
Assessment of Wheat Diseases in South Omo Zone of Ethiopia

Misgana Mitiku*, Yesuf Eshete

Department of Plant Pathology, Jinka Agricultural Research Center, Southern Agricultural Research Institute, Jinka, Ethiopia

Email address:

Misganamitiku441@yahoo.com (M. Mitiku), misganamitiku441@gmail.com (M. Mitiku), yesufjarc2006@gmail.com (Y. Eshete)

*Corresponding author

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Abstract: Wheat is one of the most important cereal cultivated in Ethiopia. It ranks fourth after Teff (*Eragrostis tef*), Maize (*Zea mays*) and Sorghum (*Sorghum bicolor*) in area coverage and third in total production. But, its production and productivity is prone to divers biotic and abiotic factors. Among biotic factor diseases are the one. But, the relative importance of each disease across locations has not been known and well profiled to develop sound management strategy in the studied areas. So, the assessment was done to watch and monitor the status of wheat diseases and observe wheat varieties response to wheat diseases and to determine the prevalence of new virulence races and monitor new stem rust race (ug99) spread in the region. The assessment was carried out in two kebeles of South Ari districts of South Omo zone i.e. Senegal and Senmamer kebeles of South Ari woreda in 2014 Meher cropping season. Results indicated that the highest mean infection of leaf rust (70%) was recorded on local variety at Senmamer kebele followed by Digalo variety in Senegal kebele which is 65% and fusarium head blight (47%) on Huluka variety followed by ETBW5890 variety which is 40% were recorded at Senegal kebele. Whereas at Senegal kebele 30% fusarium head blight was recorded as the highest mean infection. Whereas the mean infection of powdery mildew is 20% at Senmamer kebele which is less as compared to mean infection of leaf rust and fusarium head blight. Different studies reported that wheat is affected by different diseases. The current assessment indicated that complex diseases exists in different wheat varieties and their occurrence across kebeles was highly variable. In addition to introduction and promotion of different management practices, holistic and cumulative integrated approach is required to manage the complex wheat diseases in the studied areas.

Keywords: Disease, Assessment, Pathogen

1. Introduction

Bread wheat (*Triticum aestivum* L.) is the world's leading cereal grain where more than one-third of the population of the world uses as a staple food [7]. It is one of the most important cereal crop of Ethiopia [11]. It ranked fourth in land coverage and total production after tef, maize and sorghum [6]. Globally wheat is grown on 225 million ha with a total production of 600 000 tons [10]. Wheat is produced across a wide range of agro-ecological and crop management regime [3]. Countries in East Africa, North Africa, and the Middle East consume more than 150 percent of their own wheat production and are heavily dependent on wheat imports to meet their food needs [12].

The most suitable area for wheat production falls between

1900-2700 m.a.sl [11]. Also wheat (*Triticumaestivum* L.) is one of the important grain crops produced worldwide. According to the [9], report, about 620 million metric tons of wheat was produced From 217 million hectares in the year 2005/06 with an average yield of 2.85 metric tons per hectare. Wheat is grown on larger area than any other crop and its world trade is greater than for all other crops combined. Its world trade is greater than for all other crops combined. It is easily stored and transported [14].

Wheat is one of the most important cereals cultivated in Ethiopia. It ranks fourth after Teff (*Eragrostistef*), Maize (*Zea mays*) and Sorghum (*Sorghum bicolor*) in area coverage and third in total production [5]. The average per capital consumption of wheat in Ethiopia estimated to be 39 kg/year during 1994-97 and 331,000 tons of wheat imported to meet the national wheat requirements during 1995-97 [4]. The

national average yield of wheat in the country, which is 1.379 tons ha⁻¹, is 24% and 48% below the African and world average, respectively [8].

The low productivity is attributed to a number of factors including biotic (diseases, insect pest and weeds) and a biotic (moisture, soil fertility, etc) and adoption of new agricultural technologies [16]. Among these factors, diseases play a significant role in yield reduction. Diseases, insects, and weeds are a major constraint to crop production worldwide. It has been estimated over the years that they can destroy between 31 and 42 percent of all crops annually [1]. Approximately 14 percent of these losses are due to diseases which amount to about US\$220 billion (2002 dollars) annually [1].

Monitoring wheat diseases is of great importance for sustainable wheat production. SNNPR is one of the regions of the country, commercially wheat and barley grown. In this region wheat occupies an area of about 328,652ha with annual production of about 12.54 million quintals [2]. Disease survey is basic to all effective control and research programs [15].

