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Research Paper

Influence of irrigation levels and mulching on growth, water use, yield, economics and quality of potato (*Solanum tuberosum*) under new alluvial soil of West Bengal

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ABSTRACT

The field trials were conducted on sandy-loam soil of District Seed Farm, Adisaptagram, Hooghly, West Bengal, during 3 consecutive winter seasons of 2011–12, 2012–13 and 2013–14, to study the performance of 'Kufri Jyoti' potato (*Solanum tuberosum* L.) under different irrigation levels and mulching under West Bengal region of Eastern India. Growth attributes increased in all the irrigation treatments over the control, and irrigation at 20 mm cumulative pan evaporation (CPE) performed the best. Mulching also resulted in higher growth attributes over no-mulch situation. All the irrigation levels recorded higher tuber yield (grade-wise as well as total) over the control, and the total tuber yield was the highest (32.31 t/ha) with irrigation at 20 mm CPE. Consistent decline in yield (24.43 to 88.39%) was recorded with the decrease in irrigation frequency, while water-use efficiency increased linearly from 80.78 to 114.33 kg/ha-mm in response to water stress. Maximum net income and benefit: cost ratio were recorded with the crop irrigated at 20 mm CPE, accounting 179 and 54% more over the control treatment respectively. Irrespective of irrigation levels, crops in mulched plots (with paddy straw @ 5 t/ha) resulted in higher net returns and benefit: cost ratio than those crops in no-mulch plots. The plots irrigated thrice at critical stages (control) recorded 22.3, 50.7 and 15.4% higher available N, P and K content, respectively over the plots irrigated at 20 mm CPE. Quality characteristics like dry-matter content, specific gravity, crude protein, ash content, starch and vitamin C content increased with decreased frequency irrigation. Potato cultivar 'Kufri Jyoti' may be irrigated at 20 mm CPE in combination with paddy straw mulching @ 5 t/ha for higher table-purpose potato tubers, total yield and better quality of tubers.

Key words : Economics, Irrigation, Mulching, Potato tuber yield, Quality, Soil fertility, Water–use efficiency

Potato is one of the most important and widely cultivated vegetable crops of West Bengal and ranks second in terms of acreage (4.09 lakh ha) next to rice (Mozumder *et al.,* 2014). West Bengal holds considerable share of the country's total potato production (90.2 lakh tonnes), while the productivity was 22.0 t/ha during 2013-14 (Directorate of Agriculture, GoWB, 2014). The growing season of potato is characterized by cool-dry climate and very low or zero rainfall necessitating irrigation for good harvest. Potato crop, having high rate of production per unit area and time, requires higher amount of water on per day basis. In addition, under- or over-supply of irrigation water may affect growth, yield and quality of the crop. Both the productivity and quality of produce largely depend on a proper balance between soil air and soil-moisture available in the plant root zone throughout the crop-growth period, which can only be achieved by adopting a sound water-management practices (Singh *et al.*, 2012). Further, the effectiveness and preciseness of irrigation can be improvised with the proper irrigation scheduling based on potato evapo-transpiration (Sadawarti *et al.*, 2013). An adequate water supply is required from tuber initiation till the maturity for higher yield and good tuber quality. Moisture stress, especially at the most critical stages like stolon formation, tuber formation and tuber development, results sharp decline in potato productivity (Saikia, 2011). Even short-term water stress can also cause significant reduction in yield (Begum and Saikia, 2014). On the other hand, excess irrigation increases production cost, reduces yield by affecting soil aeration, and root respiration, and favours

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the occurrence of pests and diseases (Sadawarti *et al.*, 2013). Therefore, cultivar-specific optimum management of irrigation water must be done.

