

Assessment of spatial and temporal crop pest distribution and importance in Megech Irrigable Command Areas of north Gondar, Ethiopia

Asfaw Azanaw^{1*}, Yohannes Ebabuye² and Eshetu Melese³

¹ Plant pathologist, Gondar agricultural Research center, P.O.Box 1337, Gondar, Ethiopia

² Entomologist, Gondar agricultural Research center, P.O.Box 1337, Gondar, Ethiopia

³ Research Assistant, Gondar agricultural Research center, P.O.Box 1337, Gondar, Ethiopia.

* Corresponding author: Asfaw Azanaw; e-mail: asfaw.azanaw@yahoo.com

Received: 23 November 2016

Accepted: 21 December 2016

Online: 02 January 2017

ABSTRACT

Megech is the newly emerging irrigation project in Nile basin. It covers very small hectare of land under irrigation now. Despite the ecological and market potentials, the yield and the total production of crops are very low. Diseases and pests are among the important factors that contribute to the low yield and reduce the quality of the crop in the area. The objective was to assess temporal and spatial distribution and importance of major crop pests. Surveys were done at Dembia and Gondar zuria in 2011 and 2012 irrigation seasons. To conduct the survey Periodic field visit were conducted based on the crop stage. For identification of the pest visual identification and with a help of manuals, photographs, leaf lets and books were used. Interviewing with farmers, development agents and districts experts working in the area were made. Major insect pests of shallot, garlic, tomato and wheat are identified accordingly. Thrips on shallot and garlic, African boll worm on tomato and Russian wheat aphid on wheat. The major diseases are Bulb rot on shallot, Tomato leaf roll virus on tomato and wilt and root rot on pepper. Minor insect pests and diseases have also identified on these and other crops. As most of the insect pests are known insect pests in the main season with some measurable practices or demonstration of some management practices need to be done.

Keywords: Megech, insect pest, disease, weeds.

1. INTRODUCTION

Megech is the newly emerging irrigation project in Nile basin. It covers very small hectare of land under irrigation now. The proximity of market access to the biggest towns of the region (Bahir Dar and Gondar) and favorable environmental condition for crop production makes possible for the diverse production of vegetables and cereals crops under irrigation. Crops practiced under irrigation now are potato (*Solanum tuberosum*), tomato (*Lycopersicon esculentum*), pepper (*Capsicum spp.*), cabbage (*Brassica oleracea*), garlic (*Allium sativum*), shallot (*Allium cepa*) are among vegetables and during the main season wheat (*Triticum aestivum*), teff (*Eragrostis tef*), rice (*Oryza sativa*), sorghum (*Sorghum bicolor*) and chick pea (*Cicer arietinum*) are among cereals and pulses mainly produced. They play

important role in the economy and diets feed source of the command area. They are important source of carbohydrates, proteins and minerals and roughages.

Despite the ecological and market potentials, the yield and the total production of crops are very low. Diseases and pests are among the important factors that contribute to the low yield and reduce the quality of the crop in area. Various fungal, bacterial, viral diseases and parasitic weeds are known to attack the crops at different stages of the crop. Since, the area is new for irrigation there is little information available concerning the important diseases, pests and parasitic weeds for research and development intervention. But the report were based on simple observations without

due attention with the distributions and economic important. The objective of this study was to assess temporal and spatial distribution and importance of major crop pests under Megech irrigation command area.

2. MATERIALS AND METHODS

Survey was conducted in 2011 and 2012 irrigation period at megech irrigation command area at Dembia (Jangura and Robit kebele) and Gondr Zuria (M.debir kebele) districts. Forty sample fields were randomly assessed in both districts in each year. Data on incidence and damage (severity) were collected in X fashion with 50cm x 50cm quadrat on the different

stage of the crops. For identification of pest visual identification, manuals, photographs, leaf lets and books were used. Interviewing with farmers, development agents and the districts experts working in the area were made. The spatial assessment was seen among districts and kebeles and the temporal assessment in the between the seasons. The status of the pests was determined on their prevalence percentage minor (1-20%), intermediate (20-40%) and major (>40%), and pest prevalence refers to pest incidence within context of geographical area. For example ten fields in an area are inspected for pest and six are found to be infected; the pest prevalence for the area is 60% (Teng and James, 1979).

