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Response of potato (*Solanum tuberosum* L.) genotypes to different nitrogen levels for quality attributes and nutrient content in tubers

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Abstract
Potato (*Solanum tuberosum* L.) is an important crop among all vegetables for food and income generation as it produces a high yield per unit land and time. It is a balanced food containing less energy but nutritionally high-quality protein, essential vitamins and minerals including trace elements. A research trial was conducted at Research Farm of Department of Horticulture, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh during the year 2018-19 and 2019-20 to study the effect of interaction between genotypes and nitrogen levels on growth and yield of potato in the plain region of Chhattisgarh. The experiment was carried out in Factorial Randomized Block Design (FRBD) with 12 treatment combinations of 3 potato genotypes (AICRP-P-39, Kufri Garima and Kufri Pukhraj) and 4 nitrogen levels (0, 80, 160 and 240 kg N/ha) with three replications. Result regarding quality parameters and nutrient content in potato tubers revealed that AICRP-P-39 with 160 kg N/ha recorded maximum quality and nutrient content *i.e.* carbohydrate (%), starch (%), protein content (mg/100g) of tuber, total soluble solids (%), acidity (%), total sugar (mg/100g), reducing sugar (mg/100g), ascorbic acid content (mg/100g) of potato tubers, while the minimum was recorded in Kufri Garima with 0 kg N/ha. Maximum N content (%) in potato plant and tuber was recorded with AICRP-P-39 with 240 kg N/ha while the minimum was recorded in Kufri Garima with 0 kg N/ha.

Keywords: Genotypes, nitrogen levels, quality attributes, nutrient content etc.

Introduction
Potato (*Solanum tuberosum* L.) is an important crop among all vegetables and has an important role in our daily diet. Potato is a tuber crop belongs to the Nightshade family having the rich amount of edible starch. It is very important for food and income generation as it produces a high yield per unit land and time.

Potato is not only a rich source of carbohydrates and calories but also furnishes high quality of amino acids, Vitamin B, Vitamin C and minerals. One hundred grams of potato tuber contains 80% moisture, 20% dry matter, 14% starch, 20% sugar, 2% protein, 1% mineral salts, 0.61% fiber and 0.1% fat (Anonymous, 2002) [3]. It is an important tuber crop rich in carbohydrates (22.6 g per 100 g of edible portion), minerals (Ca, Mg, Cu, Fe, P, K and Na), and vitamin C (17 mg) and contains 97 kilo calories energy per 100 g of edible matter.

There are various eatable foods made by the potato *i.e.* chips, fingerchips, halwa, gulabjamun, Rasgulla, Murabba, Kheer, Guziya and barfi. Some alkaloid like solanine also found in potato. Potato has some medicinal properties also, like it has anti-scorbutic, aperients, diuretic, galacagoue, nervous sedative, stimulant to gout and antispasmodic (Rai and Yadav, 2005) [10].

In India, potato production is mainly confined to Uttar Pradesh, West Bengal, Bihar, Madhya Pradesh, Gujarat, Punjab, Assam and Haryana. The annual potato production in India was 434.17 lakh million ton from an area coverage of 21.17 lakh hectares with the productivity of 21.00 tons/ha (Anon., 2017) [4]. Presently, India ranks 2nd in area and production of potato in the world after China which contribute 11 per cent of world potato production (FAO, 2014). However, Chhattisgarh produces 644.83 thousand MT from the 41.95 thousand ha area occupies ninth rank in India in the year of 2015-16 MT/ha (Anon., 2017) [4].

The growth, yield and quality parameters of potato are mainly governed by availability of major nutrients required for its cultivation. Nitrogen is a key element in growth, development and quality improvement of crop plants. It influences the yield mainly through leaf area expansion, crop development, crop quality, and susceptibility to lodging and can also influence the behavior of other elements. Nitrogen is an integral part of purin-pyrimidins which forms RNA and DNA essential for photosynthesis.

The increased nitrogen dose helps in vigorous plant growth, increase leaf area, tuber size, total sugars, reducing sugars, protein content and resistance to leaf spots and decrease starch content.

Genetic architecture has great influence on yield and quality parameters of potato. Various varieties of potato having different genotypes have been evolved. Different potato genotypes having wide variation in their yield potential and quality attributes can be involved in studies of their performances on growth and yield under different agro-climatic or nutritional conditions. The soil and climate conditions of our state are quite suited for cultivation of potato. Due to suitability and high returns, the area of potato in Chhattisgarh is increasing day by day. Hence, keeping above facts in view an experiment was conducted to study the performance of different varieties of potato under different nitrogen levels for quality attributes and nutrient content in potato tubers under plain region of Chhattisgarh.

