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Preliminary Study on the Use of Chemical Pesticides in Beir Bullerjam's Farms, Suluq, Libya

Marei M. Abdullah [1*] - Adrees A. A. Alhursh [2] - Shuayb M. O. Alajeeli [3]

1 Dept. of plant protection, faculty of agriculture, University of Benghazi.

2 Dept. of natural resources, faculty of agriculture/ Soloq, University of Benghazi.

3 Dept. of plant science, faculty of agriculture/ Soloq, University of Benghazi.

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ABSTRACT

Pesticides in Libya have increased recently in the agriculture sector to control pests, consequently improving field and horticultural crop productivity. The present study was undertaken to assess the current pesticide utilization among farmers in different farms across Beir Bullerjam's area. Data were collected from farmers using a structured questionnaire containing the following (socio-demographic details, awareness and knowledge, and farmer practices). Our results show that all farmers were male (100%), their farming experience was 13 years, and their average age was 46 years old. Not surprisingly, farmers did not know the modes or the compositions of pesticides being used and relied mainly on pesticide commercial retailers' knowledge. The most commonly used pesticides were: insecticides, herbicides, acaricides, and fungicides (47%), (34%), (18%), and (2%) respectively. Moreover, their trade names were: Oscar wp® 50, Roundup, Gramoxyone (herbicides), AQ Dorsban*4, Permethrin, Cyberkill 25, Mospy-one 20% sp, Fl-oil, Voliam Targo (insecticides), Vertimec (acaricide), and Strike (fungicide), and they were regularly utilized by farmers in this survey. We found that farmers reuse the same pesticides over years which may result in pesticide resistance of the targeted pest. Additionally, heavy use of insecticides by farmers could harm bee populations negatively in the region or decrease the natural enemies of pests. Farmer's awareness and attitudes towards pesticide use must be improved through agriculture extension agents or workshops for better food, healthy people, and ecosystems.

KEYWORDS: pesticides, insecticides, fungicides, survey, Libya.

1. INTRODUCTION

Pesticide is defined by the U.S. Environmental Protection Agency as "any *substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest* [1]. The heavily indiscriminate use of pesticides has deleteriously impacted human health, with chronic diseases such as cancer, aging, Parkinson, and asthma as a consequence of their long-term exposure [2,3]. In addition, pesticide utilization, even at low doses, can contaminate the environment by killing beneficial insects (e.g. abnormal behavior effects on *Apis* spp.), birds, polluting the groundwater, and the air [4]. Annually, around 2 billion kilograms of pesticides are used [5]. According to McDougall's analysis [6], pesticide marketing values were $50 billion worth from 2008 to 2012.

***Correspondence**: Marei M. Abdullah

marei.abdullah@uob.edu.ly

The agriculture sector contributes roughly 3-4 % to Libya's Gross Domestic Product (GDP), yet Libyans involved in the agricultural production were significantly huge (20%) [7; 8]. Regrettably, there is no authentic or governmental data on how much and what types Libya imports of pesticides.

To the best of the author's knowledge, no scientific study has been conducted on pesticide attitudes and use patterns among farmers in Beir Bullerjam's area. Thus, the main aims of the current survey were performed: 1) to assess farmers use and knowledge of pesticides; 2) to determine if farmers wear personal protective equipment while applying; and 3) to determine the common pesticide types that are utilized by farmers.

2. MATERIAL AND METHODS

2.1 Study area description:

Beir Bullerjam's farms were located between latitude 31.67 and altitude 20.32 (Fig. 1). These farms are famously known for producing grapes, olives, figs, different vegetables for local consumption, wheat, and

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barley. The willingness of farmers to participate in this survey was an important factor in choosing the farm.

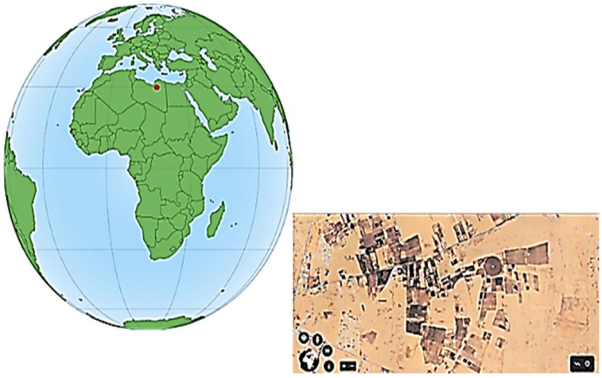

Fig. 1. Survey location.