Mulching is an appropriate approach to enhance efficiency of irrigation besides improving crop yield (Sarkar *et al.*, 2007). Mulching also helps in faster plant emergence, early canopy development (Mohammed *et al.*, 2002), conserve soil moisture especially in the early plant-growth stages and considerably reduce the water losses in the form of evaporation by allowing more water intake into the soil profile (Xing *et al.*, 2012). It also improved the hydrothermal regimes of soil favourable for higher crop yield (Singh *et al.*, 2004). Mulching can improve soil chemical properties because it has the potential to provide a considerable amount of organic carbon and nitrogen after decomposition (Xing *et al.*, 2012) which ultimately lead to an increase in soil porosity (Mulumba and Lal, 2008). In addition, mulching also provides other benefits including reduced tuber sunburn and decrease soil erosion (Rees and Chow, 2005).

Irrigation and mulching can interactively affect potato tuber yield (Xing *et al.*, 2012). A combination of mulching and proper irrigation schedule in potato may be a viable option in improving water-use efficiency (WUE), particularly in moisture-stress areas. The objective of this study was to assess the effect of irrigation with or without straw mulching on water-use efficiency, growth, yield and tuber-quality parameters.

MATERIALS AND METHODS

A field experiment was conducted at the District Seed Farm, Adisaptagram (23°26'N 88°22'E, 12 m above mean sea level), Hooghly, West Bengal, during the winter seasons of 2011–12, 2012–13 and 2013–14. The soil was sandy loam, neutral in reaction (*p*H 6.54), medium in organic carbon (0.65%), available K (211.2 kg/ha), high in available P (25.3 kg/ha) and low in available N (185.3 kg/ha). Meteorological data during the cropping seasons revealed that average maximum and minimum temperatures were 32.5 and 17.1°C respectively. Average relative humidity prevailed between 86.0 (maximum) and 52.7% (minimum). The rainfall during the experimental period (November to March) was 40.1 (4 rainy days), 44.5 (5 rainy days) and 52.0 mm (3 rainy days) in 2011–12, 2012–13 and 2013–14 respectively. The variety used in the experiment was ‘Kufri Jyoti’ (duration 90–100 days) which is largely grown for table purpose. The experiment was conducted in a factorial randomized-block design with 3 replications, comprising 8 treatments, of which 6 levels of irrigation (I_1, 20 mm CPE; I_2, 25 mm CPE; I_3, 30 mm CPE; I_4, 35 mm CPE; I_5, 40 mm CPE and irrigated at critical stages only (control), viz. stolon formation, tuber initiation and tuber-development stages) as main and 2 levels of mulching (M_0, no mulch and M_1, with mulch) as sub-factor was considered in the experiment. Mulching was done with paddy straw @ 5 t/ha and levels of irrigation were maintained with CPE (cumulative pan evaporation) value in the farm. Chopped paddy straw was laid down by hand to cover the surface of the planting ridges just after pre-emergence irrigation (about 1 week after potato planting). A strip of 30 cm wide area at the middle part between 2 crop rows and the furrow remain uncovered for easy entry of rainfall and irrigation water. Irrigation was applied in the furrows and water seeped in to the root zone of the crop.

Recommended doses of fertilizers for table varieties @ 200 kg N, 150 kg P_2O_5 and 150 kg K_2O/ha was applied through urea, single superphosphate (SSP) and muriate of potash (MOP). Half of N and full P and K were placed in bands below seed tubers at the time of planting and remaining N was applied at the time of earthing up (30 days after planting). Irrigations were applied through ridge and furrow method, and in each irrigation 50 mm water was applied. First irrigation was applied just after planting in all the plots to facilitate uniform and timely emergence of crop. The subsequent irrigations were applied as per the treatments. Plot size was 5 m × 3 m. The well-sprouted seed tubers sized 40–50 g was planted in the ridges at 60 cm × 20 cm spacing in the last week of November in each year. All cultural and plant-protection measures were also adopted as recommended for the region.

