Performance Evaluation of Nutrient Dense Potato Genotypes at High Hills of Karnali Province, Nepal

ABSTRACT

The trial was carried out to identify suitable potato genotypes for high hills of Karnali province of Nepal. The genotypes were received from International Potato Centre (CIP), Lima, Peru through National Potato Research Program (NPRP) and evaluated for two consecutive years 2017 and 2018 at Horticulture Research Station (HRS), Rajikot, Jumla, Nepal (2396 masl). Nine nutrient dense potato genotypes with two checks i.e. Desiree and Jumli Local in on-station trial were tested in Randomized Complete Block Design (RCBD) with three replications. Fertilizer was used at the rate of 100:100:60 kg NPK/ha and 20 t/ha compost. Well sprouted tubers of seed size (25-50 g) were planted at a spacing of 60cm x 25cm. The effects of different genotypes were recorded for both vegetative as well as yield parameters. There is a significant difference among tested genotypes for vegetative (emergence percentage at 30 days after planting & 45 days after planting, uniformity, ground coverage, plant height, number of main stems) as well as yield parameters (total number of tubers and tuber yield per ha). The highest tuber yield (46.93 t/ha) was recorded from genotype T 304351.109 followed by genotype T 304368.46 (41.46 t/ha) and genotype T 302498.7 (32.69 t/ha) among the nutrient dense potato genotypes. Similarly, late blight scoring was minimum (score 1) in all these three genotypes. The results of both years showed that potato genotypes T 304351.109, T 304368.46 and T 302498.7 are promising for cultivation in high hills of Karnali province to combat the malnutrition as well as ensure nutritional security.

Key words: *Genotypes, On-station Trial, Parameters, Yield*

1. INTRODUCTION

Potato (*Solanum tuberosum* L.) is one of the most important crops in Nepal. It is utilized as a major vegetable in Terai and mid-hills and used as a vegetable and staple food in high hills. In the year 2021/22 area under potato in Nepal was reported 198,788 ha and total production 33,25,231 ton with an average productivity of 16.73 t/ha which were higher than the data recorded in previous fiscal year (area: 1,88,098 ha, production: 31,31,830 tons, productivity: 16.65 t/ha [1]. It occupies the fifth position in area coverage, second in total production and first in productivity among the food crops grown in Nepal [2]. Out of the total area under potato, around 20% is in the high hills and mountains, 41.5% in the mid-hills and 38.5% in Terai [3]. Potato plays an important role in food security and livelihood due to its high cash, food and nutritive value [4]. It is grown in entire ecological region of Nepal ranging from terai to mountainous regions including Karnali zone [5, 6]. Seed potato productivity is declining in high hills and mountains of Nepal which is considered as key constraint to potato production [7]. The several factors reducing productivity could be due to loss of valuable local genotypes; lack of improved cultivation practices; weed infestation causing potato crop loss, inadequate supply of quality seed; occurrence of pest and disease especially late blight causing damage up to USD 13.5 billion per annum in developing countries [5] and low soil and nutrient management practices. Majority of farmers still use local genotypes that indicate very low seed replacement rates. The existing varieties are low yielding and highly prone to incidence of disease especially late blight and viruses as well as insect/pest.

Till 2023 only eleven varieties have been released along with the improved production technology which is insufficient for different agro-climatic conditions of Nepal. This clarifies that there is still need for the development of new potato varieties. There is always a demand of high yielding varieties which are resistant of diseases and insect pests and even perform in the drought and dry condition too [8]. Apart to the high yielding varieties, area specific varieties and quality planting material is the other most important part for the successful cultivation of the crop. There are other more promising high yielding pipeline varieties which can be promoted for growing in the large area which have shown better yield as compared to the farmer's local ones. It is necessary to strengthen formal seed system to enhance access of quality potato seeds and needs a regular training and exposure visits to improve the adaptation of improved potato varieties in Nepal [9]. Due to the unavailability of the planting material and lack of effective distribution mechanisms of the developed technologies, they are still within the research station and a small command area of the station [10]. Apart from the released varieties there are other most promising genotypes where there is a need for continuation of the research activities under guidance of NPRP, Khumaltar. Therefore, this study was conducted at HRS, Rajikot, Jumla with an objective to identify the high yielding genotype for the high hills condition of Karnali Province of Nepal.

