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Adina Getinet
Fogera National Rice Research
& Training Center, Ethiopian
Institute of Agricultural
Research, Addis Ababa,
Ethiopia

Desalegn Yalew
Fogera National Rice Research
& Training Center, Ethiopian
Institute of Agricultural
Research, Addis Ababa,
Ethiopia

Muluadam Berhan
Fogera National Rice Research
& Training Center, Ethiopian
Institute of Agricultural
Research, Addis Ababa,
Ethiopia

Correspondence
Adina Getinet
Fogera National Rice Research
& Training Center, Ethiopian
Institute of Agricultural
Research, Addis Ababa,
Ethiopia

Survey on potato late blight (*Phytophthora infestans*) in South Gondar Zone, Ethiopia

Adina Getinet, Desalegn Yalew and Muluadam Berhan

Abstract

Late blight disease is the major diseases for potato production in Ethiopia. Hence survey was conducted with the objective of finding out the intensity of late blight disease on major potato growing districts in South Gondar zone of Ethiopia during the main cropping season 2019. In the selected field, the potato late blight disease assessment was made along the two diagonals in an ('X' fashion). A total of 53 fields were visited during the survey and information on variety, locality, disease severity and plant protection measures taken were recorded. Highest average disease severity was recorded from Lay Gaiant (80.88%), Guna Begemdir (76.96%) and Farta (74.13%) districts. Mean disease severity was higher (86.94%) on local cultivar fields than improved variety fields (40.29%). The mean disease severity was higher (85.9%) on unsprayed fields followed by (39.6%) one times sprayed fields. While, two times sprayed fields recorded the least (17.5%) mean disease severity. Most of the farmers interviewed did not know the fungicides frequency, interval of application, growth stage at which fungicides applied. So this work advises popularizing late blight resistant varieties and adoption of recommended spray schedules with proper dose for improving farm productivity. Moreover, trials about disease risk analyses based on host-pathogen interactions should be planned, and research on host response should be conducted to understand how change in the climatic conditions could affect the progress of late blight diseases.

Keywords: Late blight, potato, *Phytophthora infestans*, survey

Introduction

Potato holds great promise for improving the livelihoods of millions of smallholder farmers in the highlands of Ethiopia. The potential for high yield, early maturity, and excellent food value give the potato great potential for improving food security, increasing household income, and reducing poverty [1]. In spite of its potential, the productivity of the crop is relatively low, at about 13.9 t/ha [2]. Many factors contribute to the low yield, including drought [3; 4], frost, hail, pests, diseases [5]. Late blight [*Phytophthora infestans* (Mont.) de Bary] of potato is by far the most destructive disease of potato and causes tremendous yield losses. Since late blight came to the spotlight for being the cause of the Irish potato famine in the 1840s, it has been the most studied (and still among the most destructive) potato diseases in many parts of the world [6; 7]. The disease develops and spreads rapidly under high relative humidity, moderate temperature, and substantial rainfall, and has the potential to destroy the whole potato field within a few days [7; 8]. The disease caused yield losses ranging from 31%-100%, depending on the variety used [9]. The worldwide late blight disease is reemerging, therefore this disease is constantly observed by the late blight researchers [10]. But, information is lacking on the severity and current management aspects of the disease in South Gondar zone. Therefore, this study was conducted to assess diseases severity in south Gondar zone of Ethiopia.

Materials and Methods

Field survey was conducted in 2019 main cropping season in major potato growing districts of South Gondar zone i.e. Farta, Lay Gaynt, Guna Begemdir, Estie and Dera. The selected districts were major potato producers in the zone. Random sampling was applied to select farm field in each district i.e. every potato field at interval of 5-10 km based on vehicle odometers following the main roads and accessible routes were assessed. In the selected field, the potato late blight disease assessment was made along the two diagonals in an ('X' fashion). In each field observations on late blight severity were recorded following the method of Henfling [11]. Disease severity data collected from all over the fields of a particular location were given a range (minimum to maximum %), and means were computed for a particular district.

Data on geographical information (latitude, longitude and altitude) of each field was recorded using a GPS. Information on locality, variety, crop age, disease severity and plant protection measures adopted were recorded during the course of survey.

