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Farmer's pesticide uses and risks in onion fields in the central rift valley of Ethiopia

Habtamu Gobezie* and Ferdu Azerefegne

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A B S T R A C T

Improper use of pesticides has been the most problematic factor in affecting the environment and pollinating insects. Therefore, this research was conducted to assess farmers' awareness and usage of insecticides for the protection of onion pests in the Central Rift Valley of Ethiopia from January to May 2022. A purposive sampling method was used to select onion growers in the study area. The respondents revealed that damage caused by pests and diseases led to yield loss in onions, and their choice was applying insecticide chemicals without training in the application technique of the chemical. A very high proportion of farmers (60%) in Adami Tullu Jido Kombolcha and Bishan Guracha (44%) never wear personal protective equipment (PPE) at the time of insecticide application. The result also demonstrated that only 44% of respondents from Adami Tullu Jido Kombolcha and 25% from Bishan Guracha had attended formal training. They also revealed that they purchased pesticide chemicals without knowing their safe use or disposal methods. Due to this, farmers fail to follow the label for pesticide rate, spray volume, and wearing personal protective equipment. The results of this study suggest that farmers in the study area need training and inspection on the safe use and hazardous effects of insecticides.

Keywords: Farmers, Onion, Pesticide use, Thrips damage

School of Plant and Horticultural Science, College of Agriculture, Hawassa University, P.O. Box: 05, Hawassa, Ethiopia

*Corresponding author's email: habtamugobezie38@gmail.com (Habtamu Gobezie)

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Introduction

Onion (*Allium cepa* L.) is a valuable bulb crop that is produced by smallholder farmers and commercial growers for both local and export markets in Ethiopia (Aklilu, 1997). Currently, onion is one of the most important vegetables and spice crops in Ethiopia and is mainly produced as a cash crop (Haile *et al.*, 2016). This crop can be produced year-round, both under irrigation and rainfed conditions, in different parts of the country (Belay, 2015). Onion has great economic importance in Ethiopia, but its production and productivity are low, with a national average productivity of 8.88 tons ha^{-1} (CSA, 2021).

This low productivity could be attributed to poor agronomic practices and damage by pests (Tadele and Amin, 2014). Thrips (Thysanoptera: Thripidae) are a well-known onion pest worldwide and the only insect pest that considerably lowers onion output and calls for action in Ethiopia (Gill *et al.*, 2015). Shiberu and Negeri (2014) reported 10–85% onion bulb yield losses due to onion thrips in upper-awash agro-industry areas in Ethiopia. In the central Rift Valley of Ethiopia, onion thrips can cause high losses in growth and bulb yield of onion (Etana *et al.*, 2019).

The use of insecticides is the most common management tactic for onion thrips control in Ethiopia (Gill *et al.*, 2015). In the Ethiopian Central Rift Valley, thrips on onions are widely managed with insecticides from the group's carbamate, organophosphate, organochlorine, and pyrethroid are most

frequently used (Mengistie *et al.*, 2017). Previous studies on awareness, attitude, and behaviour among smallholders in developing countries, particularly Ethiopia revealed the improper use of pesticides (Agmas and Adugna, 2020; Damte and Tabor, 2015; Mekonnen and Agonafir, 2002). However, little research has looked into how farmers use pesticides. When chemicals are misused due to inadequate information about their calibration, they may have adverse effects on the environment and biota. There is a great concern that farm workers should be aware of the adverse effects of pesticide use if not handled properly. Therefore, this research was conducted to assess farmers' awareness of and usage of pesticides for onion pests in the Central Rift Valley of Ethiopia.

Materials and Methods

Description of the study area

The survey was conducted in the Central Rift Valley of Ethiopia (Adami Tullu Jido Kombolcha and Bishan Guracha) from January to May 2022. Adami Tullu Jido Kombolcha is located at latitude and longitude 7˚45'N 38˚40'E and has an elevation of 1500 - 2300 m.a.s.l. It is situated at a distance of 142 km from Addis Ababa. The annual average rainfall is 600 - 800 mm. The temperature ranges from 18-28^{0}C. Bishan Guracha is situated 4 km to the north of Hawassa City and 266 km to the south of Addis Ababa. It is located at latitude and longitude 7.10°N, 38.48°E. The temperature ranges from 18-28^{0}C.