Methods and Materials

The research trial was carried out during the year 2018-19 and 2018-19 at Research Farm of Department of Horticulture, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. The soil of experimental field was clay-loam having pH 7.7. The experiment was laid out in Factorial Randomized Block Design (FRBD) with 12 treatment combinations of 3 potato genotypes (AICRP-P-39, Kufri Garima and Kufri Pukhraj) and 4 nitrogen levels (0, 80, 160 and 240 kg N/ha) with three replications. Healthy sprouted potato tubers were treated with fungicide and planted on a well-prepared field at 60 cm x 20 cm distance in ridge with application of recommended dose of P and K fertilizers and uniformly maintained all the cultural practices adopted in potato cultivation.

All the experimental plants were provided same cultural practices *i.e.* fertilizer application, irrigation, gap filling, earthing-up, weed management, haulm cutting and plant protection measures during whole period of investigation.

Under quality attributing parameters and nutrient content in potato tubers, the observations *i.e.* carbohydrate (%), starch (%), protein content (mg/100g) of tuber, total soluble solids (%), acidity (%), total sugar (mg/100g), reducing sugar (mg/100g), ascorbic acid content (mg/100g) and N content (%) in potato plant & tuber were recorded.

Results and Discussion

The results of trial pertaining to various aspects of quality attributing parameters and nutrient content in potato tubers are summarized as follows:

1. Carbohydrate content in potato (%)

It is evident from the data (Table 1) that effect of different potato genotypes was found to be significant in respect to carbohydrate content (%) in potato tubers under the present investigation. The maximum carbohydrate content (39.24%) was recorded under the genotype AICRP-P-39 followed by Kufri Pukhraj (38.01%). However, the minimum carbohydrate content (37.32%) in potato tubers was obtained in Kufri Garima during both the experimental years and over pooled data mean.

As regards the effect of different nitrogen levels on carbohydrate content (%) in potato tubers, the data revealed that the highest carbohydrate content (40.68%) in potato tubers was recorded with application of 160 kg N/ha followed by nitrogen level 240 kg N/ha (40.32%) and 80 kg N/ha (37.45%) during both the years and over pooled data mean. The lowest carbohydrate content (34.32%) in potato tubers was noticed under 0 kg N/ha.

The significant influence of interaction between potato genotypes and different nitrogen levels in respect to carbohydrate content (%) in potato tubers has been reported under the present investigation. The maximum carbohydrate content (41.74%) was recorded under the potato genotype AICRP-P-39 with application of 160 kg N/ha (V_1N_3) followed by AICRP-P-39 with application of 240 kg N/ha (V_1N_4) having 41.35% carbohydrate content in potato tubers, while the minimum carbohydrate content (33.59%) was recorded in Kufri Garima with application of 0 kg N/ha (V_2N_1) during both the years and over pooled data mean.

The significant variations among various treatments in respect to carbohydrate content (%) in potato tubers has been reported under the present investigation. The increase in carbohydrate content (%) might be due to the hydrolysis of polysaccharides, conversion of organic acid in to soluble sugars and enhanced solubilization of insoluble starch which is enhanced with increased level of nitrogen. In conformity of this, similar observation was reported by Singh *et al.* (1973) [11].

2. Starch content in potato (%)

The data (Table 1) recorded on starch content (%) in potato tubers revealed that potato genotypes significantly influenced the starch content (%) in potato tubers. The maximum starch content (34.19%) was recorded under the genotype AICRP-P-39 followed by Kufri Pukhraj (32.86%). However, the minimum starch content (32.11%) in potato tubers was obtained in Kufri Garima at harvest during both the experimental years and over pooled data mean.

As regards the effect of different nitrogen levels on starch content (%) in potato tubers, the data revealed that the highest starch content (35.75%) in potato tubers was recorded with application of 160 kg N/ha followed by nitrogen level 240 kg N/ha (35.23%) and 80 kg N/ha (32.37%). The lowest starch content (28.87%) in potato tubers was noticed under 0 kg N/ha during both the years and over pooled data mean.

