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# Response of different dates of sowing along with different grades of black scurf infection on plant stand, disease development and tuber yield of potato

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The study conducted at Tirhuc College of Agriculture Farm, Dholi (Muzaffarpur) during rabi season of 2001-2002, showed that there was negative correlation (r = –0.6) between the intensity of scurfed tubers and plant stand alongwith yield of tubers in the field. Maximum plant stand (82.4 thousand) and maximum yield (218.4 q/ha) were obtained with healthy seed tubers and declining yield trend was recorded in case of scurfed tuber. Early days of sowing i.e. on 10th and 20th October showed almost similar plant stand (77.1 thousand) and after this date declining trend in the plant stand was recorded irrespective of the grades of tuber infection. Maximum disease incidence (43%) and intensity (2.2) were recorded when grades of tuber infection was more than 75 per cent and minimium disease incidence (2.1%) and intensity (1.0) with healthy tubers.

**Key words :** Potato, date of sowing, black scurf infection, tuber yield

## INTRODUCTION

Potato (*Solanum tuberosum* Khun) suffers from many diseases of which black scurf caused by *Rhizoctonia solani* Kuhn. has been found major one in India. Besides the loss of quality, the disease is also responsible for a loss in yield ranging from 16 to 34 per cent. Bihar is one of the most important potato growing states in India with an area of 0.15 million hectare and production of 1.38 million tonnes (D.E.S., 2000-2001). Different dates of sowing, a major non-monetary input, plays significant role in reducing the disease there by improving the yield. The present study has been undertaken to evaluate the disease intensity and yield potential under different dates of sowing alongwith different grade of tuber infection in the northern Bihar zone.

## MATERIALS AND METHODS

The experiment was conducted at Tirhut College of Agriculture farm, Dholi (Muzaffarpur), a campus of Rajendra Agricultural University, Pusa (Samastipur) Bihar during winter (Rabi) season of 2001-2002. The experimental plot was upland and fairly uniform in topography and the soil was deep and well drained. The experiment was conducted in the split plot design as date of planting in the main plot and grades of tuber infection in sub-plot. The gross plot size was 2.4 × 2 m and the net size was 1.20 × 1.6 m with the plant spacing of 60 × 20 cm. The diseased tubers were classified on the basis of surface area covered with sclerotia of scurf fungus and the following infection grades were designated.

| Grade of infection | Description |
|---|---|
| 0 | No visible sclerotia on tubers i.e. apparently healthy tubers |
| 1 | Area covered with sclerotia upto 25% of surface area |
| 2 | More than 25% and upto 50% tuber area covered with sclerotia |
| 3 | More than 50% and upto 75% tuber area covered with sclerotia |
| 4 | More than 75% tuber area covered with sclerotia |

These graded tubers were sown at 10 day interval starting from 10th October and upto 10th December. Recommended package of practices were adopted during the entire seasons of experimentation. Response of different grades of tuber infection and different dates of sowing was studied in relation to the final plant stand and development of disease in the field. Tuber yield was recorded at harvest.

## RESULTS AND DISCUSSION

Response of different grades of tuber infection and different dates of sowing was studied in relation to final plant stand in the field and the data are presented in Table 1. It is clear from the data that there was negative correlation (r = –0.6) with the intensity of scurfed tuber and the plant stand in the field indicating highest plant stand (82.4 thousand) in case of tubers with no infection whereas the least plant stand (68.5 thousand) where more than 75 per cent of seed tuber were covered with fungal sclerotia. Other grades of tuber infection showed intermediary plant stand ranging from 73.5 to 81.0 thousand. This might be due to scurfed tuber have grater inoculum potential than a clear tuber. Kannaiyan *et al.* (1981), Gudmestad *et al.* (1999) and Sanford (1941) also reported that increase in inoculum potential increased the disease severities and hence it decreased the plant stand in the field. These data also indicate that during early days of sowing i.e. on 10th and 20th October almost similar plant stand (71.1 thousand) was recorded and after 20th October there was declining trend in the plant stand upto 10th November and after this date again there was enhancement in the plant stand irrespective of the grades of tuber infection. This