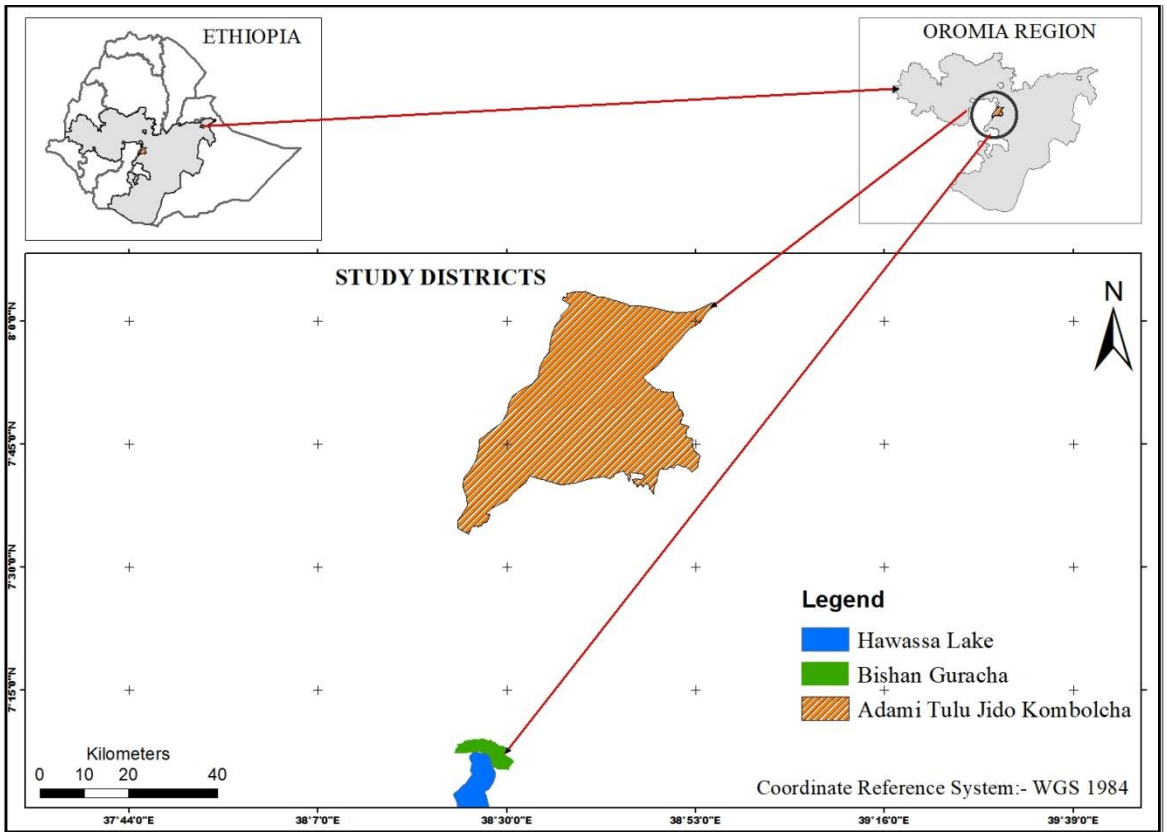

Fig. 1. Geographical location of the study area.

Sample size and sampling procedure

The survey assessed the awareness of farmers' pesticide use, and application to control onion pests. Onion growers with experience in onion production were purposively sampled. A total of 41 onion farmers willing to cooperate and work in their onion fields, 25 from Adami Tullu Jido Kombolcha and 16 from Bishan Guracha districts, were selected. Data were collected by using a structured and semi-structured questionnaire. The main findings of the survey were summarized on growers' knowledge of onion pests, onion thrips, and damage, insecticide application for onion thrips control, safe use of pesticides, and challenges encountered.

