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Attachment

# STUDIES ON LATE BLIGHT OF POTATOES AND TOMATOES IN CHITAWAN VALLEY, NEPAL

(3A-34)

Interim Progress Report

No. 2

TRIBHUWAN UNIVERSITY

INSTITUTE OF AGRICULTURE AND ANIMAL SCIENCE

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NEPAL

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# INTRODUCTION

Both potato and tomato crops are cultivated during winter in Chitawan valley. Although this valley is one of the most potential areas for cultivating these crops, the farmers are scared, they have lost the confident and cut off the areas of cultivation year after year. This was because of the late blight epidemic that occurs every year during main cropping season not these crops. As a result, the yield of potato crop is reduced by 78.8% and in case of tomato it may be even up to 100%. Heavy losses due to late blight disease on potato was also observed in the hills of Nepal during summer (Shrestha, 1970).

Therefore, different aspects have been taken to study about this disease, its occurrence, survival and the environmental factors that favours for the development of disease to epidemic proportion. Present study is mainly focused on management aspect so that the attack of disease could be reduced and the yield could be increased.

All the field experiments were conducted at IAAS, Rampur, Chitawan during the growing season of the year 1985-86, with the objectives of selecting the varieties of potato and tomato and slite modification of the environment which may result in reduction of heavy attack of late blight disease on potato and tomato at this valley.

## MATERIALS AND METHODS

In allthe experiments conducted in IAAS, Rampur to study about the late blight disease during the year 1985-86, the plant to plant and ow to row distances for potato and tomato were maintained at 25x60 cm and 50x75 cm, respectively. The fertilizers were applied at the rate of 100:80:60 kg NPK/ha foor potato and 140:80:60 kg NPK/ha for tomato through urea, complex and murate of potash on the top of FYM 200 Doko/Bigha (approx. 10 ton/ha). The phosphorus and potash were applied at the time of field preparation, while urea was applied in split doses ie. 20 kg N/ha was top dressed while earthing up to the potato plants and 60 kg N/ha was applied with split dose to the tomato plants. Watering of the plants were done whenever there was symptoms of water stress.

The disease intensity was recorded for all the experiments on the basis of following (0-5) arbitary scale.

**For Potato**

0 = No disease

1 = Less than 10% leaves of the plants infected with small lesions

2 = 10-25% leaves of the plants infected with large lesions

3 = 26-50% leaves of the plants infected with large lesions and slight infection on the stem (less than 10%)

4 = 51-75% leaves of the plants infected with large lesions and more infection on the stem (11-50%)

5 = More than 75% leaves of the plants infected with large lesions, stem infection moore than 50%, plants going to die or dead.

**For Tomato**

0 = No disease

1 = Less than 10% leaves of the plants infected with small lesions

2 = 10-25% leaves of the plants infected withlarger lesions

3 = 26-50% leaves of the plants infected with large lesions and upto 10% stems and fzuits infected

4 = 51-75% leaves of the plants infected with large lesions and 11-50% stems and fruits infected

5 = More than 75% leaves of the plants infected with large lesions, more than 50% stems and fr}its infected, plants going to die or dead

Twenty plants for potato and ten plants for tomato were selected to record disease intensity and yield from each experimental units throughout the experiments. Percent disease intensity was calculated by utilizing following formula:

$$\text{Percent disease intensity} = \frac{\text{Sum of allnumerical rating}}{\text{No. of plants observed} \times \text{Maximum rating}} \times 100$$

$$\text{and Percent disease control} = \frac{\text{Percent disease in control} - \text{Percent disease in control}}{\text{Percent disease in control}} \times 100$$

The potato and tomato cultivars/lines were categorised with late blight disease severity as follow:

| Percent disease intensity | | Category of cultivars/lines |
|---|---|---|
| 0 | = | immune |
| 1-10% | = | resistant |
| 11-25% | = | moderately resistant |
| 26-40% | = | moderately susceptible |
| 41-75% | = | susceptible |
| more than 75% | = | highly susceptible |

**Experiment No. 1**

Effect of planting dates

The 'Local Red' potato cultivar and 'Pusa Rubey' the commercial tomato variety were selected for this experiment. The potato tubers were sown at 10 day interval beginning from 21st September till 30th November, 1985 and tomato seeds were sown in the nursery beginning from August 31st till November 9th and the seedlings were transplanted after 3 weeks old in the field. These experiments had 8 treatments and 4 replications. RCBD design was applied.

