

## RESEARCH ARTICLE

# Survey on natural occurrence of diseases in potato at various locations of Odisha

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## ABSTRACT

Potato is a high yielding short duration crop and produces statically more edible energy, protein and dry matter per unit area and time than many other crops. Major contributing factor for reduction of yield in the state (14.1 q/h) of the crop than national level (18.8 q/h) was due to occurrence of different diseases. The present study was conducted at 7 locations and 6 districts of Odisha to assess the percentage of disease incidence following fixed plot survey in three consecutive years 2005-06 to 2007-08. The survey revealed that early blight, late blight, black leg, bacterial wilt and mild mosaics were different diseases in growing stage while the diseases like brown rot, soft rot and scab could be noticed at the harvesting stage.

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## INTRODUCTION

Potato is the number one vegetable crop in India. Odisha occupies 15<sup>th</sup> position both in area and production in the country. It is the 4<sup>th</sup> important vegetable crop of the state and cultivated in all 30 districts of the state in winter season and also in *Kharif* season in undivided Koraput and Phlbani districts. The prevalence of warm humid condition, wide host-range, high water table, fluctuating temperature and varied soil factor favour both fungal and bacterial diseases at different growth stages of the potato crop in coastal plains of Odisha (Shekhawat, *et al.*, 1978 and Gadewar *et al.*, 1999). Reduction in plant population due to pre and post-emergence rotting of seed tubers, wilting of the plants even before tuberization and heavy foliar damage due to different microbial association sometimes warrants the economic yield of the crop resulting in about 100 per cent loss in crop yield. Considering the extensive losses in tuber yield by different diseases, fixed plot survey was undertaken to assess the percentage of disease incidence mostly on blight, black leg, bacterial wilt, brown rot, soft rot etc. at 7 different locations of Odisha state, during three consecutive cropping years, 2005-05, 2006-07 and 2007-08.

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## MATERIALS AND METHODS

Seven different locations, such as, Bhubaneswar (the farm of All India Co-ordinated Research Project on Potato), Salipur, Jagatsinghpur, Jajpur, Bolanga, Balipatna, Kendrapara where potato is grown intensively irrespective of years were selected for the study. In each location, an area of 500sq.mtr was selected where potato was grown following standard method of cultivation with FYM 10t/ha, NPK @ 120:80:100 kg/ha, 60x20 cm spacing was maintained between row to row and plant to plant. The planting of potato tubers was done coinciding with the farmer's practice of the area.

Three popular potato cultivars Kufri, Ashoka, Kufri, Chandramukhi (80 days duration) and Kufri, Jyoti (90 days duration) were grown in the specified plots in order to maintain the uniformity in all the locations. The trial was continued for three consecutive years starting from 2005-06 to 2007-08. Observations on natural occurrence of different diseases in potato were recorded at 70 days of planting and at harvest.

### Early and late blight :

Standard scale was used to record the disease

occurrence of early blight and late blight and expressed in PDI .The early blight of potato was calculated in 0-7 Point Scale (Chist,1991) as (0-No symptom on leaf,1 – Trace to 1 per cent leaf area covered, 2 – 1 to 5 per cent leaf area covered,3-6 to 10 per cent leaf area covered,4- 11 to 25 per cent leaf area covered,5-26 to 50 per cent leaf area covered, 6 -51 to 75 per cent leaf area covered ,7-76to 100 per cent leaf area covered).

The percentage disease index(PDI) was calculated on recorded observations using the following formula :

$$\text{Percentage disease index} = \frac{\text{Sum of total ratings} \times 100}{\text{Maximum rating} \times \text{total number of samples}}$$

The late blight of potato was calculated by 0-9 point scale (Rahman *et al.*, 2008) as follows ( 1=No infection, 2-3 per cent leaf area covered, 3-10 per cent leaf area covered,4- 25 per cent leaf area covered, 5-50 per cent leaf area covered, 6- 75 per cent leaf area covered, 7-90 per cent leaf area covered, 8- 97 per cent leaf area covered, 9-100 per cent leaf area covered).