Different diseases like, rust diseases (stem rust, leaf rust and stripe/Yellow rust) are known for their destructive nature and are endemic in the region. Wheat rust diseases are worldwide in distribution and have been extensively studied in many countries (USA, Europe, Australia etc.) where it often causes heavy losses in yield.

Severe infection results in premature ripening and shrinking of the grain and sometimes grain losses reach up to 90% [15]. So, wheat diseases survey is basic to all effective control and research programs.

Therefore, the aim of the assessment was to watch and monitor the status of wheat diseases and observe wheat varieties response to these diseases and determine the prevalence of new virulence races of stem rust (race ug99) spread in the region.

2. Materials and Method

2.1. Description of the Study Areas

The Assessments was carried out in two kebeles of South Ari district of South Omo zone namely Senmamer and Senegal kebeles during August 2014, The annual minimum and maximum temperature of the area is 15°C and 35°C,

respectively, while, the minimum and the maximum annual rainfall is 800 mm and 1200 mm respectively.

2.2. Wheat Diseases Assessment

The incidence and severity of different diseases were recorded. Assessments were done in fifteen fields (5 research field, 2 FTC (farmers training center field) and 8 farmers' fields along the road side in two location of South Ari district of south Omo zone. These fields were visited and disease data were collected using disease data collection sheet/format. In every area, 50 plants of wheat were evaluated in farmers and research fields. Diseases were recorded in meher season both on leaf, stem and head of wheat plant. The incidence and severity data were the mean value of leaf, stem and head values of the assessment. Both data (incidence and severity) were expressed in percentage. The formula in calculating the disease incidence and severity was:

$$\%incidence = \frac{\text{Number of sample plant infected} \times 100}{\text{Total number of sample plant counted}}$$

$$\%severity = \frac{\text{Area of plant part infected} \times 100}{\text{Total area of plant part}}$$

For the estimation of the disease incidence, the whole number of sample plant considered as 100% and thereby the infected plant were determined by eye counting.

For estimation of percent of severity, the whole leaf surface, stem and head areas were considered as 100 and thereby the infected area was determined by eye estimation.

Identification of most diseases were made under field condition with the help of field guide books and other references.

3. Result and Discussion

Assessment was carried out at Senegal and Senmamer kebele's of South Ari district. The result indicated that fusarium head blight (*Fusariumgraminearum* or *gibberellazeae*), leaf rust (*Puccinia recondita f.sp.tritici*) and powdery mildew (*Erysiphe graminis f.sp.tritici*) were found to be the most important wheat diseases (Table 2).

Table 1. Identified disease and infection level (%) across location.

Kebele	Field	Variety	Crop stage at evaluation	Identified disease	Total plant sample/area	Incidence (%)	Severity (%)
Senmamer	Farmer	Local	Green	FHB	50	20	30
				LR		70	58.33
				FHB		25	40.11
	Research plot	Danda'a	Maturity	LR	50	27	28.33
				PM		20	10
				FHB		40	23.15
Research plot	Huluka	Maturity	LR	50	30	20	
			FHB		47	27.5	
			LR		35	45	
Senegal	Farmer	Local	Green	FHB	50	10	0.8
				LR		45	50
				FHB		30	6.5
Research plot	Digalo	Maturity	LR	50	65	28.66	

Note: LR (Leaf rust), FHB (Fusarium head blight) and PM (Powdery mildew)

Table 2. Identified pathogen and infection level (%) in wheat crop across location.

Kebele	Variety	Pathogen	%incidence
Senmamer	Local	Fusariumgraminearum or gibberellazeae	20
		Puccinia recondita f.sp. tritici	70
		Fusariumgraminearum or gibberellazeae	25
	Danda'a	Puccinia recondita f.sp. tritici	27
		Erysiphegraminis f.sp. tritici	20
	ETBW5890	Fusariumgraminearum or gibberellazeae	40
		Puccinia recondita f.sp. tritici	30
Huluka	Fusariumgraminearum or gibberellazeae	47	
	Puccinia recondita f.sp. tritici	35	
Senegal	Local	Fusariumgraminearum or gibberellazeae	10
		Puccinia recondita f.sp. tritici	45
	Digalo	Fusariumgraminearum or gibberellazeae	30
		Puccinia recondita f.sp. tritici	65