The significant influence of interaction between potato genotypes and different nitrogen levels in respect to starch content (%) in potato tubers has been reported under the present investigation. The maximum starch content (37.13%) was recorded under the potato genotype AICRP-P-39 with application of 160 kg N/ha (V_1N_3) followed by AICRP-P-39 with application of 240 kg N/ha (V_1N_4) having 36.26% starch content in potato tubers, while the minimum starch content (28.01%) was recorded in Kufri Garima with application of 0 kg N/ha (V_2N_1) during both the years and over pooled data mean.

The significant variations among various treatments in respect to starch content (%) in potato tubers has been reported under the present investigation. The increase in starch content (%) might be due to the hydrolysis of polysaccharides, conversion of organic acid in to soluble sugars and enhanced solubilization of insoluble starch which is enhanced by increased level of nitrogen. In conformity of this, similar observation was reported by Singh *et al.* (1973) [11], Ciecko and Mazur (1974) [5], Jatav *et al.* (2013) [8] etc.

3. TSS (%) of potato tubers

It is apparent from the data (Table 1) that TSS (%) of potato

tubers was influenced by different genotypes and nitrogen levels. Among different potato genotypes, the maximum TSS (6.00%) of potato tubers was recorded under the genotype AICRP-P-39 followed by Kufri Pukhraj (5.82%). However, the minimum TSS (5.46%) of potato tubers was obtained in Kufri Garima during both years and over pooled data mean.

As regards the effect of different nitrogen levels on TSS (%) content of potato tubers, the data revealed that the highest TSS (6.57%) of potato tubers was recorded with application of 160 kg N/ha followed by application of nitrogen level 240 kg N/ha (6.29%) followed by application of 80 kg N/ha (5.34%) during both the years and over pooled data mean. The lowest TSS (4.84%) of potato tubers was noticed under 0 kg N/ha nitrogen level during both the years and over pooled data mean.

The significant effect of interaction between potato genotypes and different nitrogen levels in respect to TSS (%) of potato tubers has been reported under the present investigation. The maximum TSS (6.84%) of potato tubers was recorded under the potato genotype AICRP-P-39 with application of 160 kg N/ha (V_1N_3) followed by AICRP-P-39 with application of 240 kg N/ha (V_1N_4) having 6.70% TSS in potato tubers, while the minimum TSS (4.67%) was recorded in Kufri Garima with application of 0 kg N/ha (V_2N_1) during both the years and over pooled data mean.

The significant variations among various treatments in respect to TSS (%) of potato tubers has been reported under the present investigation. The increase in total soluble solids may be accounted to the hydrolysis of polysaccharides, conversion of organic acid in to soluble sugars and enhanced solubilization of insoluble starch which is enhanced by increased level of nitrogen. In conformity of this, similar observation was reported by Singh *et al.* (1973) [11], Ciecko and Mazur (1974) [5], Jatav *et al.* (2013) [8] etc.

4. Ascorbic acid content (mg/100g) in potato tubers

It is apparent from the data (Table 1) that among different potato genotypes, the maximum ascorbic acid content (24.84 mg/100g) was recorded under the genotype AICRP-P-39 followed by Kufri Pukhraj (23.37 mg/100g). However, the minimum ascorbic acid content (22.36 mg/100g) in potato tubers was obtained in Kufri Garima during both the experimental years and over pooled data mean.

As regards the effect of different nitrogen levels on ascorbic acid content in potato tubers, the data revealed that the highest ascorbic acid content (26.47 mg/100g) in potato tubers was recorded with application of 160 kg N/ha followed by nitrogen level 240 kg N/ha (25.52 mg/100g) and nitrogen level 80 kg N/ha (22.19 mg/100g). The lowest ascorbic acid content (19.92 mg/100g) was recorded under 0 kg N/ha during both the years and over pooled data mean.

The significant effect of interaction between potato genotypes and different nitrogen levels in respect to ascorbic acid content (mg/100g) in potato tubers has been reported under the present investigation. The maximum ascorbic acid content (28.50 mg/100g) was recorded under the potato genotype AICRP-P-39 with application of 160 kg N/ha (V_1N_3) followed by AICRP-P-39 with application of 240 kg N/ha (V_1N_4) having ascorbic acid content (26.96 mg/100g) in potato tubers, while the minimum ascorbic acid content (18.93 mg/100g) was recorded in Kufri Garima with application of 0 kg N/ha (V_2N_1) during both the years and over pooled data mean.