In all the treatments the date of late blight disease appearance and the intensity of disease was recorded at three different times and averaged them.

**Experiment No. 2**

Screening of germplasms

Fifty four potato cultivars/lines were collected from different locations and were screened for their varying degree of resistance and susceptibility under natural field conditions against late blight caused by *Phytophthora infestans*. The disease intensity was noted after 50, 65, 80 days of sowing for each cultivars/lines, to take the average for each treatments.

Similarly, hundred twenty seven tomato cultivars/lines were transplanted in the field when the seedlings were 3 weeks old in the nursery. The seedlings were irrigated and fertilizer (nitrogenous) was applied and left for natural infection with late blight pathogens. Appearance of disease symptom was noted and the intensities were taken after 50, 70 and 90 days of

transplanting for each cultivars/lines.

**Experiment No. 3**

Chemical control

Locally available non-systemic fungicides were tested with different concentrations and intervals of spray. Potato variety 'Local Red' and tomato variety 'Pusa Ruby' were selected for this experiment because these varieties were found susceptible to disease and are commercially cultivated by most of the farmers. First spray was given when the initial symptoms of the late blight disease was observed in the experimental plots.

## RESULTS

### Effect of planting dates

Early planting (21st Sept.) completely escaped the potato crop from the late blight attack (Table 1). However, the disease intensity was found in increasing trend with the delay in planting time up to 6th sowing dates (10th Nov.) and then again the disease attack was found to decline. The disease intensity was recorded maximum (100%) in the 10th Nov. sowing, however, the yield of the potato was minimum (3.6 t/ha) in the last sown crop. Maximum yield (19.6 t/ha) was recorded from the 3rd planting (11th Oct.) with 68% disease intensity whereas the yield was only 14.0 t/ha in the first planting (21st Sept.) even without having any late blight disease incidence. This could be because of high soil temperature during the period of tuberization and plant growth. In the last sowing, the yield was minimum despite of having less amount of disease incidence as compair toother dates of sowing which could be because of high temperature poor soil moisture content and early attack of the plants by late blight did not allow the plant togrow vigerously. The increasing trend of disease with delay in planting could be explained by the presence of favourable climatic conditions and inoculum built up.

From the beginning of December 1985 to the 3rd week of February, 1986, the maximum day temperature was in between 22 to 27 deg C and the minimum night temperture was in between 6 to 12 deg C and the relative humidity was always about 90% in this period. Beside these climatic conditions there was sufficient dew

and morning fog till 9-10 a.m. All these conditions are very favourable for the development of disease in epidemic form.

In case of tomato var. 'Pusa Rubey' minimum disease incidence (28%) was recorded from the 1st seeded (August 31) crop with maximum yield (65.67 t/ha). As the seeding date is delayed the late blight disease incidence was increased and average yield was decreased (Table 2). In later dates, after October, 10 seeded crops the disease incidence was observed 100% and there was no marketable fruits harvested. The epidemic of late blight disease was common in late planted crops of tomato. This was because of the inoculum built-up in the viscinity of the experimental plots beside the existence of favourable climatic conditions. The plants were attacked at early vegetative growth stage and they were completely killed.This experiment clearly indicates that early planting can excape the heavy attack of late blight and good yield could be harvested.

**Screening of germplasms**

Out of fifty four different potato cultivars/lines screened for natural infestation withlate blight in the field conditions only three cultivars showed field resistance.They were Kufri Jyoti, Jaerala and CIP-720088. Other cultivars, CIP-575015, Hale, Dhankuta White, and Cruza-27 were found moderately resistant.The variety up-to-date, CIP-573275, Hayuja Local and Birtamod White, were moderately susceptible tolate blight incidence. Rest of all were either susceptible or highly susceptible (Table 3). Although the variety 'Kufri Jyoti' yielded highest (13.48 t/ha) but the yield was not significantly different withthose of the other varieties sowing field resistance upto moderate level.

