Potassium Management for Yield and Quality of Potato

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Abstract

Potassium plays a pivotal role in influencing potato yield and quality. Studies conducted in northwestern hills and Indo-Gangetic plains revealed significant response to potassium application. The potato response varied with the cultivar, time and method of application, soil test value and source. Integrated use of organic manures and potassium fertilizer gave best results in terms of yield, grade and K recovery by potatoes. Its application increased the number and yield of large size tubers. Application of K on removal basis was found to maintain soil K balance apart from sustaining crop yields in potato based cropping systems. Among potassium sources, potassium chloride is superior to potassium sulphate where produce is required for use by processing industries.

Potato (*Solanum tuberosum* L.) is an important cash crop grown under long day conditions in hills of northern and eastern Himalayas and under short day conditions in Indo-Gangetic plains of India. In peninsular India, the crop is grown both during *Rabi* and *Kharif* seasons while in Nilgiri hills, three crops of potato can be taken in a year. In the hills of northern and eastern India, it is grown during summer months (April-September) under rainfed conditions while in plains, the crop is taken under assured irrigation during winter months (October-February) when the temperatures are conducive for tuber formation.

Potato is the most sensitive crop to nutrient stress because of its sparse root system. Thus it needs high dose of fertilizers for getting full yield potential. Moreover, its application has a special significance in northern plains of India where crop is prone to frost during winter months. In north-western hills where the crop is rainfed, its application protects the crop from drought, a common feature observed in early stages of crop growth.

A mature good crop of potato removes about 170 to 230 kg K_2O/ha indicating its high responsiveness to applied K as compared to cereals which do not respond readily to its application (Grewal & Trehan, 1993). Adequate supply of K to potato maintains tone, vigour and efficiency of the plant whereas in case of mild deficiency, leaves develop dark blue coloration. Bronzing and scorching of leaves often occur in case of acute deficiency.

Potassium accumulation: The potassium concentration in dry matter varies with time, plant part and decreases with time. The tubers at harvest accumulate about 78% of total K (**Fig. 1**) with maximum accumulation occurring between 30-60 days after planting in plains and 65-75 days in hilly regions.

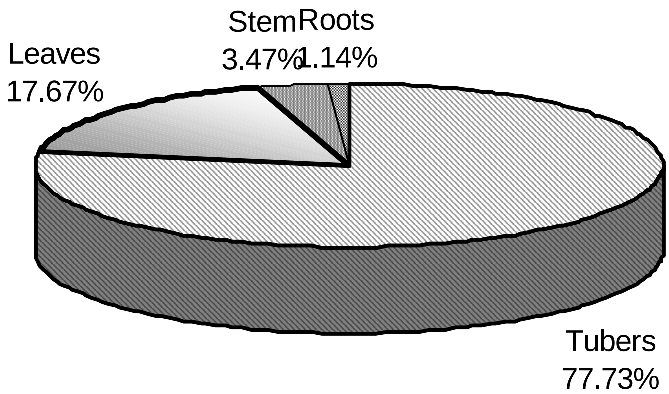

Fig. 1 *Potassium accumulation in potato plant*

Potato response to K: The potato response to K varied with soil type, season, variety, source and method of application.

Studies conducted in different agroclimatic zones in India have shown that potassium is a second limiting nutrient after nitrogen in potato in acidic, alluvial and red soils (**Table 1**). In general, the responses are high in alluvial soils where the crop duration is less than 80-90 days. The K recovery varies between 28 to 54% with an average value of 36%. Studies on the alluvial soils by Singh and Grewal (1995) showed that high utilization efficiency of absorbed K from native soil source is must thereby indicating the desirability for maintenance of fertilization for soil K status.