2.2 Data collection:

Data were collected from farmers by means of a standardized questionnaire (appendix) to obtain information on gender, education level, pesticide type, following pesticide label information, etc. The questionnaire was adopted from [9] and modified to fit our survey. The questionnaire was divided into three sections: section one deals with sociodemographic; section two deals with awareness and knowledge; and section three deals with farmer practices. Approximately, there are 30-40 small-sized (1-4 hectares) to middle-sized (50 hectares) farms in the area under our survey. These farms were owned by individuals and were irrigated by groundwater. Out of 20 filled-out questionnaires, we only chose 16 as they were completely filled out by respondents. In addition, there was no local Agriculture Farmers Association, in which they could help us in distributing and filling out more questionnaires. We firmly believe this number is relatively small, but it would give a better idea regarding the farmers attitudes, knowledge, and use of pesticides.

2.3 Data analysis

Data were presented in graphs and analyzed using descriptive statistics (mean and chi-square test). R programming and JMP SAS (2009) software were exploited in this survey [10].

3. RESULTS AND DISCUSSION

3.1 Farmer social conditions and practices

All farmers were males (100%), and their age mean was 46 years old. Interestingly, the majority of farmers have higher education levels, as shown in Fig 2. However, all farmers had no formal training or license in preparing or applying pesticides; instead, they depended entirely on pesticide retailers or read themselves the information label attached to the product. Interestingly, there was no significant effect of farmers' education levels on whether or not to follow pesticide instruction (p = 0.791). Our result matches Oztas et al. [11] who found in a similar survey that all farmers were male. Likewise, Bakhtawer and Afsheen [9] conducted a similar survey and reported males were the predominate agriculture workforce (93%). Farmers working hours mean were three hours per day, with few exceptions above seven hours.

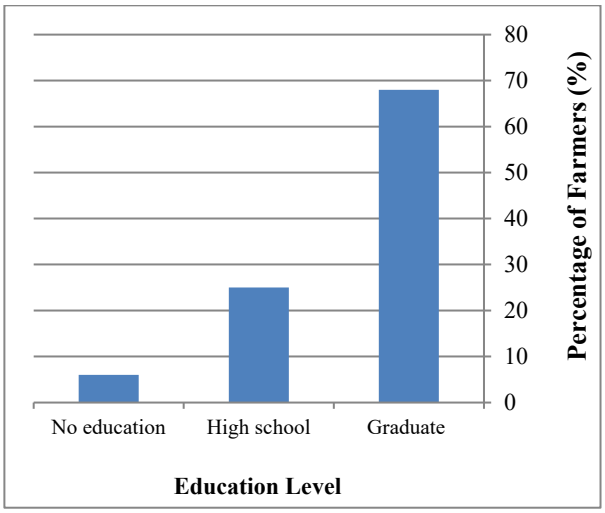

Fig. 2. Farmers education level

In this survey, most farmers wore hand gloves and face mask during pesticide application. Nonetheless, other personal protective equipment (PPE) such as coveralls and goggles were often neglected when spraying pesticides. Reasons for not wearing PPE include: farmers felt uncomfortable wearing PPE, being expensive, and ignorance of their adverse effects on their health. In accordance with our result, Egyptian farmers demonstrated a misuse of pesticide PPE [12]. Similarly, Damalas et al. [13] conducted a study on pesticide use among Greek farmers and showed that farmers unheeded the paramount of wearing PPE and their dire effect on their health, and their findings were in agreement with our results. Another study performed on Filipino farmers use of PPE during pesticide application showed farmers underestimate the value of PPE [14]. In the Palis survey, respondents believed pesticides entered the human body only through inhalation or ingestion, and no dermal absorption can occur.

The surveyed data showed that farming experience was high (13 years old). However, there is no relation between farming experience and emptied pesticide discarding (p = 0.562). It seems farmers were keen on burning the emptied containers over the other methods (Fig. 3).

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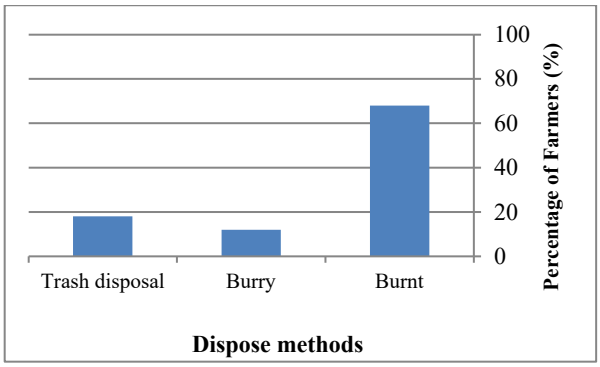

Fig. 3. The means of methods using for deposing empty pesticide containers.

Most farmers in this study preferred to apply pesticides in the early morning, followed by evening and afternoon (Fig. 4). Farmers preferred the morning because the wind was not strong, the sun was not blazing, and there was balanced humidity. According to Puspitasari's work [15], the majority of farmers chose to spray pesticides in the morning.