Data collection and analysis

The history of thrips management, including the type of insecticides used, spray frequency, safe use of insecticide, spraying equipment, the interval of spraying, disposal of empty insecticide containers, farmers' insecticide use practices, and the observed efficacy,

was recorded. The data obtained from the survey were summarised using the Statistical Package (SPSS) software version 26. The data was analyzed using descriptive statistics. The chi-square (χ^2) test was used to perform a one-way analysis of variance on the two locations.

Results

Onion pests in farmers' field

Farmers explained that the infestations of insect pests, diseases, and weeds are the main constraints to onion production (Table 1). Onion growers indicated that downy mildew and onion thrips were the main pests. Farmers were more concerned about diseases and insect pests. However, during the field survey, it was also observed that many onion fields had infestations of weeds such as gallant soldier (*Galinsoga parviflora*), nutsedge (*Cyperus* spp.), purslane (*Portulaca* sp.), and amaranthus (*Amaranthus* sp.) were the most common. During the survey, it was found that farmers are familiar with the common pests in their onion farms and identify them by their local names (Table 1).

Table 1. Major pests of onion crops identified by growers in CRV of Ethiopia.

Onion pests	Common name	Scientific name	Local name
Insects			
	Onion thrips	*Thrips tabaci*	Kuchich
	Cutworm	*Agrotis* sp.	Mura
Diseases			
	Downy mildew	*Peronospora destructor*	Fungus
	Basal rot	*Fusarium* sp.	Fungus
	Purple blotch	*Alternaria porri*	Fungus
Weeds			
	Purple nutsedge	*Cyperus rotundus*	Kunii
	Yellow nutsedge	*Cyperus esculentus*	Engicha
	Purslane	*Portulaca oleraceus*	Yetija siga
	Jimmson weed	*Datura stramonium*	Atefaris
	Apple of Peru	*Nicandra physaloides*	Lmalimi
	Green amaranth	*Amaranthus hybridus*	Aluma
	Spiny amaranth	*Amaranthus spinosus*	Aluma
	Gallant soldier	*Galinsoga parviflora*	Abadabo
	Goosefoot	*Chenopodium album*	Gime
	Puncture vine	*Tribulus terrestris*	Shimbra qura
	Black jack	*Bidens pilosa*	Chigogit
	Crab grass	*Digitaria* spp.	Wura
	Goose grass	*Eleusine indica*	Akrma
	Stink grass	*Eragrostis cilianen*	Yetef arem

Onion thrips and damage

All of the farmers interviewed accurately described the damage caused by thrips to onions and ranked it as a major pest that has the most significant impact on onion productivity. Farmers reported that onion thrips cause severe damage during the dry period. As a result, all farmers in the CRV of Ethiopia suggested that thrips had high economic importance in onion production. Thrips were named "Kuchich" by some onion growers in the Adami Tullu Jido Kombolcha district.

About 92% of the farmers in Adami Tullu and 100% in Bishan Guracha reported that the population of thrips was high during the vegetative growth stages of the onion crop and declined at maturity. All the farmers in Adami Tullu (100%) and 62.5% in Bishan Guracha areas reported that thrips damage was more severe in the Bega (Winter) cropping season (December to February), whereas the remaining 37.5% said that it is serious in the Kiremt or Meher (Summer) cropping season (June to August) in Bishan Guracha (Table 2).

Table 2. Onion thrips damage and management methods in the CRV of Ethiopia.

Variables	Proportion of respondents (yes %)			
	Bishan Guracha	Adami Tullu Jido Kombolcha	Mean	χ^2 – test
High thrips population				
Vegetative to bulb initiation	100.0	92.0	96.0	84.64**
Bulb to maturity	0.0	8.0	4.0	
Thrips damage more severe				
Winter (Bega)	62.5	100.0	81.3	38.44**
Summer (Kiremt)	37.5	0.0	18.8	
Autumn (Belg)	0.0	0.0	0.0	
Spring (Tseday)	0.0	0.0	0.0	
Pest management methods				
Chemical	100.0	52.0	76.0	87.92**
Cultural	0.0	0.0	0.0	
Use of resistant varieties	0.0	0.0	0.0	
Chemical & cultural	0.0	44.0	22.0	
Chemical & use of resistant varieties	0.0	4.0	2.0	