The varieties grown by the farmers in the studied areas were local, Digalo and Danda'a. The three wheat disease (leaf rust, fusarium head blight and powdery mildew) caused by *Puccinia recondita f.sp. tritici*, *Fusarium graminearum* or *gibberellazeae* and *Erysiphe graminis f.sp. tritici*, respectively, were found important disease in surveyed area this coincide with the study of Fantahun and Girma, (1995). The highest mean infection of leaf rust (*Puccinia recondita*) (70%) on local variety at Senmamer kebele followed by Digalo variety in Senegal kebele which is 65% and fusarium head blight (*Fusarium graminearum* or *gibberellazeae*) (47%) on Huluka variety followed by 40% in ETBW5890 variety were recorded at Senegal kebele of South Ari woreda. Whereas at Senegal kebele of South Ari district 30% of fusarium head blight (*Fusarium graminearum* or *gibberellazeae*) were recorded as the highest mean infection of wheat disease (Table 2). Whereas the mean infection of powdery mildew (*Erysiphe graminis f.sp. tritici*) on wheat was 20% at Senmamer kebele of south Ari district which is less as compared to mean infection of leaf rust (*Puccinia recondite f.sp. tritici*) and fusarium head blight (*Fusarium graminearum* or *gibberellazeae*) of wheat (Table 2).

4. Conclusion and Recommendation

Even though the yield loss caused by each pathogen is not clearly studied and quantified in the area in studied crop, this study indicate the presence of multiple diseases at different growth stage of the wheat. In this study, three pathogens attacking wheat plant were observed across surveyed kebeles. Among all diseases fungal diseases (leaf rust and fusarium head blight) are the most frequently encountered diseases in survey areas. Efforts should be made towards the integration of multiple control options.

These are development of resistance varieties, development of improved agronomic practices, awareness creation of farmers and experts from site selection upto post-harvest handling on the importance of diseases and their management. In general holistic, cumulative integrated approach is required in all urgency to manage the multiple diseases in the studied areas.

References

- [1] Agrios, G. 2005. *Plant pathology*, 5th ed. Boston, Mass., U.S.A.: Elsevier Academic Press.
- [2] Anonymous. 2010. BoA. Annual report, Hawassa.
- [3] Belay Sime and Tanner D. G. 1999. Yield potential and weather risks associated with wheat production in Ethiopia. Proceedings of the Tenth Regional wheat Workshop of Eastern, Central and southern Africa. Addis Ababa, Ethiopia, pp 316-324.
- [4] CIMMYT, 2000. 1998/99. World Wheat Facts and Trends. Global Wheat Research in a Changing World, Challenges and Achievements, CIMMYT, D. F, Mexico.
- [5] CSA (Central Statistical Authority). 2007. Agricultural Sample Survey 2006/2007, Volume I: Report on area and production of crops (Meher season). Statistical Bulletin No. 446. Addis Ababa, Ethiopia.
- [6] CSA (central statistics Authority). 2013. Report on area and crop production forecast for major grain crops. Addis Ababa, Ethiopia: statistical bulletin.
- [7] Curtis, B. C., S. Rajaram. and H. G. Macpherson (eds.) 2002. Bread wheat Improvement and production No. 30. Food and Agriculture Organization of the United Nations, Rome Italy pp 554.
- [8] FAO (Food and Agriculture Organization of the United Nations). 1994. FAO Year book Production 1993. Vol. 47. Rome, Italy.
- [9] FAO (Food and Agriculture Organization of the United Nations). 2005. FAOSTAT [Online]. Available at <http://www.fao.org/faostat> [Cited 24 Feb. 2005; verified 14 Oct. 2005].
- [10] FAOSTAT. 2009. <<http://faostat.fao.org>>. Accessed on March 2009.
- [11] Hailu G., Tanner, DG. And Mengistu, H. (eds). Wheat Research in Ethiopia: A Historical perspective, IARI and CIMMYT, Addis Ababa. PP. 392.
- [12] Singh RP, Hodson DP, Huerta Espino J, Jin Y, Njau P, Wanyera R, Herrera Foessel SA, Ward RW (2008). Will Stem Rust Destroy the World's Wheat Crop? *Adv. Agron.* 98: 271-309.

- [13] Stubbs, R. W., Prescott, J. M., Saari, E. E. and Dubin, H. J. 1986. *Cereal Disease Methodology Manual*. Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), Mexico. 46 p. Zadok, J. C., Chang, T. T.
- [14] Slafer, G. A. and E. H. Satorre, 1999. An introduction to the physiological – ecological analysis of wheat yield. In E. H. Satorre and G. A. Slafer (Eds.), *Wheat: Ecology and physiology of yield determination*, 3-12.
- [15] Wiese M. V. 1998. *Compendium of Wheat Diseases*. APS Press *The American Phytopathological Society*. USA.
- [16] Zegeye T. Taye G, Tanner D, Verkuijl H, Agidie A and Mwangi W. 2001. Adoption of improved bread wheat varieties and inorganic fertilizer by small-scale farmers in yelmana Densa and Farta districts of North western Ethiopia. EARO and CIMMYT Mexico city, Mexico.