

In the northeastern Himalayan area of India, effective fungicide spray schedules are used to control late blight (*Phytophthora infestans*) of potatoes (*Solanum tuberosum*).

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ABSTRACT

One of the most damaging phytopathogens that causes late blight disease in potatoes (*Solanum tuberosum* L.) is *Phytophthora infestans* (Mont.) de Bary, a member of the order Peronosporales. At any stage of crop development, the disease may create severe disease outbreaks that result in total defoliation and significant yield loss. The disease signs can emerge on leaves, petioles, stems, and tubers. At Chesrimai GP, Charilam block, Sepahijala, Tripura, field tests were carried out in 2020–21 and 2021–22 to determine the best fungicide management techniques to lessen the losses brought on by the destructive disease. In order to determine the optimal spray schedule against late blight disease, the experiment was set up in three replications using a randomised block design (RBD) with eight treatments containing various fungicides in various combinations. The best-performing treatments were found to be Mancozeb 75% @0.25% at 35 days after sowing (DAS), Cymoxanil 8% + Mancozeb 64% @0.25% at 42 DAS, Mancozeb 75% @0.25% at 49 DAS, and Cymoxanil 8% + Mancozeb 64% @0.25% at 15.00 and 12.75%, the lowest mean disease severity (1.58% and 0.93%), and the highest tuber yield (21.27 and 21). Additionally, throughout 2020–2021 and 2021–2022, yield increased above control by 26.6 and 27.7%, respectively, and the pooled incremental cost benefit ratio (ICBR) of 1:16.09 was shown to be the greatest of all treatments. Under field circumstances, the late blight disease of potatoes may be successfully managed using an effective spray schedule that includes contact fungicide for prophylaxis and prevention, followed by translaminar/systemic + contact fungicide.

Keywords: *Solanum tuberosum*, *Phytophthora infestans*, fungicides, late blight, spray schedule

Introduction

Known as "The King of Vegetables," potatoes (*Solanum tuberosum* L.) rank fourth in importance among non-cereal crops in India after rice, wheat, and maize (FAOSTAT 2017). Due to its great nutritional value, it is widely farmed in India's Northeast (NER). The crop is grown in over 150 nations worldwide. 165 1Krishi Vigyan Kendra (Central Agriculture University, Imphal), Sepahijala, Latiacherra, Tripura; 2ICAR-National Research Center for Integrated Pest Management, Mehrauli, New Delhi; 3 University of Science and Technology, Ri-Bhoi, Meghalaya; 4 College of Agriculture, Tripura, Lembucherra, West Tripura, Tripura; 5 College of Post-Graduate Studies in Agricultural Sciences (Central Agricultural University, Imphal), Umiam, Meghalaya; and 6 College of Fisheries (Central Agricultural University, Imphal), Lembucherra, West Tripura. *With a total output of 359 million metric tonnes (FAOSTAT 2020), the corresponding author's email address is utpaldey86@gmail.com. Potatoes are grown on 2.16 million hectares of land in India, with output and productivity of 51.3 million tonnes and 23.77 tonnes/ha, respectively (FAOSTAT 2022). While Tripura leads in productivity (17.80 tonnes/ha), Assam leads in potato farming in the Northeast region of India. However, Tripura's average potato production is lower than the country's average of 22.10 tonnes/ha (NHRDF 2016). *Phytophthora infestans* (Mont.) de Bary is an oomycetes phytopathogen that causes both qualitative and quantitative losses in potatoes. Depending on climatic conditions, late blight disease may reduce potato tuber yields in India by 11–74% (Khalid and Grover 2021). In the plains of Tripura, late blight disease has established a yearly occurrence with moderate to high disease severity due to shifting climatic trends. The disease's management is difficult given the particular ability of the infection to induce cell death, which happens in two to four days in suitable weather, and eventually the crop as a whole fails in favourable weather. Despite the pathogen's increased aggression and environmental adaptability, as well as reports of a breakdown of resistance, using a resistant variety is the best way to fight this illness (Haverkort et al. 2009). Therefore, using integrated disease management (IDM) for the disease—of which fungicides are a key component—remains the most dependable approach. In light of these

perspectives, the current work sought to identify an effective spray schedule against potato late blight in in vivo settings.