**Table 1 :** Effect of dates of sowing alongwith grades of tuber infection on the plant stand in the field

| Sowing date | Grades of tuber infection | | | | | |
|---|---|---|---|---|---|---|
| | 0% | Upto 25% | Above 25 to 50% | Above 50 to 75% | Above 75 to 100% | Average (%) |
| 10th October | 83.3 | 81.3 | 77.1 | 75.0 | 68.8 | 77.1 |
| 20th October | 83.3 | 81.3 | 77.1 | 75.0 | 68.8 | 77.1 |
| 30th October | 81.3 | 81.3 | 75.0 | 75.0 | 66.7 | 75.9 |
| 10th November | 81.3 | 77.1 | 72.9 | 68.8 | 62.5 | 72.5 |
| 20th November | 81.3 | 81.3 | 72.9 | 68.8 | 66.7 | 74.2 |
| 30th November | 83.3 | 81.3 | 77.1 | 75.0 | 70.8 | 77.5 |
| 10th December | 83.3 | 83.3 | 81.3 | 77.0 | 75.0 | 80.0 |
| Average | 82.4 | 81.0 | 76.2 | 73.5 | 68.5 | |

| *A. Grade of Tuber infection* | | | *B. Date of sowing* | | *C. interaction effect* | |
|---|---|---|---|---|---|---|
| $I_1$ | — | 82.4 | $S_1$ | — 77.1 | I × S | |
| $I_2$ | — | 81.0 | $S_2$ | — 77.1 | SEm± | — 0.13 |
| $I_3$ | — | 76.2 | $S_3$ | — 75.9 | CD(0.5) | — 0.36 |
| $I_4$ | — | 73.5 | $S_4$ | — 72.5 | I — Grade of tuber infection | |
| $I_5$ | — | 68.5 | $S_5$ | — 74.2 | | |
| SEm± | — | 4.9 | $S_6$ | — 77.5 | S — Sowing Date | |
| CD(0.05) | — | 0.13 | $S_7$ | — 80.0 | | |
| | | | SEm± | — 5.8 | | |
| | | | CD(0.05) | — 0.16 | | |

**Table 2 :** Effect of dates of sowing and grades of tuber infection on the development of black scurfed infection

| Date of Sowing | Grades of tuber infection | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0% | | Upto 25% | | Above 25% to 50% | | Above 50 to 75% | | Above 75 to 100% | | Average | |
| | Incidence (%) | Intensity (0-4) | Incidence (%) | Intensity (0-4) | Incidence (%) | Intensity (0-4) | Incidence (%) | Intensity (0-4) | Incidence (%) | Intensity (0-4) | Incidence (%) | Intensity (0-4) |
| 10th October | 2.0 | 1.0 | 4.0 | 1.2 | 25 | 1.5 | 35 | 1.7 | 40 | 2.2 | 21.2 | 1.5 |
| 20th October | 3.0 | 1.0 | 6.0 | 1.4 | 35 | 1.7 | 40 | 1.8 | 46 | 2.4 | 26.0 | 1.7 |
| 30th October | 3.0 | 1.0 | 8.0 | 1.6 | 35 | 1.6 | 42 | 1.7 | 52 | 2.5 | 28.0 | 1.7 |
| 10th November | 3.0 | 1.0 | 5.0 | 1.5 | 30 | 1.6 | 38 | 1.7 | 47 | 2.3 | 24.6 | 1.6 |
| 20th November | 2.0 | 1.0 | 5.0 | 1.2 | 30 | 1.4 | 35 | 1.6 | 42 | 2.0 | 22.8 | 1.4 |
| 30th November | 1.0 | 1.0 | 4.0 | 1.0 | 25 | 1.3 | 32 | 1.4 | 39 | 2.0 | 20.2 | 1.3 |
| 10th December | 1.0 | 1.0 | 3.0 | 1.0 | 15 | 1.0 | 28 | 1.2 | 35 | 1.8 | 16.4 | 1.2 |
| Average | 2.1 | 1.0 | 5.0 | 1.3 | 27.9 | 1.4 | 35.7 | 1.6 | 43 | 2.2 | | |