Likewise in hills, the luxurious vegetative growth of the crop during tuber bulking phase on account of onset of monsoon put more demand on K supply from fertilizer and soil pool. In hills, the response to K also depends upon the

Table 1. Potassium requirement of ware potato in various soil types in India

Potato growing zones	*Soil type*	*Nutrient dose (kg/ha)*		
		N	P_2O_5	K_2O
North western hills	Acidic	120-150	100-150	120
North eastern hills	Acidic	100-120	120-150	60
Indo-Gangetic plains	Alluvial	180-240	80-100	100-150
Plateau region	Black	100-120	60	60
Nilgiri hills	Acidic	90-120	135-150	90

soil organic matter. The response to applied K had been found to increase with increase in organic matter status of the soils. The agronomic efficiency (increase in tuber yield/kg K applied) varied between 0.29 t/ha in soil with low organic matter content to 0.54 t/ha in soils containing high organic matter (Sharma *et al.,* 1997).

Increasing Potassium Use Efficiency

The fertilizer use efficiency of K in potato is comparatively low at 40 to 55%. Several approaches have been tried for increasing K use efficiency.

Time and method of K application: As stated above, the luxuriant vegetative cover requires more K for sustaining crop growth and transfer of photosynthates to the under ground part during its bulking phase in the hills. The most appropriate approach is to resort to its split application so as to make larger K availability to the crop in later stages of crop growth (Sud *et al.*, 1994). Studies in Shimla hills have shown that application of K in two splits i.e. 1/2 at planting and 1/2 at 55-60 days after planting not only increased potato yield but also enhanced K recovery by 10-15% from applied K (**Table 2**). The increase in yield was mainly due to increase in number of large size tubers. Similar were the results from Jalandhar research station, where split application of K was found to be beneficial than full application of K at planting (Singh and Grewal, 1996). Studies conducted by Singh and Singh (1996) on alluvial soils of eastern UP showed that application of K in two split i.e. ½ at 30 days and rest at 50 days after planting significantly increased total soluble solids, crude proteins but had little effect on starch content in tubers. It was observed that late maturing cv. Kufri Jyoti responds more to K applied at planting or at earthing up while Kufri Chandramukhi,

Table 2. Effect of split application of K on Yield and K use efficiency at Kufri (HP)

K Levels (kg K/ha)		*Tuber Yield (q/ha)*		*K-Uptake (kg/ha)*	
Planting	*Earthing up*	*Total*	*Ware*	*Total*	*Ware*
0	0	209	80	74	29
75	0	246	153	90	59
100	0	242	206	96	85
0	75	254	136	85	48
25	50	285	253	102	68
37.5	37.5	295	234	107	70
50	25	270	216	100	80
CD(0.05)		31	58	20	22

an early maturing variety responds more to K applied at planting (Trehan and Grewal, 1990).

Under rainfed conditions in high hills of Shimla, method of application of K has a great influence on the K use efficiency by potato. Its application by the side of the seed tuber had been found to be superior to its application above or below seed tubers (Sud and Grewal, 1993). The potato responses were subsequently higher with K application along the seed tubers than its application above or below the seed (**Fig. 2**). Subsequently, the K recovery

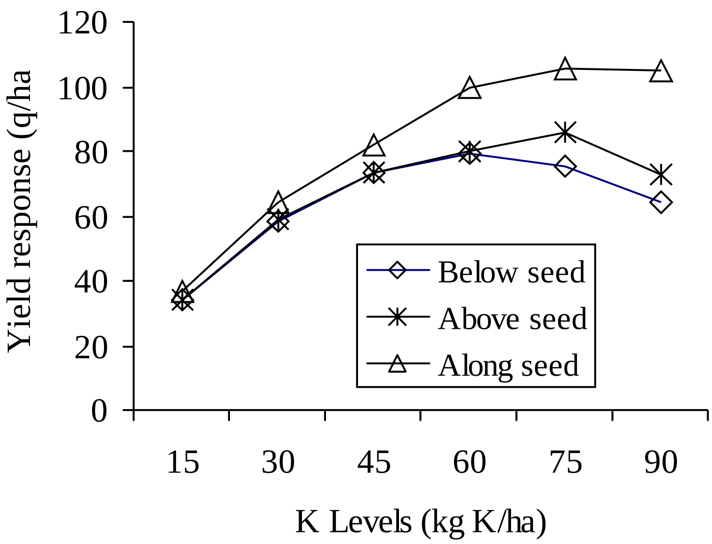

***Fig. 2** Potato response to K in relation to method of application in Shimla hills*

was also higher (64.3%) with K application along the seed tuber compared to 61.9 and 39.3 % obtained with its application above or below the tuber at the planting time. Thus K applied near the root zone in furrows at the time of planting was more effectively utilized under rainfed conditions in which the crop is taken in high hills.