METHODS AND MATERIALS

The experiment was carried out in Chesrimai GP, Charilam block, Sepahijala, Tripura, in 2020–2021 and 2021–2022. The crop was cultivated in a humid subtropical climate with heavy rainfall. During the cropping season, the average rainfall ranged from 0 to 122.4 mm, while the average humidity ranged from 93.1 to 99.6% in the morning and 48.0 to 78.6% in the evening.

In an area of 3 m by 3 m, the potato tuber cultivar Kufri Jyoti (Susceptible) was planted at 50 cm by 15 cm intervals. Standard agronomic procedures were followed while planting tubers during the second week of October (Roy 2015). To find the optimal spray schedule against late blight disease, the experiment was set up in three replications using a randomised block design (RBD) with eight treatments containing various fungicides in various combinations (Table 1).

Table 1 lists the different dosages and spray regimens (treatment).

An equivalent volume of sterile water was sprayed in the control treatment.

A method developed by Mayee and Datar (1986) was used to compute the incidence of disease. Based on numerical ratings or observed scores, the percent disease index (PDI) was computed (Mc Kinney 1923).

$$\text{PDI} = \frac{\text{Summation of numerical ratings}}{\text{No. of leaves/plants observed} \times \text{Maximum rating}} \times 100$$

Fifty plants were chosen at random from each plot in order to collect data. Additionally, each plant had one upper leaf, one middle leaf, and one lower leaf appropriately marked in order to gauge the disease's severity. The illness severity data was recorded using a 0–9 rating scale (Shutong et al. 2007). The crop was collected at the physiological maturity stage, and the tuber yield by treatment was noted. The importance of the findings was examined (Gomez and Gomez 1984). At the 5% significance level, the crucial difference (CD) was computed.

Additionally, the percentage of disease reduction over control (PDC) was computed as follows:

$$\text{PDC} = \frac{\text{PDI in control plot} - \text{PDI in treatment}}{\text{PDI in control plot}} \times 100$$

The coefficient of disease index (CODEX) was calculated as (Santosh et al. 2021):

$$\text{CODEX} = \frac{\text{Per cent disease incidence} \times \text{Per cent disease index}}{100}$$

RESULTS AND DISCUSSION

The findings showed that every fungicide tested was effective, leading to a significant drop in the incidence and severity index of late blight disease.

and CODEX in comparison to the control; T7 is the therapy that performs the best.

Treatment
T ₁ , Mancozeb 75% wP @0.25% (2.5 g/litre): 4 sprays (1 st spray at 35 DAS and 2 nd , 3 rd , and 4 th sprays at 7 day intervals)
T ₂ , Chlorothalonil 75% wP @0.125% (1.25 g/litre): 4 sprays (1 st spray at 35 DAS and 2 nd , 3 rd , and 4 th sprays at 7 day intervals)
T ₃ , Cymoxanil 8% + Mancozeb 64% wP @0.25% (2.5 g/litre): 4 sprays (1 st spray at 35 DAS and 2 nd , 3 rd , and 4 th sprays at 7 day intervals)
T ₄ , Copper Oxychloride 50% wP @0.25% (2.5 g/L): 4 sprays (1 st spray at 35 DAS and 2 nd , 3 rd , and 4 th sprays at 7 day intervals)
T ₅ , Metalaxyl 4% + Mancozeb 64% wP @0.25% (2.5 g/litre): 4 sprays (1 st spray at 35 DAS and 2 nd , 3 rd , and 4 th sprays at 7 day intervals)
T ₆ , Famoxadone 16.6% + Cymoxanil 22.1% sc @0.10% (1.0 ml/litre): 4 sprays (1 st spray at 35 DAS and 2 nd , 3 rd , and 4 th sprays at 7 day intervals)
T ₇ , One spraying of Mancozeb 75% @0.25% (2.5 g/litre) at 35

demonstrated DAS, or days after sowing.

