

Diseases, Insect Pests and Parasitic Weeds of Common Crops and their Importance under Irrigation Conditions of Ribb River, South Gondar

Agegnehu Shibabaw, Walleign Zegeye, Bayuh Belay, Fikremariam Asaregew,

Abebe Worku, Dereje Belay, Esmelealem Mihretu

Adet Agricultural Research Center, P.O.Box 08, Bahir Dar, Ethiopia

Abstract

Diseases, insect pests and parasitic weeds of crops at Ribb were surveyed under irrigation condition from 2010 to 2011 fiscal year. During the survey periods different horticultural, cereal and pulse and oil crops were inspected. Onion, potato, tomato, pepper, cabbage, garlic and shallot were among horticultural crops where as wheat, barley and maize were from cereals crops and safflower, rapeseed and lentil were from pulse and oil crops. Dozens of diseases and insect pests were recorded and identified in the surveyed area. Powdery mildew, purple blotch, yellow rust and virus were the most important disease of onion, shallot, wheat and pepper respectively. Thrips, cutworm, boll worm, and aphids were important insect pest on onion, potato, tomato, barley and wheat respectively. Porcupines (jart), birds and mole rat were vertebrate pests where as orobanchea was the single important parasitic weed on tomato. Generally, diseases and insect pest recorded as a major pest needs research and development intervention towards in designing and adopting control strategies. Moreover, regular monitoring strategy has to be designed since one minor pest at a time became major pest on other time.

Key words: Diseases, Insect Pests, Parasitic Weeds, Irrigation, Ribb

Introduction

In general irrigation enables cultivation of wide range of crop production. Different types of crops that range from vegetables to cereals produced in Ribb catchment area. According to Crow (1989) the most important widely grown crops are onion (*Allium cepa*), potato (*Solanum tubersum*), tomato (*Lycopersicum esculantium*), pepper (*Capsicum spp.*), cabbage (*Brasiica olerceae*), garlic (*Alluim sativim*), shallot (*Allium*

cepa) and rapeseeds (*Brasica napus*) are among vegetables and wheat (*Triticum astivium*), barley (*Hordeum vulgar*), maize (*Zea maiz*) and faba bean (*Fasiolus vulgaris*) are among cereals and pulses, respectively.

Irrigated agriculture is characterized by intensive land use and substantial use of external inputs. The trend enables year round growing of crops to smallholder farmers as a means of enhanced income generation. Such an overlap in crops enhances pests to continuously multiply, resulting in intensive and year-round induction of the continuous build up of pests and diseases (Tindall,1983). The pests and diseases of an irrigated crop includes those living below the soil surface (e.g., termites, cutworms), foliage feeders (e.g., beetles, caterpillars), miners/borers (e.g., fruit borers, stem miners, leaf miners) and sucking pests (e.g., aphids, thrips, white flies, spider mites and bugs). Diseases of importance on these crops range from soil-borne pathogens (damping off, root rot, wilts) to leaf diseases (blast blight, rust) and those causing rotting of vegetative parts (stem rot, sheath rot) and parts (e.g., black rot, fruit rot). Nematodes often constitute an important biotic constraint to irrigated crop production (Tesfaye, 1995).

Quantitative and qualitative data on the extent of occurrence and distribution based on the intensity and damage caused by pests and diseases are scanty in Ribb irrigation area. It is important to assemble baseline information on the relative economic importance of the commonly occurring pests and diseases in the representative production ecologies of the area. Therefore, the objective of this study was to identify the importance and spatial and temporal distribution of diseases, insect pests and parasitic weeds of different crops in the command area.

Materials and Methods

Site Description

Ribb irrigation command area is located in Libo Kemkem and Fogera woreda in South Gondar zone. It is situated at 11⁰46 to 11⁰59 latitude north and 37⁰33to 37⁰52 longitude east. Altitude ranges from 1774 to 2410 meters above sea level and predominantly

classified as Woina-Dega. Mean annual rainfall is 1216 mm occurred during June to September.

Survey Procedures

The survey was conducted in the two consecutive years of 2009/10 and 2010/11 irrigation period at Ribb irrigation command area. The target crops were different horticultural, cereal and pulse crops that were grown in the command area. Onion, potato, tomato, pepper, cabbage, garlic and shallot were among horticultural crops; wheat, barley and maize were among cereals and safflower, rape seed and lentil were among pulse and oil crops.