In case oftomato, out of 127 different cultivars orlines screened for their resistance against late blight disease under normal field conditions, non of them showed any degree of resistance. All of them were observed very susceptible to the disease. However, some varieties have recouping capacity inlater stage when the temperature goes slightly high and the relative humidity decreases. Selection-04, Selection-03, Selection-02, Selection-01, 2-2-6-Ind, Kewalo (I) Sel-1, Dhankuta local, Baramuni local, AC-111, AC-142, AC-72, AC-451, Pusa Early Dwarf, Pusa Ruhey, Marglobe, Best of All, Palpa local-2, Rampur Sano, Dhankuta Majauia, Dharan local, MAC, AC-282, Illam local-1, Illam local-3 had certain degree of reviving ability but the highest recouping capacity was observed in the 'Rampur Sano' (Table 4).

**Effect of fungicides**

Application of fungicides reduced the incidence of late blight on potato as compair to control. Maximum (66%) disease was controlled by application of Dithane M45 at the rate of 0.5% at 6 day interval and the yield was also recorded maximum, 21.1 t/ha with this treatment, however, it was not significantly different with that of the plants sprayed by Dithane M45 (0.3%) at 6 day interval. Minimum disease was controlled (12%) byBlitox (0.3%) at 14 day interval. The yield of potato tubers was observed negatively correlated with that of the late blight incidence, because as the incidence increased, the yield was decreased. Dithane M45 was found much superior as compair to Blitox-50. It is clear from the Table 5 that the interval of spray played important role than the concentration of Dithane M45 application.

In case of tomato, although the disease pressure was less in case of fungicide treated plants as compair to control, the disease intensity was not much suppressed. Highest late blight incidence was ontrolled by application of Dithane M45 (0.5%) at 6 day interval and the yield was also maximum 14.79 t/ha (Table 6). Dithane M45 was superior to Blitox-50 in reducing late blight incidence.

Higher dose of Dithane M45 with short interval could suppress the late blight incidence in tomato in Chitawan valley. They requirement of higher dose with frequent interval in this valley to control late blight of tomato could be explained by the presence of high amoount of dew that will dilute the chemical after applcation.

## ISOLATION AND MAINTENANCE OF ISOLATES

The pathogen *Cytophthora infestans* causing late blight disease on potato and tomato were tried to isolate in the laboratory utilizing different media. Like potato Dextrose Agar, Bean meal Agar, Oat meal Agar, Potato and Tomato leaf decoction agar and potato cut tubers. The pathogen was successfully isolated during winter on potato cut tubers for morphological studies but it could not stored for longer period because of lack of facilities. The temperature goes high after winter in Rampur and the electricity often goes off which disturbs the storage conditions of the fungus.

Morphological characters of potato isolates and tomato isolates of *P. infestans* looks much similar. The mycelium had no differences. There was slight variation in the size of the sporangia. Variation in the sporangial size was also observed when the isolates were made from different varieties of either potato or tomato.

**Table 1:** Effect of planting dates on the incidence of late blight and yield of potato variety 'Local Red'.

| Treatments | Percent disease intensity | Average yield t/ha |
|---|---|---|
| Sowing of potato on Sept. 21 | 0 | 14.0 |
| ,, ,, Oct. 1 | 42 | 16.7 |
| ,, ,, Oct. 11 | 58 | 19.8 |
| ,, ,, Oct. 21 | 63 | 17.9 |
| ,, ,, Oct. 31 | 74 | 14.7 |
| ,, ,, Nov. 10 | 90 | 6.8 |
| ,, ,, Nov. 20 | 96 | 4.5 |
| ,, ,, Nov. 30 | 80 | 3.6 |
| CD at 5% | | 1.35 |

