

ON-FARM EVALUATION OF POTATO CLONES IN THE HIGH HILLS OF EASTERN NEPAL

T R Chapagain*, B B Khatri**, R K Shah*** and J L Mandal***
*NCARP, Pakhribas, **NPRP, Khumaltar and ***ARS, Pakhribas

ABSTRACT

Improved potato clones selected from on-station trials were verified for two consecutive years 2009 and 2010 in the farmers' fields at Basantpur (2300 m) in Tehrathum district. Five potato clones namely CIP 396010.42, CIP 392661.18, CIP 393385.39, were compared with Desiree and Kufri Jyoti in RCBD with four replications. These clones were evaluated for tuber yield and late blight disease tolerance. Among the tested clones the highest number of tuber per plot (369.5) was recorded in clone CIP 393385.39 while the highest mean yield was observed from Kufri Jyoti (23.67 t/ha) which was at par with CIP 393385.39 (22.61t/ha). In addition to that clone CIP 393385.39 was found tolerant also to late blight disease. Both these clones were highly preferred by the participating farmers. Therefore, clone CIP 393385.39 should be recommended first for high hill rainfed potato production system of eastern development region of Nepal.

INTRODUCTION

Potato is one of the major staple food crops as well as source of income in road accessible high hills of Nepal (Chapagain, 2003). Potatoes are marketed from road linked high hills of eastern region to Terai in large quantities with high price in rainy season. Hence, the potato in high hills has a greater livelihood impact. However, potato varieties being growing in the high hills are highly susceptible to late blight diseases (ARS, 2010). Occasional hailstone also adversely affects the production as well in the high hills. Farmers need late blight and hailstone tolerant varieties to replace the traditional and old improved varieties. Demand of high yielding varieties with resistance to major disease and pest has remained always very high since long in Nepal (Khatri *et al.*, 2010).

Development, evaluation, selection and recommendation of improved potato clones on regular basis for different agro-ecological zones only can address the farmers need (Khatri and Shrestha, 1999). Selection of varieties suitable for eastern high hill condition have been continuously carrying out at ARS, Pakhribas in collaboration with NPRP, Khumaltar. Hence, some highly promising clones selected from coordinated varietal trial were evaluated in the farmers' field to identify the yield potential at farmers management condition.

MATERIALS AND METHODS

A coordinated farmers' field trial (CFFT) was conducted at Basantpur, high altitude (2300m) outreach research site of ARS, Pakhribas for two consecutive years 2009 and 2010. Three advance potato clones identified from coordinated varietal trial (CVT) namely, CIP 392661.18, CIP 393385.39 and CIP 396010.42 were compared with two improved check varieties Desiree and Kufri Jyoti under farmers' field conditions. The trial was conducted under complete rainfed bari land condition. Trial was replicated four times in RCBD where each treatment received 7.2 m² plot area. Fertilizer and manure were applied @ 80:80:60 kg NPK/ha and 20 t/ha respectively. Between rows 60 cm and within row 25 cm spacing was maintained during planting which accommodated 48 plants per plot. Plant, tuber and yield characteristics were recorded time to time. Late blight disease and farmer's preferences were also collected and tabulated. All the quantitative data were analyzed through GENSTAT 4.2.

RESULTS AND DISCUSSION

Plant Population and Vegetative Characteristics

Potato clones differed significantly for plant height (cm) and number of main stems per plant (Table 1). Similarly plant population after emergence and at harvest also varied significantly. Uniformity (1-5 scale)

did not vary among the tested clones. Kufri Jyoti was the tallest variety with the maximum main stems per plant which was at par with Desiree. Number of main stems from clone CIP 393385.39 was at par with other clones except Kufri Jyoti. Desiree had the highest plant population at 60 DAP and at harvest.