Plant emergence was recorded at 25 days after planting (DAP). Observations on plant height, number of shoots, compound leaves/plant and leaf-area index (LAI) were recorded 25, 50, 75 and 90 DAP. Potato crop was harvested at full maturity (100 DAP). Water-use efficiency (WUE) was worked out as (Reddy and Reddi, 2002):

$$\text{WUE} = \frac{\text{Tuber yield (kg/ha)}}{\text{Water applied through irrigation (mm)}}$$

The net income generated by the crop was the amount of money left when cultivation cost is subtracted from total income. The total cost of cultivation includes costs of all the inputs like potato seed, fertilizers, herbicides, fungicides, pesticides, labour wages and others. The benefit: cost (B:C) ratio was calculated by dividing the total income with total cost of cultivation.

Assessment of quality traits were made after harvesting of the crop. Tuber dry-matter content was determined by oven-drying finely chopped tuber pieces first at 80°C for 6 hours and then at 65°C till constant weight (Abbas *et al.*, 2011).

The AOAC (2005) No. 2001:11 method was used in the determination of the protein content with some modifications as: (*i*) Buchi digestion unit Model No. K-370 was used instead of digestion unit and manual titration; (*ii*) 31% NaOH and 0.25 **N** H_2SO_4 was used instead of 40% NaOH and HCl (Abbas *et al.*, 2011). Ash content of tubers was determined by following AOAC (2005) No. 923.03. Starch content was determined by following the method of FAO Manual of Food Quality Control by Martin (1979). Vitamin C content was determined by following the procedures given by Krik and Sawyer (1991).

The data collected on growth attributes, yield components and graded tuber yields were analysed following the method of analysis for factorial randomized block design as described by Gomez and Gomez (1984). The significance of different sources of variation was tested by Fisher and Snedecor's 'F' test at probability level of 0.05. For the determination of critical difference (CD) at 5% level of significance (P=0.05), the statistical table formulated by Fisher and Yates (1948) was consulted. The standard error of mean (SEm ±) and the value of CD were indicated in the tables to compare the difference between the mean values.

RESULTS AND DISCUSSION

Growth attributes

Plant emergence was significantly affected by both irrigation and mulching levels (Table 1). Irrigation at 20 mm CPE exhibited the maximum emergence, being 4.83% higher than control treatment. Plant height was significantly higher in all the irrigation treatments over the control. Although the highest plant height at 90 days after planting (DAP) was recorded at 20 mm CPE, it was statistically at par with other irrigation levels except the control. Irrigation level of 20 mm CPE also gave maximum number of shoots/plant (39.4% higher than the control treatment) and further decrease in irrigation levels up to 30 mm CPE resulted non-significant variation in shoot production/plant. Availability of optimum moisture regimes might have helped to increase number of shoots/plant (Saikia, 2011). Irrespective of irrigation levels, leaf-area index (LAI) increased, as the crop progresses till 90 DAP. The LAI was not influenced significantly up to 25 DAP and thereafter, it varied significantly. The number of compound leaves per plant increased up to 90 DAP (Table 1). Plants irrigated at 20 mm CPE produced significantly higher numbers of compound leaves, accounting 100.3% higher than control treatment at 90 DAP. The results revealed that plants receiving more number of irrigation (at 20 mm CPE) resulted in the maximum dry-matter production (147.9% more that plants irrigated with the control treatment) through increased plant height and compound leaves/plant. Plant experiencing low water supply (irrigation only at critical stages of growth and at 40, 35 and 30 mm CPE) during the crop growth period resulted in poor dry-matter accumulation which might be attributed to reduced plant height, reduced leaves and leaf size as compared to non-stressed plant.