**Table 2:** Effect of seeding dates on the incidence of late blight and yield of tomato variety 'Pusa Ruby'.

| Treatments | Percent disease intensity | Average yield t/ha |
|---|---|---|
| Seeded on Aug. 31 | 33 | 25.67 |
| ,, Sep. 10 | 58 | 19.16 |
| ,, Sep. 20 | 90 | 14.92 |
| ,, Sep. 30 | 98 | 3.41 |
| ,, Oct. 10 | 100 | 0.0 |
| ,, Oct. 20 | 100 | 0.0 |
| ,, Oct. 30 | 100 | 0.0 |
| ,, Nov. 9 | 100 | 0.0 |

**Table 3:** Field screening of potato cultivars/lines against natural infecion with *Phtophthora infestans* and yield of potatoes.

| S.No. | Potato cultivars/lines | Percent disease intensity | Average yield (t/ha) |
|---|---|---|---|
| 1. | Nepalganj-1 | 90 | 5.35 |
| 2. | Nepalganj-2 | 92 | 2.62 |
| 3. | Kufri Sindhuri | 84 | 6.50 |
| 4. | Deshi Red | 99 | 3.33 |
| 5. | Local Red | 99 | 4.50 |
| 6. | Local White | 99 | 2.08 |
| 7. | Dang Local | 82 | 6.62 |
| 8. | Misuwa | 99 | 3.33 |
| 9. | Deshi Safed | 90 | 6.66 |
| 10. | Deshi Red | 100 | 4.00 |
| 11. | K-2305 | 64 | 7.37 |
| 12. | Var-1-1062 | 68 | 6.08 |
| 13. | SIB-I-408 | 84 | 5.00 |
| 14. | CFM | 84 | 6.66 |
| 15. | Lumle Red | 95 | 2.70 |
| 16. | Beautex | 100 | 1.43 |
| 17. | Chhapadiya | 95 | 3.11 |
| 18. | Deshala | 95 | 3.33 |
| 19. | Sargam | 95 | 3.43 |
| 20. | Birtamod White | 38 | 9.99 |
| 21. | Pharasi | 90 | 5.31 |
| 22. | Hiude | 80 | 5.83 |

| | | | |
|---|---|---|---|
| 23. | Illam Red | 90 | 5.31 |
| 24. | Dhankuta Red | 70 | 5.16 |
| 25. | Dhankuta White | 16 | 12.32 |
| 26. | Hale | 25 | 12.53 |
| 27. | Hayaja Local | 34 | 8.77 |
| 28. | Lumle White | 84 | 2.04 |
| 29. | Kaskikot Local | 76 | 3.05 |
| 30. | Chitwan Local Red | 94 | 3.69 |
| 31. | BR-63/65 | 80 | 6.55 |
| 32. | Hyb-14 | 70 | 4.57 |
| 33. | CIP-270088 | 10 | 13.00 |
| 34. | CIP-573275 | 40 | 6.89 |
| 35. | CIP-377831.5 | 94 | 3.33 |
| 36. | CIP-575015 | 12 | 12.18 |
| 37. | Sarkari | 76 | 5.82 |
| 38 | Desiree | 84 | 6.66 |
| 39. | Cruza-27 | 18 | 13.06 |
| 40. | Jaerala | 10 | 12.15 |
| 41. | Red Pontiac | 97 | 3.10 |
| 42. | Up-to-date | 36 | 6.94 |
| 43. | Kennebec | 48 | 6.89 |
| 44. | NPI-106 | 60 | 4.52 |
| 45. | Sequola | 98 | 2.16 |
| 46. | Kutri Jyoti | 8 | 13.48 |
| 47. | Cardinal | 86 | 4.50 |
| 48. | Pahelo | 92 | 3.89 |
| 49. | Rato | 86 | 4.46 |

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|---|---|---|---|
| 50. | Fatima | 90 | 3.46 |
| 51. | Seto | 90 | 3.11 |
| 52. | Kalo | 84 | 4.36 |
| 53. | Nainital White | 78 | 5.21 |
| 54. | Darjeeling Red Round | 88 | 5.11 |