Integrated use of organic manures and fertilizer K: Farmyard (FYM) and green manures, both low analysis sources have been used for meeting nutrient needs of potato. Their use had been found to enrich the soil with P and K in the long run. Long term studies on hill and alluvial soils have shown that application of 30 t/ha of FYM to potato can meet entire K needs of this crop (Sharma, 1998). FYM application at reduced rate of 15 t/ha was able to economize on K dose by 50% without causing any reduction in yields (Grewal and Trehan, 1988). Recent studies have shown that even a smaller quantity of FYM viz. 5 t/ha can serve useful purpose in increasing potato yields besides enhancing K use efficiency (**Fig. 3**). Integrated use of 63 kg K and 5 t/ha of

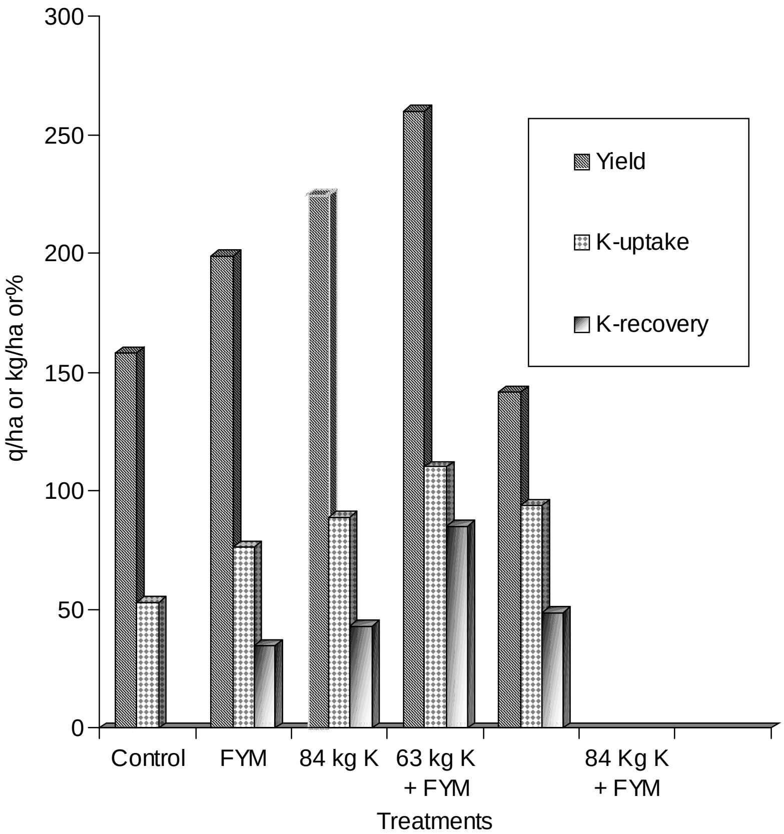

***Fig. 3** Integrated use of FYM and K in Shimla hills*

FYM not only increased K recovery by 10% but also K use efficiency from 1.02 to 1.82 tons tubers/kg K applied (Sud and Grewal, 1990). Moreover, their combined application was also effective in increasing soil K by 23.8%.

In alluvial north-western plains, Placement of K fertilizer or its amendment with FYM did not increase the tuber yield and net returns over broadcasting or no amendment (Singh and Grewal, 1996). The green manures, however, increased the levels of tuber yields significantly. The fertilizer equivalents, based on fixed yield concept were higher than optimum yield concept (Sharma and Sharma, 1990). Therefore, the green manures of *Crotalaria*, *Sesbania*, pearl millet and green gram were equivalent to 159, 176, 54 and 89 kg K/ha, respectively. This shows that green manures can help in meeting K needs of potato.