Periodic field visits at seedling, heading and maturity stages of the crop were conducted to generate comprehensive information for every 1 to 2 kilometers interval (17 fields). Leaves, roots and stem of the plant were inspected thoroughly across each field diagonally in an X- fashion usually with the help of 50*50m quadrant (Thomas, 1985). The intensity of the diseases was recorded as low (x), intermediate (xx), and high (xxx) depending on the load of infection. Low intensity means below five percent, intermediate means below 25%, and high means above 25% percent of infection (Crew, 1984). Most of the fungal, bacterial and viral diseases were identified by field symptoms following procedures indicated in Crew (1984). Further conformations were made in plant pathology laboratory found at Adet Agricultural Research Center.

Similarly, necessary insect pest data were recorded depending on the kind of pest damaging important crops. Generally, the kinds of host infested, part of plant affected, symptom observed, stage of the insects, and percent of infestation and status of insect were recorded. Moreover, as usual, insect pests were categorized as major and minor pests to understand its status for further research intervention. The severity of damage was recorded from 0 to 9 scales. Identification of most insect pests was made under field condition with the help of field guide books and other references. In addition to diseases and insect pests, fields were assessed for existence of parasitic weed. Data of host crop, weed count and distribution of parasitic weeds were recorded during the survey periods.

Results and Discussion

Diseases

During the survey periods different horticultural, cereal and pulse crops were grown in the command area. Onion, potato, tomato, pepper, cabbage, garlic and shallot were among horticultural crops, wheat, barley and maize were among cereals and safflower, rapeseed and lentil were among pulse and oil crops. However, most of the land was covered with horticultural crops especially with onion, tomato, shallot and pepper. Wheat also currently progressively increased in area of coverage. However, the crops were affected with different diseases and insect pests. Hot pepper was majorly affected with powdery mildew and the incidence was recorded to 100 percent. Mancozeb 2 to 3 kg/ha is effective against this disease. Virus, bacterial leaf spot and fusarium wilt also recorded on hot pepper. But currently these diseases are not recorded as production constraint. Onion is highly affected with powdery mildew and purple blotch. According to Bekele (1985) both are major diseases of onion and shallot. The incidence of powdery mildew and purple blotch was 100 and 60 percent respectively. Redomile 2 to 3 kg/ha is effective to control. Currently bulb rot diseases were less important and the incidence is less than 1 percent. Viruses were recorded as major diseases of tomato. Disease incidence of 10 percent was recorded in the irrigable area. The infestation was severe across all *kebeles* and locality which needs research intervention. Rust was one of the major constraints for garlic production in the area. The intensity is above 50% in all assessed areas. Tilt fungicide usually recommended means of control for rust infestation. Root rot diseases caused by fusarium were less frequent on garlic fields. Use of proper irrigation interval and crop rotation are advised to control soil inhibiting pathogens (Table 1).

The identified cereals were also affected with different diseases. Yellow rust was recorded a destructive disease on wheat fields. The incidence of the diseases was as high as to 100 percent compared to the other diseases. Tilt 0.5-1kg/ha usually recommended means of control for rust infestation (Zillinsky, 1983). Barley and maize also affected with head smut and maize strike virus respectively. However, both diseases were minor at the time of assessment (Table 1).

Lentil and safflower is the dominant pulse crop and oil crop in the surveyed area. Fusarium wilt affect lentil even though the incidence was not serious but safflower were found healthy (Table 1). In general, in the present survey more fungal diseases were encountered as compared to the other disease causing agents. Virus and bacterial diseases were less important except viruses on tomato and bacterial leaf spot on pepper (Table 1). Despite many major diseases appear during the survey periods farmers do practically nothing to control. Most farmers consider the diseases as normal feature of the crops. Awareness creation could be given to farmers as priority option in a controlling program.

Insect Pests

Lists of various insect pests were identified during the period of assessment. Tomato fields were highly affected with African boll worm (*Helicoverpa armigera*) and found as the major insect pest on tomato. The incidence of the pest was nearly 50 percent. Insecticides like Decamethrin and Cypermethrin have been recommended as a means of control. According to Gashaw and Lemma (2002), there are also some tolerant varieties recommended to reduce the bollworm damage on tomato (Table 2).