**Table 4:** Field screening of tomato germplasms against natural epidemic of late blight during the year 1985/86.

| S.No. | Name of cultivars/lines | Percent disease | Recovering (%) |
|---|---|---|---|
| 1. | Roma | 99.2 | 0.0 |
| 2. | No. 84236 | 99.5 | 0.0 |
| 3. | No. 84252 | 99.8 | 0.0 |
| 4. | No. 84253 | 99.6 | 0.0 |
| 5. | 379 Shiny Boy | 100.0 | 0.0 |
| 6. | Farmers' 301 F1 Hyb | 100.0 | 0.0 |
| 7. | Fortune F1 Hyb | 100.0 | 0.0 |
| 8. | No. 37 (N.F.) | 100.0 | 0.0 |
| 9. | Manpreems | 100.0 | 0.0 |
| 10. | Selection-04 | 98.0 | 10.0 |
| 11. | Selection-03 | 92.8 | 65.0 |
| 12. | Selection-02 | 93.0 | 45.0 |
| 13. | Selection-01 | 97.0 | 10.0 |
| 14. | 2-2-6-fnd. | 91.6 | 50.0 |
| 15. | Kewalo (I) Sel-1 | 89.5 | 35.0 |
| 16. | Kewalo (O) Sel-1 | 92.0 | 0.0 |
| 17. | Chinese | 99.0 | 0.0 |
| 18. | Red Cherry | 91.5 | 0.0 |
| 19. | Dhankuta Local | 95.8 | 60.0 |
| 20. | Saramuni Local | 94.9 | 30.0 |
| 21. | AC-256 | 92.4 | 0.0 |
| 22. | AC-111 | 89.5 | 30.0 |
| 23. | Khajura Local | 92.0 | 0.0 |

| | | | |
|---|---|---|---|
| 24. | Kunarbash Local | 91.4 | 0.0 |
| 25. | Haripura Local | 92.6 | 0.0 |
| 26. | Rajbeni Local | 95.0 | 0.0 |
| 27. | Belbahura Local | 96.5 | 0.0 |
| 28. | GC-142 | 93.8 | 20.0 |
| 29. | GC-72 | 92.5 | 25.0 |
| 30. | GC-437 | 98.0 | 0.0 |
| 31. | GC-451 | 93.2 | 30.0 |
| 32. | CL-5915-314 D4-1-1-0 | 100.0 | 0.0 |
| 33. | Hanpreeris | 99.6 | 0.0 |
| 34. | Pusa Early Dwarf | 93.0 | 10.0 |
| 35. | VC-18-1 | 98.0 | 0.0 |
| 36. | VC-35-1 | 99.0 | 0.0 |
| 37. | Apollo | 95.8 | 0.0 |
| 38. | Mapikit | 96.2 | 0.0 |
| 39. | Solsnapole | 99.2 | 0.0 |
| 40. | No. 32 | 100.0 | 0.0 |
| 41. | Chinese | 100.0 | 0.0 |
| 42. | Tropic-368-524 | 100.0 | 0.0 |
| 43. | Rome | 95.0 | 0.0 |
| 44. | CL 5715-204 D4-1-2-0 | 98.0 | 0.0 |
| 45. | CL 5915-223 D4-3-2-0 | 99.8 | 0.0 |
| 46. | CL 5915-153 D4-3-3-0 | 100.0 | 0.0 |
| 47. | CL 5915-153 D4-3-6-0 | 100.0 | 0.0 |
| 48. | CL 5915-229 D4-1-1-0 | 100.0 | 0.0 |
| 49. | CL 1131-0-0-7-2-0-11 | 100.0 | 0.0 |
| 50. | CL 1131-0-0-3-8-1 | 100.0 | 0.0 |

