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Research Paper

COMPARATIVE STUDIES OF CONVENTIONAL AND MINITUBERS OF POTATO (*Solanum tuberosum* L.) VARIETIES AS INFLUENCED BY POTASSIUM LEVELS

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Abstract

The conventional and mini tubers (G_2 stage) of two varieties of potato (*Solanum tuberosum*), namely KufriBadshah and KufriPukhraj were field grown at Chatha, Jammu, during *rabi* 2013-14 in factorial RBD using five levels of potassium(K_2O)(0, 60, 90, 120 and 150 kg ha^{-1}).The results indicated relatively better performance of tissue culture multiplied minitubers (TC) over conventionally multiplied tubers (C) for most of the growth and yield traits. The mean values indicated that genotype V_2 (KufriPukhraj - TC) ranked first for traits like number of stolons per plant (7.35), number of tubers per plant (7.94), weight of tubers per plant (0.86kg), weight of large sized tubers per plant (768.80g), weight of small sized tubers per plant (90.53g), tuber yield per plot (27.58kg) and per hectare (306.39 q). Likewise, mean values indicated that genotype V_1 (KufriBadshah-TC) ranked first for traits like emergence percentage (89.17), average tuber weight per plant (115.74g), polar diameter (63.75mm) and equatorial diameter (94.10mm).Examining the role of potassium on seed multiplication revealed that number of tubers per plant and tuber yield increased with increasing dose of K_2O. Best results were obtained at highest dose i.e.,150 kg K_2O level for traits like plant height (64.19cm), number of stolons per plant (8.37), number of tubers per plant (8.55), weight of tubers per plant (1.19kg),weight of large size tubers(1039.50g), average tuber weight (140.06g), polar diameter (70.30mm), equatorial diameter (100.37mm), tuber yield per plot (31.25kg) ,tuber yield /ha (347.20q). These results were however statistically at par with next lower dose i.e.,120 kg K_2O for traits like

number of stolons per plant (8.18), weight of large size tubers (1026.67g), average tuber weight (138.35g), polar diameter (69.04mm), equatorial diameter (99.23mm), tuber yield per plot (31.04kg), tuber yield per hectare (344.85q).The study thus concluded that minitubers of Kufri Badshah and Kufri Pukhraj performed relatively better over conventionally derived tubers for most of the growth and yield traits with best results recorded on higher dosage of potassium.
Key words: *Tissue culture tuber, Mini tuber, Conventional tuber, Potassium levels, Varieties, Solanum tuberosum*.

INTRODUCTION

Potato is the 4th important crop of India with country ranking 3rd in world potato production. In India,it occupies an area of 1992211 ha with a production of 45343590 MT,thereby having productivity of 22.80 tones per ha(Anonymous.2013). However, the productivity in India is still very poor as compared to Netherland (45.2 t/ha), Germany (44.8 t/ha) and USA (41.8 t/ha) and there is a lot of heterogeneity in potato productivity. Potato tubers are underground, fleshy stems with eyes and are used for vegetative propagation.But availability of good quality potato seed tubers is a major constraint in potato production since field grown tubers are susceptible to a wide range of fungal, bacterial, and viral diseases as well as nematodes and pests (Badoni and Chauhan, 2010). The conventional methods of multiplication has got low rate (4-6 times) of multiplication and risk of susceptibility to diseases and pests is high and diseases also get transmitted to potato seed tubers and result in poor crop (Mokhtar*et al*., 2012).

The advancement of micro-propagation has provided an excellent opportunity for progressive potato growers to produce virus free seed potatoes. The tubers produce in the laboratory in the greenhouse and consequently, in the open field become a source of prosperity amongst the potato growers. Conventional propagation of potato is done vegetatively using seed tubers and ensures uniformity of the crop in terms of growth and yield, but results in degeneration of the crop due to virus infection, the rate of degeneration varies from place to place and cropping to cropping season.

