

Distribution of Major Tef Diseases in Central Highland Area of Ethiopia

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Abstract: Tef (*Eragrostis tef* (Zucc.) Trotter), is the major Ethiopian cereal crop which feed peoples. The prevalence and damage inflicted by diseases and insect pests varies from region to region and shows large seasonal variation, the current status of diseases is generally little known. Information on the prevalence and status of diseases would be essential to devise sound management options. So, our objective is to assess the status of major tef foliar diseases in central highland area of Ethiopia. Assessment was carried in the major tef producing districts of West Shewa, South-west and North shewa zones of Ethiopia. The assessment done in 2019/2020 main cropping season along the main roads and accessible routes in each survey district, and stops made at every 5-10 km intervals based on vehicles odometers as per tef fields available. We have assessed 35 fields which have the potential to produce tef from three zones. From our assessment the major tef foliar diseases recorded were leaf rust, head smudge and spot blotch. The highest tef leaf rust severity (90S) recorded in north shewa zone Mendida district where as the lowest (0%) recorded in Awaro, Asgori, woliso and Dendi districts from South west shewa zone. The highest head smudge severity recorded in west shewa zone liben jawe district where as the lowest head smudge severity recorded in woliso, wolimera and tokekutaye district. There is no head smudge disease recorded in north shewa zone. From our assessment, we have concluded that tef leaf rust and head smudge are the most economically important diseases. Therefore, it is very crucial to develop management option to mitigate those diseases.

Keywords: *Eragrostis Tef* (Zucc.) Trotter, Disease Survey, Tef Leaf Rust and Head Smudge

1. Introduction

Tef, *Eragrostis tef* (Zucc.) Trotter, is the major Ethiopian cereal grown on about 3 million hectares annually, and serving as staple food grain [1]. It was estimated that tef made up to 24% of all the cultivated area in Ethiopia, covering about 3.08 million hectares and grown by 6.78 million farmers [2]. It is primarily used for human consumption after baking the grain flour into popular cottage bread called "injera". The straw (*chida*) is an important source of feed for animals [3]. Tef is also a resilient crop adapted to diverse agro-ecologies with reasonable tolerance to both terminal drought and waterlogging moisture stresses. Tef, therefore, is useful as a low-risk crop to farmers due to its high potential of adaption to climate change and fluctuating environmental conditions [4].

The continued cultivation of tef in Ethiopia is accentuated by

the following relative merits: 1) as the predominant crop, tef is grown in a wide array of agro-ecologies, cropping systems, soil types and moisture regimes [5]; 2) with harvests of 4.75 million tons of grain per year from about 3 million ha, tef constitutes about 30% of the total acreage and 20% of the gross yearly grain production of cereals in Ethiopia followed by maize which accounts for about 21% of the acreage and 31% of the overall cereal grain production [2, 6]; 3) the values of the grain and straw contribute more than four billion USD to the national GDP [7]; 4) it has a good export market, although domestic grain price hikes had at times led to food grain export ban [8]; 5) tef grain has got relatively good nutritive value especially since it contains relatively high amounts of iron, calcium and copper compared to other cereals [9, 10]. Because of its gluten-free proteins and slow release carbohydrate constituents, tef is recently being advocated for and promoted as health crop at the global level [11].

The national yield per unit area (1.76 t/ha) still remains low [2], quite large proportions of tef producing farmers still use unimproved local cultivars, bottleneck problems like lodging have not been alleviated, age-old traditional tef cultivation and processing methods are being used, and the demand for high-quality tef planting seed has become increasingly high. On the other hand, nutritional and end-use quality research, and the use of machinery has not been pursued to the extent that tef cultivation deserves it [12].

A number of disease pathogens [13] and insect pests [14] are known to attack tef, although the crop is said to be relatively healthy crop as compared to most other crops. Some of the diseases such as leaf rust (*Uromyces eragrostidis* Tracy), head smudge (*Helminthosporium miyakei* Niskado) and damping off (*Dreschlera* spp.) have been listed among the most important species in different areas particularly in the west and south west parts of the country [15]. The prevalence and damage inflicted by these diseases and insect pests varies from region to region and shows large seasonal

variation, the current status of tef diseases is generally little known. Information on the prevalence and status of pests would be essential to devise sound management options. So our objective was to assess the status of major tef diseases in central highland part of Ethiopia.

2. Materials and Methods

Disease surveys was carried out in the major tef producing districts of North, South-west and West Shewa zones of Amhara and Oromia regional states. Survey districts in each zone selected based on tef area coverage. The survey carried out in 2019/2020 main cropping season (from October to November) along the main roads and accessible routes in each survey district, and stops made at every 5-10 km intervals based on vehicles odometers as per tef fields available. Depending on the size of the field, 5-10 spots in quadrant (2mx2m) assessed in each field in “W” orientation. A total of 35 tef fields assessed from three tef producing zones.

Table 1. Status of Major Tef Diseases in Central Highland Areas of Ethiopia.

