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Effect of Foliar Application of Zinc on the Yield, Quality and Storability of Potato in Tista Meander Floodplain Soil

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ABSTRACT

An experiment was conducted at Breeder Seed Production Centre (BSPC), Debiganj, Panchagarh under AEZ-3 (Tista MeanderFloodplain Soil) during the Rabi season of 2013-14 and 2014-15 to study the effect of foliar application of zinc on the yield and quality of potato. The treatments comprised foliar application with six different concentration of zinc such as: T1 (0 ppm Zn), T2 (140 ppm Zn), T3 (280 ppm Zn), T4 (420 ppm Zn), T5 (560 ppm Zn) and T6 (700 ppm Zn). The experiment was laid out in a randomized complete block design (RCBD) with three replications. The tuber yield of potato was significantly influenced by the foliar application of different concentration of zinc. The maximum yield (37.2 and 36.7 t ha^{-1} for 2013-14 and 2014-15, respectively) was found in 560 ppm Zn application. The highest dry matter content of potato tuber was found in this treatment. The highest gross margin and marginal benefit cost ratio were recorded in the same treatment. T5 (560 ppm Zn) also showed the minimum weight and rottage loss of potato tuber. Therefore, foliar application of 560 ppm Zn can be recommended for quality potato production.

Keywords: dry matter, foliar application, potato storage, yield, zinc

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INTRODUCTION

Potato is one of the most important vegetables in Bangladesh. Besides, it acts as main vegetables and supplies necessary nutrients to the poor people (Hossain & Miah, 2012; Islam, Zaman, Hossain, & Hossain, 2009). Potato is one of the main tubers and a nutritious crop. Studies have shown that utilization of micronutrients increase the yield and quality of tubers. The national average yield of potato in Bangladesh is 19.5 tons per hectare and it is lower than the major potato growing countries (Bangladesh Bureau of Statistics [BBS], 2015). The causes of lower yield might be due to application of imbalanced fertilizers and lower zinc (Zn) and boron (B) content in the soils (Keller, 2013). That is why, the crop yield and production are being seriously hampered owing to micronutrients deficiencies (Bose & Tripathi, 1996; Mousa, 2009). In plant, micronutrients are needed in smaller quantities which are very essential for growth and development. (Al-Jobori & Al-Hadithy, 2014; Benepal, 1967). There are many evidences that it is impossible to achieve maximum yield from other nutrients except micronutrients (Banerjee et al., 2016; Trehan & Grewal, 1997). The micronutrient use requires a thorough knowledge about the soil capacity to supply micronutrients and plant requirement. No adhoc recommendations on their use can be made because of the antagonism between different nutrients and the polluting effect that might ensue (Kanwar, 1962). Zinc is a micronutrient necessary for plant growth. It promotes growth hormone biosynthesis, the formation of starch, seed production and maturation (Brady & Weil, 2002). Zinc has many important roles in plant growth and a constant and continuous supply is necessary for optimum growth and maximum yield (Acquaah, 2002). Deficiency of Zn has been found to reduce leaf size and shortened internodes and hence, limited plant growth (Acquaah, 2002; Alloway, 2004). Mousavi, Galavi and Ahmadvand (2007) reported that foliar application of zinc increased all plant characteristics related to yield and quality of potato. Barben et al. (2007) reported that plants grown in the upper level of treatments of zinc generally exhibited rapid growth of leaves, stems and roots. The foliar application of zinc showed optimistic effects on yield attributes, yield, quality components and chemical composition of sweet potato (Abd El-Baky, Ahmed, El-Nemr, & Zaki, 2010). Recently, Osama, El-Nasharty and Badran (2010) reported that spraying potato plants with micronutrients like Zn could improve the physiological performance of plants and nutrient balance of macro and micronutrients. For easy absorption, quick action, reduced toxicity, gathering and stoppage from stabilization, the foliar application of micronutrients such as Zn and B is very effective.