The significant variations among various treatments in respect to ascorbic acid content (mg/100g) in potato tubers has been reported under the present investigation. The increase in ascorbic acid content (mg/100g) might be due to the hydrolysis of polysaccharides, conversion of organic acid is enhanced by increased level of nitrogen. In conformity of this, similar observation was reported by Singh *et al.* (1973) [11], Ciecko and Mazur (1974) [5], Jatav *et al.* (2013) [8] etc.

5. Protein content in potato (mg/100g)

It is apparent from the data that protein content (mg/100g) in potato tubers was influenced by different potato genotypes and nitrogen levels (Table 2). Among different potato genotypes, the maximum protein content (171.08 mg/100g) was recorded under the genotype AICRP-P-39 followed by Kufri Pukhraj (167.85 mg/100g) during both years and over pooled data mean. However, the minimum protein content (164.02mg/100g) in potato tubers was obtained in Kufri Garima.

As regards the effect of different nitrogen levels on protein content in potato tubers, the data revealed that the highest protein content (173.73 mg/100g) in potato tubers was recorded with application of 160 kg N/ha followed by nitrogen level 240 kg N/ha (171.90 mg/100g), followed by 80 kg N/ha (166.99 mg/100g). The lowest protein content (158.00 mg/100g) was noticed under 0 kg N/ha during both the years and over pooled data mean.

The significant influence of interaction between potato genotypes and different nitrogen levels in respect to protein content (mg/100g) in potato tubers has been reported under the present investigation. The maximum protein content (176.9 mg/100g) in potato tubers was recorded under the potato genotype AICRP-P-39 with application of 160 kg N/ha (V_1N_3) followed by AICRP-P-39 with application of 240 kg N/ha (V_1N_4) protein content (174.4 mg/100g) in potato tubers, while the minimum protein content (150.6 mg/100g) was recorded in Kufri Garima with application of 0 kg N/ha (V_2N_1) during both the years and over pooled data mean.

The significant variations among various treatments in respect to protein content (mg/100g) in potato tubers has been reported under the present investigation. The increase in protein content (mg/100g) might be due to the hydrolysis of polysaccharides, conversion of organic acid in to amino acids and enhanced solubilization of insoluble starch which converts into amino acids which ultimately made protein is enhanced by increased level of nitrogen. In conformity of this, similar observation was reported by Singh *et al.* (1973) [11], Ciecko and Mazur (1974) [5], Jatav *et al.* (2013) [8] etc.

6. Total sugar content in potato (mg/100g)

Total sugar content (mg/100g) in potato tubers was analyzed after harvesting of crop showed significant influence by different potato genotypes and nitrogen levels (Table 2). Among different potato genotypes, the maximum total sugar content (272.52 mg/100g) in potato tubers was recorded under the genotype AICRP-P-39 (V_1) followed by Kufri Pukhraj (V_3) total sugar content (262.82 mg/100g). However, the minimum total sugar content (251.94 mg/100g) in potato tubers was obtained in Kufri Garima (V_2) at harvest during both the experimental years and over pooled data mean.

As regards the effect of different nitrogen levels on total sugar content (mg/100g) in potato tubers, the data revealed that the highest total sugar content (281.33 mg/100g) in potato tubers was recorded with application of 160 kg N/ha followed by nitrogen level 240 kg N/ha (276.81 mg/100g), followed by 80

kg N/ha (259.62 mg/100g) during both the years and over pooled data mean. The lowest total sugar content (231.95 mg/100g) in potato tubers was noticed under 0 kg N/ha.

The significant effect of interaction between potato genotypes and different nitrogen levels in respect to total sugar content (mg/100g) in potato tubers has been reported under the present investigation. The maximum total sugar content (292.7 mg/100g) was recorded under the potato genotype AICRP-P-39 with application of 160 kg N/ha (V_1N_3) followed by AICRP-P-39 with application of 240 kg N/ha (V_1N_4) having total sugar content (287.8 mg/100g), while the minimum total sugar content (218.6 mg/100g) was recorded in Kufri Garima with application of 0 kg N/ha (V_2N_1) during both the years and over pooled data mean.

The significant variations among various treatments in respect to total sugar content (mg/100g) in potato tubers has been reported under the present investigation. The increase in total sugar content (mg/100g) might be due to the hydrolysis of polysaccharides, conversion of organic acid in to soluble sugars and enhanced solubilization of insoluble starch which converts into sugar is enhanced by increased level of nitrogen. In conformity of this, similar observation was reported by Singh *et al.* (1973) [11], Ciecko and Mazur (1974) [5], Jatav *et al.* (2013) [8] etc.

