Indian Journal of Hill Farming 27(1):145-148 Available online at www.kiran.nic.in

Progress of Potato Late Blight on Staggered Planting in High Hills of Meghalaya

M.S. GURJAR, T.K. BAG, K. SURAJ SINGH

Received 5.5.2014, Revised 16.6.2014, Accepted 20.6.2014

ABSTRACT

Late blight susceptible cultivar, Kufri Jyoti was planted at three dates with 15 days interval starting from 15 February to 15 March to analyze the progress of late blight. The disease appeared in 2nd to 3rd week of May in Meghalaya high hills. Disease appeared after 72, 62 and 53 days of planting in 2011 while it appeared after 93, 78 and 52 days of planting in 2012. Progress of late blight was lower in first date of planting (AUDPC~812-882) as compared to second (AUDPC~ 1102.5-1162) and third dates (AUDPC~1102.5-1137.5) of planting. The highest tuber yield (33.33 t/ha) was observed in first date of planting (15 February) followed by second and third dates. It was concluded that yield reduction due to late blight can be avoided by planting in the middle of February in Meghalaya.

Key words: AUDPC, Late blight, Potato

INTRODUCTION

Potato is one of the most important vegetable crops grown in the North Eastern Hill (NEH) region of India comprising the states of Arunachal Pradesh, Mizoram, Nagaland, Manipur, Meghalaya, Tripura, Sikkim and Assam and accounts for nearly 10% of the country's total potato area. The potato yield in all North Eastern states except Tripura (17.8 t/ha) is fairly low (4.8 to 12.6 t/ha) compared to the national average of 22.24 t/ha (NHB 2011). The entire NEH region is characterised by undulating topography, rain-fed cultivation and inadequate management practices (Sah et al. 2007). One of the major constraints in attaining good yield is late blight disease in the high hills of Meghalaya. Late blight caused by Oomycete *Phytophthora infestans* (Mont.) de Bary is the most devastating disease of potato throughout the world (Fry and Goodwin 1997). In India, late blight appears in most of the potato growing regions in varying degrees causing yield losses to the extent of 90% (Singh et al. 2003; Singh 1996). As the *Phytophthora infestans* is a fast spreading pathogen, its management is still a challenging job to plant pathologists. The devastation of the disease is very much related with climatic factors like temperature, relative humidity, fog or dew deposition and also sunshine hours. If favourable weather prevails, the total crop failure may occur within a week causing a huge monetary loss. Late blight of potato is a constant problem faced by potato growing farmers in the hills of Meghalaya because of recurring occurrence in epiphytotic proportions every year. Though, there are lots of management strategies for the disease however, till date deployment of resistant varieties and strategic application of suitable fungicide is the best management strategy. But, application of fungicide increases cost of cultivation and also hazardous to the environment. The present study aimed at analyzing the effect of date of planting on the progress of late blight of potato and its effect on yield so that a message can be conveyed to the growers to avoid the maximum blight by adjusting date of planting and get satisfactory yield.

Central Potato Research Station, Upper Shillong -793 009 (Meghalaya)
Corresponding author: malkhan_iari@yahoo.com

MATERIAL AND METHODS

The experiments were conducted in summer season (February-July) at Central Potato Research Station, upper Shillong, Meghalaya (1800m asl, 25.54^{0}N, 91.85^{0}E) in 2011 and 2012 under rainfed conditions. Late Blight susceptible cultivar, Kufri Jyoti was planted from February to March at 15 days intervals, with spacing of 60x20 cm (plot size 5m x 6m) in randomized block design in three replications. The potato crop was raised following all standard recommended packages of practices. Late blight disease severity was recorded based on percent foliage infection at seven days interval after first appearance of late blight (Malcolmson 1976) and scored on 0-9 scale (Trace of infection=9, 10.0 %=8, 11-25 %=7; 26-40 %=6; 41-60 %=5; 61-70 %=4; 71-80 %=3; 81-90%=2; Collapsed=1). The area under disease progress curve (AUDPC) was calculated) as follows following the method of Shaner and Finney (1977).