Moreover, advantages like higher rate of multiplication, disease-free planting material (plantlets, transplants, micro-tubers and mini-tubers), convenient storage and transport, and low space requirement during multiplication (Baciu *et al*., 2009; Prematilake and Mendis, 1999), necessitates use of this new method as supplement to conventional method for multiplication of new and locally adapted varieties. The progress made in the recent past for multiplication of diseases free planting material (micro and mini tubers) through *in vitro* means holds great potential (Singh *et al*., 2013).

Further, optimum nutrient supply particularly potassium is considered one of the most important factors affecting the growth and yield of potato. Such increases in yield of potato tubers was either due to the formation of large size tubers or increasing of the number of tubers per plant or both (Dhakal *et al.,* 2011). Potassium (K) contributes to various aspects of tuber quality and plays iimportant role in stolon formation, tuberization and bulking (Chopra *et al*., 2010).

MATERIAL AND METHODS

The study was conducted at Vegetable Research Farm, Division of Vegetable Science and Floriculture, SKUAST, FOA, Chatha, Jammu during the year 2013-2014.

Chatha (Jammu) is situated at 33^0 -55' North latitude and 74^0 -58'East longitude with altitude of 296 meters above mean sea level.Jammu falls under Low Altitude Subtropical Zone. It has got hot dry summer andcold winter. The maximum temperature raises upto 45^0 C during summer (May to June) and minimum temperature can go up to 2^0 C during winters. The mean annual rainfall ranges between 1000-1200 mm and maximum is received during monsoon precipitation.The analytical result of the soil indicated that the soil is sandy loam in texture, slightly alkaline in reaction, low to medium in electrical conductivity, low in organic carbon and available nitrogen and medium in phosphorus and potassium. The experiment was laid out in factorial RBD using 20 treatment combinations. Conventional and tissue culture derived seed tubers (mini-tubers/G-2 stage) of four genotypes/ecotypes representing KufriBadshah and KufriPukhraj cultivars (V_1-Kufri Badshah-TC, V_2-Kufri Pukhraj-TC, V_3 Kufri Badshah-C, V_4-Kufri Pukhraj-C) were evaluated for growth and multiplication responses under varied potassium levels(K_2 O: 0, 60, 90, 120 and 150 kg/ha).

The seed tubers were procured from Department of Agriculture,Jammu and sowing was done in24thOctober, 2013 while maintaining the seed rate of 19 q/ha for mini tubers and 25 q/ha for conventional tubers.Planting was done manually on broad ridges of the size of 30 cm at a spacing of 60 x15 cm.The plots were supplied with full dose of FYM @25T/ha and phosphorus @80kg/ha along .with one third dose of nitrogen i.e.,85kg/ha at the time of sowing. All the recommended package of practices was followed to raise a health crop.For harvesting virus free crop,dehaulming was done after 75 days of sowing i.e.,10th January,2014.

During growth and after harvest, data was recorded on traits like days to 50% emergence, emergence percentage, plant height, number of stolons per plant, number and weight of tuber per plant, average tuber weight per plant,tuber weight by grade, polar diameter, and equatorial diameter and tuber yield.The data obtained during the experiment were subjected to statistical analysis as per the procedure given by Steel and Torrie (1981) using O.P. Sheoran, computer programme.

RESULTS AND DISCUSSION

GROWTH CHARACTERS

Data presented in Table 1 show the effect of genotype / ecotype, potassium levels, and their interaction on growth aspects of potato plants. Among four genotypes/ecotypes studied, differences for all growth traits were found to be statistically significant. The results indicated relatively better performance of tissue culture multiplied potato seed tubers (minitubers) (G_2) over conventionally multiplied tubers. Significant differences for all the growth characters in plants raised from tubers multiplied through conventional or tissue culture means. These could be due to inherent potential of each genotype/ecotype and also to some extent on original source from which potato seed tubers were obtained. Minimum days to 50% emergence (10.87 days) and maximum emergence percentage (89.17%) were recorded in KufriBadshah raised from tubers derived via tissue culture (G2). The possible reason could be better health of tissue culture derived potato seed tubers where chances of diseases and insect pests were reduced or eliminated. Higher emergence percentage of *in-vitro* derived potato seed tubers could be due better initial vigour of plants and their quick establishment.The cultivar KufriBadshah recorded the maximum mean plant height (56.63 cm) and this could be due to its better genetic potential and influence of potassium. KufriPukhraj-TC produced maximum number of stolons per tuber (7.35). Such differences may be attributed to their genetic make-up. The superiority of in *vitro*