Mulching had also significant effect on plant height and plants with paddy straw mulching was taller by 9.96% over the plants under no-mulch condition at 90 DAP (Table 1). Other investigators also reported decreases in plant height of potato when irrigation frequency was decreased under Gwalior (Sadawarti *et al.*, 2013), Modipuram (Kumar *et al.*, 2007) and Gujarat (Patel and Patel, 2001) conditions. There was significant effect of

Table 1. Effect of irrigation levels and mulching on emergence and growth characteristics of potato cv. 'Kufri Jyoti' (pooled values of 3 years)

Treatment	Emergence (%) at 25 DAP	Plant height (cm) at 90 DAP	Shoots/plant at 90 DAP	LAI at 90 DAP	Compound leaves/plant at 90 DAP	Total dry matter (g/m^2) at 90 DAP	CGR (g/m^2/day) at 75–90 DAP
Levels of irrigation							
I_1, 20 mm CPE	99.9	78.3	5.13	2.28	62.5	1276.4	6.31
I_2, 25 mm CPE	98.6	76.5	4.96	2.10	53.4	1064.7	5.84
I_3, 30 mm CPE	97.3	75.2	4.21	1.98	46.2	812.2	5.16
I_4, 35 mm CPE	92.7	73.2	3.98	1.95	45.8	787.4	5.12
I_5, 40 mm CPE	92.3	72.0	3.26	1.76	32.6	643.6	4.01
I_6, critical stages*	95.3	70.6	3.68	1.64	31.2	514.8	3.14
SEm±	2.51	2.41	0.42	0.15	4.61	93.6	0.64
CD (P=0.05)	5.42	7.38	1.29	0.45	14.07	286.7	1.96
Mulching							
M_0, no mulch	93.6	70.9	3.52	1.65	37.8	598.3	3.82
M_1, with mulch	98.5	77.9	4.89	2.26	53.4	1104.1	6.04
SEm±	1.19	2.41	0.47	0.20	4.76	167.4	0.72
CD (P=0.05)	4.86	6.94	1.35	0.56	13.76	483.7	2.07

CPE, Cumulative pan evaporation; *control treatment; DAP, days after planting; LAI, leaf-area index; CGR, crop-growth rate irrigation and mulching levels on production of shoots/plant. Plants with mulching treatment produced 38.9% higher shoots per plant than no-mulch treatment at 90 DAP. Different irrigation schedules and mulching treatments brought about significant change in LAI. At 90 DAP, the maximum LAI was recorded when irrigation was applied at 20 mm CPE (39.0% higher than the control treatment), and irrespective of irrigation levels, plants in mulched plots had 37.2% higher LAI compared to plants under no-mulch situation at 90 DAP. Mulch condition recorded 41.3% higher compound leaves/plant than no-mulch situation. Paddy straw mulching @ 5 t/ha also brought about significant changes in dry-matter accumulation (DMA), which was 84.5% higher than DMA in unmulched plots. In the present experiment, plant showed higher crop-growth rate (CGR) during later part of growth (75–90 DAP) than early part (25–50 and 50–75 DAP) at all irrigation levels. Higher frequency irrigation recorded significantly higher CGR over the control treatment. Mulching also exerted significant effect on CGR, and the extent of increase was to the tune of 40.8, 82.3 and 58.1% over no-mulch situation during 25–50, 50–75 and 75–90 DAP, respectively. This might be owing to conservation of soil moisture and reduction in soil temperature (Kar and Kumar, 2007).

Yield attributes and yield

There was significant effect of irrigation and mulching levels on grade-wise as well as total tuber yield (Table 2). Irrigation levels at 40 mm CPE resulted in higher yield of small tubers (< 40 g) (150.9% over the best irrigation at 20 m CPE), closely followed by the control treatment. While irrigation at 20 to 35 mm CPE produced less number of small-size tubers (< 40 g). The reverse trend was observed for medium-(40–100 g) and large-size tubers (> 100 g), and plants irrigated at 20 mm CPE gave the maximum yield of medium- and large- size tubers, which was 41.3 and 465.0% higher than the yield of plants in control plots. This clearly indicated that moisture-stress situations produced more number of small-size tubers at the cost of bigger-size tubers. This study also showed that irrigation at 20 mm CPE resulted in the highest total tuber yield (88.4% more than the control treatment), and it was statistically similar with 25, 30 and 35 mm CPE. Tuber yield/plant was