2. MATERIALS AND METHODS

On-station trial was conducted at Horticulture Research Station (HRS), Rajikot, Jumla. The experimental area is situated at 29°16'50"N to 29°12'20"N and 82°12'20"E to 82°12'40"E with the altitude of 2398 meters above mean sea level. Its climate is a temperate. March-April is the main planting season of potato in Jumla. Soil is sandy loam in nature. Maximum & minimum average temperature of growing season in 2017 was 20^0C to 27^0C and 3^0C to 17^0C. Total rainfall during this year was 591mm [11]. Similarly, during 2018 maximum & minimum average temperature were 21^0C to 25^0C and 4^0C to 16^0C and total rainfall was 692mm [12]. The trial was conducted for two consecutive years 2017 and 2018.
Nine different nutrient dense (3.71 to 9.22 mg iron content per 100 gm weight) potato genotypes (T 302498.7, T 303381.3, T 304347.6, T 304351.109, T 304366.46, T 304368.46, T 391058.175, T 393371.58 and T 304405.47) were introduced from International Potato Centre (CIP), Lima, Peru through National Potato Research Program (NPRP) to Horticultural Research Station (HRS), Rajikot, Jumla and tested as on-station trial at the station during 2017 and 2018. Desiree and Jumli local were used as check for on-station trial. The detail of the experiment material is given below in Table 1. The experimental plot size was 5.4 m^2 (3m x 1.8m). The plots were fertilized with 100:100:60 kg NPK/ha and 20 t/ha compost.
Well sprouted tubers of 25-50 g were planted with 60cm x 25cm spacing. The experiment was designed as RCBD with three replications. Planting and harvesting were done on the 3^{rd} week of March and 3^{rd} week of September respectively. All the management practices were followed as per the NPRP recommendation. Observation on ground coverage was recorded as percentage covered by plant canopy in each plot at six weeks after planting. Late blight scoring was done in 1-9 scale where 1 was considered as no infection of disease (resistant) and 9 was given when the disease was observed up to stems i.e. highly susceptible. Similarly plant uniformity was observed in 1-5 scale, where 5 was given to almost uniform plats. The number of tubers and total yield was recorded from experimental plot and converted as per hectare. The data for growth, yield and yield parameters were recorded and analyzed by using Genstat (15^{th} edition).

Table 1: Potato Genotypes and their Characteristics used in On-Station Varietal Trial at Horticulture Research Station, Rajikot, Jumla during 2017 and 2018

SN	Genotypes	Original name	Source	Skin color	Shape	Eye depth	Maturity	Iron content (mg/100gm)	Remarks
1	T 302498.7	Techni-tuber series 302498.7	CIP	White	Round	Shallow	Late (>120 days)	3.78	Pipeline
2	T 303381.3	Techni-tuber series 303381.3	CIP	Red	Round	Deep	Late (>120 days)	5.16	Pipeline
3	T 304347.6	Techni-tuber series 304347.6	CIP	Red	Round	Deep	Late (>120 days)	3.71	Pipeline
4	T 304351.109	Techni-tuber series 304351.109	CIP	Red	Oblong	Deep	Late (>120 days)	9.22	Pipeline
5	T 304366.46	Techni-tuber series 304366.46	CIP	Light red	Round	Shallow	Late (>120 days)	7.34	Pipeline
6	T 304368.46	Techni-tuber series 304368.46	CIP	White	Oblong	Deep	Late (>120 days)	4.53	Pipeline
7	T 391058.175	Techni-tuber series 391058.175	CIP	White	Round	Medium	Late (>120 days)	4.70	Pipeline
8	T 393371.58	Techni-tuber series 393371.58	CIP	White	Round	Shallow	Late (>120 days)	8.28	Pipeline
9	T 304405.47	Techni-tuber series 304405.47	CIP	White	Round	Deep	Late (>120 days)	5.24	Pipeline
10	Jumli local	Jumli Local	Nepal	White	Long	Shallow	Late (>120 days)	Not tested	Local
11	Desiree	Urgenta x Depesche	CIP	Red	Long	Medium	Early (<100 days)	Not tested	Released

[2, 13]

3. RESULTS AND DISCUSSION

3.1 Vegetative Parameters

Average of two years results revealed that the tested genotypes were significantly different for emergence per cent at 30 and 45 days after planting (DAP) (Table 2). In 30 DAP, maximum emergence (72.78 %) was observed in genotype T 304351.109 followed by Desiree (66.67 %) whereas the lowest emergence (23.89 %) was recorded in genotype T 302498.7. At 45 DAP, genotypes T 304368.46 (98.89 %), Desiree (98.33%), T 304351.109 (97.22%) and T 302498.7 (97.22%) showed similar but high percent of emergence; whereas the lowest emergence (81.11%) was observed in T 304347.6.Emergence is mainly related to sprouting behavior of potato tubers. Emergence significantly differed between varieties [14]. In potato tubers, sprouting is influenced by external factors such as temperature and moisture and internal factors like physiological maturity and dormancy [15, 16]. In the present study, the variation in emergence might be due to both factors.