Zone	Woreda	No. of Fields assessed	LR Incidence	Lr severity	Head smudge Inc.	Head smudge Severity	Spot Botch / Panicle Blast Inc.	Spot Blotch / Panicle Blast Severity
West Shewa	Liben Jawe	2	25-70	15MS-40S	0-20	0-20	40-60	20-30
	Tokeikutaye	3	20-30	5MR-15MS	0-25	0-25	20-40	5.0-15
	Awaro	1	0	0	50	50	10	5
	Asgori	1	0	0	5	5	40	15
	Dendi	2	0	0	10.0-15	10.0-15	40-100	5.0-80
	Ejere	2	5.0-40	tr-10MS	5.0-20	5.0-20	15-25	5.0-10
	Wolimera	3	0-50	0-25MS	0-10	0-10	0-15	0-5
South west Shewa	Mean/Range	14	0-70	0-40S	0-75	0-75	0-100	0-80
	Woliso	3	0	0	0	0	10.0-80	10.0-50
	Becho	3	0-60	0-50S	0-15	0-15	0-60	0-25
	Sebeta Hawas	3	50-90	25MS-60S	0-30	0-30	0	0
	Mean/Range	9	0-90	0-60S	0-30	0-30	0-80	0-50
	Jiru	1	20	15MS	0	0	15	10
	Siya Debir	4	15-100	5R-80S	0	0	0	0
North Shewa	Mendida	2	100	60S-90S	0	0	0	0
	Sheno	1	100	50S	0	0	0	0
	Basonawerena	1	60	30S	0	0	0	0
	Angolelanatara	1	40	20MS	0	0	0	0
	Alelitu	2	0-10	0-tr	0	0	0-20	0-5
	Mean/Range	12	0-100	0-90S	0	0	0-20	0-10
	Total	35						

3. Result and Discussion

3.1. Major tef Diseases Incidence

In west Shewa zone the highest leaf rust incidence 40-70% at Ejere, Liben jawe & Wolemera districts; whereas the lowest 0% was recorded at Aware, Asgore & Dendi districts respectively. The highest head smudge incidence 20-75% at Tokeikutaye, Awaro & Asgori districts; whereas the lowest 0-20% was recorded at Liben Jawe, Ejere & Dendi districts respectively.

In South-west Shewa zone the highest leaf rust incidence 50-90% at Bcho & Sebeta Hawas districts; whereas the lowest 0% was recorded at Woliso district respectively. The highest leaf rust severity 25MS-60S% at Bcho & Sebeta

Hawas districts; where us the lowest 0% was recorded at Woliso district respectively.

The highest head smudge incidence 30% at Sebeta Hawas district; whereas the lowest 0-20% was recorded at Becho and Woliso districts respectively.

In North Shewa zone the highest leaf rust incidence 40-100% at Mendida, Siyadebir, Angolelanatera, Sheno & Angolelanatara districts; whereas the lowest 0% was recorded at Alelitu district respectively.

3.2. Major tef Diseases Severity

In West shewa zone; the highest leaf rust severity 15MS-40S% at Liben jawe & Wolemera districts; where us the lowest 0% was recorded at Aware, Asgore & Dendi districts respectively. In South west shewa; the highest head smudge

severity 30-70% at Liben jawe, Tokekutayo & Awaro districts; whereas the lowest 0-30% was recorded at Wolemra, Ejere & Dendi districts respectively. The highest head smudge severity 50% at Sebeta Hawas district; whereas the lowest 0-30% was recorded at Becho and Woliso districts respectively. In North shewa zone; the highest leaf rust severity 2MS-90S% at Mendida, Siyadebir, Angolelanatera, Sheno & Angolelanatara districts; whereas the lowest 0% was recorded at Alelitu district respectively. The lowest incidence and severity-0% was recorded at all districts in North shewa zone.

Generally, the highest mean leaf rust severity recorded in North shewa zone whereas the lowest recorded in west shewa zone. The highest tef leaf rust severity (90S) recorded in north shewa zone Mendida district where as the lowest (0%) recorded in Awaro, Asgori, woliso and Dendi districts from South west shewa zone. From our assessment the major tef foliar diseases recorded were leaf rust, head smudge and spot blotch.

The highest head smudge severity recorded in west shewa zone liben jawe district where as the lowest head smudge severity recorded in woliso, wolimera and tokekutaye district. There is no head smudge disease recorded in north shewa zone. From our assessment, we have concluded that tef leaf rust and head smudge are the most economically important diseases.

4. Conclusion and Recommendation

From our assessment the major tef foliar diseases recorded were leaf rust, head smudge and spot blotch. The highest tef leaf rust severity (90S) recorded in north shewa zone Mendida district where as the lowest (0%) recorded in Awaro, Asgori, woliso and Dendi districts from South west shewa zone. The highest head smudge severity recorded in west shewa zone liben jawe district where as the lowest head smudge severity recorded in woliso, wolimera and tokekutaye district. There is no head smudge disease recorded in north shewa zone. We have concluded that tef leaf rust and head smudge are the most economically important diseases. Therefore, it is very crucial to develop management option to mitigate those diseases.

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