derived plantlets over conventional plants under field evaluation has been demonstrated by various workers in many crops.

Among various potassium levels used, maximum plant height (64.19 cm) and maximum number of stolons per tuber (8.37) were recorded with the highest dose of Potassium (K_4) (150 kg K_2O) which was statistically at par with K_3 (120 kg K_2O). Increase in plant height with higher dose of potassium may be due to the possible role of potassium in stomatal regulation, photosynthesis and chlorophyll formation. Similar finding have also been reported by Kumar *et al.* (2005), El-Latif (2011) and Singh and Lal (2012) while using conventional tubers. Higher number of stolons per plant observed with increased dose of potassium might be due to increased number of pseudo stems per plant. These results are in confirmation with the findings of Kumar *et al.* (2005) and Bansal and Trehan (2011) using conventional potato tubers. Among the different treatment combinations, maximum plant height of (70.22 cm) was observed in V_3K_4 (KufriBadshah -C + 150 kg K_2O), which was statistically at par with V_3K_3 (70.13) (KufriBadshah -C + 120 kg K_2O) and V_1K_3 (69.73 cm). The differences in plant height in different treatments may be attributed to genetic makeup and appropriate potassium dose. These results pertaining to better performance under higher K level are in close conformity with the findings of Moinuddin *et al.* (2005), Marzouk*et al.* (2007) while using conventional potato tubers.

Table 1. Mean morphological performance of two genotypes grown under conventional (C) and tissue culture (TC) methods at varies potassium levels

Treatment		Days to 50% emergence	Emergence percentage	Plant height (cm)	Number of stolons per plant
Genotypes					
KufriBadshah – TC		10.87	89.17 (9.49)	55.93	6.09
KufriPukhraj – TC		11.33	88.61 (9.46)	46.34	7.35
KufriBadshah – C		11.93	80.56 (9.03)	56.63	5.91
KufriPukhraj - C		11.87	85.83 (9.32)	46.93	7.21
S.E. m ±		**0.25**	**0.06**	**0.35**	**0.14**
C.D (P = 0.05)		**0.71**	**0.16**	**1.00**	**0.40**
Potassium levels					
K_0 (Control)		11.67	84.90 (9.26)	35.10	4.81
K_1 (60kg/ha)		11.33	86.28 (9.34)	43.16	5.45
K_2 (90kg/ha)		11.58	86.28 (9.28)	51.06	6.39
K_3 (120kg/ha)		11.50	87.85 (9.42)	63.77	8.18
K_4 (150kg/ha)		11.42	86.11 (9.33)	64.19	8.37
S.E. m ±		**0.28**	**0.06**	**0.39**	**0.15**
C.D (P = 0.05)		**NS**	**NS**	**1.12**	**0.44**
Interaction effect					
K_0 (Control)	KufriBadshah–TC	11.67	88.19 (9.44)	38.16	4.40
	KufriPukhraj -TC	11.33	88.19 (9.44)	31.36	5.32
	KufriBadshah -C	11.67	79.17 (8.95)	38.96	4.13
	KufriPukhraj-C	12.00	84.03 (9.22)	31.92	5.40
K_1 (60kg/ha)	KufriBadshah -TC	10.67	88.89 (9.48)	46.50	4.84
	KufriPukhraj -TC	11.33	90.28 (9.55)	39.16	6.20
	KufriBadshah -C	11.67	77.78 (8.87)	47.60	4.80
	KufriPukhraj-C	11.67	88.19 (9.44)	39.40	5.97
	KufriBadshah -TC	11.00	86.81 (9.37)	55.45	5.70