Thrips on onion and garlic, aphides on wheat and barley, cutworm on potato, pepper, onion, tomato, snap bean and haricot bean were important insect pests (Christopher 2002). The incidence of onion thrips was 100 percent in all onion growing fields. This pest is most important for smallholder farmers. According to Dennis Hill (1993), Dimethoate and Selicron insecticide has largely utilized as means of control (Table 2). Maize Thrips (*Frankiniella spp*) were counted up to 35 on average on single plant leaves at early stages of maize; however this was not seen at mid and late stages of the crop development. Stalk borers were recorded on maize crop. However, the incidence was below two percent and minor during the survey period (Table 2).

Table 1. Status and distribution of diseases of some crops in Ribb irrigable area

Host crop	Crop Growth Stage	Common name	Scientific name	Intensity	Locality
Hot pepper	Flowering/Maturity	Powdery	<i>Leveillula</i>	xxx	A,B
	Flowering	Virus	<i>virus</i>	xx	A,B
	Flowering/Seedling	Wilt	<i>Fusarium</i>	xx	A
	Flowering	Leaf Spot	X.	x	A,B
Tomato	Seedling	Fusarium Wilt	<i>Fusarium</i>	x	A
	Flowering	Virus	<i>virus</i>	xxx	A,B
	Flowering	Powdery	<i>Erysiphe</i>	xx	A,B
Wheat	Booting/Seedling	Yellow Rust	<i>Puccinia</i>	xxx	A,B
	Booting	Stem rust	<i>Puccinia</i>	x	A,B
Shallot	Bulb Incitation	Purple Blotch	<i>Alternari</i>	xxx	A,B
	Maturity	Bulb Rot	<i>Fusarium</i>	x	A
	Maturity	White Rot	<i>Sclerotiu</i>	x	A
Barley	Maturity	Loose Smut	<i>Ustilago</i>	x	A,B
Maize	Tussling/Seedling	Maize Strick	<i>Virus spp</i>	x	A,B
Potato	Flowering/Maturity	Bacterial Wilt	<i>Ralstonia</i>	x	(-)
	Flowering	Early Blight	<i>Alternari</i>	x	A,B
	Seedling/Flowering	PLRV	<i>Potato</i>	x	A,B
Garlic	Bulb Incitation	Rust	<i>Puccnia</i>	xxx	A,B
	Maturity	White Rot	<i>Sceleroti</i>	x	A,B
Cabbag	Heading	Powdery	<i>Erysiphe</i>	xxx	A,B
Onion	Maturity	Bulb Rot	<i>Fusarium</i>	x	A,B
	Maturity	White Rot	<i>Sclerotiu</i>	x	A,B
	Bulb Incitation	Purple Blotch	<i>Alternari</i>	xxx	A,B
	Bulb Incitation	Powdery	<i>Peronossp</i>	xx	A,B
Emmer	Heading	Yellow Rust	<i>Puccinia</i>	xxx	A,B
Rape seed	Flowering	Down Mildew	<i>Peronossp</i>	xx	A,B
	Flowering	Whit Rust	<i>Albigo</i>	x	A,B

When <5% of plants infested (x), 5-25% of plants infested (xx), >25% of plants infested (xxx), Abua Kokit (A), Shina Tseyon (B)

According to Polaszek (2008), striped rice stalk borer (*Chilo suppressalis* Wlk.) and stalk-eyed fly (*Diopsis thoracica* W) was recorded on rice but currently minor pests. However, their distribution was wide across all trial fields. These are relatively recent pests and had not been correctly identified yet. According to IRRI (1996), literature consulted indicated that these pests were important on rice crop (Table 2). Large areas of wheat crops have been invaded by the Russian wheat aphid (*Duraphis noxia*). The infestation of the pest was 100 percent in all surveyed fields and hence the details should be studied and loss assessments should have to be taken as area of intervention.

Cereal leaf beetles (*Oulema spp.*) were found minor insect pests occurring with numbers less than 5 per meter square. However, they may have the potential to cause damage and loss on wheat and barley at seedling stage when the environment favors. Cutworms (*Agrotis spp.*) were found most important pests on pepper, potato and snap bean at seedling stages (Table 2).