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|---|---|---|---|
| 51 | Pusa Ruby Rampur | 91.5 | 50.0 |
| 52. | Pusa Ruby-12 | 92.0 | 0.0 |
| 53. | Marbiobe | 93.8 | 10.0 |
| 54. | Pusa Ruby Nepali | 96.0 | 0.0 |
| 55. | Pusa Early Dwarf | 94.2 | 15.0 |
| 56. | W-16-18-19-26 | 100.0 | 0.0 |
| 57. | W-7-8-18 | 100.0 | 0.0 |
| 58. | W-6-8-17-20-22-23-24 | 100.0 | 0.0 |
| 59. | W-4-10-11-12-13-14-21-23-24 | 100.0 | 0.0 |
| 60. | Watermelon-21-25-27 | 100.0 | 0.0 |
| 61. | Pinkstone-9-14-16 | 100.0 | 0.0 |
| 62. | Watermelon-2-2-25-14 | 100.0 | 0.0 |
| 63. | Money Maker | 91.5 | 5.0 |
| 64. | Roma | 99.0 | 0.0 |
| 65. | S-12 | 91.0 | 0.0 |
| 66. | Best of All | 89.5 | 25.0 |
| 67. | Marbiobe | 89.5 | 10.0 |
| 68. | Pusa Gaurav | 98.0 | 0.0 |
| 69. | Dalalen | 100.0 | 0.0 |
| 70. | Sioux | 98.5 | 0.0 |
| 71. | Salimar-1 | 94.9 | 0.0 |
| 72. | Ox-heart | 89.9 | 0.0 |
| 73. | Lalmani | 93.2 | 0.0 |
| 74. | Solan Gola | 100.0 | 0.0 |
| 75. | Adamghat Local | 91.5 | 0.0 |
| 76. | Palpa Local-1 | 89.5 | 0.0 |
| 77. | Palpa Local-2 | 88.2 | 35.0 |

| | | | |
|---|---|---|---|
| 78. | Palpa Local-3 | 96.4 | 0.0 |
| 79. | Palpa Local-4 | 93.9 | 0.0 |
| 80. | Rampur Cane | 86.8 | 75.0 |
| 81. | Dhankuta Rajauta | 98.2 | 25.0 |
| 82. | Dharan Local | 91.5 | 35.0 |
| 83. | Harglabe | 94.0 | 10.0 |
| 84. | Manpreetus | 100.0 | 0.0 |
| 85. | Roma | 100.0 | 0.0 |
| 86. | Pusa Early Dwarf | 92.0 | 15.0 |
| 87. | No. 32 | 100.0 | 0.0 |
| 88. | Marioka | 100.0 | 0.0 |
| 89. | BF-101 | 100.0 | 0.0 |
| 90. | HAC | 91.5 | 20.0 |
| 91. | AC-282 | 85.6 | 35.0 |
| 92. | HS-101 | 89.2 | 25.0 |
| 93. | Hyb-8 | 100.0 | 0.0 |
| 94. | Pant-12 | 92.0 | 0.0 |
| 95. | Pusa Early Dwarf | 93.4 | 10.0 |
| 96. | HI-8 | 90.8 | 0.0 |
| 97. | J-10-2-2 | 95.0 | 0.0 |
| 98. | Ajad Kranti | 89.8 | 10.0 |
| 99. | Point Rosa | 98.2 | 0.0 |
| 100. | CL-5915-39 D4-1-4B | 100.0 | 0.0 |
| 101. | CL-5915-93 D4-1-0 | 100.0 | 0.0 |
| 102. | CL-5915 (3) D4-1-0 | 100.0 | 0.0 |
| 103. | Solan Gola | 100.0 | 0.0 |
| 104. | AC-282 | 91.2 | 15.0 |