*** Significant at p ≤ 0.01; significant * at p ≤ 0.05; ns = not significant*

The proportion of farmers using insecticides to manage onion thrips is significantly higher (Table 2). About 100% and 52% of farmers reported applying only chemical pest management methods in onion production in Bishan Guracha and Adami Tullu Jido Kombolcha districts, respectively. While in Adami Tullu Jido Kombolcha 44% of onion growers reported using chemical and cultural control methods, like crop rotation, and 4% of them applied both chemical and use resistant varieties (Table 2). Among onion varieties, Bombay Red and Nafis are currently the most popular varieties in the CRV of Ethiopia. The claim for the resistance is not confirmed and the two varieties are known to suffer from the attack of thrips. However, farmers claim they can withstand and suffer less from the attack by thrips.

Onion thrips and application of insecticides

All farmers agreed that applying insecticides to control onion thrips is profitable. In both areas, all farmers reported that it is impossible to grow onions without the application of insecticides. Organophosphates and pyrethroids were the two types that were utilized the most. Dimethoate and profenofos with various trade names (GirgitPlus, Selecron, Profit, and Ajanta) were extensively used. All onion growers reported that private vendors are the leading suppliers of pesticides in all surveyed areas, and government and non-governmental organizations (NGOs) had no contributions (Table 3).

Onion crop damage from pests and diseases has prompted many farmers in the CRV of Ethiopia to use pesticides despite their lack of experience in insecticide selection and application methods. The survey showed that about 44% and 25% of the farmers Adami Tullu Jido Kombolcha and Bishan Guracha, respectively, attended formal training sessions on pesticide application focusing on safe use and spraying operations from extension workers, NGO projects, and Universities (Table 3). A significantly high proportion of the farmers got information about insecticide applications from their neighbours and friends and also through trial and error.

Table 3. Sources of training for farmers on pesticide application.

Source of training/ Information	Proportion of respondents (yes %)			
	Bishan Guracha	Adami Tullu Jido Kombolcha	Mean	χ^2 – test
Extension workers	6.3	24.0	15.1	49.41**
Neighbours and friends	37.5	28.0	32.8	
NGO projects	12.5	20.0	16.3	
From the vendor	3.1	0.0	1.6	
Trial and error	31.3	24.0	27.6	
University	6.3	0.0	3.1	
Others	0.0	0.0	0.0	

*** Significant at p ≤ 0.01; significant * at p ≤ 0.05; ns = not significant*

Farmers in both study regions start applying pesticides on seedlings in the nursery and the field a week after transplanting to protect onions against insects and diseases. They observed a decrease in thrips populations after insecticide applications and the normal crop growth was a way of checking the effectiveness of the insecticides. In the Adami Tullu Jido Kombolcha area, 76% of farmers reported pesticide applications ceased after 70 to 75 days, and the remaining 24% between 75 and 90 days after transplanting. In contrast, 62.5% of farmers in the Bishan Guracha region ceased the application of insecticides after 70 to 75 days of planting, and 37.5% stopped application between 75 and 90 days after transplanting (Table 4). Among the insecticides used against thrips, farmers claimed that profenofos (Ajanta and Profit) is the most effective.

About 88% and 62.5% of onion growers reported that insecticides and fungicides are frequently mixed together in a tank mix to protect onions against onion thrips and foliar diseases in Adami Tullu Jido Kombolcha and Bishan Guracha, respectively (Table 4). The most frequently mixed pesticides were profenofos + mancozeb or redomil. On the other hand, farmers did not mix different insecticides in both places.

In Adami Tullu Jido Kombolcha and Bishan Guracha, respectively, about 37.5 and 40% of farmers rotated insecticides like profenofos (Profit) in the first spray, imidacloprid in the middle, and profenofos (Ajanta) last. Some farmers indicated that rotating insecticides increases the effectiveness of insecticides (Table 4).

