

## Effect of late blight disease on growth and yield of different Indian and exotic processing varieties of potato in new alluvial zone of West Bengal

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Six Dutch potato cultivars namely Cardinal, Diament, Ajax, Morfona, Sante, Fresco and four Indian potato cultivars namely Kufri Chipsona-1, Kufri Chipsona-2, Kufri Jyoti and Kufri Chandramukhi, suitable for processing, were evaluated under short day conditions of new alluvial zone of West Bengal during 1998-1999 and 1999-2000. From the result of comparative study on late blight disease, plant growth and yield performance among these Indian and exotic varieties, the Dutch cv. Cardinal in all respect, proved to be superior than other varieties including control cultivar, Kufri Chandramukhi. Cardinal not only increased plant growth in terms of plant weight, tuber number/plant and tuber weight/plant but also enhanced yield (297.0 q/ha) i.e. 22.5% increase over control (230.0 q/ha) by reducing late blight severity (8.0%) over control (30.0%). Next best performance was shown by Dutch cv. Diament in all tested parameters i.e., plant growth, yield (290.0 q/ha) and late blight severity (8.5%). After these two Dutch cultivars, newly released Indian processing variety Kufri Chipsona-1 had given third best result in terms of increased plant growth and yield (275.0 q/ha) by reducing late blight severity (9.0%) in comparison to other varieties including control. Kufri Jyoti on the other hand, a widely cultivated variety, in this region, had shown more or less similar performance with another newly released processing variety Kufri Chipsona-2 in all respect. Therefore, besides Kufri Chipsona-2 (established processing variety), two Dutch cultivars i.e. Cardinal and Diament, because of their tolerance to late blight disease & higher yield potential, appears to be highly promising for large scale cultivation as processing varieties in this new alluvial zone of West Bengal.

**Key words :** Potatos, Dutch varieties, Indian varieties, cultivation, new alluvial zone, West Bengal

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### INTRODUCTION

In West Bengal, potato is an important field crop, next to cereals, occupying nearly 0.25 million hectare area and total production approximately 6 million tonnes, at an productivity of 24 t/ha (Shekha Wat and Naik, 1999). Hooghly district under new alluvial zone of West Bengal, is a major potato growing area, where Kufri Jyoti is a widely cultivated variety. This kufri Jyoti cultivar at present is not performing up to the mark, as it did earlier 10-15 years ago. Late blight, caused by *Phytophthora infestans* (Mont) de Bary, is one of the most important diseases of potato in this state,

causing average annual yield loss approximately 75% of the total production (Paharia, 1961). On the other hand entire production of this state is consumed as table potatoes. To encourage diversification of potato consumption pattern in this state, efforts were made to identify some processing cultivars having late blight tolerance and highest potato production and ensure the needed sustainability for potato revolution in our state. From this point of view, a field trial was carried out, taking both Indian and exotic (Dutch) potato cultivars in Hooghly district of West Bengal, with full support in all respect from Central Potato Research Institute, Shimla, Himachal Pradesh.

## MATERIALS AND METHODS

The trial was conducted under field condition with six Dutch potato cultivars, namely, Cardinal, Diamont, Ajax, Fresco Morfona, Sante and four Indian potato cultivars, namely, Kufri Chipsona-1, Kufri Chipsona-2, Kufri Jyoti, Kufri Chandramukhi, during winter of 1998-99 and 1999- 2000 at Adisaptgaram Block Seed Farm, Hooghly, West Bengal. The experiment was designed in RBD, with four replications, having plot size 3.0 m X 2.0 m. Seeds of these above mentioned cultivars, were sown during middle of November, every year at 60 X 20 cm spacing. In this trial, Kufri Chandramukhi cultivar, highly susceptible to late blight disease, was used as control. Standard recommended dose of fertilizer i.e. N:P:K :: 180 : 150 : 150 kg/ha were applied at the time of land preparation. But plant protection measures was not taken in this trial in order to encourage the disease infestation. Data on growth parameters i.e., average plant weight (g), average number of tuber / plant and average tuber yield/ plant (g), per cent disease index, (PDI) and yield of tuber (q/ha) were taken into account for this study. In every year, natural incidence of late blight disease on these different cultivars was recorded at first and subsequently the severity of disease in terms of Per cent Disease Index (PDI) was measured. Per cent disease index (PDI) was calculated by using formula given by Mc Kinney (1923).

$$\text{where, DI (Disease Index)} = \frac{\text{Sum of all numerical ratings}}{\text{No. of leaves examined} \times \text{maximum disease rating}} \times 100$$

Where, disease rating was done in a 9 point scale, designed by Malcolmson (1970) :

1 = collapseed, 2= 81-90% area infected;  
3=71-80% area infected; 4 = 61-71% area infected;  
5=51-60% area infected; 6=41-50% area infected;  
7 = 26-40% area affected; 8=11-25% area infected;  
9=Trace of infection.

Yield increased or decreased over control, was also calculated. Seeds of all these varieties were collected from Central Potato Reserch Institute (ICAR) ,Shimla, for this trial.