Usually at the tips or margins of lower leaves (Supplementary Fig. 1) and stems (Supplementary Fig. 2), the illness manifested as tiny, light to dark green, circular to irregularly shaped water-soaked lesions. These lesions rapidly enlarge into dark brown necrotic lesions (Supplementary Fig. 3) under favourable conditions of cool (15–18°C) and moist weather ($RH \geq 80\%$). This causes the plants to dry out (Supplementary Fig. 4), and in the early morning, whitish cottony growth was seen on the abaxial leaf surface (Supplementary Fig. 5). Under a microscope, a characteristic lemon-shaped *P. infestans* sporangium (Figs. 1A and 1B) and a detached sporangiophore (Fig. 1C) were seen. The opinions of Wiik (2014), Hembram et al. (2018), Al Harethi et al. (2023), and Pasalkar et al. (2024) also supported a similar pattern. Zoospores or germ tubes are the means by which infection or germination occurs.

Incidence of late blight disease: The findings showed that at 50, 57, 64, and 71 DAS, respectively, the late blight disease incidence was reported in the range of 19.00–41.33%, 16.67–46.33%, 14.00–48.67%, and 10.33–54.00%.

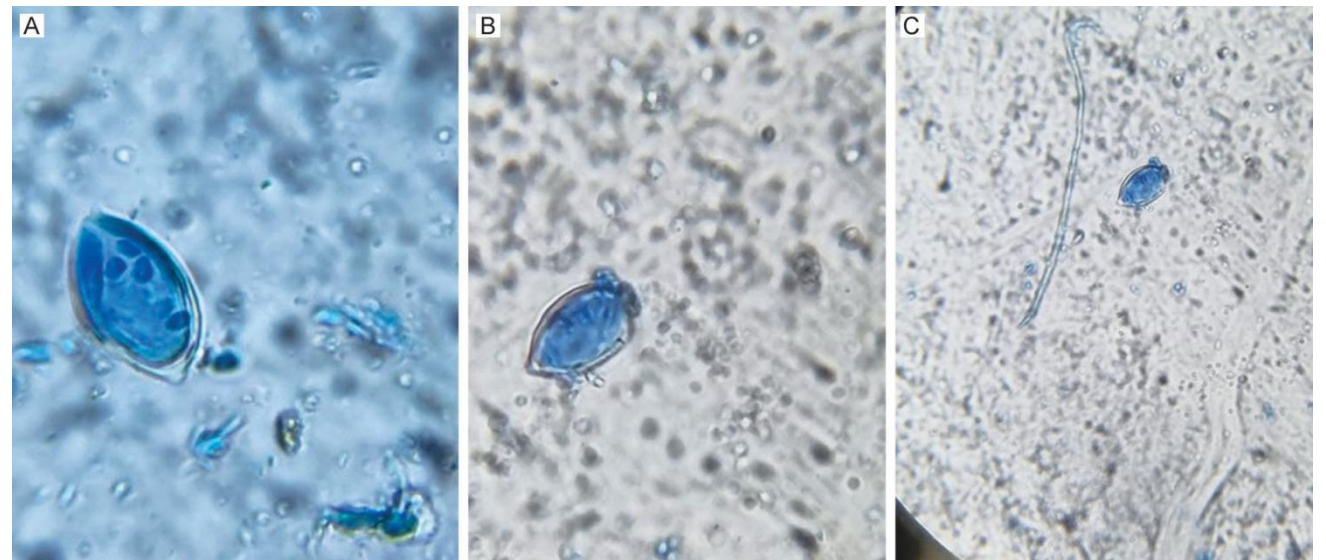
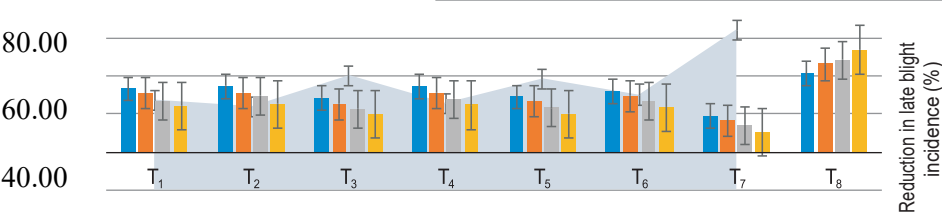


Fig. 1 (A) Lemon-shaped sporangium (40X magnification); (B) Sporangium of *Phytophthora infestans* (40X magnification); (C) Sporangium detached from sporangiophore (40X magnification)

treatments (Fig. 2A). Least late blight disease incidence of 19.00%, 16.67%, 14.00%, and 10.33% were recorded with T7 at 50, 57, 64, and 71 DAS, respectively, followed by T3 (28.67, 25.33, Late blight incidence (2020–21)