K_2 (90kg/ha)	KufriPukhraj -TC	11.00	84.72 (9.26)	45.93	7.37	
	KufriBadshah -C	12.67	83.33 (9.18)	56.25	5.61	
	KufriPukhraj-C	11.67	85.42 (9.30)	46.62	6.90	
K_3 (120kg/ha)	KufriBadshah -TC	10.67	91.67 (9.63)	69.73	7.64	
	KufriPukhraj -TC	11.00	88.19 (9.44)	57.10	8.92	
	KufriBadshah -C	12.00	84.03 (9.22)	70.13	7.30	
	KufriPukhraj -C	12.33	87.50 (9.41)	58.11	8.86	
K_4 (150kg/ha)	KufriBadshah -TC	10.33	90.28 (9.55)	69.83	7.87	
	KufriPukhraj-TC	12.00	91.67 (9.63)	58.14	8.95	
	KufriBadshah -C	11.67	78.47 (8.92)	70.22	7.72	
	KufriPukhraj -C	11.67	84.03 (9.22)	58.58	8.93	
C.D (P=0.05)		**NS**	**NS**	**2.24**	**NS**	
C V (%)		**8.35**	**2.35**	**2.62**	**8.11**	

Figure: Emergence percentage given in the parenthesis denotes the root square transformed values

TUBER CHARACTERS

Data illustrated in Table 2 and 3 show the effect genotype / ecotype, potassium levels and their interaction on tubers and yield traits of potato. Significant differences were observed for different yield characters among the varieties. Maximum numbers of tubers per plant (7.94), weight of tubers per plant (0.85 kg), weight of small size tubers (90.53 g), were observed with tissue culture derived seed tubers of KufriPukhraj. However, KufriBadshah-TC recorded the maximum polar diameter (63.75 mm), maximum equatorial diameter (94.10 mm) and maximum average tubers weight (115.74 g). Higher number of tubers per plant in tissue culture derived tubers could be attributed to genetic differences and source of seed tuber. Further, increase in weight of tubers per plant and increase in average tubers weight may be due to the more numbers of stolons and more number of tubers per plant. Moreover, tissue culture derived seed tuber indicated certain superiority over conventional seed tuber for average tuber weight, polar diameter and equatorial diameter. Such differences among the cultivars may be attributed to their differences in genetic make-up, source oftubers and appropriate potassium level.

Among the various potassium doses, maximum number of tubers per plant (8.55), weight of tubers per plant (1.19 kg), average tubers weight (140.06 g) weight of large size tubers (1039.50), polar diameter (70.30mm) and equatorial diameter (100.37 mm) were recorded with the highest potassium dose (K_4) (150 kg K_2O) whereas, minimum values were recorded in control. Increase in the above said underground parameters might be due to the possible role of potassium on photosynthesis, phloem loading, translocation and rapid bulking of the tubers. Similar findings have also been reported by Kumar *et al.* (2005), Singh and Lal (2012), Khan *et al*. (2010), Haile and Boke (2011) while using conventional potato tubers. The tissue culture derived plants, gave significantly better tuber yield per plant over conventional seed tubers. It could be their better potential for growth and tuber production. Further, higher number of tubers per plant with increased dose of potassium might be due to increased number of stem per plant under the influence of optimum level of potassium. The results are in confirmation with the findings of Ajalli*et al.* (2013), Bansal and Trehan (2011), kumar *et al.* (2005) while using conventional tubers. Maximum tubers weight per plant and maximum average tuber weight in response to higher potassium dose might be due to

better development of root system, enhanced photosynthesis and rapid bulking of the tubers. The similar findings have been reported by El-Sirafy (2008), Chopra *et al.* (2010), Haile and Boke (2011), Singh and Lal (2012) using conventional tubers. Similarly, maximum polar and equatorial diameter might be due to genetic factors and potassium that built up adequate food reserve for formation and elongation of cell and enhanced photosynthesis activity. The use of tissue culture derived seed tuber and increased potassium could have also effect on enhancing the tuber equatorial and polar diameter.