## RESULTS AND DISCUSSION

From the data presented in Table1, it is clearly

evident that, ten potato cultivars, suitable for processing, were tested in the Hooghly district of West Bengal. Out of six Dutch (exotic) and Indian potato cultivars, Cardinal exhibited very well in all respect . In fact, this particular cultivar showed increased plant growth i.e. plant weight (av. 225.g), tuber number /plant (av. 15.5) and tuber yield/ plant (av. 650.0 g) respectively. Besides plant growth, in Cardinal, total yield (297.0 q/ha) was significantly more and late blight severity was remarkably low (8.0), as compared to control cultivar Kufri Chandramukhi, where not only plant growth and total yield (230.0 q/ha) were lower but also the late blight severity was noticeably more (30.0 %). The second best performance was also shown by Dutch cultivar Diamont, which resulted into enhanced yield (290.0 q/ha) and plant growth in terms of plant weight (av 217.5 g), tuber number/plant (av. 13.0) and tuber yield/plant (av. 635.5g) respectively through reducing late blight severity (8.5%) in comparison top control. But other Dutch potato cultivars i.e. Ajax, Morfona, Sante and Fresco did not performed up to the mark in all respect as because cultivars neither increased the yield and plant growth nor reduced the late blight severity.

On the other hand, Kufri Jyoti and Kufri Chandramukhi being released in 1968, are very old cultivars. But Kufri Chipsona-1 and Kufri Chipsona-2 are newly released potato processing cultivars from Central Potato Research Institute, Shimla, Himachal Pradesh in the year 1998. Kufri Chipsona-1 has performed as third best in this investigation, showing much better than control cultivar Kufri Chandramukhi and widely cultivated variety in this region i.e. Kufri Jyoti in all respect.

Lastly, Kufri chipsona-2 and Kufri Jyoti had shown similar performances in all respect during this study. From this investigation, it may be inferred that being an old variety Kufri Jyoti is still now cultivated by the farmer in this region, instead of degeneration due to remarkable disease infestations. But at this very moment two very nice Indian processing cultivars i.e. Kufri chipsona-1 and Kufri Chipsona-2 having tolerance to late blight pathogen and higher yield potential undoubtedly are in a position to replace Kufri Jyoti in this region. Therefore, from the results of this study, it is clearly

**Table 1** : Effect of late blight on growth and yeild of potato cultivars.

Potato cultivar	Country origin	Duration	Plant growth			Per cent Disease Index (%) PDI	Yield (q/ha)	Yield increase or decrease over control (%)
			Av plant weight (g)	Av. tuber number/plant	Av. tuber weight/plant (g)			
Cardinal	Dutch	90 days	225.0*	15.5*	650.0*	8.0* (16.43)**	297.0*	+22.5
Diamont	Dutch	90 days	217.5	13.0	635.5	8.5 (16.95)	290.0	+20.7
Ajax	Dutch	90 days	190.5	7.0	475.2	20.0 (26.57)	234.7	+2.0
Fresco	Dutch	90 days	110.0	6.0	250.8	18.2 (25.25)	228.0	-0.9
Morfona	Dutch	90 days	185.6	7.0	450.8	15.7 (23.34)	233.3	-1.41
Sante	Dutch	90 days	90.5	5.2	208.5	35.2 (36.39)	208.0	-10.6
Kufri	Indian	90 days	191.5	10.0	600.0	9.0 (17.46)	275.0	+16.4
Chipsona-1	Indian	90 days	186.0	9.0	530.0	10.5 (18.91)	250.0	+8.0
Chipsona-2	Indian	90 days	180.0	8.0	550.0	10.0 (18.43)	252.0	+8.73
Kufri Jyoti	Indian	90 days	105.0	6.0	260.0	30.0 (33.21)	230.0	-
Kufri Chandramukhi (control)								
CD ( P = 0.05)	0.05	-	-	6.45	2.75	4.38	3.60	8.85

\*Average of two years. \*\* Figures in parenthesis are angular transformed value.

noticed that, both the Dutch (exotic) potato cultivars, due to their tolerance to late blight pathogen and higher yield potential, have tremendous scope for large scale cultivation in this area of West Bengal. Besides Kufri Chipsona-1 and Kufri Chipsona-2, Dutch potato cultivars i.e. Cardinal and Diamont should spread, in this region among the farming community, because processing varieties of potatoes from this state can be provided to the processors, both to organised and unorganised sectors in future, according to their demand.

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#### REFERENCES

- Malcolmson, J. F. (1970). Vegetative hybridity in *Phytophthora infestans*. *Nature*. London, **255** : 917-972.
- McKinney, H.H. (1923). Influence of soil temperature and moistures on infection of wheat seedlings by *Helminthosporium sativum*. *J. Agric. Res.* **26** : 195-218.
- Paharia, K. D. (1961). Late blight of potatoes in the plains and its control. *Indian Potato Journal.* **3** : 61-71.
- Shekhawat, G. S. and Naik, P. S. (1999). Potato in India. Technical Bulletin No. 1. CPRI, Shimla, H.P. India. pp : 66-69.

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