Table 2: Effect of different potato genotypes on emergence (%) at 30 and 45 days after planting in On-Station Varietal Trial at Horticulture Research Station, Rajikot, Jumla during 2017 and 2018

SN	Genotypes	Emergence % at 30 DAP			Emergence % at 45DAP		
		2017	2018	Average	2017	2018	Average
1	T 302498.7	5.56 d	42.22 bc	23.89 e	95.56	98.89 a	97.22 a
2	T 303381.3	51.11 abc	51.11 b	51.11 bcd	96.67	76.67 bc	86.67 bc
3	T 304347.6	74.44 a	25.56 c	50 bcd	97.78	64.44 c	81.11 c
4	T 304351.109	58.89 abc	86.67 a	72.78 a	95.56	98.89 a	97.22 a
5	T 304366.46	53.33 abc	58.89 b	56.11 abc	95.56	92.22 ab	92.89 ab
6	T 304368.46	64.44 abc	66.67 ab	65.56 abc	100	97.78 a	98.89 a
7	T 391058.175	43.33 bc	22.22 c	32.78 de	96.67	83.33 ab	90 abc
8	T 393371.58	37.78 c	52.22 b	45 cd	95.56	94.44 ab	95 ab
9	T 304405.47	62.22 abc	52.22 b	57.22 abc	94.44	85.56 ab	90 abc
10	Jumli local	54.44 abc	63.33 ab	58.89 abc	93.33	95.56 ab	94.44 ab
11	Desiree	70 ab	63.33 ab	66.67 ab	97.78	98.89 a	98.33 a
	Mean	52.3	53.1	52.7	96.26	89.7	92.98
	F test	**	**	**	NS	**	*
	CV (%)	29.5	26.1	20.3	3.6	11.2	5.8
	LSD (0.05)	26.25	23.61	18.24		17.12	9.16

Note: NS=Non Significant *= Significant at p<0.05 **=Significant at p<0.001 LSD=Least Significant Difference CV= Coefficient of Variation

The plant height was found significant among tested genotypes. The plant height was found the highest (79.67 cm) in genotype T 303381.3 and T 304405.47 (79.5 cm) whereas it was recorded the lowest (40.2 cm) in check variety Desiree followed by Jumli Local (50.7 cm). The highest number of main stems per plant (5.13) were observed in genotype T 304351.109 followed by T 391058.175 (4.55) whereas the lowest (2.91) was recorded in Jumli Local and Desiree (3.5) (Table 3). Previous report [17] showed the difference in plant height of potato genotypes linked with genetic makeup and environmental factors. In the present study, it was also related to the both factors, as the experimental site is dry upland with limited irrigation and nutrients were supplied through organic fertilizers as well the genotypes might have difference in response to solar radiation. Similar results were also reported by researchers [18, 19, 16]. Morphological traits such as plant height are highly dependent on varieties due to their genetic variations [20]. Similar variation in varieties for plant height and other growth parameters was observed [21].

Table 3: Effect of different potato genotypes on Plant height (cm) and number of main stems/plant in On-Station Varietal Trial at Horticulture Research Station, Rajikot, Jumla during 2017 and 2018