Foliar application of K: Studies conducted on alluvial soils (Trehan and Sharma, 1998) reveal that application of K through Foliar application of 2% KCl at 50, 70 or 50 and 70 days after planting although increased tuber yield of Kufri Badshah by 35 to 43 q/ha but could not supplement soil application of K (**Table 3**). However, utilization efficiency of absorbed K was more in foliage-applied K than soil-applied K. In frost prone areas of north- western plains, the application of K protects the crop from frost damage (**Table 4**). This increase in K concentration in leaves in turn lowers the freezing point of the cell sap thereby, allowing the crop to escape the frost injury (Upadhaya and Sharma, 1999). The resistance to stress situation is also associated with role of K in carbohydrate metabolism. Thus, this approach can be helpful in maintaining higher K concentration in leaf tissue so that crop can be protected from frost.

Table 3. Effect of soil and foliar application of K on potato yield (q/ha) at Jalandhar (Punjab)

At Planting (kg K/ha)	*Foliar application of K*			
	Water		*2% KCl*	
	50 &70 days	*50*	*70*	*50 &70 days*
0	266	309	301	312
33	314	325	317	315
66	321	332	343	336
99	358	352	332	351
CD (0.05)	29			

Table 4. Interaction between N and K on tuber yield and frost damage index at Modipuram (UP)

K Levels (kg K_2O/ha)	*N Levels (kg N /ha)*			
	0	*100*	*200*	*Mean*
	Tuber yield (q/ha)			
0	255	320	344	344
100	296	373	382	382
200	313	374	405	364
Mean	288	355	377	
	Frost index			
0	3.5	4.1	3.7	3.8
100	0.7	0.8	1.4	1.0
200	0.5	0.5	1.0	0.7
Mean	1.6	1.8	2.0	

Interaction of K and N: Nitrogen induced K efficiency has been observed in Kufri variety as a result, proper combination of N/K is needed, since N decreased K concentration in leaves and also tubers especially in drought years. Studies have shown that 120 kg/ha K should be applied along with 180 kg N. This also increased plant resistance to late blight, a dreaded disease in the hills (Sharma and Sood, 1999). Potassium countered the negative effect of NP on soil organic matter thus maintaining higher status of soil organic matter thereby sustaining higher productivity. Application of K increased the N use efficiency and positively related to K composition of the plant.

Potassium management in relation to soil tests: Studies have shown that in acidic soils, major part of the applied K to potato was retained as exchangeable-K and water soluble –K under slow equilibria whereas under long term equilibria, non-exchangeable-K was more dominant form (Sud and Grewal, 1990). Contribution of non-exchangeable-K towards potato nutrition was non-significant. Soils with less than 1.3 % readily oxidizable carbon were found deficient in K and needed K application (Sharma and Sharma, 1987). The critical limit by NH_4Oac method was found to be 120 ppm in the hill soils while it was 105 ppm for light textured alluvial soils of Jalandhar and 130 ppm for fine textured alluvial soils (Grewal and Sharma, 1980; Grewal and Singh, 1979). Fertilizer adjustment equations for K fertilizer recommendation for various cultivars have been worked out (**Table 5**). These

Table 5. Targeted equations for potato tuber production based on soil tests

Location	*Soil Type*	*Variety*	*Equation*
Pantnagar	Mollisol	Kufri Dewa	FK_2O = 0.380T-0.41SK
Modipuram	Alluvial	Kufri Bahar	FK_2O = 3.258T-4.85SK
		Kufri Jyoti	FK_2O = 1.817T-0.32SK
		Kufri Badshah	FK_2O = 2.492T-3.12SK
		Kufri Sutlej	FK_2O = 2.545T-3.42SK

have been tested on cultivator's fields and were found of high order at 20-30 tons of tuber yield targets (Upadhaya and Sharma, 1999).