The advantages of foliar application are quick correction of nutrient deficiency and application of lesser rates and thus, reducing toxicity arising from excessive accumulation of elements and preventing nutrients fixation in the soil (Parmar, Nandre, & Pawar, 2016). Nutrient absorption (such as micronutrients) through foliar application is very quick than the soil application through plant roots (Hashemy, Malakoty, & Tabatabaey, 1998). For sustainable production of potato, micronutrient especially zinc management is very important. However, no data is available regarding foliar application of zinc for potato in Bangladesh. So, the experiment was initiated with the following objectives: i) To evaluate the response of zinc through foliar application, ii) to determine the actual rate of Zn through foliar application to get the highest yield of potato and iii) to find out influence of zinc through foliar application on the quality and storability of potato.

MATERIALS AND METHODS

Experimental Site and Soil Characteristics

The experiment was conducted at high land of Breeder Seed Production Centre (BSPC), Debiganj, Panchagarh during the Rabi season of 2013-14 and 2014-15. The geographical distribution of experimental plot was located at N-26° 12′ and E-88° 76′ in the Tista Meander Floodplain Soil (AEZ-3) of Bangladesh. The texture of soil was sandy loam with acidic in nature where available phosphorus (P) and iron (Fe) were found higher than the critical limit but other nutrients such as total N (0.06%), exchangeable calcium (Ca), magnesium (Mg), sulphur (S), zinc (Zn), and boron (B) were lower than the critical level. The organic matter content was also low. The exchangeable potassium was at par to the critical level (Table 1).

Table 1

The chemical properties of initial soil of the experimental field

Location	Soil texture	pH	O.M%	Ca	Mg	K	Total N%	P	S	B	Fe	Zn
				meq/100g				µg/ml				
BSPC, Debiganj	Sandy loam	5.70	1.10	1.30	0.45	0.14	0.06	28	7.47	0.18	72	0.53
Critical level		-	-	2.0	0.5	0.12	-	7.0	10	0.2	4.0	0.6

Cropping Season

There are three cropping seasons in Bangladesh such as *Rabi* (mid-October to mid-March), *Kharif-I* (mid-March to the end of June) and *Kharif-II* (early July to mid-October). In Bangladesh, potato is cultivated only in winter season from November to February. The highest mean temperature in November was 24.2°C and 25.2°C in 2013 and 2014, respectively, where the coldest month was January. In January 2014, the lowest temperature was observed and it was 15°C. Between two seasons, February was the dry where mean relative humidity was 84.9% and 86.8% in 2014 and 2015, respectively, with 19.3 mm rainfall in February 2014. In 2014-15, December and January were the most humid months with relative humidity of 90.0 and 89.9%, respectively, including a sudden rain flash (38.7 mm) in January 2015. Rest of the months in both seasons was relatively dry.

Experimental Design, Treatment, Fertilizer Application and Intercultural Operation

The experiment was laid out in a randomized complete block design (RCBD) with three replications. There were six treatments comprising different levels of zinc: T1 (0 ppm Zn), T2 (140 ppm Zn), T3 (280 ppm Zn), T4 (420 ppm Zn), T5 (560 ppm Zn) and T6 (700 ppm Zn). Fertilizers were used on soil test basis except zinc (Zn). Urea, TSP, MOP, gypsum, magnesium sulphate, zinc sulphate and boric acid were used as a source of N, P, K, S, Mg, Zn and B, respectively. All the fertilizers but half of urea was applied to the soil before planting tubers. Potato variety *BARI Alu-25* (Asterix) was used as test crop. The unit plot size was 3 m × 3 m. Whole tubers of the potato were planted with a spacing of 60 cm × 25 cm on 15 and 17 November of 2013 and 2014, respectively. The irrigation was applied four times during the growing period. For proper germination, a light irrigation was applied at 7 days after planting (DAP) and second irrigation was done at 30 DAP after earthing up and side dressing of the rest urea. Rest two irrigations were done according to the demand of crops which was at 48 and 63 DAP. Zinc sulphate ($ZnSO_4$) was applied at three stages of plant growth (stolonization, tuberization and bulking) followed by three foliar sprays. In each case of foliar spray, 2.25 L of $ZnSO_4$ solution was applied at 9 m^2 plot (2500 L ha^{-1}). Weeding and mulching were performed as per requirement. Late blight disease was managed by spraying Dithane M45 at the rate of $2gL^{-1}$. After maturity, potato was harvested on 25 February 2014 and 30 February 2015, respectively.