Table 1: Insect pests of different irrigated crops with their status in 2011 and 2012 at Dembia and G. zuria, Ethiopia.

Districts kebele	crop	Insect Pest		stage of the crop	Status of the pest	Incidence (%)	Level of damage	Damage (%)
		Common name	Scientific name					
Jangura	shallot	Thrips	<i>Thrips tabaci</i>	Seedling to maturity	major	100	Moderate	20-55
Robit	shallot	Thrips	<i>Thrips tabaci</i>	Seedling to maturity	major	100	Moderate	25-40
M.debir	shallot	Thrips	<i>Thrips tabaci</i>	Seedling to maturity	major	100	Moderate	26-43
Jangura	Garlic	Thrips	<i>Thrips tabaci</i>	Seedling to maturity	major	100	Moderate	32-50
Robit	Garlic	Thrips	<i>Thrips tabaci</i>	Seedling to maturity	major	100	Moderate	30-36.25
Jangura	Tomato	African boll worm	<i>Hilicoverpa armijira</i>	fruiting	major	-	-	-
Jangura Robit and M.debir	cabbage	White aphid	<i>Brevicoryne brassicae</i>	Growth to maturity	Major	100	Moderate	25-30
Jangura	potato	White fly	<i>Bemisia tabaci</i>	growth	minor	<20	minor	<10
Jangura	wheat	R. wheat aphid	<i>Diuraphis noxia</i>	Growth to maturity	major	-	minor	-
Jangura	wheat	Stem borer	<i>Chilo spp</i>	Flowering to maturity	minor	<20	minor	<10
Jangura	Maize	Stalk borer	<i>Buseola busca</i>	Seedling to maturity	Minor	<20	minor	Trace
Jangura	Maize	Aphid	<i>Aphid spp</i>		minor	<20	minor	Trace
Jangura	pepper	Cut worm	<i>Agrotis spp</i>	Seedling	minor	<25	minor	<10
Jangura	Tomato	White fly	<i>Bemisia tabaci</i>		minor	50	minor	<10
Jangura	Chick pea	Cut worm	<i>Agrotis spp</i>	Seedling	minor	<10	minor	<10
Robit	Cabbage	Diamond back moth	<i>Plutella xylostella</i>	Seedling to maturity	Major	100	Moderate	30

NB: Robit and Jangura are Dembia districts kebeles and M.dabir is a kebele in G.zuria district

3. RESULTS AND DISCUSSION

The result of the survey indicates that Thrips (*Thrips tabaci*), African boll worm (*Hilicoverpa armijira*) and Russian wheat aphid (*Diuraphis noxia*) are the major insect pests on irrigated shallot and garlic, tomato, and wheat respectively. Wheat aphid, white fly and stem borer were the minor insect pests on cabbage, potato and wheat respectively. Vertebrate like porcupine are also problems on maize (Table 1 and Table 2). Most of the insect pests are leaf miners (sucker); Thrips, R. wheat aphid, white aphid and white fly and some are stalk and fruit borers. In addition most of the pests are main season insect pests.

Thrips on shallot and garlic were assessed their intensity which was at about of 100 percent both at Dembia and G/zuria and with level of damage 20-55%

on shallot(Jangura), 26-43% on shallot (M.debir), 25-40% on shallot (Robit) and 32-50% on garlic(Jangura), 30-36% on garlic (Robit) which is moderate in their level of damage (Table 1). Thrips makes the crops change their color to orange, mined the leaves and with stunted growth on their seedling to maturity stage. Thrips feed on leaves, flowers and fruit and some carry plant viruses. They are slender, tiny (1 to 2 mm long) and Thrips pierce plant cells with their mouthparts and feed on plant juices. The collapse of plant cells can result in the formation of deformed flowers, leaves, fruit, stems and shoots (DAFWA, 2007).