Potassium management in relation to plant tissue tests: Tissue testing methodology for K recommendation has been developed both for rainfed and irrigated crops of potato. It consists of analyzing K in petiole or leaf blade collected from 4^{th} leaf of main shoot at stolon formation, tuber initiation or tuber bulking stage. Petioles contain more K than leaf and it vary between 7.5 to 12.0% on dry weight basis at stolon formation stage and tuber initiation stage and starts decreasing afterward (Sud and Grewal, 1993). The K deficiency is observed right from stolon formation stage and aggravates with crop growth. The critical concentration in plant parts at various growth stages have been worked out (**Table 6**). In hills where the crop is grown under rainfed condition during summer months, the critical K concentration in petiole of 4^{th} leaf in Kufri Jyoti at 35-40 days was found to be higher than in the crop grown under short day and assured irrigation. Studies also showed that Kufri Jyoti is more sensitive to K stress than Kufri Chandramukhi. Tuber yield showed an immense relationship with K concentration in petioles as well as leaf (Sud and Grewal, 1993; Trehan and Grewal, 1994). In case of K deficiency observed

Table 6. Critical concentration of K in leaf blades and petioles (%)

Growth stage	*Kufri Jyoti (Hills)*		*Kufri Jyoti (Plains)*		*Kufri Chandramukhi (Plains)*	
	Leaf	*Petiole*	*Leaf*	*Petiole*	*Leaf*	*Petiole*
Stolon formation	3.6	11.9	3.6	6.8	3.7	7.2
Tuber initiation	3.1	10.7	2.6	5.3	2.7	5.4
Tuber bulking	2.8	8.3	2.0	4.3	2.2	4.1

Hills – Rainfed crop; Plains – Irrigated in early stages of crop growth i.e. stolon formation or tuber initiation than, corrective dose that can be applied along with the second dose of N have been worked out both for the hills and plains.

Potassium management in potato based crop sequence

Results from seventeen years long-term study in the northwestern plains (Singh *et al.*, 2000) showed that application of K had a significant effect on production potential of various crops (**Table 7**) in P-W-R (potato-wheat-rice), P-W-M (potato-wheat-Maize), P-P-M (Potato-Potato-Maize) and P-P-M-W-Gm (potato-potato-maize-wheat-green manuring) sequences. Its application through inorganic and organic source was equally effective. The responses were higher with annual application of K through inorganic fertilizers as well as farmyard manure in all the crop sequence whereas in P-P-M sequence, alternate manuring gave better results over annual or biennial application. Potato (autumn and spring) responded more to applied K than rice or maize crops. Moreover, application of K along with N, P and FYM tended to arrest the rate of decline in crop yields in the long run and also helped in maintaining soil K balance.

Table 7. Effect of K on production potentials of cropping systems in alluvial soils of Jalandhar (Punjab)

Treatments	*Manuring frequency*	*Production potential (q/ha)*			
		P-W-R	*P-W-M*	*P-P-M*	*P-P-M-W-GM*
Control		200	213	290	222
P	Annual	252	260	382	257
	Alternate	246	256	381	252
	Biennial	231	245	348	248
PK	Annual	287	286	398	270
	Alternate	269	277	403	263
	Biennial	250	269	364	261
FYM	Annual	316	323	449	290
	Alternate	300	318	466	279
	Biennial	271	277	392	277
Mean		262	272	388	262

*K was applied at 83 kg K/ha from KCl and FYM applied at 30 t/ha

Likewise, nutrient removal was 17% higher with potato-sunflower-rice than potato-sunflower-maize sequence. The former sequence removed 510 kg K against 431 kg K removed by later (Roy *et al.*, 2000). This was also reflected in the post harvest analysis data of soil samples after four crop cycles where a negative net nutrient balance of P and K was observed (**Table 8**). Studies conducted by Roy and Srivastava (1996) on laterite soils of Ranchi (Bihar) showed that K application although helped in getting higher potato equivalent yield ha in potato-wheat inter cropping but left a negative K balance in soil with inadequate K application upto 84 kg K.