The percentage disease index(PDI) was calculated on recorded observations using the following formula :

$$\text{Percentage disease index} = \frac{\text{Sum of total ratings} \times 100}{\text{Maximum rating} \times \text{total number of samples}}$$

**Bacterial wilt, black leg and mild mosaics :**

Occurrence of all these diseases were recorded by counting the number of affected plants in a plot at 70 DAP growth stages of each cultivar. Per cent disease incidence was calculated for each disease using the following formula:

$$\text{Per cent wilt} = \frac{\text{Number of wilted plants in the plot}}{\text{Total number of plants in the plot}} \times 100$$

$$\text{Per cent mild mosaic} = \frac{\text{Number of infected plants in the plot} \times 100}{\text{Total number of plants in the plot}}$$

**Brown rot, soft rot and scab :**

Occurrence of these diseases were recorded by counting the number of affected tubers in a plot at the time of harvest of each cultivar. Per cent disease was calculated for each disease using the following formula :

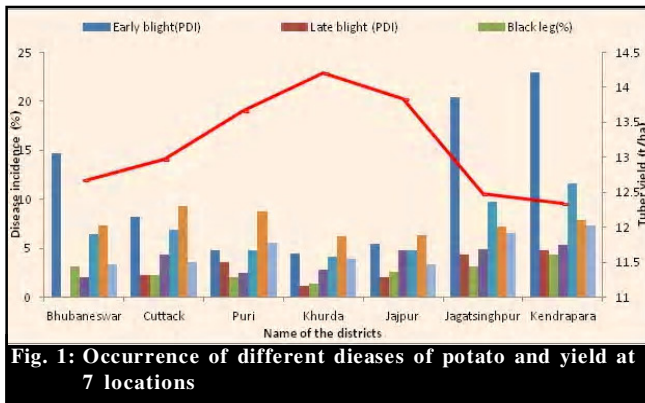
$$\text{Per cent rotting} = \frac{\text{Number of wilted plants in the plot}}{\text{Total number of plants in the plot}} \times 100$$

**RESULTS AND DISCUSSION**

The pooled figures comprising of the plant stand at 30 days after planting in 7 different locations recorded the maximum plant stand of 96 per cent at Barachana, followed by Salipur (94.89%), Jajanga ( 93.78% and Bolanga(93.3% ) (Table1, Fig. 1). The lowest per cent of plant stand was recorded from Biridi block (90.0%). In contrast to the farmers field , the plant stand of only 91.7 per cent was recorded in AICRP on Potato at Bhubaneswar.The plant stand in all locations were stastically

Sl. No.	Cultivar	Barachana (96.00%)	Salipur (94.89%)	Jajanga (93.78%)	Bolanga (93.30%)	Biridi (90.00%)	AICRP (91.70%)	Farmers field (91.70%)
1.	AICRP	91.70 (91.70)**	94.89 (94.89)	93.78 (93.78)	93.30 (93.30)	90.00 (90.00)	91.70 (91.70)	91.70 (91.70)
2.	Salipur	94.89 (94.89)	94.89 (94.89)	93.78 (93.78)	93.30 (93.30)	90.00 (90.00)	91.70 (91.70)	91.70 (91.70)
3.	Jajanga	94.89 (94.89)	94.89 (94.89)	93.78 (93.78)	93.30 (93.30)	90.00 (90.00)	91.70 (91.70)	91.70 (91.70)
4.	Bolanga	94.89 (94.89)	94.89 (94.89)	93.78 (93.78)	93.30 (93.30)	90.00 (90.00)	91.70 (91.70)	91.70 (91.70)
5.	Biridi	94.89 (94.89)	94.89 (94.89)	93.78 (93.78)	93.30 (93.30)	90.00 (90.00)	91.70 (91.70)	91.70 (91.70)
6.	Farmers field	94.89 (94.89)	94.89 (94.89)	93.78 (93.78)	93.30 (93.30)	90.00 (90.00)	91.70 (91.70)	91.70 (91.70)
7.	Average	94.89 (94.89)	94.89 (94.89)	93.78 (93.78)	93.30 (93.30)	90.00 (90.00)	91.70 (91.70)	91.70 (91.70)
S.E.D.		1.16	0.85	0.91	0.91	0.91	0.91	0.91
C.D. (0.05)		3.70	2.70	2.70	2.70	2.70	2.70	2.70

at par. The incidence of diseases recorded from the potato fields were early blight, late blight, black leg and bacterial wilt in growing stage, where as the diseases like brown rot, soft rot and scab disease could be noticed at harvesting time of the potato crop. Significantly maximum disease incidence (22.91%) due to early blight was observed at Jajanga, followed by Jagat Singhpur (20.39%), Bhubaneswar (14.66%), Salipur (8.25%). Barachana (5.43%), Bolanga (4.83%) and Balipatna (4.5%).



