Potato J. 33 (1 - 2) : 94-96, 2006

SHORT NOTE

EFFECT OF SPLIT DOSES OF N AND K AND FYM LEVELS ON THE PRODUCTIVITY OF SEED POTATO IN COLD DESERT REGIONS OF H.P.

Sanjay Chadha*, S.S. Rana, Rameshwar and D.R. Chaudhary[1]

Potato (*Solanum tuberosum* L.) is one of the major cash crops of Himachal Pradesh. The high altitude disease free potatoes are preferred for seed in various parts of the country. Due to poor soil status, fluctuations in day and night temperatures and desiccating winds, yield of potato is very low in Spiti Valley. The integrated use of fertilizer nutrients *i.e.* N and K, and FYM play vital role in boosting production (7, 8, 9). But due to high mobility of N and K resulting in their loss on account of frequent irrigation. The present investigation was undertaken to study the response of split application of N and K and doses of FYM in seed potato production in cold desert region.

The field experiment was conducted during the two summer seasons (2000 and 2001) at the Research sub station, Lari in the Spiti Valley of Himachal Pradesh (3300 m amsl). The soil of the experimental field was silty loam, alkaline (pH 8.3) and low in available N (178 kg/ha) and organic matter (0.55%). The temperature during winter (November to April) varies from -21.7°C to 8.2°C and during summer (May to October) from 0.1°C to 25.6°C. Rainfall varies from 15-20 cm and annual snowfall between 1-2 m (December-March)

Twelve treatments involving combinations of 3 nitrogen splits [60 kg/ha each at planting and earthing up (45 DAP); 40 kg/ha each at planting, earthing up and 60 DAP, and 30 kg/ha each at planting, earthing up, 60 and 75 DAP], 2 potash splits (60 kg/ha at planting and 30 kg/ha each at planting and earthing up) and two FYM doses (15 and 25 t/ha) were tested in randomized block design with three replications. The variety Kufri Jyoti was planted in June at 50 cm x 12 cm spacing. Whole P_2O_5 (80 kg/ha) and N and K_2O as per the treatment were supplied through single super phosphate, calcium ammonium nitrate and murate of potash, respectively. For weed control pre plant incorporation of fluchloralin 1.0 kg/ha was made one day before planting. Recommended package of practices were followed for raising the crop. Harvesting of potato tubers was done in the second week of October and yield was recorded. Economics of the treatments were computed based upon prevalent market prices.

Split application of N

N is absorbed continuously throughout the growth period of crop (4). However, in view of losses of N through leaching and runoff under frequent irrigation, its split application was advantageous especially at higher dose (1, 2, 4). Thus in the present investigation potato responded significantly to the split application of N. Plant height, shoots/hill and tubers/hill increased significantly with the increase in number of splits of N from 2 to 4 (**Table 1**). The increase in growth and yield attributes may be ascribed to the higher number of stolons and better

[1] Chaudhary Sarwan Kumar H.P. Krishi Vishvavidyalaya, Research sub station Lari 172 113, Himachal Pradesh, India.
*Present Address: Deptt. of Veg. Sci. & Floric., CSKHPKV, Palampur 176 062, Himachal Pradesh, India.

assimilation of carbohydrates and their translocations to the tubers. Similar findings have been reported by Singh *et al*. (10) and Singh and Raghav (11). Owing to the increase in growth and yield attributes, N application in 4 splits increased tuber yield by 23.1 and 13.4% over its application in 2 and 3 splits, respectively. The higher yield resulted in more net returns and Benefit : Cost (B : C) ratio with the increase in two to four splits.

Split application of K

K is required by the crop right from the early stages (1, 5, 13). But its threat of losses especially in coarse textured soils warrants split application over basal alone. Potassium application in 2 splits significantly increased tubers/hill in both the years and plant height during 2000 over the completely basal. The catalytic involvement of K in increasing large size tubers (6, 11) due to better availability and absorption at the tuber bulking stage resulted in significantly higher yield over the completely basal (4, 9, 12). Increase in yield, net returns and B : C ratio owing to K application in 2 splits was 7.1, 11.2 and 11.3%, respectively.

FYM

Tubers/hill in both the years and plant height during 2000 increased significantly with 25 t FYM/ha compared to 15 t FYM/ha. The role of FYM in improving physical and chemical properties of soil such as soil structure, soil aggregation, water retention and higher CEC is well known (5). Moreover, FYM also partly meets P and K needs of potato (3, 4). Thus the positive influence of FYM in the poor organic matter soils, tended to increase mean yield by 13.3% with 25 t FYM/ha over 15t FYM/ha. Net returns owing to 25 t FYM/ha increased by 13.7%, but B:C ratio was not influenced significantly with the FYM doses tried.

N x K interaction

N and K interaction was significant for yield, net returns and B:C ratio. The highest pooled yield (187 q/ha), net returns (Rs. 75540/ha) and B : C ratio (2.07) was obtained with N application in four splits and K application in two splits. This might be due to better absorption of N and K from the fertilizer nutrients during the different growth phases of the crop. (10, 11).