Table 4. Mixing and rotation, termination and frequency of pesticide application on onion field in the CRV of Ethiopia.

	Proportion of respondents (%)			
Variables	Bishan Guracha	Adami Tullu Jido Kombolcha	Mean	χ^2 – test
Mixing of pesticides				
Insecticides and fungicides	62.5	88.0	75.3	
Insecticides	0.0	0.0	0.0	
Rotation of insecticides	37.5	40.0	38.8	
Termination of pesticide applications				
70 to 75 days	62.5	76.0	69.3	14.44**
75 to 90 days	37.5	24.0	30.8	
Insecticide application interval				
< 7 days	31.3	0.0	31.3	66.02**
7 days	6.3	8.0	7.1	
As necessary	62.5	92.0	77.3	
Insecticide spray frequency				
5 to 10 times	43.8	40.0	41.9	2.56**
10 to 15 times	56.3	60.0	58.1	

*** Significant at p ≤ 0.01; significant * at p ≤ 0.05; ns = not significant*

Most of the time, the thrips populations determine the number of days between two consecutive insecticide applications. In Adami Tullu Jido Kombolcha, 92% of farmers spray when necessary, and 8% every seven days, while in Bishan Guracha, about 62.5% of farmers spray when necessary, 6.3% within 7 days, and the remaining 31.3% less than 7 days (Table 4).

Farmers spray onions many times to control thrips. In Adami Tullu Jido Kombolcha, 60% of farmers spray 10 to 15 times, whereas the remaining 40% apply 5 to 10 times. In Bishan Guracha, 56.3% of farmers sprayed between 10 and 15 times, whereas 43.8% sprayed 5 to 10 times. Farmers believed that the increased frequency of insecticide application against thrips increases the bulb yield of onions (Table 4).

Safe use of pesticides by farmers

About 60% of the farmers in the Adami Tullu Jido Kombolcha region and 50% in the Bishan Guracha region can read and comprehend the instructions on pesticide container labels. Conversely, 40% to 50% of farmers in these areas reported occasionally purchasing pesticides without reading the labels. Farmers reported that they look at product names, expiry dates, and the price. Every farmer in the study area considers the price of pesticides when making purchases. However,

farmers in the study areas had a limited understanding and concern for the type of formulation, the active ingredient, concentrations, safety periods, and application rates (Table 5). The farmers explained that they are more concerned about the efficacy and affordability of the pesticides.

All onion farmers had sprayers and knapsack sprayers were the most popular piece of equipment. About 60.4% of farmers, on average, use hired labour to spray onions with pesticides, while about 35.6% of the farmers themselves spray their fields (Table 5).

Table 5. Information checked during pesticide purchase and sprayer equipment used by farmers.

Variables	Proportion of respondents (yes %)			
	Bishan Guracha	Adami Tullu Jido Kombolcha	Mean	χ^2 – test
Read pesticide labels	50.0	60.0	55.0	
Information checked				
Name of pesticide	68.8	80.0	74.4	81.54**
Concentration	25.0	20.0	22.5	
Formulation	18.8	24.0	21.4	
Expiry date	60.0	68.0	64.0	
Rate of application	56.3	64.0	60.1	
Price	100.0	100.0	100.0	
Type of pesticide sprayer equipment used				
Knapsack	100.0	100.0	100.0	
Tractor mounted	0.0	0.0	0.0	
Hand sprayer	0.0	0.0	0.0	
Aerial/aircraft	0.0	0.0	0.0	
Who sprays pesticides?				
Owner of the farm	31.3	40.0	35.6	47.36**
Hired workers	68.8	52.0	60.4	
Owner and hired workers	0.0	8.0	4.0	

*** Significant at p ≤ 0.01; significant * at p ≤ 0.05; ns = not significant*

In Adami Tullu Jido Kombolcha areas, about 24% of the onion farmers always use personal protective equipment (PPE), 16% of the growers wear it sometimes, and the significant majority of them (60%) never wear PPE during insecticide application. Similar trends were observed in Bishan Guracha, where 25% of the onion growers always wear PPE, 31% sometimes, and 44% never wear it (Fig. 2).