7. Reducing sugar (mg/100g) in potato

It is apparent from the data regarding reducing sugar (mg/100g) in potato tubers was influenced by different genotypes and nitrogen levels (Table 2). Among different potato genotypes, the maximum reducing sugar content (261.28 mg/100g) in potato tubers was recorded under the genotype AICRP-P-39 followed by Kufri Pukhraj (250.81 mg/100g). However, the minimum reducing sugar content (239.62 mg/100g) in potato tubers was obtained in Kufri Garima during both the experimental years and over pooled data mean.

As regards the effect of different nitrogen levels on reducing sugar content (mg/100g) in potato tubers, the data revealed that the highest reducing sugar (270.52 mg/100g) in potato tubers was recorded with application of 160 kg N/ha (N_3) followed by application of nitrogen level 240 kg N/ha (266.95 mg/100g) followed by 0 kg N/ha (246.99 mg/100g) during both the years and over pooled data mean. The lowest reducing sugar content (217.80 mg/100g) in potato tubers was noticed under 0 kg N/ha.

The significant effect of interaction between potato genotypes and different nitrogen levels in respect to reducing sugar content (mg/100g) in potato tubers has been reported under the present investigation. The maximum reducing sugar content (282.7 mg/100g) was recorded under the potato genotype AICRP-P-39 with application of 160 kg N/ha (V_1N_3) followed by AICRP-P-39 with application of 240 kg N/ha (V_1N_4) having reducing sugar content (278.1 mg/100g), while the minimum reducing sugar content (203.4 mg/100g) was recorded in Kufri Garima with application of 0 kg N/ha (V_2N_1) during both the years and over pooled data mean.

The significant variations among various treatments in respect to reducing sugar content (mg/100g) in potato tubers has been reported under the present investigation. The increase in reducing sugar content (mg/100g) might be due to the hydrolysis of polysaccharides, conversion of organic acid into soluble sugars and enhanced solubilization of insoluble starch and converts into sugars which is enhanced by increased level of nitrogen. In conformity of this, similar observation was reported by Singh *et al.* (1973) [11], Ciecko and Mazur (1974) [5], Jatav *et al.* (2013) [8] etc.

8. N content in potato plants and tubers

Nitrogen content in potato plants and tubers was estimated by Kjeldal method after crop harvesting. The data on N content in plant and tubers (Table 3) revealed that there was significant influence of genotypes on nitrogen content in plant and potato tubers. Maximum nitrogen content in plant (1.21%) and tubers (0.31%) was recorded with genotype AICRP-P-39 followed by Kufri Pukhraj (1.09 and 0.28%) during both the years and over pooled data mean. Kufri Garima showed least values of nitrogen content in plant (1.00%) and tubers (0.24%) during both the years and over pooled data mean. Varieties have different genetic potential which might have resulted in differed uptake and absorption of nitrogen resulting in varied nitrogen content in plant. Kumar *et al.* (2008) [9] and Jatav *et al.* (2018) [7] also reported significant difference among varieties for nitrogen content in potato.

Table 1: Carbohydrates, starch, TSS and ascorbic acid content in potato tubers as influenced by different genotypes and nitrogen levels

Carbohydrates, starch, total soluble solids (TSS) and ascorbic acid content of potato tuber												
	Carbohydrates (%)			Starch (%)			TSS (%)			Ascorbic acid (mg/100g)		
Treatments	**2018-19**	**2019-20**	**Pooled Mean**	**2018-19**	**2019-20**	**Pooled Mean**	**2018-19**	**2019-20**	**Pooled Mean**	**2018-19**	**2019-20**	**Pooled Mean**
Varieties/Genotypes												
V_1: AICRP-P-39	40.09	38.39	39.24	34.98	33.39	34.19	6.04	5.95	6.00	25.44	24.25	24.84
V_2: Kufri Garima	38.07	36.57	37.32	32.65	31.57	32.11	5.53	5.40	5.46	22.95	21.77	22.36
V_3: Kufri Pukhraj	38.83	37.20	38.01	33.53	32.20	32.86	5.89	5.76	5.82	23.97	22.78	23.37
S.Em ±	0.05	0.07	0.06	0.01	0.03	0.02	0.03	0.01	0.02	0.11	0.10	0.10
CD (P = 0.05)	0.16	0.22	0.18	0.03	0.10	0.06	0.09	0.04	0.06	0.33	0.30	0.31
CV	5.88	4.11	5.15	3.77	3.96	3.83	4.87	5.19	4.45	4.23	4.13	4.18
Nitrogen Levels												
N_1: 0 kg/ha	35.27	33.37	34.32	29.37	28.37	28.87	4.91	4.77	4.84	20.52	19.32	19.92
N_2: 80 kg/ha	38.21	36.70	37.45	33.03	31.70	32.37	5.40	5.27	5.34	22.78	21.60	22.19
N_3: 160 kg/ha	41.44	39.92	40.68	36.58	34.92	35.75	6.62	6.52	6.57	27.05	25.88	26.47
N_4: 240 kg/ha	41.07	39.56	40.32	35.89	34.56	35.23	6.34	6.24	6.29	26.11	24.92	25.52
S.Em ±	0.07	0.06	0.06	0.03	0.04	0.03	0.03	0.01	0.02	0.12	0.11	0.11
CD (P = 0.05)	0.21	0.18	0.19	0.09	0.12	0.10	0.09	0.04	0.07	0.35	0.34	0.33
CV	4.39	3.24	3.81	4.11	3.86	3.75	3.32	4.28	3.51	3.45	3.31	3.54
Interaction (V x N)												
V_1N_1	36.37	34.18	35.28	30.52	29.19	29.85	5.04	4.90	4.97	21.43	20.26	20.84