Results and discussion

From the total fields surveyed, only 22.64 % of the fields were covered with improved variety, 39.62% field with local cultivars, and the remaining 37.74 % field with unknown cultivars. Mean disease severity was higher (86.94%) on local cultivar fields. While, improved variety fields recorded the least (40.29%) disease severity. During

the survey, fungicide sprayed and unsprayed fields were identified and only 9.6% growers applied fungicides two times and 13.16 % growers applied fungicides one times from the total surveyed fields but 51.92% growers' did not use fungicides at all. The mean disease severity was higher (85.9%) on unsprayed fields followed by (39.6%) one times sprayed fields. While, two times sprayed fields recorded the least (17.5%) mean disease severity (Table 1). Among 5 districts surveyed, highest average disease severity was recorded from Lay Gaiant (80.88%) followed by Guna Begemdir (76.96%) and Farta (74.13%) (Table 2). Ridomil and Mancozeb were frequently used fungicides by the growers.

Table 1: Potato late blight intensity based on different independent variables in 2019

Variables	Variable class	No. of fields inspected (%)	Severity (%)	
			Range	Mean
Cultivar	Improved	22.64	0-95	40.29
	Local	39.62	75-100	86.94
	Unkown	37.74	50-100	71.92
Fungicide	One spray	13.16	20-85	50
	Two spray	9.6	10-30	17.5
	Un spray	51.92	50-100	85.9
	Unkown	25	5-95	54.23

Most of the farmers interviewed did not know the fungicides frequency, interval of application, growth stage at which fungicides applied and specific diseases they were spray for. It was observed that the disease severity was high in all surveyed districts. It might be due to growing susceptible varieties and improper management methods of the disease. Moreover, change in climatic conditions for the area is also an important parameter for spreads of disease. Most of the studies have showed that meteorological factors suitable for potato late blight development are: temperature, humidity,

and rainfall or leaf wetness interval. Temperature ranged between 17 to 22 °C and humidity in excess of 90% is observed to favor potato blight development in the areas of sample collection [12]. While humidity also have greater impact if the pathogen developed greater tolerance for dry conditions and the requirement for high humidity, a proxy for leaf surface wetness, is common for many foliar pathogens including *P. infestans* causing late blight disease [13].

Table 2: The intensity of potato late blight disease in districts of South Gondar Zone in 2019

District	Locality	Altitude range (M.A.S.L.)	No. of fields assessed	Severity (%)	
				Range	Mean
Farta	Awuzet	2873-2907	3	50-83	72.67
	Maynet	2806-2856	2	90-100	95
	Kolay Dengors	2429-2483	2	30-75	52.5
	Stegur	2594	1	90	90
	Hiruy Abaregay	2625	1	90	90
	Wowa magera	2621-2648	2	80-95	87.5
	Seare	2731-2792	3	25-95	56.6
	Range/ Subtotal	2429-2856	14	25-100	74.13
Guna Begemdr	Ataye	2816-2848	3	20-95	66.6
	Argadidib	2888-2977	2	90-95	92.5
	Range/ Subtotal	2816-2977	5	20-95	76.96
Lay Gaiant	04	3140-3171	3	95-100	98.3
	08	3112-3170	3	75-100	83.3
	09	3080-3235	7	50-100	78.5
	10	2959-3003	3	5-100	66.6
	Range/ Subtotal	2959-3235	16	5-100	80.88
Dera	Zara	1869-1950	3	5-75	26.6
	Gedam gergera	1961	1	10	10
	Godere	2082	1	5	30
	Guha	2361-2462	2	80	80
	Wagramisili	1906-2390	2	70-75	72.5
	Gelawdiowes	2290-2366	3	30-75	51.66
	Range/ Subtotal	1869-2462	12	5-80	48.32
Estie	Shimaglie giorgis	2443	3	25	25
	Licha	2306-2354	2	25-75	41.6
	Range/ Subtotal	2306-2443	5	25-75	31.64

Conclusion

This work advises popularizing late blight resistant varieties and adoption of recommended spray schedules with proper dose for improving farm productivity. Moreover trials about disease risk analyses based on host–pathogen interactions should be planned, and research on host response should be conducted to understand how change in the climatic conditions could affect the progress of late blight diseases.

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