Table 1. Combined mean values for population and vegetative characteristics of potato clones at farmer's field in Tehrathum, Basantpur (2300m)

Potato Clones	Emergence at 60 DAP	No. of harvested plant/plot	Plant height (cm)	No. of main stem/plant	Uniformity (1-5 scale)
392661.18	47.75a†	43.50bc	46.00c	5.25ab	4.25
393385.39	47.00b	42.25c	44.50c	5.00b	4.00
396010.42	47.75a	45.50ab	46.50bc	4.50b	4.50
Desiree (ch)	47.50a	47.00a	54.50ab	5.25ab	4.25
Kufri Jyoti (ch)	47.75a	43.50bc	55.00a	6.00a	4.25
LSD0.05	0.55*	2.95*	7.98*	0.85*	ns
CV%	1.1	6.1	14.9	15.0	20.5
Covariate	-	Ns	-	-	-

† Mean of four replications. * indicates significance at 0.05. NS indicates Non significant relationship. The same letter within a column indicates non significant relationship.

Tuber Characteristics

Potato clones differed for total number of tuber, number of small and seed sized tuber per plot (Table 2). Likewise, the weight of different categories of potato tuber per plot was varied among the tested clones. Though the weight of large sized potato tubers differed among the clones, they provided statistically the same number of large sized tubers per plot. Clone CIP 393385.39 gave the highest small and seed sized tubers which comprise the highest number of tuber per plot. Kufri Jyoti is only superior to CIP 393385.39 for the weight of large size tuber.

Table 2: Combined mean values for tuber characteristics of potato clones at farmer's field in Tehrathum, Basantpur (2300m)

Potato Clones	Total No. of tuber	No. Small size (<25 gm)	Wt. Small size (<25gm)	No. Seed size (25-50 gm)	Wt. Seed size (25-50 gm)	No. Large size (>50gm)	Wt. Large size (>50 gm)
CIP 392661.18	264b†	127b	3.13b	72b	3.75a	65	7.11ab
CIP 393385.39	369a	201a	4.37a	103	4.94a	65	6.69ab
CIP 396010.42	196c	109b	2.19cd	59b	3.12b	53	5.35b
Desiree (ch)	194c	81c	1.94d	60b	2.93b	54	5.84ab
Kufri Jyoti (ch)	296b	134b	2.81bc	90a	4.88a	72	8.45a
LSD0.05	50.79***	28.75***	0.88***	20.01*	1.23*	NS	1.86*
CV	18.8	21.5	30	25.4	30.6	26.3	27.2

† Mean of four replications. * indicates significance at 0.05 and *** indicates significance at <0.001. NS indicates Non significant relationship. The same letter within a column indicates non significant relationship.

Tuber Yield (t/ha)

Potato varieties differed significantly for tuber yield (t/ha). Similarly, the yield also varied significantly over the years (Fig.1). Kufri Jyoti produced the highest tuber yield (23.67 t/ha) which was at par with clone CIP 393385.39 (22.61 t/ha). However, clone CIP 393385.39 produced highest yield in 2009. Among the tested clones, Desiree produced the lowest yield.

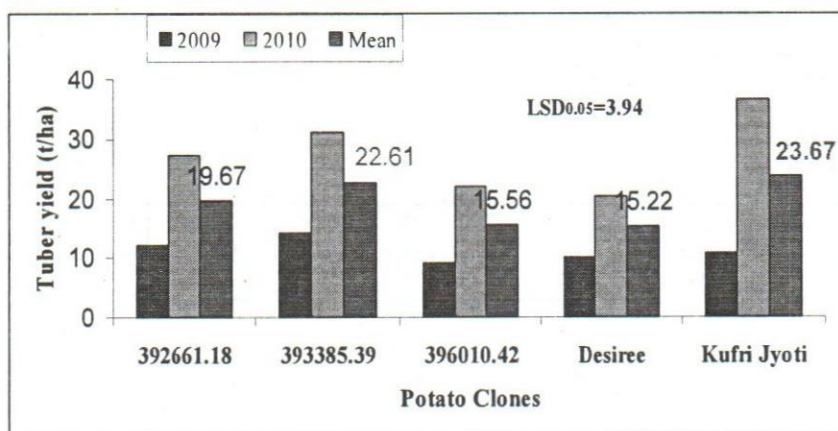


Figure 1. Tuber yield (t/ha) of potato clones at farmers field in Tehrathum, Basantpur in 2009/10.

Farmers reference

Participating farmers' response to key indicators over preference of potato varieties varied (Table 3). Based on the yield, color and taste, majority of the farmers preferred clone CIP 393385.39 among the introduced clones. However, they also preferred Kufri Jyoti for its high yield and Desiree for its attractive tuber size and color. Besides, yield and other performances clone CIP 393385.39 were also less affected by late blight.