Table 2. Status and distribution of insect pests of some crops in Ribb irrigable area

Crop	Growth stage	Pest common name	Insect stage	Scientificna	Status	Locality
Tomato	Fruiting	Boll worm	larva	<i>Helicoverpa</i>	major	A,B
	Fruiting	Cut worm	larva	<i>Agrotis spp.</i>	major	A,B
	Fruiting	Leaf minor	larva	<i>Liriomyza</i>	minor	A,B
Pepper	Seedling	Cut worm	larva	<i>Agrotis spp.</i>	major	A,B
	Flowering	White fly	Nymph/adul	<i>Bemisia</i>	major	A
	Flowering	Leaf minor	larva	<i>Liriomyza</i>	major	A
	Pod Setting	Boll Warm	larva	<i>Helicoverpa</i>	major	A
Potato	Rhizome	Cut worm	larva	<i>Agrotis spp.</i>	major	A,B
Onion	Bulb Incitation	Thrips	Nymph/adul	<i>Thrips tabaci</i>	major	A,B
	Seedling	Cut worm	larva	<i>Agrotis spp.</i>	major	A,B
Garlic	Bulb Formation	Thrips	Nymph/adul	<i>Thrips</i>	major	A,B
Saff	Flowering	Aphids	Nymph/adul	<i>Aphis spp.</i>	major	A,B
Rice	Heading	Striped rice stalk	larva	<i>Chilo</i>	minor	A
	Heading	Stalk-eyed fly	unknown	<i>Diopsis</i>	minor	A
Maize	Tussling	Thrips	Nymph/adul	<i>Frankiniella</i>	minor	A,B
	Silking	Stalk borer	Nymph/adul	<i>Busseola</i>	minor	A,B
	Tussling	Aphids	Nymph/adul	<i>Rhopalosiphu</i>	minor	A,B
	Heading	Lady bird beetle	unknowen	<i>Epilachena</i>	minor	AB
Wheat	Heading	Russian wheat aphid	Nymph/adul	<i>Diuraphis</i>	major	A,B
	Heading	Cereal leaf beetle	Nymph/adul	<i>Nematocerus</i>	minor	A,B
	Heading	Stem borer	larvae	<i>Chilo spp.</i>	minor	A
Barley	Heading	Russian wheat aphid	Nymph/adul	<i>Diuraphis</i>	minor	A
	Heading	Cereal leaf beetle	unknowen	<i>Nematocerus</i>	minor	A
	Heading	Aphids	Nymph/adul	<i>Rhopalosiphu</i>	major	A
Snap	Pod Setting	Cutworm	larva	<i>Agrotis spp.</i>	major	A

**Abua Koki (A), Shina Tseyon (B)

Parasitic weed

The only parasitic weed found in the command area was orobanchea. It parasitizes especially tomato during the irrigation season. The intensity of the weed was more at Shina Tseyon kebele than other kebeles. However, the practice of farmers growing tomato year after year will favor in the near future to cover large geographical area. Orobanchea can be effectively controlled with rotation of non-host crops.

Vertebrate pests

Different vertebrate pests were recorded on tomato, potato, pepper and wheat during the survey periods. The pests were porcupines, birds and mole rat. However, their status was minor to be destructive in the command area (Table 3).

Table 3. Status and distribution of vertebrate pests in Ribb irrigable area

Host	Common name	Scientific name	Locality	Status
Potato	Porcupines	<i>Hystrix cristate</i>	Shina tseyon	Minor
Pepper	Birds	<i>Unknowen spp</i>	Shina tseyon	Minor
Wheat	Mole rat	<i>Tachyoryctes spp</i>	Shina tseyon	Minor
Rice	Birds	<i>Unknown spp</i>	Abua kokit	Minor

Conclusion and Recommendations

Dozens of diseases and insect pests were recorded and identified in the surveyed area. Powdery mildew, purple blotch and rust were the most important diseases. Thrips, cutworm, boll worm and aphids were important insect pests. Porcupines, birds and mole rat were vertebrate pests where as orobanchea was the single important parasitic weed. Hence, immediate control measure has to be suggested and practiced especially for major pests and diseases.

Few crops such as rice, tomato and onion dominate the surveyed areas. This leads to the existence of aggressive pests to have more generations without breaking the life cycle. Hence, diversification and introduction of additional adaptive crops will be required. In the surveyed area, many crops are grown in the same area, which leads to the existence of aggressive pests to have more generations without breaking the life cycle. Hence, diversification and introduction of additional adaptive crops will be required. Therefore, strong extension service has to be suggested about the importance of crop rotation in breaking the life cycle of diseases, insect pests and weeds. In general, many kind of insect pests and diseases were recorded in the surveyed area. Some of the pests were found major, which needs to take action and some others were minor during the periods of surveying. Hence, periodic monitoring strategies should be designed in the study area.

References

AICAF (2001).