N x FYM interaction

N applied in splits had significant interaction with FYM levels for yield, net returns and B:C ratio. The highest yield (191 q/ha) and net returns (Rs. 76255/ha) were

Table 1. Effect of N, K and FYM on growth, yield attributes, yield and economics of potato

Treatment	*Plant height (cm)*		*Shoots/hill*		*Tubers/hill*		*Tuber yield (q/ha)*		*Mean*	*Net returns (Rs/ha)*	*B : C ratio*
	2000	*2001*	*2000*	*2001*	*2000*	*2001*	*2000*	*2001*			
Nitrogen											
Two splits	38.1	36.7	4.10	3.94	9.61	7.88	152	141	147	51780	1.43
Three splits	41.6	38.3	4.19	3.96	9.90	8.64	166	153	159	59355	1.64
Four splits	42.4	40.6	4.32	4.20	11.27	10.08	186	176	181	72060	1.98
LSD (P=0.05)	1.1	1.4	0.13	0.17	0.34	0.19	3.3	3.1	3.1	1848	0.05
Potassium											
Whole basal	39.9	38.1	4.17	4.06	9.92	8.40	162	151	157	57825	1.59
Two splits	41.4	38.9	4.24	4.06	10.58	9.33	173	162	168	64305	1.77
LSD (P=0.05)	0.9	NS	NS	NS	0.28	0.15	2.7	2.5	2.5	1506	0.04
FYM (t/ha)											
15	40.2	38.0	4.18	4.02	9.62	8.73	158	146	152	57140	1.67
25	41.2	39.0	4.22	4.05	10.80	9.00	178	167	172	64990	1.69
LSD (P=0.05)	0.9	NS	NS	NS	0.28	0.15	2.7	2.5	2.5	1506	NS

NS = not significant

obtained following N application in four splits and FYM at 25 t/ha. But N in four splits and FYM at 15 t/ha was at par with N in four splits and FYM at 25 t/ha in influencing B : C ratio.

K x FYM interaction

K and FYM interaction was significant for yield and net returns. The highest yield (178 q/ha) and net returns (Rs. 68405/ha) were obtained with application of K in two splits along with FYM at 25 t/ha. The fertility schedule increased yield and net returns by 7.0 and 11.1%, respectively over the recommended dose of K as a basal and FYM at 25 t/ha.

N x K x FYM interaction

N and K application in splits interacted significantly with FYM levels to bring about variation in yield, net returns and B : C ratio (**Table 2**). The highest yield and net returns resulted with N application in 4 splits, K in 2 splits and FYM at 25 t/ha. But N in four splits, K in two splits and FYM at 15 t/ha fertility schedule was at par to N in four splits, K in two splits and FYM at 25 t/ha in influencing B : C ratio. The best fertility schedule (N in four splits, K in two splits and FYM 25 t/ha) increased yield and net returns by 30.9 and 52.9%, respectively over the existing recommendation of N in two splits, K whole as basal and FYM 25 t/ha.

Table 2. Integrated effect of N, K and FYM on yield and economics of potato

N splits	*FYM (15t/ha)*		*FYM (25t/ha)*	
	K basal	*K split*	*K basal*	*K split*
	Yield (2000)			
Two splits	133	149	157	169
Three splits	153	162	169	180
Four splits	171	181	191	200
LSD (P=0.05)		6.5		
	Yield (2001)			
Two splits	129	136	146	156
Three splits	137	146	159	169
Four splits	159	170	179	196
LSD (P=0.05)		6.1		
	Yield (Mean)			
Two splits	131	143	151	162
Three splits	145	154	164	175
Four splits	165	176	185	198
LSD (P=0.05)		6.2		
	Net return (Rs/ha)			
Two splits	44390	51380	52390	58960
Three splits	53075	58265	59935	66145
Four splits	64760	70970	72400	80110
LSD (P=0.05)		3702		
	B:C ratio			
Two splits	1.30	1.50	1.37	1.53
Three splits	1.56	1.70	1.56	1.72
Four splits	1.89	2.07	1.88	2.07
LSD (P=0.05)		0.10		

The present finding suggested N application in four splits and K in two splits along with FYM at 25 t/ha for better productivity and economics of seed potato in the Spitti valley of HP.

LITERATURE CITED

1. Cheema, S.S., B.K. Dhaliwal and T.S. Sahota. 1991. *Agronomy,* pp. 274. Kalyani Publishers, Ludhiana, India.
2. Grewal J.S., R.S. Verma and B.S. Bist. 1979. *Indian J. Agric. Sci*. **49**: 683-88.
3. Grewal, J.S. and R.C. Sharma. 1978. *Potassium in soils and crops*, pp. 309-26. Potash Research Institute of India, New Delhi, India.
4. Grewal, J.S. and S.P. Trehan. 1984. *Fertilizer News* (April 1984). pp. 34-41.
5. Hunsigi, G. and K.R. Krishna. 1998. *Science of field crop production*, pp. 433. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi, India.
6. Maity, K. and P.N. Arora. 1980. *Indian J. Agron*. **25**: 390-97.
7. Raskar, B.S. 2003. *Indian J. Agron*. **48**: 229-31.
8. Sharma, I.P., K. Roy, R. Tiwari and U.K. Verma. 1983. *Indian J. Agric. Res*. **17**: 25-29.
9. Sharma, R.C., J.S. Grewal and A.K. Sharma. 1978. *J. Indian Potato Assoc*. **5**: 56-89.
10. Singh, D., T. Singh and S.K. Verma. 1997. *J. Indian Potato Assoc*. **24**: 40-43.
11. Singh, N.P. and M. Raghav. 2000. *J. Indian potato Assoc*. **27**: 47-48.
12. Singh, S.N. and J.S. Grewal. 1979. *J. Indian potato Assoc*. **6**: 79-86.
13. Singh, S.S. 1998. *Crop management*, pp. 574. Kalyani Publishers, Ludhiana, India.

MS Received: 04.03.2005