| *A. Grade of Tuber infection* | |
|---|---|
| $I_1$ | 2.1 |
| $I_2$ | 5.0 |
| $I_3$ | 27.9 |
| $I_4$ | 35.7 |
| $I_5$ | 43.0 |
| SEm± | 0.4 |
| CD(0.05) | 1.14 |

| *B. Date of sowing* | |
|---|---|
| $S_1$ | 21.2 |
| $S_2$ | 26.0 |
| $S_3$ | 28.0 |
| $S_4$ | 24.6 |
| $S_5$ | 22.8 |
| $S_6$ | 20.2 |
| $S_7$ | 16.4 |
| SEm± | 0.47 |
| CD(0.05) | 1.3 |

| *C. Interaction effect* | |
|---|---|
| | A × B (I × S) |
| SEm± | 1.0 |
| CD(0.5) | 3.0 |
| I — | Grade of tuber infection |
| S — | Sowing Date |

might be due to the decrease in the soil temperature resulting lesser load of inoculum near the rhizosphere. Lower temperature also caused hindrance in disease development in case of delayed sowing i.e. sowing after 10th November. However, this is not in accordance with findings of Singh and Singh (1999) and Lal *et al.* (1981). The data presented in Table 2 explain the effect of dates of sowing and grades of tuber infection on the development of Black scurfe infection. It is clear from the data that the maximum disease incidence (43%) and intensity (2.2) were recorded when grades of tuber infection was more than 75 per cent and the minimum disease incidence (2.1%) and intensity (1.0) with healthy tuber. Again the minimum disease incidence (16.4%) and intensity (1.2) were recorded on 10th December sowing irrespective of grades of tuber infection.

**Table 3 :** Effect of dates of sowing alongwith tuber infection on tuber yield (q/ha)

| Sowing date | Grades of tuber infection | | | | | |
|---|---|---|---|---|---|---|
| | 0% | Upto 25% | Above 25 to 50% | Above 50 to 75% | Above 75 to 100% | Average (q/ha) |
| 10th October | 190.0 | 184.0 | 155.0 | 127.0 | 105.0 | 152.2 |
| 20th October | 215.0 | 208.0 | 180.0 | 153.0 | 145.0 | 180.2 |
| 30th October | 250.0 | 240.0 | 214.0 | 192.0 | 185.0 | 216.2 |
| 10th November | 255.0 | 248.0 | 222.0 | 201.0 | 195.0 | 224.2 |
| 20th November | 242.0 | 237.0 | 204.0 | 195.0 | 188.0 | 213.2 |
| 30th November | 220.0 | 216.0 | 198.0 | 158.0 | 147.0 | 187.8 |
| 10th December | 157.0 | 154.0 | 138.0 | 115.0 | 109.0 | 134.6 |
| Average | 218.4 | 212.4 | 187.3 | 163.0 | 153.4 | |

*A. Grade of Tuber infection*

$I_1$ — 218.4
$I_2$ — 212.4
$I_3$ — 187.3
$I_4$ — 163.0
$I_5$ — 153.4
SEm± — 0.39
CD(0.05) — 1.10

*B. Date of sowing*

$S_1$ —152.2
$S_2$ —180.2
$S_3$ —216.2
$S_4$ —224.2
$S_5$ —213.2
$S_6$ —187.8
$S_7$ —134.6
SEm± — 0.046
CD(0.05) — 1.30

*C. interaction effect*

I × S
SEm± — 1.0
CD(0.5) — 2.9
I — Grade of tuber infection
S — Sowing Date

Response of grades of tuber infection and different dates of sowing were also studied in relation to the tuber yield and the data are presented in Table 3. It is clear from the data that the maximum tuber yield (218.4 q/ha) was obtained with healthy seed tubers and declining yield trend was recorded in case of the use of scurfed tuber, other dates of sowing resulted intermidiary tuber yield.

The yield of tuber increased when sowing was done on 10th November and onward upto 10th December with healthy seed. These increase in yield might be due to decrease in inoculum potential and a congenial environmental condition for plant growth.

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