
Surveillance of bacterial diseases of potato at coastal plains of Odisha

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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. There is a very little incidence of viral infections. Among them, bacterial diseases, i.e. bacterial wilt and brown rot caused by *Ralstonia solanacearum*, black leg and soft rot caused by *Pectobacterium carotovorum* are more dreaded. Both the bacterial diseases reduce plant population due to pre and post emergence rotting of seed tubers, wilting of the plants even before tuberization affect the economic yield of the crop some times resulting about 100% loss in crop yield. Hence, 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 the black leg and bacterial wilt were different diseases in standing crop while the brown rot and soft rot were could be noticed at the harvesting time. The presence of bacterial wilt and black leg ranged between 1.35 to 5.33% during 70DAP where as at harvesting stage the soft rot and brown rot incidence varied from 4.19% to 11.60% at different locations. Research works should be under taken to develop effective management schedules against these diseases.

Key words: Fixed plot survey, assessment, bacterial diseases

INTRODUCTION

Potato is a high yielding short duration crop produce more edible energy, protein and dry matter per unit area and time than many other crops. Potato is the number one vegetable crop in India. Odisha occupies 15th position both in area and production in the country. It is the 4th 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 Phulbani districts. Major contributing factor for reduction of yield in the state (14.1 q/h) of the crop than na-

tional level (18.8 q/h) is due to occurrence of different diseases. The bacterial wilt, caused by *R. solanacearum* is endemic in coastal plains of Odisha. There is a loss of 20.1% from harvest till it reaches consumer's level by *Pectobacterium carotovorum*. *R. solanacearum* affects other solanaceous crops and can also survive through weed hosts. Major potato yielding districts of the state lie in coastal plains, i.e. Cuttack, Kendrapara, Jagatsinghpur, Jajpur, undivided Balasore, Khurda and Puri districts. In this context, it is felt necessary to survey different bacterial diseases by fixed plot methods in coastal plain districts of the state,

the time of occurrence and their extent of damage, which will help in developing the effective management schedules against these diseases, ultimately help in reducing the yield loss in future.

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 500 sq.m was selected where potato was grown following standard method of cultivation with FYM10t/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 were 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 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 bacterial diseases in potato were recorded at 70 days of planting and at harvest.

Occurrence of Bacterial Wilt and Black leg 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.

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

Occurrence of Brown Rot and Soft Rot 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.

$$\text{Per cent rotting} = \frac{\text{Number of rotted tubers}}{\text{Total number of tubers}} \times 100$$

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% at Barachana, followed by Salipur (94.89%), Jajanga

(93.78%) and Bolanga (93.3%)(Table 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% was recorded in AICRP on Potato at Bhubaneswar. The plant stand in all locations were statistically at par. The bacterial diseases recorded from the potato fields were, black leg and bacterial wilt in growing stage, where as the diseases like brown rot, soft rot disease could be noticed at harvesting time of the potato crop.

Highest incidence of black leg (Table 2) 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 Jagatsinghpur (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% of disease incidence respectively.

Table 1 : Plant stand recorded at 30DAP in different locations of coastal plains over the years

Sl. No	Locations	Plant stand on 30 DAP			
		2005-06	2006-07	2007-08	Mean
1	AICRP on potato BBSR	89.00 (9.43)	90.00 (9.49)	96.00 (9.80)	91.77 (9.57)*
2	Salipur (Cuttack Dist)	93.00 (9.64)	92.00 (9.59)	98.00 (9.90)	94.89 (9.71)
3	Bolanga (Puri Dist.)	90.00 (9.49)	92.00 (9.59)	98.00 (9.90)	93.30 (9.66)
4	Balipatna (Khurda, Dist)	98.00 (9.90)	90.00 (9.49)	94.00 (9.70)	92.00 (9.59)
5	Badachana (Jajpur Dist)	92.00 (9.59)	92.00 (9.59)	90.00 (9.49)	96.00 (9.79)
6	Biridi (Jagat Singhpur Dist)	93.00 (9.64)	88.00 (9.38)	98.00 (9.90)	90.00 (9.49)
7	Jajanga (Kendrapara Dist)	92.00 (9.59)	94.00 (9.70)	94.00 (9.70)	93.78 (9.66)
	SE(m)±	0.09	0.06	0.06	0.11
	CD(0.05)	0.27	0.18	0.18	0.34

*Figures in parentheses indicate angular transformed values

Table 2 : Incidence of black leg and bacterial wilt percentage at 70 DAP in different locations of coastal plains over the years

