

Assessment on Prevalence, Incidence and Severity Wheat Rust diseases in Silte, Gurage and Hadiya Zones, Southern Ethiopia

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Abstract— Assessment was conducted to describe the geographic distribution, incidence, severity and to know the shift in disease resistance of varieties under cultivation in the region. The survey was conducted in 2017 in September following the main roads and accessible routes in each survey district, and stops were made at every 5 km intervals based on vehicles odometers as per wheat fields available. Yellow, Stem and leaf rust prevalence reached up to 61%, 9.5% and 65% in surveyed areas respectively and overall mean incidence 12.8%, 1.16% and 16% were recorded whereas severity value 5.3%, 0.81% and 6.15% in the same order. *Septoria leaf blotch* was the least prevalent disease with 0-67%. Among wheat varieties, *Picaflor* is the most popular one followed by *Danda 'a*. Yellow rust severity up to 20Mr and 20Mrms were recorded on variety *Huluka* and *Alidoro*, respectively. Less yellow rust severity was recorded on the variety *Simba* and *Kingbird*.

Keyword— Yellow rust, Stem rust, leaf rust, *Puccinia graminis f. sp. Tritici*; Sr genes.

I. INTRODUCTION

Bread wheat (*Triticum aestivum* L. em. Thell) is the world's leading cereal grain where more than one-third of the population of the world uses as a staple food. It is one of the most important cereal crops of Ethiopia (Hailu et al., 2011 and Bekele et al., 2000). Wheat is an important staple food crop in Ethiopia, especially in urban areas. It is a staple food in the diets of several Ethiopians, providing about 15 percent of the caloric intake for the country's over 90 million population (FAO 2015a), placing it second after maize and slightly ahead of teff, sorghum, and enset, which contribute 10-12 percent each (Minot et al., 2015).

Wheat is produced across a wide range of agro ecological and crop management regime. The most suitable area for wheat production falls between 1900-2700 m.a.s.l (Hailu et al., 2011). Despite the large area under wheat in Ethiopia

the national average yield is 2.11 t/ha (CSA, 2013), which is far below the average of African and world yield productivity. The low productivity is attributed to a number of factors including biotic (diseases, insect pest and weeds) and abiotic (moisture, soil fertility, etc) and adoption of new agricultural technologies (Zegeye et al., 2001). Among these factors, diseases play a significant role in yield reduction.

Therefore, disease monitoring and surveillance are of paramount significance for sustainable wheat production and tackle food insecurity. Hence, the present research aims to survey of rusts and *Septoria* leaf blotch of wheat in Silte, Gurage and Hadiya zones.

II. MATERIALS AND METHODS

Survey of wheat diseases

Wheat diseases survey was conducted in 2017 cropping season in three major wheat producing districts of Silte, Gurage and Hadiya zones. A total of 48 fields were assessed in 11 districts in three zones. The surveys were made following the main roads and accessible routes in each survey district, and stops were made at every 5-10 km intervals based on vehicles odometers. Disease prevalence, incidence and severity were recorded for three rusts (yellow, leaf and stem) and *Septoria* leaf blotch. The disease prevalence was calculated using the number of fields affected divided by the total number of field assessed and expressed in percentage. Incidence was calculated by using the number of plants infected and expressed as percentage of the total number of plants assessed. Severity was scored visually using the modified Cobb's Scale (Peterson et al., 1948) for the three rusts.

The mean incidence and severity of each field was computed from three to five stops. The results of the survey were summarized by districts and varieties. The geographic coordinates (latitude and longitude), and altitude were

recorded using Geographic Positioning System (GPS) unit. The latitude and longitude coordinates were used to map the distributing of the three rusts and *Septoria* leaf blotches of wheat in the survey areas.

III. RESULTS AND DISCUSSIONS

Assessment of Wheat yellow, steam and leaf rust

Wheat rust diseases early survey was carried out in potential wheat growing area of Silte, Gurage and Hadiya zone in 11 districts a total 48 fields were surveyed. The survey result showed that the prevalence of yellow, steam and leaf rust is 61%, 9.5% and 65% respectively in surveyed areas. Yellow, stem and leaf rust mean incidence of 22.78%, 1.36% and 7.96% were recorded in Silte zone whereas 10.62%, 0.62% and 22.5% in Hadiya zone and 5%, 1.5% and 17.5% were recorded in Gurage zone in that order. Maximum incidence 70%, 25% yellow and stem rust in Mirab Azerenet District and leaf rust 65% in Analemo district were recorded.

Over all mean yellow, steam and leaf rust severity with 5.3%, 0.81% and 6.15% respectively were recorded in the surveyed areas. The maximum mean yellow and steam rust

severity of 25% and 20%, respectively were recorded in Mirab Azernet district while, 25% severity of leaf rust was recorded in Analemo district. In general, the distribution of stem was less in survey areas. This may be due to the unfavorable weather condition during 2017 cropping season.