Among the different treatment combinations, higher number of tubers per plant of (9.54), was observed in V_2K_4 (KufriPukhraj-C + 150 kg K_2O), which was statistically at par with V_2K_3 (KufriPukhraj-TC + 120 kg K_2O (9.44) and V_4K_4 (KufriPukhraj-C + 150 kg K_2O) (9.45). Maximum average tuber weight (154.27 g), maximum polar diameter (72.31 mm), maximum equatorial diameter (106.31 mm) was observed in V_1K_4 (KufriBadshah-TC + 150 kg K_2O) It could be large leaf area , better growth and efficient utilization of nutrients by the crop application of optimum level of potassium. These results are in conformity with that of El-Sirafy (2008) and Singh and Lal (2012).

Table 2. Mean tubers and yieldperformance of two genotypes grown under conventional (C) and tissue culture (TC) methods at varies potassium levels

Treatment		Number of tubers per plant	Weight of tubers per plant (kg)	Average tuber weight (g)	Polar diameter (mm)	Equatorial diameter (mm)	Tuber yield per plot (kg)	Tuber yield (q/ha)
Genotypes effects								
KufriBadshah – TC		6.79	0.81	115.74	63.75	94.10	27.02	300.22
KufriPukhraj – TC		7.94	0.86	103.24	57.94	86.54	27.58	306.39
KufriBadshah – C		6.53	0.76	112.06	63.20	93.27	25.94	288.23
KufriPukhraj - C		7.69	0.81	101.02	57.18	85.99	26.21	291.22
S.E. m±		**0.03**	**0.02**	**0.60**	**0.53**	**0.36**	**0.35**	**3.85**
C.D (P = 0.05)		**0.09**	**0.07**	**1.72**	**1.52**	**1.04**	**0.99**	**11.03**
K - level effect								
K_0 (Control)		5.92	0.47	74.88	46.67	77.87	20.76	230.64
K_1 (60kg/ha)		6.31	0.53	84.19	54.91	83.77	23.10	256.64
K_2 (90kg/ha)		7.10	0.73	102.60	61.67	88.63	27.29	303.25
K_3 (120kg/ha)		8.31	1.14	138.35	69.04	99.23	31.04	344.85
K_4 (150kg/ha)		8.55	1.19	140.06	70.30	100.37	31.25	347.20
S.E. m±		**0.03**	**0.03**	**0.67**	**0.59**	**0.41**	**0.39**	**4.31**
C.D (P = 0.05)		**0.10**	**0.08**	**1.92**	**1.70**	**1.17**	**1.10**	**12.33**
Interaction effect								
K_0 (Control)	KufriBadshah–TC	5.77	0.450	77.36	53.27	81.48	20.73	230.37
	KufriPukhraj–TC	6.27	0.557	76.65	41.09	75.10	20.97	232.96
	KufriBadshah–C	5.61	0.413	73.35	51.71	80.53	20.49	227.63
	KufriPukhraj-C	6.03	0.440	72.15	40.60	74.38	20.84	231.59
K_1 (60kg/ha)	KufriBadshah–TC	6.23	0.550	88.03	56.94	86.01	22.72	252.41
	KufriPukhraj–TC	6.78	0.587	86.39	53.33	82.15	23.92	265.81
	KufriBadshah–C	5.95	0.487	81.89	56.85	85.03	22.35	248.33
	KufriPukhraj-C	6.28	0.507	80.45	52.51	81.88	23.40	260.00
K_2 (90kg/ha)	KufriBadshah–TC	6.78	0.723	106.26	65.67	91.62	27.64	307.15
	KufriPukhraj–TC	7.67	0.757	98.45	58.20	85.88	27.90	310.04
	KufriBadshah–C	6.53	0.690	105.42	65.65	91.27	27.21	302.37
	KufriPukhraj-C	7.43	0.747	100.26	57.16	85.75	26.41	293.44