Table 8. Effect of nutrient management practices on nutrient removal, soil K and soil net nutrient balance in alluvial soils of Jalandhar (Punjab)

Nutrient Management practices	*Yield (q/ha)*			*Soil K** (kg/ha)*	*Net balance (kg K/ha)*	*Net income (000 Rs/ha)*
	Potato	*Sunflower*	*Rice or Maize grain*			
Potato-sunflower-Maize						
Control (N)	202	21.7	22.5	184	–1344	8.09
Annual PK	296	20.9	25.4	170	–1340	34.93
Biannual PK	305	20.8	27.4	172	–1149	37.19
IMM*	311	24.5	30.9	206	–834	44.23
Potato-sunflower-rice						
Control (N)	199	19.8	52.6	148	–1644	10.85
Annual PK	292	22.6	59.4	180	–1768	41.99
Biannual PK	300	22.2	59.5	176	–1486	42.54
IMM*	309	23.4	59.8	194	–924	46.13

*IMM represent integrated management through residue and fertilizers
**Soil initial K was 224 kg/ha

Integrated nutrient management involving residue incorporation of byproducts i.e. potato haulms, sunflower stalks and rice straw along with mineral fertilizers was able to minimize the loss (Singh *et al.,* 1997). This technique also gave higher crop productivity and higher net returns. A crop of sunflower with 20 q/ha of seed yield can have stalk [178 kg K/ha in addition to 75 kg N and 20 kg P] available for recycling in the above two systems. Thus recycling can enrich the soil not only with NPK but also vital micronutrients like Zn and Fe.

Potassium Management in Relation to Varietal

The potato varieties differ widely with regard to K use efficiency (**Table 9**). The high response to K was partly due to the production of extra large tubers and also to higher cation exchange capacity of its roots. Potato cultivars namely Kufri Bahar and Kufri Badshah responded only upto 50 kg K/ha. Kufri Jyoti and Kufri Chandramukhi on the other hand responded upto 100 kg K/ha (Trehan and Grewal, 1991). The low response in Kufri Badshah could be attributed to the fact that it extracts more K from non-exchangeable K thus require less K dose as compared to Kufri Jyoti and Kufri Chandramukhi. Similarly, the plant height also plays a significant role in varietal response to K. Greater plant height resulted in fewer shoot numbers (Kufri Jyoti and Kufri Sutlej) and subsequently higher response to K while lowest plant height in Kufri Jawahar made it least responsive to K (Upadhaya and Sharma, 1999).

Table 9. Potassium requirement of different potato cultivars

Variety	*K requirement (kg/ha)*	*% Utilization from soil*	*% utilization from fertilizer*
Kufri Jyoti	1.48	68.05	15.53
Kufri Lalima	1.10	90.69	12.01
Kufri Anand	1.27	92.00	37.70
Kufri Sutlej	1.80	76.24	31.12
Kufri Ashoka	1.14	84.40	31.38
Kufri Badshah	1.83	82.65	21.57
Kufri Bahar	1.08	91.00	16.23

Potassium Management for Seed and Ware Crop

Large size is not desirable attribute in seed production where emphasis is on to get maximum number of seed size tubers. Since K helps in increasing the yield and size of large grade tubers, the K dose has to be reduced. Studies have shown that 80 kg K_2O/ha is sufficient for seed crop (Roy and Sharma, 1999).

Recent studies have shown that K dose for ware tuber production needs to be revised (Roy and Sharma, 1999). Moreover, as the crop removal of K is much more than that is added on response basis, the deficiency of K in potato is likely to be aggravated with time. It is advocated that instead of response basis, the dose recommended should be on the removal basis. Results from four year study at Jalandhar (Punjab) has shown that K application on uptake basis was better in terms of tuber and paddy yield (Roy *et al.*, 2000) than on response basis in potato-sunflower-paddy sequence (**Table 10**). The need for K is more felt in years of drought (north-western plains) and late blight disease incidence in hills where the reduction in yields due to K omission has been found to be 35 to 40%. The late blight occurs every year in hills while almost in alternate years in the plains.

