Research Article
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Evaluation of different insecticide for onion thrips management in East shewa, Ethiopia

Volume 9 Issue 2 - 2019

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Received: August 24, 2017 | **Published:** April 02, 2019

Introduction

Onion (*Allium cepa* L.) is one of the major economically important vegetable crops grown in the central region of the country in the upper Awash and Lake Ziway areas.[1] An altitude of 700-1800m above sea level with a temperature of 20-26°C is suitable for the production of onion crop in the country. Among alliums group, onion is introduced recently but is rapidly becoming a popular vegetable among users due to its flavoring purpose.

Onion is one of the most popular vegetable in the world. In Ethiopia onion is produced as a cash crop by small farmers and commercial growers especially under irrigated conditions. Onion is valued for its distinct pungency or mild flavor and form essential ingredients of many dishes. It is consumed in small quantity in many homes almost daily as a seasoning or flavoring of varieties of dishes, sauce, soup, sandwiches, etc in many countries of the world. Onion contributes substantially to the national economy apart from overcoming local demand. Product like bulbs and cut flower are exported to different countries of the world. According to marketing report (ETFRUIT, 1985-87) the average annual scale of onion was estimated about 1.5million ETB. This indicates that Ethiopia has high potential to benefit from onion crop. In view of this onion is one of the most important cash generating crops for farmers especially around east shoa zone.[2]

According to research experiment and production experience obtained so far, it is evident that there is a high potential for the production of onion in the country.[3] FAO reported that the World average is 145q/ha while the African yield average is 123q/ha and for Ethiopia, it is only 102q/ha. However, experimental yields obtained in awash valley ranged from 300-400q/ha.[1] This shows that there is a great potential to improve the Productivity of the crop by research.

Thrips are known to be serious pests on a wide range of fruit, vegetable, flower, and agronomic crops. Thrips are members of the order Thysanoptera, which contains a number of genera and species. For example, there are at least two species of thrips that attack onions: onion thrips (*Thripstabaci*) and western flower thrips (*Frankliniella occidentalis*). Both species have a wide host range, including cereals and broad-leafed crops.[4] The information contained in this publication is largely generic and applies broadly to most kinds of thrips. Onions are often Thrips feed by rasping the leaves and other tissues of plants to release the sap, which they then consume. This feeding reduces the plant's ability to produce food and interferes with transportation of foliar nutrients to the bulb. The resulting damage is usually measured as an overall reduction in bulb size and weight of onions and flower corms produced. There may also be effects on the number, size, and appearance of flowers. The injury caused by thrips' rasping of the leaves enables various plant pathogens to gain entry, thus increasing disease problems. In addition, thrips carry plant pathogens on their mouth parts from one plant to another. In onions, entire fields can be destroyed, especially in dry seasons.

Chemical pesticides are applied to combat plant pathogens in agricultural fields. In Ethiopia this practice has been going on for over 40 years[5] between 1983 and 1993 the import was approximately 3.800tonnes annually and about 203tonnes annually was donated. Of the imported pesticides 72% were insecticides, 25% herbicides, 2.6% fungicides and 1.3 % others.

However, pesticides are applied without adequate knowledge of the pest and the identity of the pesticide including dosage and frequency. Major of the farmers are applying chemicals by the advice they get from local farmers near to them and few may get this advice from some experts and research centers. This practice has made pesticidal control ineffective, encouraged development of pest resistance and decimated natural controlling factors such as parasitoids.

Cultivation of tropical vegetables like tomato and onion in mid rift valley is impossible without applying agrochemicals. Controlling variable pests with pesticides imported and manufactured domestically with the level listed on the cover of the equipment is not working as a result farmers are forced to apply a little bit more than the recommendation set for it which may cause health problem. Some of the reasons for improper use of pesticides by growers include lack of knowledge on pest identification and use of the correct pesticide at the right dosage, among others. Those chemicals are not killing the particular disease or pests that are applied for. And also farmers are using little number of chemicals for many disease and pests which are the rivers is true. This makes disease and pests are adopting those chemicals easily.