Per cent reduction over control Mean Incidence (%) 50 DAS Incidence (%) 57 DAS Incidence (%) 64 DAS Incidence (%) 71 DAS



and 19.67%, respectively) as compared to control. Both treatments, T7 and T3, were

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Treatments

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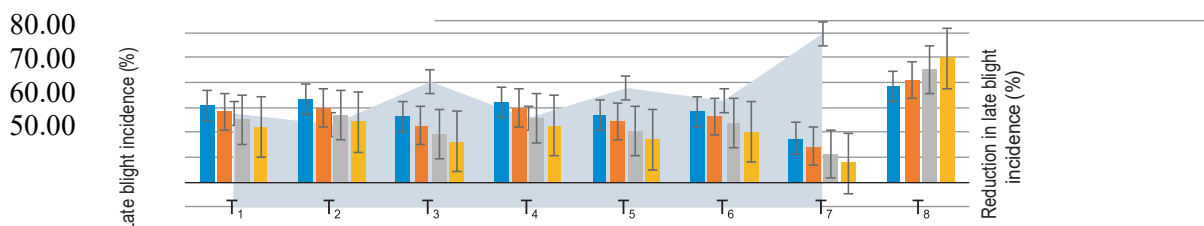
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statistically significant with

each other (CD at 5% level 3.35, 3.19, 3.09 and 3.37). In

Per cent reduction over control Mean ■ Incidence (%) 50 DAS

Incidence (%) 57 DAS ■ Incidence (%) 64 DAS ■ Incidence (%) 71 DAS



T3 (48.24) (Fig. 2A). The

mean late blight disease incidence was recorded in the range of 12.75–43.67% with the mean per cent disease reduction over control in the range of 33.22–69.73 (Fig. 2B). Moreover, in case of pooled data, the mean late blight disease incidence was recorded in the range of 13.88–45.63% with the mean per cent disease reduction over control in the range of 34.19–

68.63 (Fig. 2C). This may be

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Figure 2 shows the impact of fungicides on the incidence of potato late blight and the percentage decrease above control in 2020–2021 (A), 2021–2022 (B), and pooled (C).

Table 1 provides information about treatments. Days after sowing, or DAS.

in line with the findings of previous studies by Chakraborty and Mazumdar (2012) and Rani et al. (2009). Sharma and Saikia (2013) noted a similar pattern, noting that curative sprays with Dimethomorph @0.1% and Cymoxanil+Mancozeb @0.3% were followed by preventative sprays with Mancozeb @0.25% for successful treatment of the potato late blight disease. Late blight disease severity index: T7 had the lowest late blight disease severity index of 14.70%, 12.53%, 9.45%, and 5.48%, with percent reductions over control of 60.35%, 70.34%, 78.59%, and 80.86% at 50, 57, 64, and 71 DAS, respectively (Table 2). T3 came next, with late blight disease severity indices of 24.38%, 21.24%, 18.14%, and 14.82% and percent reductions over control of 34.26%, 49.72%, 58.92%, and 63.58% at 50, 57, 64, and 71 DAS, respectively. In contrast, T7 had the lowest late blight disease severity index of 13.29%, 5.83%, 6.65%, and 3.43% at 50, 57, 64, and 71 DAS, respectively, with percent reductions over control of 61.13%, 82.22%, 83.78%, and 92.44%. Wet circumstances from rainfall caused a small rise in the late blight disease severity index at 64 DAS. T7 had the largest mean percentage illness decrease over control (88.85), followed by T3 (69.85) (Table 3). The current research' findings are consistent with those of Muchiri et al. (2009), Bhat et al. (2009), Alexandrov (2011), Chakraborty and Banerjee (2016), Manjunath et al. (2017), and Singh et al. (2023). According to Chakraborty and Mazumdar (2012), the late blight disease of potatoes may be successfully treated with Mancozeb @0.25% as a preventative spray, followed by Cymoxanil+Mancozeb or Dimethomorph+Mancozeb @0.3% as a curative spray.