Table 10. Effect of K on nutrient removal basis on crop productivity in alluvial soils of Jalandhar

Treatments	*Yield (q/ha)*			
	Potato	*Sunflower*	*Rice*	*Potato equivalent yield*
100% NP to all crops	194	16.6	53.8	44.8
100% NK to all crops	220	16.3	55.5	47.7
100% NPK to all crops	267	16.8	62.2	54.6
150% NPK to potato & rice and 50% to sunflower	304	18.7	58.0	58.3
150% NP to all crops and K on removal basis	319	17.7	63.6	60.7
CD(0.05)	123	1.95	3.83	

Potassium management in tuber quality attributes: As stated earlier, potassium application is known to influence tuber size. Studies conducted at Shimla showed that the increase in yield is largely due to increase in yield of large size tubers (**Table 11**). The tuber quality is greatly influenced by the

Table 11. Effect of K on different grades and total tuber yield of potatoes at Modipuram (UP)

K Levels (kg K/ha)	*Tuber yield (q/ha)*			
	Large grade	*Medium grade*	*Small grade*	*Total*
0	96	120	18	234
50	145	123	13	281
100	170	120	15	305
150	190	123	13	326
CD (0.05)	17.6	NS	NS	24.6

source. Application of K as potassium chloride (MOP) or potassium sulphate (SOP) is recommended for potato crop. Earlier studies conducted by Sharma *et al.* (1976) on acidic soil of Shimla (HP) and alluvial soils of Dauralla (UP) have shown that SOP was superior to MOP in terms of tuber dry matter content, ascorbic acid and starch content (**Table 12**). Data from alluvial soils of Jalandhar showed that potassium sources viz. MOP aand SOP did not differ much in dry matter content in tubers harvested at 100 days (Singh *et al.*, 1996). Higher total and reducing sugars with SOP application confirmed the results from earlier studies at Shimla (HP) and Dauralla (UP).

Table 12. Effect of different K sources on the tuber quality

Attributes	**Shimla**			
	Control	*MOP*	*SOP*	*Schoenite*
Tuber yield (q/ha)	239	274	290	271
Dry matter (%)	22.4	21.4	21.9	22.1
Total sugars (mg/100 g)	1105	1301	1380	1376
Reducing sugars(mg/100 g)	281	355	353	309
Vitamin C (mg/100 g)	17.0	19.3	19.8	20.9
Jalandhar				
Tuber yield (q/ha)	302	324	321	–
Dry matter (%)	19.40	19.05	19.30	–
Total sugars (mg/100 g)	570	573	651	–
Reducing sugars(mg/100 g)	320	378	438	–
Soluble proteins (mg/100 g)	956	961	998	–

Potato industry requires large grade tubers with better chipping quality. Potassium application through potassium chloride has been found to improve chipping quality of tubers. The improvement in tuber quality is mainly attributed to low reducing sugar content of tubers produced with potassium chloride. MOP was found to be better than SOP as it decreases enzymatic discoloration and phenol content of the tubers (**Table 13**) thereby improving the chip colour (Joshi et al 1982). Studies conducted on alluvial soils of prominent potato growing region of western UP have shown that potassium application through potassium chloride improved the crude protein content in the tubers as well as its agronomic efficiency (Singh and Bansal , 2000).

Table 13. Effect of source of K on enzymic discolouration and phenol content in tubers at Shimla (HP)

K Levels (kg K/ha)	*Enzymic discolouration**		*Phenol content***		*Tuber K (%)*	
	SOP	*MOP*	*SOP*	*MOP*	*SOP*	*MOP*
0	0.458	0.479	100	100	1.5	1.6
50	0.478	0.390	90	88	1.6	1.9
100	0.456	0.328	83	82	1.7	2.1
150	0.454	0.278	81	72	1.7	2.2
200	0.453	0.282	81	75	1.8	2.3

*Absorbance at 465 nm aand **relative to control taken as 100

Recently, a lot of emphasis is being given to the processing quality attributes of the cultivars. The varieties also reacted differentially to K-source. Studies conducted on *tarai* soils in UP had shown that SOP was better source than MOP (**Fig. 4**) in Kufri Chandramukhi (KCM), Kufri Jyoti (KJ) and Kufri