| | | | |
|---|---|---|---|
| 105. | Selection-22 | 94.5 | 0.0 |
| 106. | Morutham | 92.8 | 0.0 |
| 107. | Sel-T | 89.5 | 0.0 |
| 108. | Pusa [illegible]-2 | 89.9 | 0.0 |
| 109. | S-12 | 91.5 | 0.0 |
| 110. | Sinus | 99.5 | 0.0 |
| 111. | Punjab Chhura | 89.5 | 0.0 |
| 112. | Pusa [illegible] Quarf | 92.0 | 10.0 |
| 113. | Pusa [illegible] | 98.2 | 0.0 |
| 114. | Pusa Subey | 94.5 | 15.0 |
| 115. | Mangloha | 93.4 | 10.0 |
| 116. | [illegible] | 92.5 | 15.0 |
| 117. | Moruthum | 91.0 | 0.0 |
| 118. | Kurihasa | 100.0 | 0.0 |
| 119. | CI-5915-314 D4-1-1-0 | 100.0 | 0.0 |
| 120. | PI-203[illegible] | 100.0 | 0.0 |
| 121. | PI-203[illegible] | 100.0 | 0.0 |
| 122. | Dhankuta Thulo | 92.0 | 15.0 |
| 123. | Illam Local-1 | 95.6 | 15.0 |
| 124. | Illam Local-2 | 94.2 | 0.0 |
| 125. | Illam Local-3 | 93.5 | 25.0 |
| 126. | Dhankuta Majauta | 92.8 | 15.0 |

**Table 5:** Effect of fungicides application on the incidence of late blight and yield of potato during 1985/86.

| Treatments | Disease intensity (%) | Disease control (%) | Average yield (t/ha) |
|---|---|---|---|
| Blitox-50 (0.5%) at 14 day interval | 73.3 | 12.0 | 6.3 |
| ,, ,, 12 ,, ,, | 61.6 | 26.0 | 8.1 |
| ,, ,, 10 ,, ,, | 56.6 | 32.0 | 11.5 |
| ,, ,, 8 ,, ,, | 48.2 | 42.1 | 11.7 |
| ,, ,, 6 ,, ,, | 45.7 | 45.1 | 13.9 |
| Dithane M45(0.3% at 14 ,, ,, | 55.0 | 33.9 | 9.3 |
| ,, ,, 12 ,, ,, | 44.1 | 47.0 | 10.9 |
| ,, ,, 10 ,, ,, | 43.3 | 48.0 | 13.2 |
| ,, ,, 8 ,, ,, | 34.1 | 59.0 | 16.5 |
| ,, ,, 6 ,, ,, | 30.8 | 63.0 | 20.3 |
| Dithane M45(0.5% at 14 ,, ,, | 46.5 | 44.1 | 9.8 |
| ,, ,, 12 ,, ,, | 43.3 | 48.0 | 11.7 |
| ,, ,, 10 ,, ,, | 40.8 | 51.0 | 14.3 |
| ,, ,, 8 ,, ,, | 31.6 | 62.0 | 18.7 |
| ,, ,, 6 ,, ,, | 28.3 | 66.0 | 21.1 |
| Control (no spray) | 83.3 | 0.0 | 4.9 |

**Table 6:** Effect of fungicides application on the incidence of late blight and yield of tomato during 1985/86.

| Treatments | Disease intensity (%) | Disease control (%) | Average yield (t/ha) |
|---|---|---|---|
| Blitox-50 (0.3%) at 14 day interval | 96.6 | 3.4 | 5.0 |
| ,, ,, 12 ,, ,, | 89.0 | 11.0 | 5.29 |
| ,, ,, 10 ,, ,, | 86.6 | 13.4 | 5.93 |
| ,, ,, 8 ,, ,, | 80.0 | 20.0 | 6.59 |
| ,, ,, 6 ,, ,, | 78.0 | 22.0 | 7.44 |
| Dithane M45(0.3% at 14 ,, ,, | 71.3 | 28.7 | 5.98 |
| ,, ,, 12 ,, ,, | 70.9 | 29.1 | 6.65 |
| ,, ,, 10 ,, ,, | 66.6 | 33.4 | 8.37 |
| ,, ,, 8 ,, ,, | 63.3 | 36.7 | 9.36 |
| ,, ,, 6 ,, ,, | 60.6 | 39.4 | 11.19 |
| Dithane M45(0.5%)at 14 ,, ,, | 70.0 | 30.0 | 5.87 |
| ,, ,, 12 ,, ,, | 68.0 | 32.0 | 6.65 |
| ,, ,, 10 ,, ,, | 63.3 | 36.7 | 9.07 |
| ,, ,, 8 ,, ,, | 60.3 | 39.7 | 11.01 |
| ,, ,, 6 ,, ,, | 55.0 | 45.0 | 14.79 |
| Control (no spray) | 100.0 | 0.0 | 2.87 |