V_1N_2	39.33	37.82	38.58	34.16	32.82	33.49	5.54	5.41	5.47	23.64	22.46	23.05
V_1N_3	42.53	40.96	41.74	38.3	35.96	37.13	6.85	6.81	6.84	29.10	27.91	28.50
V_1N_4	42.12	40.59	41.35	36.93	35.59	36.26	6.72	6.69	6.70	27.55	26.38	26.96
V_2N_1	34.35	32.84	33.59	28.18	27.84	28.01	4.73	4.60	4.67	19.52	18.35	18.93
V_2N_2	37.25	35.74	36.49	32.08	30.74	31.41	5.25	5.16	5.18	21.84	20.66	21.25
V_2N_3	40.53	39.02	39.78	35.36	34.02	34.69	6.28	6.15	6.21	25.47	24.31	24.89
V_2N_4	40.15	38.64	39.39	34.98	33.64	34.31	5.85	5.72	5.79	24.93	23.74	24.33
V_3N_1	35.08	33.06	34.07	29.4	28.06	28.73	4.95	4.81	4.88	20.58	19.36	19.97
V_3N_2	38.03	36.52	37.28	32.86	31.52	32.19	5.41	5.28	5.35	22.85	21.69	22.27
V_3N_3	41.25	39.75	40.50	36.09	34.75	35.42	6.74	6.61	6.67	26.58	25.41	25.99
V_3N_4	40.94	39.43	40.19	35.77	34.43	35.10	6.45	6.32	6.38	25.84	24.65	25.24
S.Em ±	0.10	0.11	0.10	0.02	0.05	0.04	0.06	0.02	0.04	0.21	0.20	0.20
CD (P = 0.05)	0.29	0.32	0.30	0.07	0.14	0.12	0.18	0.07	0.13	0.62	0.60	0.61
CV	5.24	3.18	4.34	4.68	3.39	4.54	4.46	4.68	5.27	4.43	4.14	4.87

Table 2: Protein, total sugar and reducing sugar content in potato tubers as influenced by different genotypes and nitrogen levels