K_3 (120kg/ha)	KufriBadshah–TC	7.48	1.14	152.77	70.58	105.05	31.93	354.74
	KufriPukhraj–TC	9.44	1.20	126.79	68.11	94.08	32.51	361.22
	KufriBadshah–C	7.06	1.05	148.60	70.37	104.50	29.53	328.15
	KufriPukhraj–C	9.26	1.16	125.24	67.11	93.26	30.18	335.30
K_4 (150kg/ha)	KufriBadshah–TC	7.69	1.19	154.27	72.31	106.31	32.08	356.45
	KufriPukhraj-TC	9.54	1.22	127.93	68.98	95.48	32.57	361.93
	KufriBadshah–C	7.51	1.14	151.06	71.42	105.02	30.12	334.67
	KufriPukhraj–C	9.45	1.20	126.99	68.49	94.68	30.22	335.74
S.E. m ±		**0.70**	**0.05**	**1.34**	**1.19**	**0.81**	**0.77**	**8.61**
C.D (P=0.05)		**0.20**	**NS**	**3.84**	**3.41**	**2.33**	**NS**	**NS**
CV (%)		**1.38**	**12.50**	**12.15**	**3.40**	**1.57**	**5.03**	**5.03**

Table 3. Mean tubers and yieldperformance of two genotypes grown under conventional (C) and tissue culture (TC) methods at varies potassium levels

Treatment		**Weight of tuber by grad**		
		Weight of small size tuber (<40 g)	Weight of medium size tuber (40-60 g)	Weight of large size tuber (>60 g)
Genotypes effects				
KufriBadshah –TC		86.67	117.55	742.00
KufriPukhraj –TC		90.53	118.88	768.80
KufriBadshah –C		82.13	111.73	720.67
KufriPukhraj-C		81.87	117.43	732.00
S.E. m ±		**2.30**	**5.18**	**24.63**
C.D (P=0.05)		**6.58**	**NS**	**NS**
K-level effect				
K_0 (Control)		98.50	113.40	384.00
K_1 (60kg/ha)		93.83	115.50	538.83
K_2 (90kg/ha)		90.33	115.60	715.33
K_3 (120kg/ha)		73.33	118.32	1026.67
K_4 (150kg/ha)		70.50	119.17	1039.50
S.E. m ±		**2.57**	**5.79**	**27.54**
C.D (P=0.05)		**7.36**	**NS**	**78.87**
Interaction effect				
K_0 (Control)	KufriBadshah –TC	107.33	115.07	388.00
	KufriPukhraj –TC	103.33	1116.00	396.00
	KufriBadshah –C	94.00	110.00	370.67
	KufriPukhraj-C	89.33	112.53	381.33
K_1 (60kg/ha)	KufriBadshah –TC	93.33	118.00	547.33
	KufriPukhraj –TC	99.33	118.67	559.33
	KufriBadshah –C	93.33	111.00	534.00
	KufriPukhraj-C	89.33	114.00	514.67
K_2 (90kg/ha)	KufriBadshah –TC	86.00	115.33	708.67
	KufriPukhraj –TC	98.67	118.40	716.67
	KufriBadshah –C	84.00	108.67	694.00
	KufriPukhraj-C	92.67	120.00	742.00
	KufriBadshah –TC	74.67	119.33	1025.33
	KufriPukhraj –TC	75.33	119.33	1080.00

K_3 (120kg/ha)	KufriBadshah –C	72.67	115.33	999.33
	KufriPukhraj –C	70.67	119.27	1002.00
K_4 (150kg/ha)	KufriBadshah –TC	72.00	120.00	1040.67
	KufriPukhraj-TC	76.00	122.00	1092.00
	KufriBadshah –C	66.67	113.33	1005.33
	KufriPukhraj –C	67.33	121.33	1020.00
S.E. m ±		**5.14**	**11.59**	**55.08**
C.D (P=0.05)		**NS**	**NS**	**NS**
C V (%)		**10.44**	**16.12**	**2.58**

