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Performance of popular varieties of potato against diseases in coastal plains of Odisha

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■ G. BISWAL AND N.K. DHAL¹

AUTHORS' INFO

Associated Co-author :

¹College of Agriculture, Orissa
University of Agriculture and
Technology, BHUBANESWAR
(ODISHA) INDIA

Author for correspondence:

G. BISWAL

College of Agriculture, Orissa
University of Agriculture and
Technology, BHUBANESWAR
(ODISHA) INDIA

ABSTRACT : Potato is one of the most popular vegetable crop of Odisha consumed by all sections of people irrespective of its age. Major contributing factor for reduction of yield in the state is due to occurrence of different diseases at different stages of crop growth. The selection of varieties plays an important role to combat the disease problem. The present studies were conducted in coastal plains of the state on the performance of three popular varieties, *i.e.*, Kufri Chandramukhi, Kufri Ashoka and Kufri Jyoti consecutively for three years from 2005-06 to 2007-08 following standard fixed plot survey method. It is revealed that early blight, late blight, phoma blight, black leg, bacterial wilt, leaf roll, mild mosaic, were commonly occurred in growth stage while brown rot, soft rot and scab were observed at harvest. Among these varieties Kufri Jyoti produced maximum yield (15.01t/h) with least disease incidence followed by Kufri Ashoka (11.63t/h) and Kufri Chandramukhi (12.40t/h) under natural condition.

KEY WORDS : Varieties, Diseases, Fixed plot survey, Coastal plains

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Potato is one of the most preferred vegetable crop of Odisha consumed by all sections of people irrespective of age. It is cultivated all districts of the state in winter season and also in Phulbani and Koraput districts in *Kharif* season. The yield reduction in plant population is much below the national average is mainly due to occurrence of different diseases which causes reduction of plant population due to pre and post emergence rotting of seed tubers in initial stage, wilting of plants and heavy foliar damage to different microbial association in growing period, rotting of tubers at harvest and storage under ambient conditions. Integrated disease management strategies are to be followed to overcome the situations. Growing of resistant /tolerant variety play decisive role in this aspect which is eco-friendly as well as economic. Hence, the studies were conducted on the performance of different varieties against different

diseases consecutively for three years from 2005-06 to 2007-08 following standard method for fixed plot survey in coastal plains, *i.e.*, the most potential area of potato production, of the state.

RESEARCH PROCEDURE

An area of 500 sq.m. was selected in six locations (All India Co-ordinated Research Project on potato, *i.e.*, Central Farm of Orissa University Agriculture and Technology, Salipur, Bolanga, Badachana, Biridi, Jajanga) of six different districts *i.e.*, Khurda, Cuttack, Puri, Jajpur and Kendrapara, respectively in coastal plains of the state. Three popular cultivars of the state *i.e.*, Kufri Chandramukhi (80 days), Kufri Ashoka (80 days) and Kufri Jyoti (90 days) were grown in the specified plots consecutively for three years from 2005-06 to 2007-08

following standard method of cultivation with FYM 10t/h, NPK@120/80/100kg/h, 6x20cm spacing was maintained between row to row and plant to plant. Observations on the natural occurrence of different diseases were recorded at 70 days after planting and also at harvest.

Early blight of potato :

Occurrence of this disease was recorded in 0-7 point scale developed by Christ (1991) as follows (0 = No symptom on leaf, 1=Trace to 1% leaf area blighted, 2 =1-5% leaf area blighted, 3 = 6-10% leaf area blighted, 4 = 11-25% leaf area blighted, 5= 26-50% leaf area blighted, 6 = 51-75% leaf area blighted, 7= 76-100% leaf area blighted).

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

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

Late blight of potato :

Occurrence of this was recorded was recorded in 0-9 point scale developed by Rahman *et al.* (2008) as follows (1=No infection in leaf, 2=1-3% leaf area blighted, 3= 4-10% leaf area blighted, 4=11-25% leaf area blighted, 5=26-50% leaf area blighted, 6=51-75% leaf area blighted, 7= 76-90% leaf area blighted, 8=91-97% leaf area blighted, 9= 98-100% leaf area blighted).