CODEX: According to the results shown in Supplementary Table 1, T7 had the lowest CODEX value (1.58%) compared to the control (20.53%), followed by T3 (4.73%). When compared to the control, the current observations of the treatments showed statistically significant differences. In their evaluation of several treatments for potato late blight, Santosh et al. (2021) found that applying treatments together lowers late blight

disease incidence (%), disease intensity (%), and CODEX (%) compared to control.

Tuber yield: According to the results, every treatment considerably decreased the frequency and severity of late blight disease, which resulted to the highest possible tuber yield (Supplementary Table 1). In 2020–2021 and 2021–2022, the rhizome yield was between 17.40–21.27 t/ha and 18.55–21.68 t/ha, respectively, while the percentage increase in yield above control was between 3.6–26.6 and 9.2–27.7%. In the field experiments, T7 produced the highest tuber yield (21.27 and 21.68 t/ha), followed by T3 (20.15 and 20.65 t/ha), which were statistically comparable to the control (16.80 and 16.98 t/ha) in both consecutive years. It is evident from the two years in a row that tuber production decreases as late blight severity increases. Chakraborty and Banerjee (2016), Lal et al. (2017), and Haveri et al. (2018) all found comparable results. Khadka et al. (2020) assessed on their own

Table 2 Effect of fungicides on late blight severity in potato

Treatment	Per cent disease index*									
	2020–21				Mean	2021–22				Mean
	50 DAS	57 DAS	64 DAS	71 DAS		50 DAS	57 DAS	64 DAS	71 DAS	
T1	29.09 (32.64)	26.91 (31.25)	22.48 (28.31)	19.53 (26.23)	24.50 (29.67)	26.61 (31.06)	19.41 (26.14)	21.01 (27.28)	18.20 (25.25)	21.31 (27.49)
T2	30.36 (33.43)	27.23 (31.46)	25.20 (30.13)	20.48 (26.91)	25.82 (30.54)	28.88 (32.51)	22.51 (28.33)	23.32 (28.88)	20.99 (27.27)	23.93 (29.28)
T3	24.38 (29.59)	21.24 (27.44)	18.14 (25.21)	14.82 (22.64)	19.64 (26.31)	20.95 (27.24)	14.30 (22.22)	15.07 (22.84)	12.35 (20.57)	15.67 (23.32)
T4	30.06 (33.25)	27.26 (31.47)	23.46 (28.97)	19.82 (26.44)	25.15 (30.10)	27.74 (31.78)	21.34 (27.51)	22.18 (28.10)	19.12 (25.93)	22.60 (28.38)
T5	24.57 (29.71)	22.53 (28.34)	18.83 (25.72)	15.14 (22.90)	20.27 (26.76)	21.94 (27.93)	16.06 (23.63)	17.12 (24.44)	14.05 (22.01)	17.29 (24.57)
T6	27.42 (31.58)	25.58 (30.38)	22.18 (28.10)	18.81 (25.70)	23.50 (29.00)	24.09 (29.39)	17.90 (25.03)	20.25 (26.74)	17.01 (24.36)	19.81 (26.43)
T7	14.70 (22.55)	12.53 (20.73)	9.45 (17.90)	5.48 (13.54)	10.54 (18.94)	13.29 (21.38)	5.83 (13.97)	6.65 (14.94)	3.43 (10.67)	7.30 (15.68)
T8	37.09 (37.52)	42.24 (40.54)	44.15 (41.64)	49.17 (44.52)	43.16 (41.07)	34.19 (35.78)	32.76 (34.92)	41.00 (39.82)	45.35 (42.33)	38.33 (38.25)
SEm (±)	1.19	1.13	1.13	1.26	--	1.15	1.44	1.19	1.46	--
CD (P=0.05)	3.62	3.44	3.42	3.83	--	3.47	4.37	3.62	4.44	--

*, Average of replications; **, Figures in parenthesis are Arc sine transformed values. Treatment details are given under Table 1.

DAS, Days after sowing.