African boll worm on tomato occurs on trials and farmers field at the stage of fruit formation which makes the fruit perishable and unmarketable and it is major pest in production of the crop in the area.

Table 2: Common weeds and vertebrate pests different irrigated crops with their status in 2011 and 2012 at Dembia and G. zuria, Ethiopia.

Location	Common name	Crop damaged	Scientific name	Stage of the crop damaged	Status
Weeds					
	Bulbosa	All crops	<i>Kyllinga bulbosa p.beauv.</i>	Growth to maturity	minor
	Mexican poppy	All crops	<i>Argemone Mexicana l.</i>	Growth to maturity	major
	Cyprus	All crops	<i>Cyprus esculuntus</i>		
Vertebrate pest					
	Porcupine	Maize	<i>Erethizon dorsaum</i>	Fruiting	Major
	Mouse	Chickpea	<i>Mus musculus</i>	Podding	Major

Table 3: Diseases of different irrigated crops with their status in 2011 and 2012 at Dembia and G. zuria, Ethiopia.

Kebele	Crop	Diseases	stage of the crop	Status	Incidence (%)	Level of damage	Severity (%)	
		Common name	Scientific name					
Jangura	shallot	Bulb rot	<i>Fusarium spp.</i>	Bulb formation	Major	41-80	Moderate	21-55
Robit	shallot	Bulb rot	<i>Fusarium spp.</i>	Bulb formation	Major	43-92	Moderate	18-58
M.debir	shallot	Bulb rot	<i>Fusarium spp.</i>	Bulb formation	Major	-	Moderate	-
Jangura	Tomato	Tomato leaf role	<i>Tomato leaf curl viruseAu</i>	Fruit formation	Major	75-100	severe	-
Jangura	Tomato	sunscald		fruit	Minor	<20	minor	-
Jangura	Pepper	Wilt	<i>Fusarium spp</i>	Growth	Major	>40	Moderate to high	>40
Jangura	Pepper	Root rot	<i>Fusarium spp</i>	Growth	Major	>40	Moderate to high	>40
Jangura	Potato	blight	<i>Phytophitera infesta</i>	flowering	Minor	<20	minor	<10
M. debir	Tomato	sunscald		fruit	Minor	<20	minor	-
Jangura	Garlic	Leaf rust	<i>Puccinia alli</i>	Vegetative maturity	to Major	25	Moderate	10-15
Robit	Garlic	Leaf rust	<i>Puccinia alli</i>	Vegetative maturity	to Major	80-90	Moderate	25-30
M. debir	Garlic	Leaf rust	<i>Puccinia alli</i>	Vegetative maturity	to Major	25-30	Moderate	10-15
Jangura	Garlic	Powdery mildew		Vegetative maturity	to Minor	<10	Minor	<5
Jangura	Chickpea	Wilt	<i>Fusarium spp</i>	Seedling	Minor	<15	Minor	<15
Jangura	Lentil	Wilt	<i>Fusarium spp</i>	Seedling	Minor	<5	Minor	<5

NB: Robit and Jangura are Dembia districts kebeles and M.dabir is G.zuria district kebele

Bulb rot (*Fusarium spp.*) on shallot (Dembia and G.zuria) *Tomato leaf role (Tomato leaf curl virus)* on tomato (Dembia) and Wilt and Root rot (*Fusarium spp.*) on pepper are the major diseases on the irrigated crops both on trials and farmer's field. Sunscald on tomato and Blight on potato are the minor diseases in the area. Except Tomato leaf role and sunscald all the diseases are soil born and caused by fungus (*Fusarium spp.*) which primarily damage the root and bulb of the crops (Table 3). Most of the diseases are usual disease occurs during the main season on the crops.