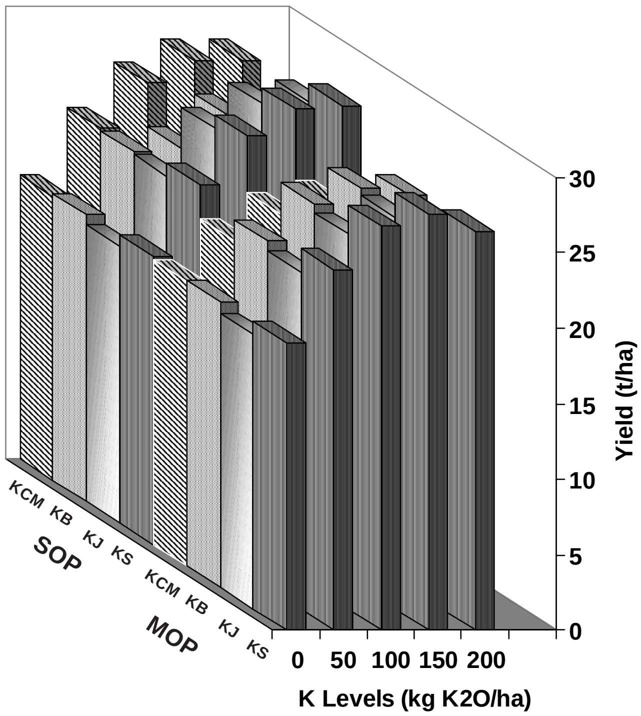

Fig. 4 *Varietal response to K application in tarai soils of UP*

Sindhuri (KS) but not in Kufri Bahar (KB) The magnitude of response to K differed according to the cultivar (Shahid and Moinuddin, 2001). At Modipuram, the sources were compared for not only yield but tuber dry matter content and chip colour (**Table 14**). Wide difference was observed

Table 14. Effect of K-source on tuber yield, dry matter content and chip colour of potato cultivars at Modipuram (UP)

K_2O (kg/ha)	*Varieties*					
	Anand	*Sutlej*	*Chandramukhi*	*Lalima*	*Chipsona I*	*Chipsona II*
Tuber Yield (q/ha)						
0	330	390	300	360	310	280
SOP						
75	340	420	310	380	330	330
150	360	440	310	390	330	340
MOP						
75	320	420	310	380	370	360
150	360	420	310	420	360	360
Dry Matter (%)						
0	20.7	21.1	21.1	20.7	21.6	23.1
SOP						
75	20.2	19.6	19.7	23.1	21.3	23.3
150	20.8	19.2	21.4	23.4	21.9	22.5
MOP						
75	20.0	20.3	20.5	19.8	24.7	22.7
150	19.9	18.5	19.8	20.0	23.7	22.5
Chip Colour						
0	7	7	6	6	4	4
SOP						
75	6	6	6	5	3	5
150	6	7	7	5	4	5
MOP						
75	6	6	6	6	3	4
150	6	7	6	6	4	4

CD (0.05) yield or K rate -2
SOP= Sulphate of Potash, MOP= Muriete of Potash

with source and varieties with regard to dry matter and chip colour (Upadhayay *et al.*, 1999). Recent studies have shown that adequate K application reduced the intensity of late blight in hills and plains.

The two sources of K i.e. MOP and SOP did not differ significantly about the weight loss, sprouting and rottage of potato tubers stored in evaporative cooled storage at Jalandhar (**Table 15**). However, application of 150 kg K/ha was able to reduce the weight loss and sprouting in tubers by 22 and 9%, respectively as compared to tubers stored without K fertilization.

Table 15. Effect of sources and levels of K on keeping quality of potatoes

Main effects	*Weight loss (%) Weeks of storage*		*Sprouting (%)*	*Total rottage %)*
	11	*14*		
Source				
MOP	9.4	18.4	8.9	7.2
SOP	8.7	17.4	10.0	6.3
CD (0.05)	NS	NS	NS	NS
K Levels (kg/ha)				
0	9.4	20.4	8.5	7.1
50	9.1	17.9	11.0	7.1
100	9.4	17.4	10.7	7.9
150	8.3	15.9	7.7	4.8
CD(0.05)	NS	3.6	2.3	NS

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