Soil Sampling and Chemical Analysis

Soil samples were collected, dried and ground for chemical analysis. Bulk density was determined by core sampler Method (Blake, 1965), soil pH was measured by glass electrode pH meter (1:2.5) and organic carbon by wet oxidation method (Walkley & Black, 1935). Total N content of soil was determined by Kjeldahl method, and available P (Bray-1 method), exchangeable K and available S contents by 0.5M $NaHCO_3$

(pH 8.5), NH_4OAc and $CaCl_2$ extraction methods, respectively as outlined by Page, Miller and Kuny (1989). Available Zn content was determined following DTPA method.

Data Collection

Data were taken on plant height, foliage coverage, stems / hill, tubers / hill, wt. of tubers / hill, tuber yield and tuber dry matter of potato. Tuber size and number were also recorded. Plant height, stem per hill and foliage coverage was assessed at 60 DAP using green method (Groves, Wiltshire, Briddon, & Cunnington, 2005). The yield data were collected at harvest and dry weight was recorded at 7 days after harvest.

Storage Data

The potato tubers were collected after harvest and weight of tubers were recorded. Weighing of tubers started from 30 DASt (days after storing) and continued at 15 days intervals up to 150 days. Rotten tubers were discarded after weighing.

Cost Benefit Analysis

The cost of chemical fertilizers, pesticides (inputs) and outputs (Tuber) were estimated as per prevailing market price. The gross return, net return and return per dollar invested in different nutrient management systems were assessed by computing the cost of the inputs and price of the produce/ output. Economic analysis was performed through partial budgeting followed by marginal benefit cost ratio (MBCR) as suggested by International Maize and Wheat Improvement Center (CIMMYT) (1988).

Statistical Analysis

The analysis of variance (ANOVA) for different crop parameters and dry matter was done following F test. When the F was significant at the $p < 0.05$ level, the means were separated by DMRT (Steel & Torrie, 1960) test. The SAS software (version 9.3) was used to analyze the data.

RESULTS AND DISCUSSIONS

Foliar Application of Zinc on the Yield Contributing Characters of Potato

The plant height (cm), foliage coverage, stem per hill and number of tuber per hill were positively influenced by the application of different doses of foliar zinc but their effects were not significant (Table 2). The weight of tuber per hill was significantly variable among different doses of foliar zinc (Table 1). The highest weight of tubers per hill (0.63 and 0.61kg $hill^{-1}$ for 2013-14 and 2014-15, respectively) was found in T5 (560 ppm Zn) which was followed by T6 (0.62 and 0.60 kg $hill^{-1}$ for 2013-14 and 2014-15, respectively) and T4. The lowest weight of tubers per hill (0.50 and 0.45 kg $hill^{-1}$ for 2013-14 and 2014-15, respectively) was recorded in the control (0 ppm Zn). Mousavi et al. (2007) reported that the weight of tuber was increased with foliar application of Zn at 800 ppm, which is in agreement with the findings of our result.

Foliar Application of Zinc on the Yield and Dry Matter Content of Potato Tuber

The potato tuber yield and dry matter content were significantly influenced by the foliar application of zinc (Table 3). The highest tuber yield of potato (37.2 and 36.7 t ha^{-1} for 2013-14 and 2014-15, respectively) was found in T5 (560 ppm Zn) which was statistically similar with T6 (700 ppm Zn). The lowest tuber yield (29.3 and 27.9 t ha^{-1} for 2013-14 and 2014-15, respectively) was recorded in the control. It was observed that tuber yield of potato was increased with increase in Zn concentration up to 560 ppm after which yield decreased. Similar results were also observed by Al-Fadhly (2016), Al-Jobori and Al-Hadithy (2014), Mousavi et al. (2007), Sharma and Trehan (1984), Trehan and Grewal (1989) where maximum potato tuber yield was obtained with foliar application of zinc. The dry matter content ranged from 18.7 to 20.7% and 18.8 to 21.1% for 2013-14 and 2014-15, respectively. The highest dry matter content (20.7 and 21.1% for 2013-14 and 2014-15, respectively) was noted in 560 ppm Zn which was followed by 700 ppm Zn and 420 ppm Zn (Table 3).