The percentage disease index (PDI) was calculated on recorded observations using the formula (As in case of early blight).

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 :

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

Brown rot, soft rot and scab :

Occurrence of these diseases was 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 :

$$\text{Per cent rotting/scab infection} = \frac{\text{Number of affected tubers}}{\text{Total number of tubers}} \times 100$$

The yield of healthy tubers were recorded at the harvest and analysed statically (Gomez and Gomez, 1984).

RESEARCH ANALYSIS AND REASONING

The pooled figures comprised of the plant stand at 30 days after planting in 6 different districts revealed plant stand varied irrespective of varieties and locations (Table 1a and 1b). Maximum plant stand (95.33%) was recorded in Jagatsinghpur followed by 94.67 per cent in Salipur in the variety K. Ashoka. Lowest plant stand was obtained in Badachana in the K Chandramukhi (8.8%). Early blight incidence was maximum in Jajang (25.73%) followed by 23.83 per cent in the same location in the variety K. Ashoka while minimum incidence of early blight was observed in Bolanga (3.83%). Late blight incidence was maximum (5.8%) in Badachana followed by Jagatsinghpur 4.0 per cent. In Bhubaneswar the disease did not appear. Phoma blight incidence varied from 1.3 per cent in Bolanga to 3.64 per cent in Jajanga in the variety K. Ashoka. Black leg and bacterial wilt incidence varied from 1.67 to 6.0 per cent and 2 to 7.67 per cent in different locations. Maximum incidence of bacterial wilt (7.67%) followed by black leg (6.0%) occurred in Salipur in the variety K. Ashoka. Mild mosaic (1.0 to 3.33%) and leaf roll (1.22 to 3.67%) recorded at all locations. Maximum infestations due to mild mosaic was observed in 3.33 per cent in Jagatsinghpur in K. Chandramukhi. minimum in Bolanga (1%). Leaf roll was maximum 3.67 per cent in K. Chandramukhi and 1.44 per cent Salipur in K. Jyoti. Brown rot and soft rot incidence varied 3.6 to 15.13 per cent. Maximum rotting was observed in Kendrapara (15.13%) followed by Jagatsinghpur (12.52%) in K. Ashoka. In Kendrapara K. Chandramukhi and K. Jyoti exhibited 9.0 and 8.17 per cent brown rot incidence, respectively. Soft rot was maximum in Bolanga (10.07) followed by Kendrapara (9.52%), Jagatsinghpur (9.44%) Scab incidence varied from 3.13 to 8.99 per cent in different locations.

Maximum yield was obtained in K. Jyoti in Badachana followed by Bolanga, Salipur, Bhubaneswar, Biridi and Jajanga. This finding is in conformity with that of Shekhawat *et al.* (1978), Anonymous (1990) and Dhal (1993).

Among these varieties kufri Jyoti produced significantly maximum (15.01t/h) yield with least disease incidence followed by Kufri Ashoka (12.40t/h) and Kufri Chandramukhi (11.63t/h) (Table 2). There was no

significant difference in yield in varieties in different locations. Similar work related to the present investigation was also carried out by Biswal and Dhal (2013) and Parmar *et al.* (2013).

Table 1a : Varietal response in the occurrence of diseases in different locations

Sr. No.	Location	Plant stand	V ₁ = Kufri Jyoti									
			Disease incidence at different stages of growth									
			EB (PDI)	LB (PDI)	PB (PDI)	BL (%)	BW (%)	MM (%)	LR (%)	BR (%)	SR (%)	Scab (%)
T ₁	AICRP On Potato (Khurda dist.)	92.33	11.68	0.5	2.7	5.0	2.0	1.02	2.0	5.0	5.90	4.25
T ₂	Salipur (Cuttack dist)	94.00	6.33	2.0	1.7	.517	3.0	1.02	1.44	5.17	7.57	4.80
T ₃	Bolanga (Puri dist)	92.67	3.83	2.17	1.18	3.50	2.0	1.03	1.67	3.50	7.67	6.61
T ₄	Badachana (Jajpur dist)	92.67	4.1	2.5	1.57	3.6	3.3	1.05	2.0	3.6	4.77	3.58
T ₅	Biridi (Jagat Singhpur dist)	92.67	17.33	4.0	2.90	7.5	3.67	1.33	1.22	7.5	5.7	7.88
T ₆	Jajanga (Kendrapara dist.)	93.33	19.33	3.5	1.37	9.0	3.67	1.33	2.33	9.0	6.33	8.99