Reaction of wheat varieties to rust diseases

Wheat varieties Kekeba, Hidase, Kingbird, Danda'a, Huluka, Simba, Shorima and Alidoro were grown in the surveyed areas. Among wheat varieties, Picaflor is the most popular one followed by Danda'a. Yellow rust severity up to 20Mr and 20MrmS were recorded on variety Huluka and Alidoro, respectively. Less yellow rust severity was recorded on the Variety Simba and Kingbird.

All varieties grown in the area except Simba and Danda'a are not affected by steam rust. The maximum steam rust severity 20mrms were recorded on Danda'a wheat. All varieties grown in the areas except Huluka and Alidoro were affected by leaf rust. Leaf rust severity with 25mrms and 20mrms, were recorded on variety Shorima and Simba.

Table.1: Distribution of Yellow, Steam and Leaf rust of wheat in Silte, Gurage and Hadiya zones.

Zone	Districts	Yellow rust			Steam rust			Leaf rust		
		Prevalence %	Incidence %	Severity %	Prevalence %	Incidence %	Severity %	Prevalence %	Incidence %	Severity %
Silte	Worabe Zuria	100	50	15	0	0	0	0	0	0
	Dalocha	66.6	13.33	5	0	0	0	100	16.6	5
	Lanfuro	33.3	5.83	1.6	0	0	0	66.6	11.6	5
	Silti	71.4	27	6.4	0	0	0	57	7.1	3.6
	Hulbareg	83.3	23.3	10.63	16.6	3.3	1.6	33.3	19.2	7.5
	Alicho	75	8.75	3.75	0	0	0	25	1.25	1.25
	Mir Azernte	100	31.25	11.25	25	6.25	5	0	0	0
Mean		75.65	22.78	7.66	5.94	1.36	0.94	40.27	7.96	3.19
Gurage	Meskan	25	6.25	2.5	0	0	0	100	25	10
	Mareko	40	4	3	20	3	2	60	10	3
Mean		32.5	5.13	2.75	10	1.5	1	80	17.5	6.5
Hadyia	Analemo	50	6.25	2.5	25	1.25	1	100	40	15
	Lemo	100	15	8.75	0	0	0	50	5	2.5
Mean		75	10.62	5.625	12.5	0.625	0.5	75	22.5	8.75
G.Mean		61	12.8	5.3	9.5	1.16	0.81	65.1	16	6.15

Table.2: Response of improved wheat varieties to Yellow, Seam and Leaf rust

Varity	Altitude (masl)	Yellow Rust				Steam rust				Leaf rust			
		Incidence		Severity		Incidence		Severity		Incidence		Severity	
		Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
Kekeba	1803-2307	0-50	11.92	0-15mr	4.2	0	0	0	0	0-50	15	0-20mr	5.7
Hidase	1834-2359	0-25	15	0-5mr	4	0	0	0	0	0-25	10	0-10mr	4
Kingbird	1773-2332	0-30	5	0-10mr	1.6	0	0	0	0	0-50	20.8	0-20mrms	9.1
Huluka	2306	35	35	20mr	20mr	0	0	0	0	0	0	0	0
Simba	2033-2102	0-15	6.6	0-5mr	3.3	0-20	8.3	0-10mr	5	0-60	28.3	0-20mrms	8.3
Danda'a	2506-2891	0-20	12.5	0-15mr	7.5	0-25	3.1	0-20mrms	2.5	0-10	1.9	0-5mr	1.25
Alidoro	2620	70	70	20mrms	0	0	0	0	0	0	0	0	0
Shorima	2050	0	0	0	0	0	0	0	0	65	65	25mrms	25mrms

Survey of *Septoria* leaf blotch of wheat

Septoria leaf blotch was found to be among diseases observed during the growing season across surveyed areas. The overall distribution/prevalence of the disease in the area reached 20.1%.

The highest mean incidence (19.16%) was recorded in Hulbareg district. The overall mean incidence 4% was recorded in the surveyed areas. The result indicated that *Septoria* leaf blotch became the less important disease in the surveyed areas in the growing season this may be due to the survey has been conducted at early stage i.e. booting and heading stage of the crop.

Table.3: Distribution of *Septoria* leaf blotch of wheat in Silte, Gurage and Hadiya zones.

Zone	Woreda	Altitude (m.a.sl)	Septoria leaf blotch		
			Prevalence (%)	Incidence (%)	Severity (%)
Silte	Dalocha	1896-1953	34	3.3	3.3
	Lanfuro	1803-2069	0	0	0
	Silti	1843-2359	0	0	0
	Hulbareg	1988-2332	67	19.16	24.16
	Alicho	2566-2891	25	2.5	8.75
	Mir Azernte	2585-2737	25	4	4.4
Gurage	Meskan	1828-2068	0	0	0
	Mareko	1773-1837	0	0	0
Hadiya	Analemo	2044-2277	50	11	0
	Lemo	2197-2506	0	0	0

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