Locations	Black leg (%)				Bacterial wilt (%)			
	2005-06	2006-07	2007-08	Mean	2005-06	2006-07	2007-08	Mean
AICRP on potato BBSR	3.00 (1.73)	3.33 (1.82)	3.00 (1.73)	3.11 (1.76)	2.00 (1.41)	2.00 (1.41)	2.00 (1.41)	2.00 (1.41)*
Salipur (Cuttack Dist)	2.00 (1.41)	3.00 (1.73)	2.00 (1.41)	2.31 (1.52)	4.00 (2.00)	4.00 (2.00)	5.00 (2.24)	4.36 (2.09)
Bolanga (Puri Dist.)	2.00 (1.41)	2.00 (1.41)	2.00 (1.41)	2.00 (1.41)	2.00 (1.41)	4.00 (2.00)	2.00 (1.41)	2.54 (1.59)
Balipatna (Khurda Dist)	1.00 (1.00)	2.00 (1.41)	3.00 (1.73)	1.35 (1.16)	2.00 (1.41)	5.00 (2.24)	3.00 (1.73)	2.80 (1.67)
Badachana (Jajpur Dist)	2.00 (1.41)	3.00 (1.73)	2.3 (8.72)	2.56 (1.60)	3.00 (1.73)	2.00 (1.41)	4.00 (2.00)	4.80 (2.19)
Biridi (Jagat Singhpur Dist)	3.00 (1.73)	3.00 (1.73)	4.00 (2.00)	3.12 (1.77)	4.00 (2.00)	3.00 (1.73)	3.00 (1.73)	4.93 (2.22)
Jajanga (Kendrapara Dist)	4.00 (2.00)	4.00 (2.00)	5.0 (2.45)	4.36 (2.01)	4.00 (2.00)	3.00 (1.73)	5.00 (2.44)	5.33 (2.31)
SE(m)±	0.16	0.09	0.17	0.08	0.15	0.17	0.14	0.08
CD(0.05)	0.48	0.26	0.49	0.24	0.44	0.51	0.41	0.22

*Figures in parentheses indicate angular transformed values

Table 3 : Incidence of brown rot and soft rot percentage at harvest in different locations of harvest over the years

Locations	Brown rot (%)				Soft rot (%)			
	2005-06	2006-07	2007-08	Mean	2005-06	2006-07	2007-08	Mean
AICRP on potato BBSR	6.20 (2.49)	8.21 (2.86)	5.00 (2.24)	3.11 (1.76)	7.30 (2.70)	9.40 (3.07)	5.2 (2.28)	7.30 (2.70)*
Salipur (Cuttack Dist)	6.00 (2.45)	9.2 (3.03)	5.5 (2.34)	2.31 (1.52)	9.40 (3.07)	11.33 (3.37)	7.2 (2.68)	9.31 (3.05)
Bolanga (Puri Dist.)	4.00 (2.0)	6.33 (2.52)	3.50 (1.87)	2.00 (1.41)	8.00 (2.83)	10.40 (3.22)	8.0 (2.83)	8.80 (2.97)
Balipatna (Khurda Dist)	4.00 (2.0)	6.0 (2.45)	2.57 (1.60)	1.35 (1.16)	6.24 (2.48)	8.17 (2.86)	4.40 (2.10)	6.27 (2.50)
Badachana (Jajpur Dist)	4.19 (2.05)	7.00 (2.65)	3.3 (1.73)	2.56 (1.60)	6.30 (2.51)	7.60 (2.76)	5.0 (2.24)	6.30 (2.51)
Biridi (Jagat Singhpur Dist)	9.50 (3.08)	11.5 (3.39)	8.19 (2.86)	3.12 (1.77)	7.00 (2.65)	8.81 (2.97)	6.00 (2.45)	7.27 (2.22)
Jajanga (Kendrapara Dist)	11.80 (3.44)	14.50 (3.81)	8.5 (2.92)	4.36 (2.01)	7.50 (2.74)	10.29 (3.21)	6.00 (2.45)	7.93 (2.82)
SE(m)±	0.16	0.15	0.10	0.08	0.09	0.17	0.06	0.08
CD(0.05)	0.48	0.43	0.29	0.24	0.26	0.51	0.14	0.22

*Figures in parentheses indicate angular transformed values

The incident of soft rot and brown rot symptoms at different locations are presented in Table 3. Extent of brown rot disease in potato varied from 1.35 4.36 per cent.

Maximum soft rot disease incidence was found in Salipur with 9.31% followed by Bolanga 8.80%(soft rot). The test locations like Jajanga, Jagatsinghpur, AICRP on Potato centre Bhubaneswar exhibited

the soft rot incidence of 7.30 percent. This finding is in conformity with that of Shekhawat *et al* (1978) and Anonymous (1990)

Black leg ,bacterial wilt were different diseases in growing stage while the diseases like brown rot and,softrot were could be noticed at the harvesting stage.Effective management schedules should be developed against,bacterial wilt and brown

rot,black leg and soft rot , to minimize the yield loss.

REFERENCES

- Anonymous,1990: Eighteenth Progress Report.All India Co-ordinated Potato Improvement Project,Central Potato Research Institute, Shimla.130 pp.
- Shekhawat,G.S.;R.Singh and V.Kishore.1978.Disribution of bacterial wilt and races and biovars of the pathogen in India.*Journal of Indian Potato Association*.5:155-165.