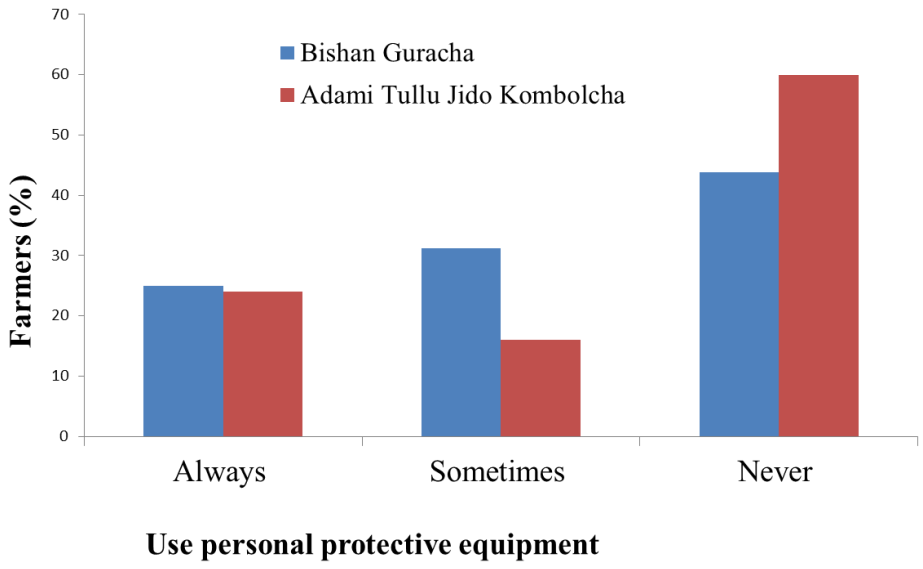

Fig. 2. Use of personal protective equipment (PPE) when mixing and applying pesticides.

Some farmers knew that pesticides had negative impacts and reported that these chemicals contaminate water bodies, affecting both people and animals. According to the respondents, itching or other negative effects on the skin or eyes were felt after applying pesticides and they were afraid that this may cause serious illness. They disclosed that the commonly used insecticides like lambda-cyhalothrin (Karate) and profenofos (Profit and Ajanta) make them uncomfortable after spraying.

Farmers in the study area disposed of insecticide residues and containers in various ways. In Bishan Guracha, about 12.5% of the farmers disposed of the unused leftover insecticides in the field, 56% of farmer's mix only the required amount of insecticides, 6.25% of farmers disposed in the sewer, and 25% of them reported they sprayed on other crops or weeds. While in Adami Tullu Jido Kombolcha about 20% of the farmers disposed of the wastes in the field, only 68% of farmers said only the required insecticides were mixed, 4% of farmers disposed of in the sewer and 8% of them reported they spray on the leftovers on other crops or weeds (Table 6).

Different methods are used by farmers to discard empty insecticide containers. In Adami Tullu Jido Kombolcha and Bishan Guracha, respectively, about 44% to 50% of the farmers discarded containers on the farm, about 20% burn or bury them on the farm and 24% to and 31% of the farmers reuse containers for other purposes. In addition, in Adami Tullu Jido Kombolcha about 12% of farmers reported washing and selling pesticide containers for recycling (Table 6).

Table 6. Handling of unused leftover diluted insecticides and ways to dispose of empty insecticide containers after application.

Variables	Proportion of respondents (%)			
	Bishan Guracha	Adami Tullu Jido Kombolcha	Mean	χ^2– test
Unused leftover insecticides				
Dispose in the field	12.5	20.0	16.3	76.56**
Mix only the required amount	56.3	68.0	62.1	
Apply on the other crops /weeds	0.0	0.0	0.0	
Dispose in sewer/ditches	6.3	4.0	5.1	
Others	25.0	8.0	16.5	
Disposal of empty insecticide container				
Discard on farm	50.0	44.0	47.0	26.00**
Incinerate/bury on farm	18.8	20.0	19.4	
Reuse for other purposes	31.3	24.0	27.6	
Others	0.0	12.0	12.0	