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Table 3 Effect of fungicides on late blight disease reduction over control in potato

Treatment	Per cent reduction over control*									
	2020–21				Mean	2021–22				Mean
	50 DAS	57 DAS	64 DAS	71 DAS		50 DAS	57 DAS	64 DAS	71 DAS	
T1	21.56	36.30	46.81	54.94	60.27	22.15	40.77	48.76	59.87	42.89
T2	18.15	35.53	42.92	53.09	58.34	15.51	31.28	43.12	53.72	35.91
T3	34.26	49.72	58.92	63.58	69.85	38.71	56.35	63.25	72.77	57.77
T4	18.95	35.47	49.12	54.32	59.68	18.85	34.87	45.90	57.85	39.37
T5	33.76	46.66	57.35	62.96	69.20	35.81	50.98	58.24	69.03	53.52

T6	26.06	39.43	49.76	56.17	61.74	29.54	45.37	50.62	62.49	47.01
T7	60.35	70.34	78.59	80.86	88.85	61.13	82.22	83.78	92.44	79.89
T8	--	--	--	--	--	--	--	--	--	--

*, Average of replication. Treatment details are given under Table 1. DAS, Days after sowing.

Using various fungicide combinations, which shown that these combinations were successful in controlling the disease with a good tuber yield.

Economic evaluation: Compared to other treatments, treatments T7 and T3 had the greatest pooled ICBRs of 16.09 and 9.74 (Supplementary Table 1). T7's ICBR was 65.2% greater than T3's, indicating an increase in gross revenue. Pooled data showed that T1 had a higher ICBR of 8.22 than T5 and T6 due to the lower overall cost of plant protection (₹3,140/ha). However, over the course of many years, yield was greater under T5 and T6 than under T1. According to Chakraborty and Mazumdar (2012), the most effective therapy for late blight disease in West Bengal was a first spray with Mancozeb @ 0.25%, followed by Cymoxanil+Mancozeb or Dimethomorph+Mancozeb @ 0.3% and Mancozeb @ 0.25%. The current investigation likewise showed a similar pattern of outcomes. Furthermore, our results are consistent with those of Lal et al. (2017), Mhatre et al. (2021), and Chakraborty and Banerjee (2016). In comparison to post-symptomatic sprays in the field, prophylactic spraying with contact fungicide, second spraying with translaminar/systemic + contact fungicide when the first symptoms appeared, third spraying with contact fungicide, and fourth spraying with translaminar/systemic + contact fungicide effectively managed the late blight disease. Protective fungicides prevent *P. infestans* zoospores or sporangia from germinating (Bruck et al. 1980). Fungistatic action may be ascribed to a mixture of systemic and contact fungicides that produce zoospores and sporangia. The greatest defence against this fatal threat is the prompt application of both preventative and therapeutic fungicides.

CITATIONS Al Harethi A A, Abdullah Q Y M, Al Jobory H J, Al Aquil S A, and Arafa R A. 2023. *Phytophthora infestans*, which causes potato late blight in Yemen, has been molecularly identified for the first time. 13: 16365 in Scientific Reports.

Alexandrov V. (2011). Some fungicides are effective against tomato late blight. *Journal of Agricultural Science in Bulgaria*, 17(4), 465-69.

Tyagi P, Singh B P, and Bhat M N. 2009. Translaminar fungicides' effectiveness against potato late blight in subtropical plains. *Mycology and Plant Pathology Journal* 39: 107–09.

Mundt C C, Apple A E, Fry W E, and Bruck R I. 1980. impact of protective fungicides on *Phytophthora infestans* developmental phases in potato leaves. 164–66 in *Phytopathology* 71.

Banerjee H. and Chakraborty A. (2016). Effective control techniques for potato late blight. Chakraborty A. and Mazumdar D. *SAARC Journal of Agriculture* 14(1): 111–17. 2012. creation of an efficient spray schedule to control potato late blight in West Bengal's plains. *Journal of Potatoes* 39: 92–94.

FAOSTAT, 2017. Information about food and agriculture. FAOSTAT, FAO Statistical Databases, 2020. <http://www.fao.org/faostat/en/#data/QCinfo> FAOSTAT. The FAOSTAT database is accessible at <https://www.potatonewstoday.com/2022/03/28/fao-updates-global-potato-statistics/FAOSTAT>. 2022. Gomez K. A. and Gomez A. A. 1984. Statistical Procedures for Agricultural Research, International Rice Research Institutes; accessible at <http://www.fao.org/faostat/en/#data/QC>. New York, Chichester, Brisbane, Toronto, Singapore, John Wiley and Sons, pg. 643.