Protein, total sugar and reducing sugar content of potato tuber									
	Protein (mg/100)			**Total sugar (mg/100g)**			**Reducing sugar (mg/100g)**		
Treatments	**2018-19**	**2019-20**	**Pooled Mean**	**2018-19**	**2019-20**	**Pooled Mean**	**2018-19**	**2019-20**	**Pooled Mean**
Varieties/Genotypes									
V_1: AICRP-P-39	172.58	169.58	171.08	273.48	271.56	272.52	262.53	260.03	261.28
V_2: Kufri Garima	165.52	162.52	164.02	252.90	250.98	251.94	240.87	238.37	239.62
V_3: Kufri Pukhraj	169.35	166.35	167.85	264.03	261.61	262.82	252.01	249.60	250.81
S.Em ±	0.01	0.01	0.01	0.38	0.28	0.19	0.37	0.01	0.18
CD (P = 0.05)	0.02	0.02	0.03	1.12	0.82	0.56	1.11	0.02	0.55
CV	3.83	3.79	3.06	5.81	4.73	4.79	4.72	4.65	4.68
Nitrogen Levels									
N_1: 0 kg/ha	159.50	156.50	158.00	233.12	230.78	231.95	218.63	216.97	217.80
N_2: 80 kg/ha	168.49	165.49	166.99	260.45	258.78	259.62	247.99	245.99	246.99
N_3: 160 kg/ha	175.23	172.23	173.73	282.67	280.00	281.33	272.08	268.97	270.52
N_4: 240 kg/ha	173.40	170.40	171.90	277.64	275.98	276.81	268.51	265.39	266.95
S.Em ±	0.01	0.01	0.01	0.44	0.32	0.22	0.43	0.01	0.21
CD (P = 0.05)	0.02	0.02	0.02	1.29	0.96	0.64	1.28	0.03	0.64
CV	4.49	4.82	4.79	4.46	3.88	4.59	3.68	4.85	3.77
Interaction (V x N)									
V_1N_1	165.3	162.3	163.8	245.3	243.6	244.4	231.5	230.5	231.0
V_1N_2	170.8	167.8	169.3	265.9	264.2	265.1	254.3	252.3	253.3
V_1N_3	178.4	175.4	176.9	294.1	291.4	292.7	284.4	281.0	282.7
V_1N_4	175.9	172.9	174.4	288.7	287.0	287.8	280.0	276.3	278.1
V_2N_1	152.1	149.1	150.6	219.9	217.3	218.6	204.4	202.4	203.4
V_2N_2	166.3	163.3	164.8	253.8	252.2	253.0	240.7	238.7	239.7
V_2N_3	172.5	169.5	171.0	270.1	268.4	269.3	260.4	257.4	258.9
V_2N_4	171.2	168.2	169.7	267.7	266.1	266.9	258.0	255.0	256.5
V_3N_1	161.2	158.2	159.7	234.2	231.5	232.8	220.0	218.0	219.0
V_3N_2	168.4	165.4	166.9	261.6	259.9	260.8	249.0	247.0	248.0
V_3N_3	174.8	171.8	173.3	283.8	280.2	282.0	271.5	268.5	270.0
V_3N_4	173.1	170.1	171.6	276.5	274.9	275.7	267.6	264.9	266.3
S.Em ±	0.01	0.01	0.01	0.76	0.57	0.38	0.75	0.02	0.37
CD (P = 0.05)	0.03	0.03	0.03	2.24	1.65	1.12	2.22	0.05	1.11
CV	3.98	4.83	4.27	5.68	4.97	4.17	4.75	4.46	4.63

Table 3: Nitrogen content in potato plants and tubers as influenced by different potato genotypes and nitrogen levels

Nitrogen content in potato plant and tuber (%)						
	In plant (%)			**In tuber (%)**		
Treatments	**2018-19**	**2019-20**	**Pooled Mean**	**2018-19**	**2019-20**	**Pooled Mean**
Varieties/Genotypes						
V_1: AICRP-P-39	1.27	1.15	1.21	0.34	0.29	0.31
V_2: Kufri Garima	1.03	0.96	1.00	0.27	0.22	0.24
V_3: Kufri Pukhraj	1.14	1.05	1.09	0.31	0.26	0.28
S.Em ±	0.01	0.02	0.02	0.01	0.01	0.01
CD (P = 0.05)	0.02	0.05	0.06	0.03	0.02	0.02
CV	6.88	6.11	6.95	5.83	6.79	6.06
Nitrogen Levels						
N_1: 0 kg/ha	0.88	0.82	0.85	0.21	0.15	0.18
N_2: 80 kg/ha	1.05	0.98	1.01	0.27	0.22	0.24
N_3: 160 kg/ha	1.26	1.18	1.22	0.35	0.31	0.34
N_4: 240 kg/ha	1.39	1.24	1.31	0.39	0.34	0.38

