Abstract: Late blight (Phytophthora infestans) is the most potential disease threat to the potato production in Bangladesh. Epidemiological studies indicate that the disease appears in the first week of January when the day temperature range 14-19°C and night temperature 9-14°C accompanied with foggy weather and heavy deposition of dew drops. The sporangial production accelerated when temperature gradient ranged 15-20°C and low temperature (10-13°C) supports enormous production of zoospore. Twenty races of P. infestans have been identified in the country. Initially simple races were predominant but in last five years complex races have recorded. The complex races are predominant in the northern part of the country where winter sets earlier and continues for longer period. Twelve CIP clones were tested for late blight resistance at three locations in 2006-07 and 2007-08. CIP-39077.159 had moderate resistance to late blight under all three locations. Some of the clones yielded over 40t/ha but were highly susceptible to late blight. The indiscriminate use of metalaxyl containing fungicides throughout the country has developed metalaxyl resistant strain of P. infestans. Till now more than 30 fungicides such as mancozeb, phenylamides copper, dimethomorph, chlorothalonil, phenomadone, priopaneb have been registered in the country. The varieties Raja, Dheera and BARI TPS-1 having moderate resistance to late blight have also become susceptible. Biocontrol agents like Trichoderma harzianum, T. viride, Penicillium sp., Chaetomium sp., collected from Phylosphere have been tested against late blight. Some of these proved effective against P. infestans when applied as prophylactic but were ineffective when applied as curative.

INTRODUCTION

Late blight (Phytophthora infestans) is the most potential disease threat to the potato crop, accounting for significant annual losses world-wide. It causes 25-57% yield losses in potato (1). The disease can destroy the entire foliage quickly causing reduced tuber yields. Sporangia released from infected plants are known to be capable of wind borne migration for over several kilometres. The disease is of common occurrence in Bangladesh for over 30 years and causes considerable yield loss. Research on this disease is going on at Tuber Crops Research Centre (TCRC), BARI over several years. Research findings obtained so far on late blight in Bangladesh are presented in brief.

Prevalence of the disease

The disease is very common and widespread in the county wherever potato is grown with varying degree of severity. The disease is more concentrated and damaging at the North-West and North-East region of the country (Fig. 1). Severe infestation of late blight occurrence was recorded in 2006-07 crop season where the mean disease incidence in the country ranged 50.0-78.4% (Fig. 2).

Yield loss

Yield loss depends on (i) availability of inoculum (ii) susceptibility of the host (iii) stage of plant attack (iv) prevailing environmental condition, etc. Earlier, as high as 57% yield loss has been documented in the country following artificial condition (1). Recently in a study under natural condition yield loss has been estimated 17.44, 25.23 and 35.84%, respectively from BARI TPS-1 (MR), Dheera (T) and Chamak (S) (Fig. 3).
In general, the disease appears during the first week of January when the day temperature range 14-19°C and night temperature 9-13°C accompanied with foggy weather and heavy deposition of dew. After infection mycelium spreads from the point of spore penetration producing a lesion with the dark green water soaked appearance associated with tissue destruction. The sporangial production is accelerated when temperature ranges 15-20°C and low temperature (10-13°C) forced enormous production of zoospores (4). Disease spread is favoured by period of warm and humid condition but at dry conditions (above 24°C), the development of blight becomes slow. It was also found that stem blight becomes slow. Recently, it has been noticed that the disease appears during mid December.

**Race spectrum of *P. infestans***

Identification of races of *P. infestans* in Bangladesh was initiated in 1994-95 crop season. Upto 2001-02 simple races were predominant but from last five years complex races have been detected (6). So far 20 races of the fungus have been identified in the country (Fig. 4) (8) The complex races are predominant in the northern part of the country where winter sets early and continues for longer period.

**Epidemiological studies**

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Metalaxyl resistant strains

Presence of metalaxyl resistant strain of *P. infestans* has been detected in the country. Collected isolates were maintained on potato slice and tested following the method outlined by Arora (2). Results revealed that metalaxyl resistant strain of *P. infestans* was predominant in northern part of country (where winter comes earlier and leaves later, maximum potato producing area and metalaxyl fungicides used indiscriminately over years) compared to other regions of the country.

Management Practices

Resistant varieties

More than 600 varieties/germplasm/TPS progenies have been tested through artificial inoculation following “Detached leaf method”. In general, it appeared that germplasm of TPS origin exhibited resistance to *P. infestans* compared to tuber germplasm. Tuber varieties like Dheera and Raja remained resistant for five to six years of their release but later resistance was broken down while BARI TPS-1 is still performing as moderately resistant to late blight (1, 8).

*CIP Clones:* Twelve CIP clones were tested for late blight resistance under multilocational trials in 2006-07 and 2007-08. Clone CIP 393077.159 showed moderate resistance to late blight. Some of the clones (393371.58, 395011.2 and 396244.12) yielded over 40 t/ha but were highly susceptible to late blight (5).

Planting time

Although early planting gave the higher AUDPC score for late blight irrespective of varieties but it also gave the higher yield compared to late planted crops (9). The reason is that late blight infection get initiated early in late planted crop.

Chemical control

**Fungicidal:** More than 30 fungicides have been registered in the country against late blight so far. The fungicidal groups are: chlorothalonil, copper, dimethomorph, mancozeb, phenylamides, phenomadone, propineb etc. (1, 3, 4, 7, 10). Of them mancozeb, phenylamides and dimethomorph are widely used throughout the country.

**Inorganic salts:** Thirteen inorganic salts have been tested at different concentration against *P. infestans*. Among them magnesium sulphate and disodium hydrogen phosphate at 5.0% concentration while cupric sulphate, zinc sulphate and ammonium chloride at 0.12, 0.25 and 0.5% concentration, respectively showed encouraging performance in minimizing late blight infection (6).

**Spray schedule:** Alteration of fungicide application instead of single fungicide proved more effective in reducing late blight infection (Fig. 5) and increasing yield.

![Fig. 5. Efficacy of different fungicide schedule.](image-url)

Biological control

Biocontrol agents like *Trichoderma harzianum*, *T. viride*, *Penicillium* sp. and *Chaetomium* sp. showed their potentiality against *P. infestans* when applied as prophylactic but proved ineffective when applied as curative (Fig. 6). In prophylactic measure conidial suspension of antagonists were sprayed on potato plants seven days earlier to *P. infestans* inoculation.
while in case of curative method \textit{P. infestans} appeared on potato plants seven days earlier than antagonists application.

**Integrated disease management**

Early planting (within Nov. 15) using certified seeds of tolerant variety followed by 2 to 3 foliar application (mancozeb alter with acrobat/ mancozeb alter with melody duo (propineb)/mancozeb→acrobat→mancozeb) has been suggested to combat the disease efficiently.

**LITERATURE CITED**


MS Received: 5-5-2009; Accepted: 11-6-2010