SN	Genotypes	Plant height (cm)			No. of main stem		
		2017	2018	Average	2017	2018	Average
1	T 302498.7	54.8 b	75.6 ab	65.2 b	3.67 cde	4.33	4 bc
2	T 303381.3	66.07 a	93.27 ab	79.67 a	3.47 de	3.67	3.57 cd
3	T 304347.6	49.8 bc	77.33 ab	63.57 b	4.13 bc	4.2	4.17 bc
4	T 304351.109	56.2 b	95.67 a	75.93 a	5.2 a	5.07	5.13 a
5	T 304366.46	51.93 bc	76 ab	63.97 b	3.4 e	3.67	3.53 cd
6	T 304368.46	50.6 bc	76.2 ab	63.4 b	3.2 ef	4.13	3.67 c
7	T 391058.175	51.2 bc	77.67 ab	64.43 b	4.4 b	4.7	4.55 ab
8	T 393371.58	49.87 bc	72.4 bc	61.13 b	3.53 de	4.13	3.83 c
9	T 304405.47	65.6 a	93.4 ab	79.5 a	3.93 bcd	4	3.96 bc
10	Jumli local	46.93 c	54.47 cd	50.7 c	2.9 f	2.93	2.91 d
11	Desiree	40.2 d	40.2 d	40.2 d	3.53 de	3.47	3.5 cd
	Mean	53.02	75.7	64.3	3.76	4.03	3.89
	F test	**	**	**	**	NS	**
	CV (%)	7.4	15	9.4	7.3	18.6	9.3
	LSD (0.05)	6.69	19.39	10.28	0.47		0.61

Note: NS=Non Significant *= Significant at p<0.05 **=Significant at p<0.001 LSD=Least Significant Difference CV= Coefficient of Variation

Percentage of ground coverage of different potato genotypes found significantly differed among each other. Maximum ground coverage (59.17%) was recorded in T 304368.46 whereas the lowest (36.67%) was recorded in T 304405.47 followed. Similarly, plant uniformity was recorded the highest (5) in genotypes T 303381.3, T 304351.109, and T 304368.46 whereas the lowest (2.33) in Jumli Local (Table 4). Ground coverage is also related to the diameter of canopy. Canopy diameter significantly varied among potato varieties in a previous study [22], which also agreed to the present study. Soil Improvement during cropping increased the vigor of the potato plant [23].

Table 4: Effect of different potato genotypes on ground coverage (%) and Plant uniformity (1-5 scale) in On- Station Varietal Trial at Horticulture Research Station, Rajikot, Jumla during 2017 and 2018

SN	Genotypes	Ground coverage (%) at six weeks of planting			Uniformity (1-5 scale)		
		2017	2018	Average	2017	2018	Average
1	T 302498.7	58.33 abc	55 a	56.67 ab	4.67 abc	4.67 abc	4.67 ab
2	T 303381.3	46.67 cd	48.33 ab	47.5 abc	5 a	5 a	5 a
3	T 304347.6	50 abcd	45 ab	47.5 abc	4 e	4 e	4 c
4	T 304351.109	60 ab	56.67 a	58.33 ab	5 ab	5 ab	5 a
5	T 304366.46	48.33 bcd	48.33 ab	48.33 abc	4.33 acde	4.33 acde	4.33 bc
6	T 304368.46	61.67 a	56.67 a	59.17 a	5 ab	5 ab	5 a
7	T 391058.175	43.33 d	48.33 ab	45.83 bc	4 e	4 e	4 c
8	T 393371.58	40 d	43.33 ab	41.67 c	4 ce	4 ce	4 c
9	T 304405.47	38.33 d	35 b	36.67 c	4.67 abcd	4.67 abcd	4.67 ab
10	Jumli local	40 d	38.33 b	39.17 c	2.33 f	2.33 f	2.33 d
11	Desiree	38.33 d	38.33 b	38.33 c	4 cde	4 cde	4 c
	Mean	47.7	46.7	47.2	4.27	4.27	4.27
	F test	**	*	**	**	**	**
	CV (%)	13.6	17.3	14.4	8.2	8.2	7.5
	LSD (0.05)	11.06	13.76	11.6	0.6	0.6	0.54

Note: NS=Non Significant *= Significant at p<0.05 **=Significant at p<0.001 LSD=Least Significant Difference CV= Coefficient of Variation

3.2 Insect pest damage and late blight scoring

Damage caused by insect (Blister beetle, Leaf minor) was minimum in all the genotypes. Insect damage percentage was maximum (3.83%) in genotype Jumli local followed by Desiree (3.5%), and T 304366.46 (3%) whereas minimum in genotype T 304405.47 (2%). Potato tuber moth, red ants, green peach aphid, white grubs and leaf miner fly are top 5 pests of potato in Nepal [24] but the case is different in Jumla. Quality seeds, resistant cultivars, appropriate cultural practices, biological and chemical control are the major strategies for managing potato pests. Similarly, occurrence of late blight was less in all tested genotypes than in the check cultivar Jumli Local (Table 5).Variation in resistance of potato cultivars against late blight disease was also observed by some researchers [25]. In a previous experiment, potato genotypes CIP 392657.8, CIP 384321.15, CIP 392637.10, CIP 393280.57, CIP 393077.159 and LBr40 were consistently found to be resistant to late blight over years and different agro-climatic conditions [26] indicating variation in genotypes against disease resistance.