Materials and method

Description of the experimental sites

The experiment was conducted using irrigation at Adami Tulu Agricultural Research Center (ATARC) 20162017 off season. ATARC is located on the road to Hawassa town in the mid Rift Valley of Ethiopia about 167km south from Addis Ababa. It lies at a latitude of 7° 9'N and longitude of 38° 7'E. It has an altitude of 1650m.a.s.l. and it receives a bimodal unevenly distributed average annual rainfall of 760.9mm per annum. The long-term mean minimum and the mean maximum temperature are 12.6 and 27°C respectively. The pH of the soil is 7.88 The soil is fine sandy loam in texture with sand, clay and silt in proportion of 34, 48 and 18% respectively.[6]

Experimental Design and Management

The Onion (allium sepa) variety Bomby Red was used for the experiment. Seedlings was raised on raised seed bed of 10m^2 and transplanted on attaining the third to fourth true leaf stage. Each plot

had three, 4m long ridges each with one row of cabbage on each side. Ridges were spaced 60cm apart. The spacing between plants was 10cm. Treatments were arranged in randomized complete block design (RCBD) with three replications. Spacing between plots and blocks was 1 and 1.5m, respectively. All data were collected only from the central four rows. The crop was irrigated twice per week for the first four weeks after transplanting and once weekly thereafter. Plots were fertilized with diammonium phosphate (DAP) and urea at the rate of 200 and 300kg/ha, respectively. The whole amount of DAP were applied just before transplanting, while urea were applied by splitting the total amount in two. Half of the 100kg was applied one month after transplanting and the remaining half at the beginning of head formation stage. Other field management practices like weeding, cultivation and maintenance of ridges were carried out as needed. Applications of treatments were started two weeks after transplanting. Spray was made using manually operated knapsack sprayer of 15L capacity using hollow cane nozzle.

Treatments

T1, spraying thinnics of 2L/ha once per week;

T2, spraying profit of 2L/ha once per week;

T3, spraying karate2L/ha once per week;

T4, spraying mixed chemical (thinnics, diaznon 2L/ha, profit 2L/ha and karate) once per week;

T5, spraying mixed chemical (thinnics, diaznon and profit and karate) two per weeks;

T6, rotating of 4 chemicals per 3 weeks.

Data collected

Vegetative data

Number of leaf per plant, Plant height and leaf numbers

Numbers of leaves per plant and leaf numbers measurements were taken from randomly selected 10plants from each of the treatment plots one week before harvesting. Plant height was measured from the soil surface to the apex of the plant using ruler at the time of harvest. The highest point reached by the plant was recorded as the height of the plan.

Yield component

Bulb length (cm), bulb diameters/plant (cm), marketable yield kg/row, unmarketable yield kg/row, total yield q/ha were collected.

Small and big size bulbs (<2.5cm diameter and >6.5cm diameter) are categorized under unmarketable bulb yield as they have no demand from the market.

Onion thrips leaf damage

All plants and plant parts were examined for leaf damage before treatment application and at weekly interval thereafter. The score on each leaf of a plant was taken based on a scale of 0 to 5 (0= no leaf damage; 1= up to 20% of the total leaf area damaged; 2= 21-40% of the total leaf area damaged; 3= 41-60% of the total leaf area damaged; 4=61-80 % of the total leaf area damaged; and 5=more than 80 % leaf area damaged).

Data Analysis

Data analysis was carried out using the SAS version 9.2. To stabilize the variance count and percentage data were transformed either to logarithmic or square root scale. The mean value of the recorded data's was subjected to analysis of variance (ANOVA). If there was significant difference among the treatments, mean separation was carried out using tukey's significance difference at P0.05.

Results and discussion

Leaf damage visual scores across weeks

In the 1nd and 3rd weeks, there were significant differences (P<0.05) among treatments in the extended of leaf damaged score. The highest leaf damage was recorded on spraying thinnics of 2L/ha once per week and spraying mixed chemical (thinnics, diaznon and profit and karate) two per weeks sprayed onion, whereas the least leaf damage was recorded on spraying mixed chemical (thinnics, diaznon 2L/ha, profit 2L/ha and karate) once per week and rotating of 4chemicals per 3weeks treated cabbages. in the other hand the, 4th, 5th and 6th weeks there non were significant differences (P<0.05) among treatments in leaf damaged, though there were leaf damage scale variations among treatments . In most the cases the spraying mixed chemical (thinnics, diaznon and profit and karate) two per weeks cabbage had the highest leaf damage score whereas cabbages treated with rotating of 4chemicals per 3weeks had the lowest leaf damage due onion thrips. In all weekly applications, chemicals can reduced onion thrips population below threshold levels, since all applied chemicals were the property to control the, but ruther then mixing chemicals it is better to rotate them for insect pest management.