Late blight on potato being a major destructive fungal disease was also recorded simultaneously in all test locations during the fixed plot survey. The differential incidence of the disease recorded at Jajanga was 4.84% followed by Biridi (4.36%), Bolanga(3.54%) and Salipur (2.29%). A low incidence (1.16%) the late blight was recorded in potato crop in the test location of Balipatna, with no incidence at AICRP on Potato Centre, Bhubaneswar.

The symptomatological survey of the affected potato plants, revealed the presence of black leg and brown rot diseases incited by the bacterial pathogens which ranged between 1.35 per cent to 5.33 per cent during 70 DAP where as at harvesting stage.

The occurrence of different disease of potato at different locations also with tuber yields have been presented in Table 1 and depicted with Fig.1 the soft rot and brown rot symptoms appeared within the range of 4.19 per cent to 11.60 per cent at different locations. Highest incidence of black leg in potato was recorded from Jajanga (4.36%) followed by Biridi (3.12%), Bhubaneswar (3.11%), Barachana (2.56%) and Salipur (2.31%). The lowest incidence of black leg was observed in Balipatna (1.35%) and Bolanga (2.0%). The wilted plants recorded the complete damage of the affected plant.

The observations on bacterial wilt incidence at Jajanga was found to be significantly maximum (5.33%) followed by Jagat Singhpur (4.93%), Badachana (4.8%), Salipur (4.36%). The other test centres like AICRP on Potato, OUAT, Bolanga and Balipatna exhibited 2.0, 2.54 and 2.8 per cent of disease incidence, respectively.

Mild mosaic incidence was least among the other diseases in all the test locations. The ranges varied from 1 to 2 per cent. The maximum incidence was found to be 2 per cent in Jajanga while lowest 1 per cent was observed in Bolanga and Balipatna.

Extent of brown rot disease in potato varied from 4.19 to 11.60 per cent with highest rotting at Jajanga (11.60%), followed by Jagat Singhpur (9.73%), Salipur (6.7%) and like AICRP on Potato, The lowest soft rot disease like AICRP on Potato (4.19%) was recorded from Balipatna Centre (6.47%). The lowest incidence of soft rot disease was recorded from Balipatna centre (4.19%). The per cent of disease incidence in Bolanga and Badachana was observed to be 4.83 per cent.

The incidence of soft rot and scab disease was recorded at the time of harvest of the potato crop. Maximum soft rot disease incidence was found in Salipur with 9.31 per cent and scab 3.63 per cent followed by Bolanga 8.80 per cent (soft rot) and 5.56 per cent (scab). The test locations like Jajanga, Jagatsinghpur, AICRP on Potato centre, Bhubaneswar exhibited the soft rot incidence of 7.93, 7.27 and 7.30 per cent, respectively, whereas the scab disease load was observed to be 7.27 per cent at Jajanga and 6.57 per cent at Jagatsinghpur. The highest 7.30 per cent with 3.40 per cent at AICRP on potato centre, Bhubaneswar. The per cent disease incidence of brown rot and scab observed in Badachana and Balipatna locations was 6.30, 6.27 and 3.32, 3.87, respectively.

However, the summation of the disease load and the corresponding tuber yield of the test locations revealed a negative co-relations, indicating disease incidence, less will be more the tuber yield and vice versa. Accordingly, significantly the highest tuber yield (142.03q/h) was bagged from Balipatna with lowest disease incidence of 24.14 per cent followed by Badachana with the yield of 138.33q/h and the total disease incidence of 30-40 per cent. The lowest yield of 123.4 q/h was harvested from Jajanga with highest disease incidence (22.91% early blight, 4.84% late blight, 4.36% black leg, 5.33% bacterial wilt, 11.60% brown rot, 7.93% soft rot, 7.33% scab) succeeding to Jagatsinghpur with 124.83 q/h of tuber yield.

These findings are in conformity with that of Shekhawat *et al.* (1978), Anonymous (1990) and Dhal (1993).

**Conclusion :**

Early blight, late blight, black leg, bacterial wilt and mild mosaics were different diseases in growing stage while the diseases like brown rot, soft rot and scab could be noticed at the harvesting stage. Effective management schedules should be developed against early blight, bacterial wilt and brown rot, black leg and soft rot, scab and mild mosaics to minimize the yield losses.

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