization of farmers in their subzones. Management and staff of Hamelmalo Agricultural College (HAC) for facilitating the study and providing infrastructure and logistics for the study.

References

1. Food and Agriculture Organization of the United Nations, Agriculture and Consumer Protection Department, 2008. http://www.fao.org/ag/AGP/AGPP/IPM/ Default.htm
2. World Health Organization. Sound management of hazardous wastes from health care and from agriculture. New Delhi; WHO South- East Asia Regional Office, 2006.

3. Matthews G, Wiles T, Baleguel P. A survey of pesticide application in Cameroon. Crop Prot. 2003; 22:707-14.
4. Miles JR, Harris CR, Morrow DC. Assessment of hazard associated with pesticide container disposal and of rinsing procedures as a means of enabling disposal of pesticide containers in sanitary landfills. J Environ Sci Heal B. 1983; 18:305-15.
5. Mamat MJ, Anas AN, Sarif Hashim SH. Safer pesticide application equipment for small-scale farmers in developing Asian countries. In: Forget, G., Goodman, T., de Villiers, A. (Eds.), Impact of Pesticide use on Health in Developing Countries. IDRC, Ottawa, 1993, pp. 178-185.
6. Whitaker MJ. The handling and use of paraquat by Malaysian rubber and oil palm small holders. J. Plant Protection. Tropics. 1989; 6:231-249.
7. Ministry of Agriculture, Annual vegetable production and consumption in Eritrea, 2012.
8. Leipzig. Country report to the FAO International technical conference on plant genetic resource. Prepared by Ministry of Agriculture, Asmara, 1996.
9. Ministry of Agriculture Horticulture Division Report, Asmara, Eritrea, 2000.
10. FAO. International Year of the Potato (IYP): Potato World. [online] Available from: http://www.potato2008.org.
11. Biniam Yemane, Ghebrehiwet Medhanie. Ethnobotanical study of medicinal plants in sub zoba Debarwa, zoba Debub, Eritrea. Eritrea journal of Science and engineering. 2014; 2(1):63-97.
12. Osan. Central Highlands Irrigated Horticulture Development Project Completion Report Agriculture and Agro-Industry Department, 2009.
13. Ntow WJ, Gijzen HJ, Kelderman P, Drechsel P. Farmer perceptions and pesticide use practices in vegetable production in Ghana. Pest Manag Sci. 2006; 62:356-365.
14. Isin S, Yildirim I. Fruit-growers' perceptions on the harmful effects of pesticides and their reflection on practices: the case of Kemalpasa, Turkey. Crop Prot. 2007; 26:917-922.
15. Bolognesi C, Merlo FD. Pesticides: human health effects. Encyclo Environ Health, 2011, 438-453.
16. Forget G. Balancing the need for pesticides with the risk to human health. In: Forget G., Goodman T., de Villiers A. (eds) Impact of pesticide use on health in developing countries. IDRC, Ottawa, 1993, 2.
17. Rola AC, Pingali PL. Pesticide, rice productivity, and farmers' health: an economic assessment. Laguna: International Rice Research Institute, Philippines, 1930.
18. Wilson C, Tisdell C. Why farmers continue to use pesticides despite environmental, health and sustainability costs. Ecol Econ. 2001; 39:449-62.