*** Significant at p ≤ 0.01; significant * at p ≤ 0.05; ns = not significant*

Discussion

According to the farmers interviewed, insect pests, diseases, and weeds are major constraints of onion production. Similarly, a survey in the Rift Valley of Ethiopia confirmed that pests and diseases were major contributors to the low crop yields (Bekele *et al.*, 2006). Moreover, Dinham, (2003) reported that insect pest infestation is the most important vegetable production problem, followed by disease, lack of pesticides and poor management. High infestation of insect pests and infectious diseases accentuates high pre and postharvest losses in Ethiopia (Etana *et al.*, 2019). In Ethiopia, insect pests such as thrips, cutworms, and various caterpillars were the main pests, and purple blotch, downy mildew, damping off, and iris yellow spot virus were the most significant diseases of onions (Haile *et al.*, 2016).

Both adults and larvae of onion thrips cause damage to their hosts by piercing the surface tissues and sucking the contents of plant cells. This damage decreases plants' ability to photosynthesise (Woldemelak, 2020). About 100 and 62.5% of farmers reported that thrips damage was more severe in the winter cropping season in Adami Tullu Jido Kombolcha and Bishan Guracha areas, respectively, whereas the remaining 37.5% said that it was the summer cropping season in Bishan Guracha.

The occurrence of more thrips population in the onion was due to hot dry periods in the

entire surveyed districts. Earlier studies on the population dynamics of *T. tabaci* showed that the number of thrips peaked during the hot dry periods of February through April and fell down during the rainy seasons of June to August (Tsedeke, 1995). The other findings were also made by Ibrahim and Adesiyun (2010), who reported that the number of thrips on onion crops increased rapidly during dry weather and quickly decreased after rainfall.

Farmers in the CRV of Ethiopia apply pesticides to control damage caused by thrips and diseases on onion crops. The results of the present assessment showed that all farmers used (100%) insecticide spray to control onion pests. Similarly, Negash *et al.* (2019) reported that onion growers had no other option than to use insecticides to manage the thrips that were infesting their crops in the CRV of Ethiopia.
Chemicals are too often used as the major tool for arthropod pest management, ignoring the potent evolutionary forces from chemical selection pressures that lead to resistance (Umina *et al.*, 2019). According to the present survey, Adami Tullu Jido Kombolcha and Bishan Guracha farmers spray up to 10 to 15 times per cropping season. Farmers typically thought that using more insecticides to control thrips led to higher yields. As a result of this misconception about the usage of pesticides, thrips are becoming a bigger issue in onion production. In the East Shewa Zone, Ethiopia, all small-scale vegetable farmers use pesticides exclusively, and they do so often to keep pests under control (Damte and Tabor, 2015). Nevertheless, the extensive use of pesticides contributes to the rise in insecticide resistance (Din *et al.*, 2016). Similarly, Khaliq *et al.* (2014) reported that as a result of continuous usage of synthetic chemical insecticides, onion thrips develop resistance.

In both areas, a very high proportion of farmers, 60% in Adami Tullu Jido Kombolcha and 44% in Bishan Guracha, never wear personal protective equipment (PPE) during insecticide application. Damte and Tabor (2015) reported that 71% of the respondents did not use personal protective equipment while spraying pesticides, but a few used one or two types of PPE. Similarly, Mengistie *et al.* (2017) indicated that farmers purchase pesticides without having proper knowledge, storage, safe handling, safe use, and safe ways of disposal. As a result, farmers fail to follow the labelled pesticide rate and spray volume recommendations or to wear the proper personal protective equipment. The number of farmers who can read and comprehend the directions on pesticide container labels is only 60% and 50% in Adami Tullu Jido Kombolcha and Bishan Guracha, respectively. Dinham (2003) claimed that vegetable growers in developing countries cannot follow pesticide label instructions.