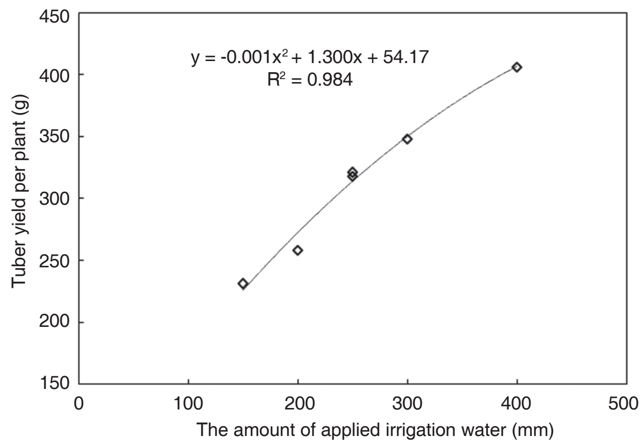

Fig. 1. The relationship between total amount of applied water and the total fresh tuber yield

Table 2. Effect of irrigation levels and mulching on tuber yield, water use and economics of potato cv. 'Kufri Jyoti' with different grades (pooled values of 3 years)

Treatment	Grade-wise tuber yield (t/ha)			Total tuber yield (t/ha)	Water used (mm)	Water-use efficiency (kg/ha-mm)	Net returns (× 10^3 ₹/ha)	Benefit: cost ratio
	Small size (<40 g)	Medium size (40-100 g)	Large size (>100 g)					
Levels of irrigation								
I_1, 20 mm CPE	3.23	9.69	19.39	32.31	400 (8)**	80.8	118.0	2.52
I_2, 25 mm CPE	3.44	9.45	15.75	28.63	300 (6)	95.4	101.3	2.38
I_3, 30 mm CPE	3.95	9.21	13.16	26.32	250 (5)	105.3	93.0	2.38
I_4, 35 mm CPE	4.41	9.07	12.44	25.91	250 (5)	103.6	90.3	2.34
I_5, 40 mm CPE	8.11	6.83	6.40	21.34	200 (4)	106.7	65.4	1.99
I_6, critical stages*	6.86	6.86	3.43	17.15	150 (3)	114.3	42.3	1.64
SEm±	0.20	0.63	2.57	2.40	-	2.00	2.30	0.04
CD (P=0.05)	0.61	1.92	7.86	7.33	-	6.12	7.01	0.12
Mulching								
M_0, no mulch	3.82	6.07	7.99	17.7	148	89.1	47.0	1.77
M_1, with mulch	6.18	10.97	15.53	32.9	369	119.5	123.0	2.64
SEm±	0.49	1.18	2.17	3.83	-	3.35	4.13	0.11
CD (P=0.05)	1.41	3.41	6.26	11.06	-	10.22	12.60	0.35

CPE, Cumulative pan evaporation; *control treatment; **number of irrigations applied are given in parentheses;
Price of produce: ₹6,000/t; cost of variable component (irrigation water, paddy straw mulch and its application) ₹800/ treatment

significantly correlated (R^2=0.98) to amount of applied irrigation water (Fig. 1). Plant receiving irrigation only at critical stages gave lower yield as well as total tuber number/ha, and revealed no significant difference with the crop irrigated at 40 mm CPE. This may be attributed to optimum soil moisture available in frequent irrigation treatments than the control and 40 mm CPE treatments. Sharma and Dubey (2000), Patel and Patel (2001) and Sood and Singh (2003) also demonstrated decline in large-size tuber yield and total tuber number upon exposure to moisture-stress conditions.