AICRP=All India Co-ordinated Research Project, Dist= Districts, EB=Early blight, LB=Late blight, BW=Bacterial wilt, BL=Black leg, SR=Soft rot, BR=Brown rot, PDI=Plant disease intensity

Table 1b : Varietal response in the occurrence of diseases in different locations

	V ₂ =Kufri Chandramukhi											V ₃ =Kufri Ashoka										
	Disease incidence at different stages of growth											Disease incidence at different stages of growth										
	EB (PDI)	LB (PDI)	PB (PDI)	BL (%)	BW (%)	MM (%)	LR (%)	BR (%)	SR (%)	Scab (%)	EB (PDI)	LB (PDI)	PB (PDI)	BL (%)	BW (%)	MM (%)	LR (%)	BR (%)	SR (%)	Scab (%)		
91.33	14.50	0.5	0.5	2.67	2.0	1.67	3.0	6.11	7.1	3.33	91.33	17.79	0.5	2.95	4.0	2.0	1.67	2.67	8.97	8.90	4.25	
94.67	7.70	2.0	2.0	1.67	4.0	1.0	3.3	6.54	9.46	3.50	94.33	10.38	3.4	2.97	3.67	6.0	1.0	1.89	8.87	7.56	4.80	
94.0	4.53	2.5	2.5	2.0	2.67	1.0	1.56	5.37	8.67	5.67	93.33	6.12	3.92	1.3	2.0	2.67	1.0	1.89	6.0	10.07	6.61	
88.0	5.40	3.5	3.5	2.33	4.67	2.33	2.56	4.10	6.1	3.13	89.33	6.79	5.8	1.73	4.0	6.0	1.67	2.67	6.06	7.33	3.58	
93.0	20.0	4.0	4.0	3.33	4.0	3.33	3.22	4.5	7.0	6.67	95.33	23.83	4.0	3.30	4.33	5.33	1.33	2.11	12.52	9.44	7.88	
91.33	23.67	4.0	3.5	4.0	3.3	4.0	3.67	8.17	7.83	7.0	90.67	25.73	7.1	3.64	6.0	7.67	1.67	2.89	15.13	9.52	8.99	

AICRP=All India Co-ordinated Research Project, Dist= Districts, EB=Early blight, LB=Late blight, BW=Bacterial wilt, BL=Black leg, SR=Soft rot, BR=Brown rot, PDI=Plant disease intensity

Table 2 : Varietal response to the yield at different locations

Main plot (Varieties)	Yield (t/h)
V ₁ = Kufri Jyoti	15.01
V ₂ = Kufri Chandra mukhi	11.63
V ₃ = Kufri Ashoka	12.40
S.E. ±	0.76
C.D. (P=0.05)	3.016
Sub-plot (Locations)	
T ₁ (AICRP, BBSR)	12.67
T ₂ (Salipur)	12.97
T ₃ (Bolanga)	13.66
T ₄ (Bada Chana)	13.83
T ₅ (Biridi)	12.48
T ₆ (Jajanga)	12.34
S.E. ±	1.354
C.D. (P=0.05)	3.90
Mean	12.99
Interaction (significant or not)	NS

NS= Non-significant

Conclusion :

Early blight, late blight, black leg, bacterial wilt and mild mosaics were different diseases in growing stage while the diseases like brown rot, softrot and scab were could be noticed at the harvesting stage in these varieties. Kufri Jyoti was found to produce significantly more yield with least disease incidence than Kufri Ashoka and Kufri Chandramukhi. 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 loss in these varieties.

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