S.Em ±	0.01	0.01	0.01	0.01	0.01	0.01
CD (P = 0.05)	0.03	0.03	0.03	0.03	0.02	0.03
CV	6.39	7.24	7.81	6.49	7.82	6.79
Interaction (V x N)						
V_1N_1	0.97	0.89	0.95	0.23	0.18	0.20
V_1N_2	1.09	1.06	1.05	0.31	0.25	0.29
V_1N_3	1.37	1.29	1.33	0.43	0.38	0.42
V_1N_4	1.64	1.38	1.51	0.45	0.39	0.44
V_2N_1	0.73	0.68	0.70	0.18	0.12	0.15
V_2N_2	1.00	0.94	0.98	0.24	0.19	0.21
V_2N_3	1.17	1.11	1.13	0.32	0.27	0.30
V_2N_4	1.21	1.12	1.16	0.34	0.29	0.32
V_3N_1	0.94	0.80	0.90	0.22	0.16	0.19
V_3N_2	1.05	0.99	1.01	0.27	0.23	0.25
V_3N_3	1.24	1.17	1.20	0.38	0.33	0.36
V_3N_4	1.31	1.22	1.26	0.39	0.34	0.38
S.Em ±	0.01	0.02	0.03	0.01	0.01	0.01
CD (P = 0.05)	0.03	0.04	0.09	0.03	0.02	0.03
CV	7.24	7.18	7.34	5.98	6.83	6.27

Application of nitrogen showed increase in nitrogen content in plant and tubers up to 240 kg N/ha. Maximum nitrogen content in plant (1.31%) and tubers (0.38%) was recorded with application of 240 kg N/ha followed by 160 kg N/ha (1.22 and 0.34%) followed by application of 80 kg N/ha (1.01 and 0.24%) during both the years and over pooled data mean. The lowest nitrogen content in plant (0.85%) and tubers (0.18%) was recorded with application of 0 kg N/ha during both the years and over pooled data mean. Similar findings have been reported by Singh and Grewal (1979); Adhikari *et al.* (2004) [1]; Sud (2006) [13] and Kumar *et al.* (2008) [9].

Combined effect of potato genotypes and nitrogen levels revealed significant influence on nitrogen content in plant and tubers. Maximum nitrogen content in plant (1.51%) and tubers (0.44%) was found under AICRP-P-39 with application of 240 kg N/ha (V_1N_4) during both the years and over pooled data mean. Lowest value of nitrogen content in plant (0.70%) and tubers (0.15%) was determined under V_3 N_1 during both the years and over pooled data mean. It indicates that higher nitrogen application to the soil increase up take of higher amount of N, resulting in more N content in plant and tubers. These findings are corroborated by those of Jatav *et al.* (2018) [7].

References

1. Adhikari, Ram, Sharma C, Moha D. Use of chemical fertilizers on potatoes in sandy loam soil under humid sub-tropical condition of Chitwan. Nepal Agric. Res. J 2004;5:23-26.
2. Anand S, Krishnappa KS. Effect of different levels of N and K on the growth, yield and quality of potato in sandy loam soil. Mysore J Agric Sci 1988;22:483–488.
3. Anonymous, The Hindu Survey of India 2002.
4. Anonymous, Horticultural Statistics at a Glance Horticulture Statistics Division Department of Agriculture, Cooperation & Farmers Welfare Ministry of Agriculture & Farmers Welfare Government of India 2017.
5. Ciecko Z, Mazur T. Effect of increased nitrogen fertilization on yield and chemical composition of the tubers.3rd revised edition, ICAR, New Delhi 1974¸ 70-79.
6. FAO Food and Agriculture, Statistics, 2014. http//www.fao.org.in/potato.
7. Jatav AS, Kushwah SS, Mishra SN, Naruka IS. Effect of potato varieties and nitrogen levels on dry matter accumulation, chlorophyll content, grade wise tuber yield and post-harvest nutrient content in plant and soil. Internat. J agric. Sci 2018;14(1):46-55.
8. Jatav MK. Effect of nitrogen and varieties of potato on yield and agronomic nitrogen use efficiency in north-western plains of India. Potato J 2013;40(1):55-59.
9. Kumar, Praveen, Trehan SP, Singh BP, Rawal S, Khan MA. Precising nitrogen requirement of table potato (*Solanum tuberosum* L.) cultivars for different growth periods. Indian J Agron 2008;53(4):314-317.
10. Rai N, Yadav DS. Advances in Vegetable Production. Research co Book Centre. New Delhi. 2005, pp. 743-771.
11. Singh K, Minhas MS, Srivastava OP. Studies on poultry manure in relation to vegetable production. II. Potato. Indian J Horti 1973;30(3-4):537-541.
12. Singh SN, Grewal JS. Dry matter production and NPK uptake by the potato variety Kufri Chandramukhi (*Solanum tuberosum* L.) in alluvial soil. J Indian Potato Assoc 1979;6(2):78-86.
13. Sud KC. Anionic balance of nitrogen, phosphorus and sulphur in potato levels under rainfed condition in Shimla Hills. Potato J 2006;33(1-2):68-73.i