$$AUDPC = \sum_{i=1}^{n} [(x_i + x_{i+1})/2](t_{i+1} - t_i)$$

Where, n= total number of observations; x_i=disease severity at the i^{th} observation; i= time (days) at i^{th} observations

Tuber yield was recorded at harvest and data were analyzed statistically. The weather parameters were taken from Indian Meteorological Department, Upper Shillong (Meghalaya) *viz*. temperature (^{O}C), relative humidity (%), rainfall (mm). The data were correlated with appearance of late blight and yield.

RESULT AND DISCUSSION

It is evident from the results (Table 1) that in 2011, late blight appeared after 72 days planting in the first date, after 62 days in the second date and 53 days in the third date. In 2012, it appeared at 93 days, 78 days and 52 days in the first, second and third date of planting respectively. In both the years, entire foliage was lost within 2-3 weeks after late blight disease initiation. Disease spread was progressively higher from the first date of planting (AUDPC~812-882), to the second (AUDPC~ 1102.5-1162) and to the third date (AUDPC~ 1102.5-1137.5) of planting. Analysis of weather data (during disease development period i.e. April to May) showed that mean temperature ranged from 13.36 to 24.16 ^{O}C, mean relative humidity (R.H.) varied from 65.40 to 84.41 % and rainfall from 4.85-10.03 mm in 2011 and mean temperature 14.15 to 25.24 ^{O}C, mean R.H. 64.90 to 77.29%, rainfall 3.11 to 5.34 mm in 2012. Epidemiological parameters were quiet conducive for late blight development and first appearance of late blight was observed from first to third week of May in both the years. Further development of the disease was supported by prolonged favourable epidemiological parameters (Table 2) and the crop got completely blighted with loss of entire foliage which was reflected on yield reduction in the subsequent date of plantings. The maximum tuber yield (33.33 t/ha) was recorded in first planted crop followed by second (25.33 t/ha) and third (23.00 t/ha) planted crop in the year 2011. Maximum yield of 24.35 t/ha was obtained in first planted crop followed by second and third planted crop in the year 2012 also although the yield was lower than the previous year (Table 1). It was evident that yields (33.33 t/ha and

Table 1: Effect of date of planting on late blight progress, severity, AUDPC, potato tuber yield (2011 and 2012)

Year	Planting dates	Blight appeared at crop stage	Blight severity (%) at 7 days interval				*AUDPC	Tuber Yield (t/ha)
			7	14	21	28		
2011	D1:15/2/2011	72 days	2	20	60	90	882.0	33.33
	D2:02/3/2011	62 days	5	30	75	100	1102.5	25.33
	D3:17/3/2011	53 days	5	30	75	100	1102.5	23.00
2012	D1:14/2/2012	93 days	2	15	55	90	812.0	24.35
	D2:01/3/2012	78 days	2	30	90	90	1162.0	15.72
	D3:16/3/2012	52 days	5	30	80	100	1137.5	13.56

*AUDPC= Area under the Disease Progress Curve

Table 2: Weather parameter during the crop period in 2011 and 2012 at CPRS Shillong

Month	2011					2012				
	Mean Temperature (°C)		Mean Relative Humidity (%)		Mean Rainfall (mm)	Mean Temperature (°C)		Mean Relative Humidity (%)		Mean Rainfall (mm)
	Max	Min	Min	Max		Max	Min	Min	Max	
January	15.03	4.61	49.22	82.9	0.08	18.82	5.62	64.7	84.19	0.52
February	18.61	8.11	55.46	75.5	0.86	19.4	8.19	44.86	66.58	0
March	22.3	11.40	59.45	68.13	1.95	22.31	11.4	48.39	53.67	0.12
April	23.49	13.36	65.4	74.6	4.85	24.42	14.15	64.9	67.7	3.13
May	24.16	15.81	79.83	84.41	10.03	25.24	16.27	68.87	77.29	5.34
June	24.98	17.62	85.45	85.9	24.98	24.48	17.86	86.86	83.93	12.01
July	25.16	18.05	82.83	85.64	6.34	24.59	18.5	85.09	80.03	12.34