Table 5: Effect of different potato genotypes on insect damage (%) and late blight infection (scale 1-9) in On-Station Varietal Trial at Horticulture Research Station, Rajikot, Jumla during 2017 and 2018

SN	Genotypes	Insect damage (%)			Late blight reading (1-9 scale)		
		2017	2018	Average	2017	2018	Average
1	T 302498.7	2.67 b	2.67 a	2.67 bc	1 d	1 d	1 e
2	T 303381.3	2.67 b	2.33 a	2.5 bc	1 d	1 d	1 e
3	T 304347.6	2.67 b	2.67 a	2.67 bc	1 d	1 d	1 e
4	T 304351.109	2.33 b	3 a	2.67 bc	1 d	1 d	1 e
5	T 304366.46	2.67 b	3.33 a	3 abc	2.67 c	2.33 c	2.5 c
6	T 304368.46	2.33 b	2.33 a	2.33 c	1 d	1 d	1 e
7	T 391058.175	2 b	2.33 a	2.17 c	1 d	1 d	1 e
8	T 393371.58	2 b	2.67 a	2.33 c	1 d	2 c	1.5 d
9	T 304405.47	2 b	2 a	2 c	1 d	1 d	1 e
10	Jumli local	4.33 a	2.67 a	3.83 a	4 a	4.33 a	4.17 a
11	Desiree	4.33 a	3.33 a	3.5 ab	3 b	3 b	3 b
	Mean	2.73	2.67	2.7	1.6	1.69	1.65
	F test	**	NS	*	**	**	**
	CV (%)	24.1	31.1	20.8	10.8	14.9	10.9
	LSD (0.05)	1.12		0.96	0.29	0.43	0.31

Note: NS=Non Significant *= Significant at p<0.05 **=Significant at p<0.001 LSD=Least Significant Difference CV= Coefficient of Variation

3.3 Yield and yield attributing parameters

Most of the tested potato genotypes were late in maturity than the early maturing check variety Desiree. Varieties could affect the 50% emergence, flowering and maturity and it provide basis for selection of late or early maturing varieties [27].The variation in length of growing period among varieties might be due to the difference in genetic makeup [28] as flowering and maturity both are heritable traits [29, 30]. In our study, maturity primarily relied on genotypic performance. Significant difference was also recorded in tuber number per hectare. High number (686235) of tubers per hectare was recorded in Jumli local, T 304368.46 (598642) and T 304351.109 (518457), while it was less in Desiree (334630) and T 391058.175 (365802). This difference was related to the number of tubers per plant in the experimental plot. The difference in number of tubers per plant depends on genetic makeup of plant, canopy development and environmental conditions [16].Results of the present study were also in line with the fact and were also supported by the previous researchers [31, 17]. Genetic and environmental factors also affect stolon and tuberization processes [30]. In our results, both factors might have equal influence in tuber formation, tuber development and maturity processes. The same factors may influence in tuber yield. In our experiment, tuber yield was the highest in T 304351.109 (46.93 t/ha) and T 304368.46 (41.61 t/ha) whereas the lowest yield (12.59 t/ha) was recorded in Jumli local (Table 6). Tuber size, weight and other characteristics basically rely on genetic inheritability, which is also supported [16]. Previous report [32] showed that the difference in tuber weight and other traits of different cultivars. The difference in tuber yield in the present study was also related to the difference in emergence and ground coverage. Large size great weight of tubers may be obtained from fast emergence of plants and their improved growth [33]. Significantly higher tuber yield (46.93 t/ha, 41.46 t/ha and 32.69 t/ha) were obtained from T 304351.109, T 304368.46 and T 302498.7 respectively at research block of Horticulture Research Station, Rajikot, Jumla, Nepal. Productivity of these genotypes ranged from 32.69 t/ha to 46.93 t/ha in two consecutive years.