The present observation is in line with finding of Ayalew G.[7] also reported that insecticides are generally considered the most effective means of protecting crops against insect damage as they provide rapid reduction of wide pest complex of major crucifer's pests, and growers concerned about leaf damage, even of a few holes, tend to spray insecticides.[8] Believed that repeated insecticide applications are required to minimize onion thrips, especially during the peak population period. However, Motoyama et al.[9] warned that effective insecticidal control of onion thrips might not be achieved for longer period as the insect can develop resistance to a new insecticide very quickly because of its unique feature of insecticide resistance.

Effect of chemical insecticides on onion agronomic parameters

Plant height at harvest

There was significant difference (P<0.05) among treatments in affecting plant height (Table 1). Onion sprayed with either rotating of 4chemicals per 3weeks or spraying mixed chemical (thinnics, diaznon 2L/ha, profit 2L/ha and karate) once per week produced the tallest plants. However, head cabbage sprayed with spraying karate2L/ha once per week onion had the shortest plants height. This is consistent with the finding of Asare et al.[10] who indicated that treating cabbage with insecticide reduced the insect population on onion and hence better growth of the crop.

Leaf number and leaf height

The result showed that Leaf number, and leaf heights were found to be statistically non-significant (Table 2).

Bulb length, bulb diameters and marketable and un marketable yield

The result showed that all parameters were found to be statistically non-significant (Table 3).[11–13]

Citation: Begna F. Evaluation of different insecticide for onion thrips management in East shewa, Ethiopia. *Adv Plants Agric Res.* 2019;9(2):364–367. DOI: 10.15406/apar.2019.09.00449

Table 1 Mean leaf damage due to onion thrips on onion treated with different chemicals in five weeks period

Weeks	Week 1		Week 2		Week 3		Week 4		Week 5	
Treatment	BSPA	ASPA	BSPB	ASPB	BSPC	ASPC	BSPD	ASPD	BSPA	ASPE
spraying thinnics of 2L/ha once per week	7AB	4AB	9.66A	7.8A	11A	5AB	10AB	4A	10A	4A
spraying profit of 2L/ha once per week	6B	4AB	9A	6.4A	11A	6A	9B	5A	9A	5A
spraying karate2L/ha once per week	6B	3.33AB	9.66A	6.8A	9AB	5AB	13A	7A	7A	4A
spraying mixed chemical (thinnics, diaznon 2L/ha, profit 2L/ha and karate) once per week	6B	3.33AB	9.33A	6.5A	5B	3B	10AB	5A	10A	4A
spraying mixed chemical (thinnics, diaznon and profit and karate) two per weeks	9A	5A	9.A	8.2A	11A	5AB	12A	6A	7A	2AB
rotating of 4 chemicals per 3 weeks	6B	2.7B	8.3A	7A	8AB	4B	12A	6A	7A	3.6A
CV	18	34	26	20	31	28	28	41	37	32

Table 2 Effect of chemicals on agronomic characteristics of onion at Adami Tullu

Treatment	Leaf height	Plant height	Leaf number
spraying thinnics of 2L/ha once per week	30.8A	30A	12A
spraying profit of 2L/ha once per week	29.66A	30A	11A
spraying karate2L/ha once per week	31A	24B	13A
spraying mixed chemical (thinnics, diaznon 2L/ha, profit 2L/ha and karate) once per weeka	29A	37.7A	11.8A
spraying mixed chemical (thinnics, diaznon and profit and karate) two per weeks	31.2A	24B	11A
rotating of 4 chemicals per 3 weeks	33A	42A	13A
CV	9.5	34.6	22.5

Table 3 Effect of chemical application on yield of onion

Treatments	Bulb length	Bulb diameter	Marketable yield	Unmarketable yield
spraying thinnics of 2L/ha once per week	2.4A	3.3A	12.3	2A
spraying profit of 2L/ha once per week	2.7A	3.6A	15.8	1.5AB
spraying karate2L/ha once per week	2.5A	3.6A	15	1B
spraying mixed chemical (thinnics, diaznon 2L/ha, profit 2L/ha and karate) once per week	2.7A	3.7A	18.5	1.3AB
spraying mixed chemical (thinnics, diaznon and profit and karate) two per weeks	2.5A	3.3A	12.3	1.7AB
rotating of 4 chemicals per 3 weeks	2.6A	3.8A	16.6	1.1B
CV	17.5	15.6	27.9	31

Conclusion and recommendations

From the one year results, it can be concluded that across the most parameters, rotating the above then mixing showed a significance effect in reducing the damage of onion thrips., it provides a better and wide control options.

Acknowledgment

None.

Conflicts of interest

The author declares that there is no conflict of interest.

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DOI: 10.15406/apar.2019.09.00449