Bulb rot (*Fusarium spp.*) on shallot was assessed its intensity which was with incidence of 41-80 percent (Jangura) and 43-92 percent (Robit) and severity of 21-55%(Jangura) and 18-58% (Robit) which is moderate in its level of damage (Table 3). Since in the area shallot is planted in flat bed, broad casting, high seed(seedling) rate and simply water is flooded the crop bulb faced to damage by funguses.

On Tomato a new virus disease is occurred to the area known as Tomato leaf role which makes the crop leaf curl and stunted during fruit formation(at the top end) of the crop. Its incidence was assessed and scored in arrange of 75-100 percent both in trials and farmer's fields (Table 3). Research as Conde *et. al*, 1994 reported that at Berrimah farm has shown tomato leaf roll to be a virus disease which can be experimentally graft transmitted to tomatoes and some other solanaceous plants. The virus that causes the disease is now known as the Tomato leaf curl virus, Australian strain (TLCV-Au) which is a gemini virus. The work has shown the virus can be transmitted to tomato plants by the sweet potato whitefly, *Bemisia tabaci*. It is suspected that the TLCV-Au is harboured by some wild plants and is transmitted from them to the tomato plant. Trials have indicated that there is little, if any, transmission from a tomato plant to another tomato plant. Once a plant is infected with tomato leaf roll TLCV-Au moves through the sap and eventually invades the whole plant. Because of this, the virus cannot be prevented from

invading other parts of a plant by pruning affected branches.

Plants affected by tomato leaf roll suffer a greatly reduced growth rate and so become stunted or dwarfed. Leaflets are rolled upwards and inwards while the leaves are often bent downwards (epinasty) but are stiff rather than limp as in wilted plants. Leaves are thicker than normal and of a leathery texture and often have a purple tinge to the venation on the undersurface. The newly produced young leaves are paler in color than those on healthy plants. Fruit, if produced at all on affected plants, is smaller than normal, dry in texture and unsalable. Plants with an advanced infection will not produce fruit. Tomato leaf roll is one of the two most serious diseases of tomatoes in the Top End. Tomato leaf roll is particularly serious along coastal areas. Losses of up to 100% have been recorded and losses of 60% are quite common. In contrast to the 1970s and 1980s, the last several years up to and including 2001 were relatively free of tomato leaf roll. However, in 2002 there was a sharp increase in the reported cases of the disease attacking tomato plants, reaching the severe levels of the 1970s and 1980s (Conde *et. al*, 1994).

4. CONCLUSION

Major insect pests of shallot, garlic, tomato and wheat are identified accordingly Thrips on shallot and garlic, African boll worm on tomato and Russian wheat aphid on wheat. The major diseases are Bulb rot on shallot, Tomato leaf role on tomato and wilt and root rot on pepper. Minor insect pests and diseases have also identified on these and other crops at Megech irrigation site. As to this most of the insect pests are known insect

pests in the main season with some measurable practices in the area demonstration of some management practices need to be done. Agronomic practices such as bed preparation, seed (seedling) rate and scheduling of water need to be done (demonstrated) with bulb rot on shallot and garlic in the area.

Acknowledgments: We would like to express our appreciation to Amhara Regional Agricultural Research Institute (ARARI) and NIDP Project for its financial support. We are also indebted for the assistances provided by the research and technical staff of the cereal case team of Gondar Agricultural Research Center (GARC).

5. REFERENCES

1. Condé, B.D. and Connelly, Megan I. (1994). Australian tomato leaf curl virus, a whitefly-transmitted geminivirus causing a disease of tomatoes in Northern Australia. Proceedings of the 4th International Conference on Plant Protection in the Tropics, Kuala Lumpur Malaysia, 28-31 March 1994, pp. 235-7.
2. DAFWA (2007). Common Seasonal Pests: your guide to prevent the spread of animal and plant pests, diseases and weeds. Bulletin 4705.
3. P.S Tengs and W.C James (1979). Diseases and yield loss assessment.

© 2017; AIZEON Publishers; All Rights Reserved

This is an Open Access article distributed under the terms of the Creative Commons Attribution License which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.