This indicates that these genotypes have genetic potentiality to perform better under Jumla condition of Nepal. Yield and growth parameters may also vary with the intra-row spacing and time of earthing [34]. Application of potassium fertilizer increased the tuber yield [35]. Varietal and environmental variations and their interactions had influence on tuber yield and other attributes [36]. In the present study, the yield of the genotypes also varied in the seasons of two years indicating the influence of variation in weather parameters across the years. Yield differences in potato genotypes over years were also reported by some researchers [37].

Genotypes were also different in their shape and color. Genotypes T 302498.7, T 303381.3, T 304347.6, T 304366.46, T 304368.46, T 391058.175, Jumli Local and Desiree were round in shape; while T 304351.109 and T 304368.46 were oblong. Tuber traits like tuber shape, eye depth, skin and flesh color are crucial aspects for consumers and may also impact processing quality [38]. Tuber shape is control by various factors [39, 38]. Genotypes T 302498.7, T 304368.46, T 391058.175, T 393371.58, T 304405.47 and Jumli Local were white, T 304366.46 was light red and remaining genotypes were red in tuber color. The skin color of potatoes is controlled by numbers of genetic factors [40]. Mainly carotenoids and anthocyanins pigments are responsible for color of potato [41]. In a study [42], potato color was also affected by reducing sugar content and dry matter content. However, in our study, it was mainly due to the genotypic effect. In Nepalese condition, the consumers' choice for colors also varies across the locations. For instance, white tubers are preferred in Jumla and some other districts while red tubers are preferred in Kathmandu and other major cities (personal experience). Simlarly, round tubers are preferred in remote villages while long and oblong tubers are preferred in Pokhara and other cities (personal experience). The significant variation in vegetative as well as yield parameters has been reported by different researchers [43, 44, 45]. Significant differences for almost all the vegetative as well as yield parameters show the wider genetic diversity as well as variability and potentiality among the tested potato genotypes [46, 47].

Table 6: Effect of different potato genotypes on number of tuber/ha and tuber yield (t/ha) in On-Station Varietal Trial at Horticulture Research Station, Rajikot, Jumla during 2017 and 2018

SN	Genotypes	Tuber number per ha			Tuber yield (t/ha)		
		2017	2018	Average	2017	2018	Average
1	T 302498.7	419259 cd	401235 bc	410247 d	31.99 bc	33.4 c	32.69 b
2	T 303381.3	430370 cd	406173 bc	418272 cd	31.03 bc	32.26 c	31.64 b
3	T 304347.6	407407 cd	333333 c	370370 d	36.44 ab	25.67 cd	31.05 bc
4	T 304351.109	499259 cd	537654 ab	518457 bc	42.74 a	51.11 a	46.93 a
5	T 304366.46	480000 bcd	391358 bc	435679 cd	29.75 bc	28.69 cd	29.22 bc
6	T 304368.46	589630 ab	587654 a	598642 b	40.3 a	42.93 b	41.61 a
7	T 391058.175	382222 cd	399383 c	365802 d	29.15 bc	26.08 cd	27.61 bc
8	T 393371.58	454815 cd	404938 bc	429877 cd	30.96 bc	26.35 cd	28.56 bc
9	T 304405.47	393333 cd	274691 c	334012 d	31.15 bc	25.86 cd	28.5 bc
10	Jumli local	697778 a	674691 a	686235 a	12.77 d	12.42 e	12.59 d
11	Desiree	360000 d	309259 c	334630 d	27.72 c	22.49 d	25.11 c
	Mean	464916	424579	444747	31.27	29.75	30.51
	F test	**	**	**	**	**	**
	CV (%)	13.8	19.3	12.4	13	15.7	11
	LSD (0.05)	108968	139772	93919	6.93	7.94	5.7

Note: NS=Non Significant *= Significant at p<0.05 **=Significant at p<0.001 LSD=Least Significant Difference CV= Coefficient of Variation

4. CONCLUSION

The results of the experiment during 2017 and 2018 at the station showed that potato genotypes T 304351.109, T 304368.46 and T 302498.7 performed better. Productivity of these genotypes ranged from 32.69 t/ha to 46.93 t/ha during two years whereas the national productivity of potato is 16.73 t/ha. Therefore, these potato genotypes are suitable for food security point to the farmers in Jumla and high hills of Karnali Province of Nepal for commercial cultivation.

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COMPETING INTERESTS

Authors declare that there is no conflict of interest related to the publication of this manuscript.

AUTHORS' CONTRIBUTIONS

This trial was carried out in close collaboration among the all authors. All the authors reviewed the first draft paper, commented, suggested and approved the final paper for submission.

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