Table 3: Farmers preference on different characteristics of potato clones at farmer's field in Tehrathum, Basantpur (2300m) in 2009/2010.

Potato Clones	Farmers Rating in 2009				Farmers Rating in 2010				Color	Late Blight (%)
	Plant	Yield	Tuber	Taste	Plant	Yield	Tuber	Taste		
392661.18	G	F	F	G	G	F	F	Good	Red	35
393385.39	G	G	G	G	VG	G	G	Good	Red	15
396010.42	G	F	G	G	G	F	G	VG	Red	45
Desiree (ch)	VG	G	G	G	G	G	G	Good	Red	15
Kufri Jyoti (ch)	G	G	G	G	G	G	G	Good	White	35

Significant differences for many plant characteristics among tested clones suggest their wider genetic variation. Though plant population at harvest varied among the tested clones, it did not affect the tuber yield. Covariate analysis considering plant population at harvest was non significant. Significantly more tubers from CIP 393385.39 under rainfed growing condition suggest its genetic potential to perform better even under stress condition. Kufri Jyoti provided the highest yield be due to the taller plants, more main stems per plant and more large size tubers and weight. However, 393385.39 gave the statistically similar result. It suggests that both these varieties are equally suitable for high hill rainfed condition. Similar yield trend of Kufri Jyoti has also been reported in recent studies in different agro-ecological zones of Nepal (Chapagain *et al.*, 2004; Khatri *et al.*, 2009). Due to more seed sized tubers, CIP 393385.39 could be preferred by potato seed producing farmers.

Though the yield variation over the years exists, the higher yield from year 2010 indicates that these clones are more productive. Due to at par yield results with Kufri Jyoti and being red in skin color, clone CIP 393385.39 should be provided to the farmers for commercial production. Nepalese consumers prefer red skinned varieties of potatoes and it has higher demand in Nepal (Chapagain and Khatri, 2003).

CONCLUSION

All the tested clones provided the higher yield than the national average productivity of the potato. Among the tested clones 393385.39 is highly preferred due to its, high yield potential and late blight tolerance. The study suggests that CIP 393385.39 should be alternate variety to Kufri Jyoti in the hills. This variety is

suitable for commercial production. However, further studies on potato tuber moth tolerance and storability are important.

ACKNOWLEDGEMENTS

The authors are thankful to all the participating farmers for their cooperation and providing valuable information about potato clones.

REFERENCES

- ARSP, 2010. Annual Report, Agricultural Research Station, Pakhribas, Dhankuta.
- Chapagain, T R, Khatri, B B and Shakya, S M (2004). Technology development on early potato (August planting) in the eastern hills of Nepal. Fourth National Horticultural Research Workshop (March 2-4, 2004), Khumaltar, Kathmandu, Nepal.
- Chapagain, T R and Khatri, B B (2003). Marketing aspect of the autumn potato in the Terai markets of Nepal. Second National Convention of Society of Agriculture Scientist, Nepal (SAS-Nepal) at Khumaltar, Kathmandu, Nepal.
- Chapagain, T R (2003). Participatory potato variety selection in the mid hills of the eastern region of Nepal. Proceedings of Third National Horticultural Research Workshop (June 7-8, 2000) at Khumaltar, Kathmandu, Nepal.
- Khatri B B., B P Sharma, D Chaudhari, B P Luitel, S Ahamad and T R Chapagain (2010). On-farm performance of three advanced potato clones in different agro-ecological zones of Nepal. Proceedings of Ninth Outreach Research Group Workshop, Khumaltar, Kathmandu, Nepal.
- Khatri, B B, Luitel, B P Sharma, D Chaudhary, T R Chapagain, S A, Khan, C Adhikari and I P Gautam (2009). High Yielding and late blight disease resistant potato variety development for Nepal. Proceedings of National Potato Technical Group workshop, Khumaltar, Kathmandu, Nepal
- Khatri, B. and S. L. Shrestha, 1999. New potato varieties released for different agro-ecological zones of Nepal, Nepal Agri. Res. Journal 3(45-50).