In mulched plots, grade-wise as well as total tuber number increased significantly by 61.9, 80.6, 94.5 and 85.4% for small-size, medium-size, large sized and total tuber yield, respectively, over no-mulched plots (Table 2). It might be owing to better absorption and utilization of irrigation water and plant nutrients from the soil profile (Singh *et al.*, 2012). It is also expected that mulching and irrigation should result in increased potato tuber yield because of increasing soil carbon, soil moisture and adjusting soil temperature (Kumar, 2015; Singh *et al.,* 2015) and the results of present study confirms this.

Water use efficiency

Water-use efficiency (WUE) is an index to quantify the effectiveness of water resources towards the crop production. Under limited water supply, this index plays critical role to screen for suitable irrigation management (Mukherjee *et al.*, 2010). In the present study, consistent decline in yield to the tune of 24.4 to 88.4% was recorded with the decrease in irrigation frequency, while WUE increased linearly from 80.8 to 114.3 kg/ha-mm in response to water stress. Ngouagio *et al.* (2007) reported that reduced irrigation enhanced a deeper and more extensive rooting system which would allow plants to use water from deeper layer of soil. In contrast, when the crop was irrigated frequently (20 mm CPE) enough moisture remains in the soil surface as well as in the subsoil which promotes evaporation loss at a faster rate along with greater transpiration rate through stomata (Mukherjee *et al.*, 2010). Dibal *et al.* (2010) also reported that irrigation at 20 mm CPE had the highest seasonal crop water use.

In the present study, mulching treatment recorded 34% higher WUE than no-mulch condition (Table 2). This finding corroborates with that of Kar and Kumar (2007), who reported significantly higher WUE in the mulched plots compared to the non-mulched plots. Mulch increased WUE by producing higher yield/mm of water used. Singh *et al.* (2012) reported that the application of paddy straw mulch @ 5 t/ha resulted in 10.8% higher yield than without mulch. The beneficial effect of mulch could not only be attributed to the improved soil-water status as a result of reduced evaporation, but also to maintain the optimum soil temperature regime (Singh *et al.*, 2015). Under no-mulched situation, uninterrupted solar radiation reached the soil surface increased evaporation and resulted in lower WUE (Mukherjee *et al.*, 2010).

Economics

Production economics is the ultimate target of any study for its acceptability to the common beneficiary groups of farming community either small or marginal

Table 3. Soil-fertility status as influenced by irrigation levels and mulching on potato cv. 'Kufri Jyoti' (pooled values of 3 years)

Treatment	*p*H (Soil : water 1:2.5)	Electrical conductivity (dS/m)	Organic carbon (%)	Available nitrogen (kg/ha)	Available phosphorus (kg/ha)	Available potassium (kg/ha)
Initial value	6.54	0.75	0.65	185.3	25.3	211.2
Levels of irrigation						
I_1, 20 mm CPE	6.81	0.072	0.62	152.3	25.6	218.6
I_2, 25 mm CPE	6.42	0.074	0.64	156.2	29.5	221.5
I_3, 30 mm CPE	6.46	0.080	0.68	168.4	32.5	226.5
I_4, 35 mm CPE	6.29	0.086	0.69	178.5	37.2	242.3
I_5, 40 mm CPE	6.21	0.092	0.76	180.0	37.8	249.6
I_6, critical stages*	6.13	0.093	0.78	186.2	38.6	252.2
SEm±	0.107	0.004	0.23	5.91	2.31	8.17
CD (P=0.05)	0.321	0.011	0.69	7.76	5.96	24.61
Mulching						
M_0, no mulch	6.01	0.074	0.62	147.7	28.3	201.7
M_1, with mulch	6.76	0.092	0.77	193.2	39.0	268.5
SEm±	0.227	0.007	0.05	12.63	3.41	17.72
CD (P=0.05)	0.681	NS	0.14	37.62	10.16	52.81

CPE, Cumulative pan evaporation; *control treatment; NS, non-significant

Table 4. Quality of produce as influenced by irrigation levels and mulching on potato cv. 'Kufri Jyoti' (pooled values of 3 years)

