



# Forecast and Need Based Fungicide Application for Effective Management of Late Blight of Potato

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## ABSTRACT

Late blight caused by *Phytophthora infestans* (Mont) de Bary is one of the most dreaded diseases of potato worldwide and cause significant losses in production. It affects both potato foliage in the field and tubers in storage. A number of management techniques for late blight have been developed and used throughout the world. Effective control of this disease requires an integrated disease management approach. Fungicides alone can't control late blight effectively, but should be used as a tool in an integrated management. In present studies, weather forecast based targeted application of fungicides with recommended cultural practices (use of healthy seed, seed treatment, proper spacing and hilling etc.) were used for effective management of the disease. Preventive fungicide applications were given, by identifying conducive period for disease development using local weather forecast. Effective management of disease i.e. 92.17 and 90.93 per cent during 2014 and 2015, respectively was achieved in demonstration trials by following prophylactic spray of mancozeb, sprays of cymoxanil 8% + mancozeb 64%, just after disease appearance, followed by need based sprays of mancozeb and cymoxanil 8% + mancozeb 64% at 10 days interval. contrary to this, in control i.e. farmers' practice, disease incidence of 95.83 and 96.94 per cent was recorded during 2014 and 2015, respectively, as farmers sprayed fungicides indiscriminately, only after disease appearance.

## Key Words:

## INTRODUCTION

Potato is an important cash crop in north western hills of Himachal Pradesh. Being grown during off-season, potato from Shimla hills fetches a premium price in the market, thus ensuring high returns to the farmers of the region. However, late blight of potato, which is caused by *Phytophthora infestans* (Mont) de Bary is the major bottleneck in potato production in the hills of Shimla district, where the crop is grown under rainfed conditions. This disease is well known, highly studied and still the most destructive of all potato diseases. Late blight affects all plant parts i.e. leaf, stem and tubers. There are specific requirements of temperature and humidity for initiation and further build up of disease. Temperature requirement for spore germination, spore production and fungus growth is 10-20°C, 18-22°C and 16-20°C, respectively. For infection and disease development temperature 7.2

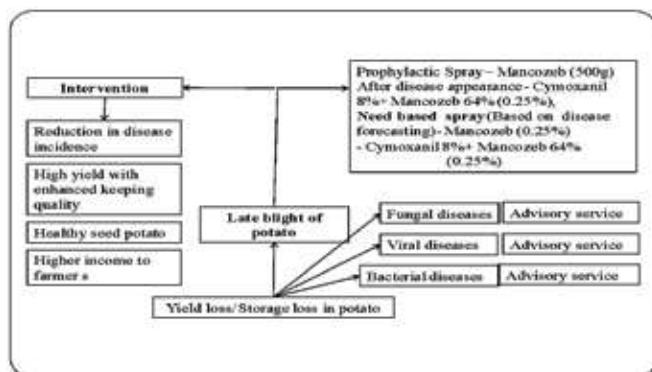
to 26.6°C with optimum temperature 18±1°C and 100 per cent humidity is required, whereas, spore get killed under the humidity less than 75 per cent (Arora *et al*, 2014). Tubers carrying the pathogen are the real carriers and serve as the source of the disease in the subsequent season. Thus, for effective management an integrated management approach is required. In the present studies, cultural practices are the first line of defense i.e. use of healthy seed, seed treatment, proper spacing and hilling with forecast based targeted application of fungicides for effective management of the disease. The trials were laid out at farmer's field at ten locations during 2014 and 2015 and per cent disease control i.e. 90.00 and 71.85 per cent was found, respectively by following prophylactic sprays of Dithane M45 (Mancozeb), spray of Curzate (Cymoxanil 8% + Mancozeb 64%) just after disease appearance followed by sprays of Dithane M45 (Mancozeb) and Curzate

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(Cymoxanil 8% + Manacozeb 64%) at 10 days intervals, whereas, in farmers' practice (control), disease incidence of 95.83 and 96.94 percent was recorded during 2014 and 2015, respectively.

## MATERIALS AND METHODS



Flow Chart 1: Reasons for yield /storage losses in potato

During the survey, it was observed that potato crop was infected with number of diseases (fungal, bacterial and viral), which were causing huge yield and storage losses. However, among all diseases, late blight was appearing in epiphytotic conditions in the hills of district Shimla. So, keeping in view the losses due to late blight thirty three potato fields in Chirgaon, Rohru, Theog and Jubbal blocks were selected to record the incidence of the disease. Experimental trials at five locations were conducted for the management of the disease, using three fungicides [(Curzate (Cymoxanil 8% + Manacozeb 64%), Acrobat 50 WP (Dimethomorph 50%) and Ridomil Gold 68 WG (Matalaxyl 4% + Mancozeb 64%)] with farmers' practice as control. Three sprays were applied at 10d interval immediately after disease appearance. It was found that Ridomil Gold 68 WG (Matalaxy 1 4% + Mancozeb 64%), which was used mostly by the farmers for the management of late blight of potato, was least effective, whereas, Curzate (Cymoxanil 8% + Manacozeb 64%) gave maximum disease control. Thereafter, demonstrations were planned using need based sprays of Dithane M45 -Mancozeb and Curzate -Cymoxanil 8% + Manacozeb 64% (Flow Chart 1) on the basis information of weather

forecast (temperature, relative humidity and rainfall) received from Central Potato Research Institute, Shimla, Himachal Pradesh, following recommended cultural practices (seed treatment, spacing, fertilizers, hilling etc.). To layout demonstration, ten fields were selected for the disease management and prophylactic spray of Dithane M45 (Mancozeb) was applied before the onset of rainy season in the month of June. A spray of Curzate (Cymoxanil 4% + Mancozeb 64%) was given immediately after the climatic conditions became conducive for disease development (based on alert received from CPRI Shimla). Need based sprays of Dithane M45 (Mancozeb) and Curzate (Cymoxanil 4% + Mancozeb 64%) were followed at 10d interval. Contrary to this, farmers' practice i.e. sprays of Mancozeb or Matalaxyl 4%+ Mancozeb 64% irrespective of disease and climatic condition, was kept as control.