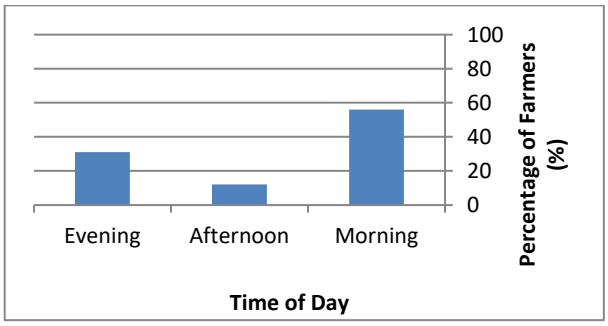

Fig. 4. Times of applying pesticides.

3.2 Types of pesticides

Four kinds of pesticides were reported in this survey. These pesticides were listed in the following: insecticides, herbicides, acaricides, and fungicides (fig. 5). Farmers apparently applied more insecticides and herbicides in comparison with the others.

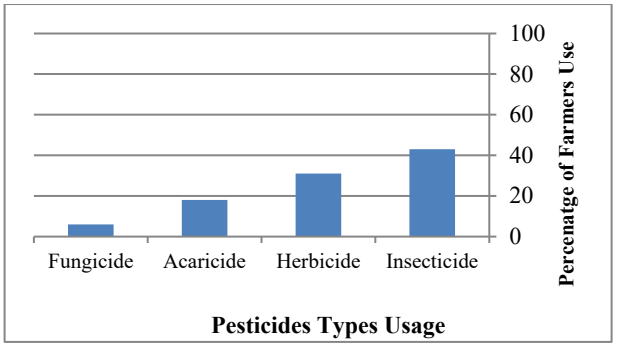

Fig. 5. Percentages of pesticides types that utilizing by farmers.

The type of pesticides being applied by farmers was not affected by farmers' education level ($p = 0.679$).

Our survey found three kinds of herbicides that farmers sprayed. The herbicides were Oscar wp® 50, Roundup, and Gramoxyone (Fig. 6). Their active ingredients were tribenuron-methyl (TBM), glyphosate, and paraquat (PQ), respectively. TBM belongs to the sulfonylurea group, and it has been shown that this herbicide had a negative effect on the liver tissue of zebrafish (*Danio rerio*) [16]. PQ is a highly toxic compound to humans; even a small dosage can be lethal and cause mortality [17]. Some countries, e.g., Central America, have banned or restricted its use [18]. Both Oscar and Roundup were frequently sold in pesticide shops in Sirte, Libya [19].

Our results showed five types of insecticides., viz., AQ Dorsban, Permethrin, Cyberkill 25, Mospy-one 20% SP, and Voliam Targo (Fig. 6). The active ingredients were chlorpyriphos (CP), pyrethroid, cypermethrin, acetamiprid, and both chlorantraniliprole and abamectin, respectively. Long-term exposure to CP can cause endocrine disruption in humans [20]. It has been shown that dermal absorption of pyrethroid is associated with chronic diseases such as cardiovascular and Parkinson [21]. In a study conducted on farmers in the Aljebal Alakhtar region, Libyans who were exposed to pesticides had higher levels of total protein, albumin, globulin, total bilirubin, total cholesterol, triglycerides, urea, and creatinine compared with people who were not exposed to pesticides [22]. This study was so alarming specifically to Libyan farmers, and let this be our take-home message.

Both acaricide and fungicide were represented by Vertimec and Strike, respectively (Fig. 6). Vertimec's active ingredient was abamectin, whereas the active ingredient in Strike was triadimefon and trifloxystrobin.

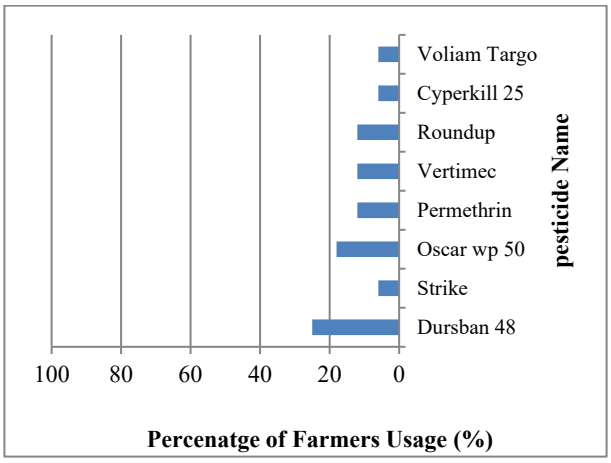

Fig. 6. Percentage of farmers using pesticides by brand name.

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4. CONCLUSION

The survey indicated that farmers had no formal training on pesticide knowledge and mode of action. Personal protective equipment (PPE) was neglected by most farmers. Farmers reuse the same type of pesticides over years, and that ultimately leads the pest to evolve resistance towards pesticides. Some pesticides in this survey were highly toxic to bees. There is a necessity to educate and enhance farmers knowledge and perceptions about the detrimental effects of pesticides on their health in the long term.

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