**Meteriologicai data (Weekly Average)**

| Date | Temperature Max C | Min C | Relative Humdity (%) | Rainfall in mm | Morning Fog upto (A.M.) | Cloudy Sky |
|---|---|---|---|---|---|---|
| 1st week of Sept.1985 | 32.42 | 24.57 | 96.14 | 24.78 | - | Mostly Partial |
| 2nd week of Sept.1985 | 34.28 | 24.00 | 80.71 | 10.61 | - | Mostly Clear |
| 3rd week of Sept.1985 | 33.28 | 22.28 | 86.57 | 14.34 | - | Mostly Partial |
| 4th week of Sept.1985 | 32.28 | 22.28 | 86.42 | 8.52 | - | Mostly Partial |
| 1st week of Oct. 1985 | 32.71 | 22.14 | 84.0 | - | - | Mostly Clear |
| 2nd week of Oct. 1985 | 30.28 | 21.14 | 87.85 | 18.57 | - | Mostly Partial |
| 3rd week of Oct. 1985 | 30.28 | 18.85 | 86.85 | 6.85 | - | ,, |
| 4th week of Oct. 1985 | 31.00 | 15.71 | 84.57 | - | 8-10 | Mostly Clear |
| 1st week of Nov. 1985 | 30.28 | 14.85 | 89.71 | - | 8-9 | Clear |
| 2nd week of Nov. 1985 | 28.28 | 13.85 | 88.71 | - | 8-9 | ,, |
| 3rd week of Nov. 1985 | 29.71 | 11.14 | 94.25 | - | 7-9.30 | ,, |
| 4th week of Nov. 1985 | 27.47 | 10.71 | 91.85 | - | 9-10 | Mostly Partial |
| 1st week of Dec. 1985 | 26.42 | 10.14 | 96.57 | - | 9-10.30 | ,, |
| 2nd week of Dec. 1985 | 25.85 | 9.57 | 95.85 | - | 8-10 | ,, |
| 3rd week of Dec. 1985 | 24.71 | 11.14 | 97.00 | - | 9-10.30 | ,, |
| 4th week of Dec. 1985 | 22.42 | 9.57 | 98.57 | 11.25 | 9-11 | ,, |
| 1st week of Jan. 1986 | 18.85 | 9.28 | 100.00 | - | 9-10.30 | ,, |
| 2nd week of Jan. 1986 | 24.62 | 8.0 | 99.12 | - | 10-10.30 | Mostly Clear |
| 3rd week of Jan. 1986 | 24.85 | 7.0 | 98.00 | - | 8-11 | ,, |
| 4th week of Jan. 1986 | 25.28 | 7.71 | 94.14 | - | 7-11.30 | Mostly Partial |
| 1st week of Feb. 1986 | 24.85 | 9.28 | 97.00 | - | 8-12 | ,, |
| 2nd week of Feb. 1986 | 25.75 | 9.75 | 90.50 | 2.13 | 7-10 | ,, |
| 3rd week of Feb. 1986 | 25.14 | 9.57 | 87.85 | 1.14 | - | Mostly Clear |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4th week of Feb. | 1986 | 28.42 | 10.0 | 87.28 | - | - | Clear |
| 1st week , March | 1986 | 29.42 | 10.14 | 75.71 | - | - | Mostly Partia |
| 2nd week, March | 1986 | 32.00 | 13.57 | 72.71 | - | - | ,, |
| 3rd week, March | 1986 | 32.71 | 13.28 | 54.85 | - | - | Mostly Clear |
| 4th week, March | 1986 | 34.71 | 13.14 | 50.42 | - | - | ,, |
| 1st week, April | 1986 | 37.28 | 15.71 | 42.71 | 0.14 | - | ,, |
| 2nd week, April | 1986 | 34.83 | 15.14 | 66.66 | 6.76 | - | ,, |