24.35 t/ha) were higher in first planted crop in both the year 2011 and 2012 because first planted crop enjoyed longer blight free period (72 and 93days) and tuber bulking (tuberisation) phase as compared to second (62 and 78 days) and third (53 and 52days) planted crop in both years. The potato tuber yield decreased gradually with delay of planting in both 2011 and 2012 because of early attack of late blights which put high disease pressure on the crop and subsequent death of plants and thereby the late planted crops got less bulking period. Similar observations on late blight management and increased yield by early planting have been reported by Shailbala and Pundhir (2006); Arora et al. (1999) in Uttar Pradesh and North Western plains respectively. In Meghalaya hills, tuber yield depends on onset of rainfall at potato planting and late blight. The main potato crop is usually taken in summer season under rain fed conditions. The tuber yield is affected by initial rainfall during planting and late blight pressure during crop growth period. Naturally, date of appearance and pressure of late blight is one of the factors determining the yield of potato, provided the rainfall is normal in the growing season. Conversely, early onset of rain in the crop season facilitates to raise normal potato crop and contributes to higher yields; which, in turn, encourages the disease creating condition favourable for blight in the hills. Further, if rainfall is delayed or less, the normal crop growth and yields are affected owing to delay in germination of crop and having shorter bulking phase in field. In 2011, tuber yield was higher in all three dates of planting because of normal rainfall (0.86 to 10.03mm from February to May) at the early stage of planting contributing better crop growth and tuberisation. However, tuber yield was comparatively less in all three dates of planting in 2012 owing to the late and less rainfall (0 to 5.24mm from February to May) at the early stage of crop growth creating some moisture stress. The first rainfall in hilly region is usually received during third and fourth week of February. Hence, further early planting before 15 February may not be feasible due to sever moisture stress. Crop planted around middle of February can give higher tuber yield owing to disease escape and longer duration of tuberization.

CONCLUSION

Late blight causes heavy yield losses in summer crops under rain fed conditions in mid hills of Meghalaya. The first appearance of late blight was recorded from 2nd to 3rd week of May in Meghalaya high hills. It can be concluded that yield reduction can be avoided by adjusting planting date of potato to middle of February to avoid late blight pressure .

REFERENCES

Arora RK, Sharma KK, Bombawale OM (1999). Management of potato late blight by changing planting dates in north western plain. J Mycol Pl Pathol 29(3): 355-358.

Fry WE, Goodwin SB (1997). Resurgence of the Irish potato famine fungus. Biosci 47: 363-371.

Malcolmson JF (1976). Assessment of field resistance to blight *(Phytophthora infestans)* in potatoes. Trans Brit Mycol Soc 67: 321-325.

NHB (2012). Area-production statistics. National Horticulture Board, Gurgaon, India.

Sah U, Kumar S, Kumar A (2007). Need perception of tribal farmers with regard to recommended potato production practices in Meghalaya. Potato J 34: 248-51.

Shailbala, Pundhir VS (2006). Effect of date of planting on late blight severity and yield of potato. *Ann Pl Protec Sci* 14(2)**:** 404- 406.

Shaner G, Finney RF (1977). The effect of nitrogen fertilization on the expression of slow mildewing resistance in knox wheat. Phytopath 67**:** 1051-1056.

Singh D (1996). Fungicidal spray schedule for economical management of potato late blight in North-western hills of India. Indian J Mycol Plant Pathol 26(3):252-55.

Singh BP, Kaushik SK, Singh PH, Joseph TA (2003). Potato late blight and its management. Indian Farm 53: 19-23.