In conventional seed potato systems, farmers use seed potato tubers for the multiplication and production. This method has some major disadvantages (Beukema and Van der Zang, 1990; Struik and becWiesema, 1999). Over the last three decades rapid multiplication system became an important technique to provide disease free propagules. These technique yield in vitro plantlets, transplants, microtubers and minitubers, which are used in the initial phases of a seed tubers production scheme (Jones, 1988).

COMPARATIVE STUDIES

Among genotypes/ecotypes studied, differences for most of the traits were found to be statistically significant. The mean values indicated that genotype V_2 (KufriPukhraj - TC) ranked first for traits like number of stolons per plant (7.35), number of tubers per plant (7.94), weight of tubers per plant (0.86kg), weight of large sized tubers per plant (768.80g), weight of small sized tubers per plant (90.53g), tuber yield per plot (27.58kg). These values were statistically higher in tissue culture derived potato seed tubers of Kufri Pukhraj when compared with conventional potato seed tubers of both Kufri Badshah and Kufri Pukhraj. Likewise, mean values indicated that genotype V_1 (KufriBadshah-TC) ranked first for traits like emergence percentage (89.17), average tuber weight per plant (115.74g), polar diameter (63.75mm) and equatorial diameter (94.10mm).Besides, minimum mean value (10.87 days) for days to 50% emergence was recorded in V_1. Possible reasons for relatively better performance of each cultivar over respective genotype/ecotype (raised from tissue culture derived tubers) for most of the traits could be due to appropriate source of tubers and inherent genetic potential of varieties. These results are also in agreement with Tadesse *et. al*. (2001) and Ozturk and Yildirim (2010).

Ozturk*et al*. 2012 demonstrated superiority of *in vitro* plantlets over traditional seed roots in sweet potato. Similarly, Singh *et al*. 2013 compared performance of *in vitro* derived turmeric plants with conventional rhizome under field conditions and demonstrated superiority of former over later for horticultural traits. Further Mokhtar*et al.,* 2012 observed in potato that performance of genotype *in vitro* is not measure of its field performance. The present result indicating superiority of *in vitro* derived tubers demonstrates importance of tissue culture technique to provide disease free propagules like *in vitro plantlets*, transplants, microtubers and ultimately minitubers.

CONCLUSION

It can be concluded from present studies that tissue culture derived tubers Kufri Badshah- TC (V_1) and Kufri Pukhraj –TC (V_2) performed relatively better over conventionally derived tubers of Kufri Badshah (V_3) and Kufri Pukhraj (V_4) for most of the growth and yield traits. Best results were obtained on 150 kg K_2O /ha and these were statistically at par with 120 kg K_2O dose. Among genotypes / ecotypes , the ability of tissue culture derived seed tubers towards multiplication of seed tubers (medium sized) was relatively better in Kufri Pukhraj(conventional and tissue culture derived tubers) at 90 Kg K_2O while that of Kufri Badshah (conventional and tissue culture derived tubers) at 120 and 150 kg K_2O. For meeting increasing demand of seed tubers, tissue culture derived seed tuber (mini tubers) (G_2 stage) can serve as an alternative option to conventional potato seed tubers.

The progressive increase ofpotassium from 0 to 150 kg K^2O ha^{-1} significantly affected growth and yield components in both conventional and mintuber genotypic differences with regard to optimum potassium requirement for medium sized tubers were also observed. The results indicate that Kufri Pukhraj exhibited the higher performance in terms of medium sized tube yield and interacted best with a K rate of 90 kg K_2O ha^{-1} while Kufri Badshah exhibited best performance with 120 kg K_2O and it was comparable at 150 kg K_2O.

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