Treatment	Dry-matter content (%)	Crude protein (%)	Ash content (%)	Starch content (%)	Vitamin C content (mg/100g)
Levels of irrigation					
I_1, 20 mm CPE	16.0	6.3	8.06	11.9	20.1
I_2, 25 mm CPE	16.8	7.0	8.47	12.5	22.5
I_3, 30 mm CPE	18.2	7.3	8.89	13.2	24.1
I_4, 35 mm CPE	18.8	8.6	9.12	14.1	26.9
I_5, 40 mm CPE	20.0	9.0	9.82	14.5	27.3
I_6, critical stages*	20.6	10.0	10.03	15.1	29.0
SEm±	0.80	0.75	0.52	0.67	1.17
CD (P=0.05)	2.41	2.26	1.55	2.03	3.51
Mulching					
M_0, no mulch	16.5	7.0	8.02	12.1	22.2
M_1, with mulch	20.4	9.0	10.11	14.9	27.7
SEm±	1.20	0.67	0.69	0.93	1.84
CD (P=0.05)	3.56	2.01	2.07	2.78	5.49

CPE, Cumulative pan evaporation; *control treatment

considering its economic viability in the regions. In the study, system productivity corresponding to its benefit over subtracting the cost for production was calculated in terms of net return expressed in ₹/ha and ultimately benefit: cost (B:C) ratio of the system (Table 2). Maximum net income and benefit: cost ratio were recorded with the crop irrigated at 20 mm CPE, accounting 179 and 54% more over the control treatment respectively. Irrespective of irrigation levels, crops in mulched plots resulted higher net returns and benefit: cost ratio than those crops in no-mulch plots. These findings confirm the results of Kumar (2015) who opined that more favourable water regime manifested in higher yields makes mulching not only soil protective but economically favourable also.

Soil-fertility status

All the irrigation levels exhibited significant influence on chemical properties of post-harvest soil (Table 3). The soil pH increased in the plots irrigated at 20 mm CPE over the initial value, but there was a marginal decline in *p*H value in plots irrigated at 25, 30, 35, 40 CPE and critical stages. The electrical conductivity (EC) of post-harvest soil increased significantly with the decrease in irrigation frequency from 20 to 40 CPE, and the value was the highest in the control plots. The similar trend was observed in organic carbon content. The available N, P and K content of post-harvest soil followed similar trend to EC and organic carbon content. The plots irrigated thrice at critical stages (control) recorded 22.3, 50.7 and 15.4% higher available N, P and K content, respectively over the plots irrigated at 20 mm CPE. Mulching operation exhibited significant influence on chemical properties of soil except EC, resulting in 12.5, 24.2, 305.0, 37.9 and 33.1% higher *p*H, organic carbon, available N, P and K content, respectively, over no-mulched situation.

Quality of produce

Quality characteristics, as estimated in the present study, like dry-matter content, crude protein, ash content, starch and vitamin C content increased with the decrease in number of irrigation (Table 4). Plants irrigated with 20 mm CPE produced poor quality tubers compared to other plants grown with other tested irrigation schedules. Similar results were obtained Bosnjak *et al.* (2004) and Carli *et al.* (2014), who reported that dry-matter, starch content and vitamin C content of potato tubers increased with water restriction. While plants irrigated only at critical growth stages produced tubers having better-quality parameters. Mulching with paddy straw also significantly influenced tuber quality over no-mulch condition except specific gravity.

It is concluded that under new alluvial zone of West Bengal, potato cultivar 'Kufri Jyoti' may be irrigated at 20 mm CPE for higher table-purpose potato tubers and higher total yield. Mulching is beneficial for moisture conservation, higher yield and better quality of tubers over no-mulching under water-scarce conditions. For the adoption of straw mulch application, chopped instead of long straw should be used, as it is more effective in covering the soil surface.

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