Santhosha H M, Thulasiram K, Shashidhar K R, and Haveri N. 2018. *Phytophthora infestans*-induced potato late blight can be effectively managed. *Current Microbiology and Applied Science International Journal*, 7(9), 2688–95.

Struik P C, Visser R G F, Jacobsen E, and Haverkort A J. 2009. using biotechnology to fight *Phytophthora infestans*-caused potato late blight. *Potato Research* 52(3): 249–64.

Hembram S, Baskey S, Patsa R, and Hansda M. (2018). The impact of meteorological indicators on the control of late potato blight in the northern area of West Bengal, India. *Current Microbiology and Applied Science International Journal*, 7(9), 1737–43.

In 2020, Khadka R B, Chaulagain B, Subedi S, Marasini M, Rawal R, Pathak N, and Sharma P D. An assessment of fungicides used in Nepal's plains to prevent potato late blight (*Phytophthora infestans*). *Phytopathology Journal* 168(5): 245–53.

Grover A. and Khalid H. 2021. Late blight, or *Phytophthora infestans*

- of potato): A summary. *Agriculture Sciences Advances* 30: 35–60.
- Singh B P, Yadav S, and Lal M. 2017. effectiveness of novel fungicides against potato late blight in India's subtropical plains. *Pure and Applied Microbiology Journal* 11: 599–603.
- Manjunath B, Vasanthi B G, Devaraja S K N, and Manjunath G. 2017. Evaluation of *Phytophthora infestans*-induced late blight in potatoes. Mayee C. D. and Datar V. V. 1986. *Phytopathometry*, pages. 66. Tech. Bull-I Marathwada Agricultural University, Parbhani, Maharashtra. *International Journal of Plant Protection* 10(2): 410–14.
- Mc Kinney. 1923. A new plant disease grading system. *Agricultural Research Journal* 26: 195–218.
- Mhatre P M, Venkatasalam E P, Lekshmanan D, and Bairwa A 2021. Control of the late blight (*Phytophthora infestans*) potato disease in India's southern highlands. *Phytopathology Journal* 169(1): 52–61.
- Muchiri F N, Ariga E S, Nyankanga R O, Aanya O M, and Nada R D. 2009. The effectiveness of fungicide combinations in controlling *Phytophthora infestans* (US-1) on potatoes. *Phytoprotection* 90: 19–29. NHRDF. 2016. data on area productivity. India's National Horticultural Research and Development Foundation.
- In 2024, Pasalkar J, Gorde G, More C, Memane S, and Gaikwad V.
- Machine learning is used to identify potato leaf disease. *Journal of Current Agriculture Research*, 11(3), 949–54.
- Singh B P, Bhat M N, and Rani A. 2009. Efficacy of cymoxanil + mancozeb in suppressing late blight of potato in sub-tropical plains. *Mycology and Plant Pathology Journal* 39: 55–58. Roy B. Khatriya Phsaler Beej Utpadaner Adhunik Paddhati (Quality Seed Production Technology of Field Crops), 2015. Publ.
- Uttar Banga Krishi Viswavidyalaya, Director of Farm, Pundibari, Cooch Behar, West Bengal, pp. 95–105.
- Mounika K, Simon S, and Santosh B. 2021. In vivo assessment of bio-resources against *Phytophthora infestans*-caused potato late blight, plant development, and potato production (*Solanum tuberosum* L.). *Plant Pathology and Microbiology Journal* 12: 580.
- Saikia M. K. and Sharma P. (2013). Chemical management of potato late blight. 23–26 in *IOSR Journal of Agriculture and Veterinary Science* 2(2).
- In 2007, Shutong W, Tongle H U, Fengqiao Z, Forrer H R, and Keqiang C A O screened for plant extracts to prevent potato late blight. *China's Agricultural Frontiers* 1(1): 43–46.
- Mer R, Singh S S, and Renu. 2023. Combination fungicides are evaluated in the field to prevent potato (*Solanum tuberosum*) late blight. 217–20 in *The Indian Journal of Agricultural Sciences*, 93(2).
- Wiik L. (2014). Results from thirty years of field experiments on potato late blight and tuber production. 57: 77–98 in *Potato Research*.