Different methods are used by farmers to discard empty insecticide containers. Farmers do not follow any one kind of method of disposal because they are not informed and trained on the proper disposal of pesticides. As a result, each of them decides what to do with leftover pesticides, empty containers, or any other waste. As a result, some farmers in the study area dispose of wastes in the field, burn them, or reuse the containers for other purposes. Similarly, Damte and Tabor (2015) reported that 62% of the respondents threw empty pesticide containers around the field after spraying. Additionally, Tilahun and Hussen (2014) suggested that about 91% of all respondents did not use protective equipment during spraying and never had any training about pesticide use. After the spray, they dispose of empty containers in the soil, throw them anywhere, sell, and burn and then wash the containers to use for water and food storage. In the other study, farmers use the improper storage of pesticides at home (Ngowi *et al.*, 2007).

In this survey, it was found that mixing insecticides and fungicides by onion growers is very common to protect onions from onion thrips and foliar diseases. Similarly, Negatu *et al.* (2016) reported that some farmers mix two pesticides before application and this helps farmers to save time and labour, and they have considered it to have higher efficacy in pest and disease control. Interactions between insecticides, fungicides, and water mineral content may be more toxic, risky, less efficient, neutralised or resistant to pesticides against insect mortality and fungal pathogens (Ngowi *et al.*, 2007). Although the practice of mixing pesticides is accepted, it must be knowledge-based. Pesticides that complement each other and are not antagonistic can be mixed in a tank and be used.

In addition, Nault *et al.* (2013) evaluated the effects of co-applying spinetoram, abamectin, and spirotetramat with commonly used fungicides to manage onion thrips in onion farms. The result showed that co-applications of insecticides with chlorothalonil fungicides reduced thrips control by 25 to 48% compared with control levels provided by the insecticides alone in three of five trials.

The survey showed that only 44 and 25% of the farmers attended formal training sessions on pesticide application, which focused on safe use and spraying operations from extension workers, NGO projects, and Universities in Adami Tullu Jido Kombolcha and Bishan Guracha, respectively. Ntow *et al.* (2006) suggested that, without adequate training, farmers are unable to make good crop decisions. Knowledge of pesticide selection, application rates, and timing is poor, and different pesticides are often combined in the belief that the effect will be more significant; re-entry periods after spraying and essential harvest intervals are not known.

Similar to the present study, high pesticide use trends were observed by Mengistie *et al.* (2017) in the CRV of Ethiopia, where 97% of the farmers used pesticides as part of their agricultural input. In other instances, the pesticide levels are significantly higher, which highlights the necessity of routine pesticide monitoring programs for vegetables and surface waters in the Ethiopian CRV (Loha *et al.*, 2020).

In addition, Agmas and Adugna (2020) reported that farmers in North-West Ethiopia applied chemicals indiscriminately and inappropriately on their farms, used unsafe storage facilities, and ignored risks and safety instructions. Therefore, there is a high possibility of chemical residues affecting food products (milk, meat, fish, vegetables, and fruit) that may pose a public health risk.

Yorobe *et al.* (2011) examined the effect of Farmer Field Schools (FFS) on Philippine onion producers' use of pesticides. The impact of FFS's reduction in insecticide use on the environment and public health is significant, and it shows how well the FFS teaching method is working to disseminate critical IPM concepts in the country. Also, the other study showed that enhancing farmers' knowledge through training and information sharing in workshops is essential to improving pesticide usage, handling, and storage practices (Mequanint *et al.*, 2019). The current study also recommends that farmers in the CRV of Ethiopia need training on the safe use and application of insecticides.

Conclusion

Onion production constraints, farmers' knowledge of thrips, and pesticide usage patterns were discussed with farmers in the CRV of Ethiopia. Farmers describe thrips and the damage it causes to the onion and consider them the most important pests of onion. They said that damage is more severe during the winter season. Insecticides are used by farmers to manage onion thrips, but the use and handling of insecticides are not effectively understood. Therefore, training farmers and building their knowledge is crucial to fostering safe, economical, and acceptable methods of onion pest management.

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Conflict of interest statement

The authors declare that the research was conducted in the absence of any conflict of interest.

Data availability statement

The data used in this manuscript are available upon request from the corresponding author.

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