## RESULTS AND DISCUSSION

The survey conducted revealed that the incidence of late blight in potato was between 70 to 100 per cent, with highest 100 per cent incidence in fields located at Samala and Patsari areas of Rohru block in district Shimla.

Three fungicides namely Curzate (Cymoxanil 8% + Mancozeb 64%), Acrobat 50WP (Dimethomorph 50%) and Ridomil Gold 68 WG (Matalaxyl 4% + Mancozeb 64%) were evaluated for the management of late blight of potato. In the study, minimum disease incidence 9.7(17.56) and 7.8(15.11) per cent with maximum 90.12 and 91.68 per cent disease control was recorded in the fields sprayed with Curzate (Cymoxanil 8% + Mancozeb 64%) during 2012 and 2013, respectively. Acrobat (Dimethomorph 50%) was also found effective with 88.19 and 80.95 percent disease control. Ridomil Gold 68 WG (Matalaxyl 4% + Mancozeb 64%) was least effective with 72.10 and 68.01 per cent disease control during, 2012 and 2013, respectively (Table 2). Similar results were obtained by Jonson *et al* (2000) and Siddique *et al* (2016), who reported that Sunaxanil 72 WP (Cymoxanil 8% +

## Need Based Fungicide Application

**Table 2. Efficacy of different fungicide in controlling *Phytophthora infestans* causing late blight in potato.**

Sr. No.	Treatment	2012		2013	
		Percent Disease Incidence*	Percent Control	Percent Disease Incidence*	Percent Control
1.	Curzate (Cymoxanil 8% + Mancozeb 64%)- 0.25%	9.7 (17.56)	90.12	7.80 (15.11)	91.68
2.	Acrobat 50WP (Dimethomorph)	11.6 (19.41)	88.19	17.80 (24.65)	80.95
3.	Ridomil Gold 68 WG (Matalaxyl 4% + Mancozeb 64%)- 0.25%	27.4 (31.32)	72.10	30.60 (33.04)	68.01
4.	Control	98.20 (84.25)	-	98.94 (85.53)	-
	CD	5.372		6.997	

\*Pooled data for five location

Figures in parentheses are Arc sine transformed values

Mancozeb 64%) has prophylactic activity against *P. infestans*. In the present study, Ridomil Gold 68 WG (Matalaxyl 4% + Mancozeb 64%) was found least effective in management of the disease. It might be due to continuous and increased use of Matalaxyl, which may lead to the development of resistant strain of *P. infestans* as was evident (Singh *et al*, 2005), who recorded the resistant strains of *P. infestans* against Matalaxyl. Samoucha and Cohen

(1988) also found Cymoxanil mixtures effective for managing matalaxyl resistant strains.

During 2014 and 2015, forecast based targeted application of fungicides i.e. Dithane M45 and Curzate [(Prophylactic Spray of Mancozeb (0.25%), after disease appearance spray of Cymoxanil 8% + Mancozeb 64% (0.25%) and need based sprays (based on disease forecasting) of Mancozeb (0.25%) and Cymoxanil 8%+ Mancozeb 64%

**Table 3. Efficacy of forecast based application of fungicides in controlling *Phytophthora infestans* causing late blight in potato.**

Treatment	2014		2015	
	Percent Disease Incidence*	Percent Control	Percent Disease Incidence*	Percent Control
Prophylactic Spray – Mancozeb (0.25%) After disease appearance - Cymoxanil 8%+ Mancozeb 64% (0.25%) Need based spray (Based on disease forecasting)- Mancozeb (0.25%) and Cymoxanil 8%+ Mancozeb 64% (0.25%)	7.5 (15.50)	92.17	8.79 (16.48)	90.93
Control	95.83(81.05)	-	96.94(82.54)	-
CD	3.610		2.416	

\*Pooled data for ten locations

Figures in parentheses are Arc sine transformed values

(0.25%)] resulted in 92.17 and 90.93 per cent disease control in comparison to farmers' practice (Table 3), respectively, with increased yield (24.75 and 25.13t/ha) over control (16.65 and 16.30 t/ha). Mynit *et al* (2001) also observed that need and weather forecast based applications of fungicides provide effective management of late blight in potato.

### CONCLUSION

Weather forecast based targeted application of fungicides with recommended cultural practices (use of healthy seed, seed treatment, proper spacing and hilling etc.) was found effective in management of late blight of potato caused by *Phytophthora infestans*. Effective management of disease *i.e.* 92.17 and 90.93 per cent during 2014 and 2015, respectively was achieved in demonstration trials by following prophylactic spray of mancozeb, sprays of cymoxanil 8% + mancozeb 64%, just after disease appearance, followed by need based sprays of mancozeb and cymoxanil 8% + mancozeb 64% at 10 days interval, using local weather forecast.

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