The minimum dry matter content (18.7 and 18.8% for 2013-14 and 2014-15, respectively) was noted in the control. Mousavi et al. (2007) reported that application of Zn at 800 ppt increased per cent dry matter of up to 5% in comparison to control which corroborated our findings. It was also found that dry matter content was increased with increase in Zn concentration up to 560 ppm beyond that dry matter decreased (Table 3). Romemheld and El-Fouly (1999) reported that foliar application of nutrients had become an efficient way to increase yield and quality of crops. These results are in agreement with those reported by several authors (Barben et al., 2007; Brady & Weil, 2002; Bybordy & Malakoty, 2001; Hashemy et al., 1998; Mousavi et al., 2007; Ranjbar & Malakoty, 2000) who found that zinc application increased all plant characteristics relating to yield and quality of potato.

Zinc plays an important role in protein synthesis, enzyme activation and metabolism of carbohydrate, utilization of fertilizers containing this element increase qualitative and quantitative performance of potato tubers. Due to shortage of Zn, performance and quality of potato decreases (Alloway, 2004).

Table 2
Effect of foliar application of zinc on the yield contributing characters of potato

Treat	Plant height (cm)		Foliage coverage (%)		Stem hill^{-1} (no.)		Tuber hill^{-1} (no.)		Tuber weight hill^{-1} (kg)	
	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15
T1	67.6	57.3	95.7	89.7	8.13	7.66	10.5	10.2	0.50c	0.45d
T2	69.9	57.9	95.0	90.0	8.33	7.53	10.5	12.3	0.53bc	0.49cd
T3	66.2	61.1	94.3	93.7	7.73	7.66	10.3	11.8	0.55bc	0.53bc
T4	67.4	59.6	95.0	93.0	7.46	7.60	11.2	11.5	0.58ab	0.57ab
T5	66.8	59.5	95.3	94.7	7.46	8.33	11.6	11.5	0.63a	0.61a
T6	68.2	59.3	96.7	94.7	7.33	8.20	11.5	11.2	0.62a	0.60a
CV (%)	4.31	4.96	2.11	2.48	22.7	13.0	9.97	12.5	3.23	3.00
LSD	5.31	5.34	3.65	4.18	3.16	1.55	1.95	2.61	0.057	0.057

Figure(s) in column having same letter(s) do not differ significantly at 5% level. Note: T1=0 ppm Zn, T2=140 ppm Zn, T3=280 ppm Zn, T4=420 ppm Zn, T5=560 ppm Zn, T6=700 ppm Zn

Table 3

Effect of foliar application of Zinc on the tuber yield and dry matter of potato

Treat	Tuber yield (t/ha)		Dry mater (%)	
	2013-14	2014-15	2013-14	2014-15
T1	29.3 d	27.9 e	18.7 b	18.8 d
T2	30.8 cd	30.2 d	19.7 ab	19.3 cd
T3	32.3 c	32.7 c	20.3 a	19.7 b-d
T4	34.4 b	34.3 bc	20.3 a	20.3 a-c
T5	37.2 a	36.7 a	20.7 a	21.1 a
T6	36.6 a	35.2 ab	20.6 a	20.3 ab
CV (%)	2.57	3.33	3.29	3.35
LSD	1.56	1.57	1.20	1.22

Means followed by the same or no letter in the same column do not differ significantly each other at the 5% level. Note: T1=0 ppm Zn, T2=140 ppm Zn, T3=280 ppm Zn, T4=420 ppm Zn, T5=560 ppm Zn, T6=700 ppm Zn

Several studies reported that utilization of micronutrients increases performance and quality of potato tubers (Mohamadi, 2000; Mousavi et al., 2007; Ranjbar & Malakoty, 2000). Plants supplied with micronutrients during stolonization, tuberization and bulking recorded increased tuber yield and this might be due to the positive effect on mean weight of tuber as well as increased dry matter percentage. Zinc also has a great influence on plant life processes, such as nitrogen metabolism (uptake of nitrogen and protein quality), photosynthesis (chlorophyll synthesis) and carbon anhydrase activity (Al-Fadhly, 2016). Kohnaward, Jalilian and Pirzad (2012) reported that micronutrients increase photosynthesis rate and improved leaf area duration thus resulting in tuber yield increase (Cakmak et al., 1999). Micronutrient elements play a critical role in plants that lead to increased leaf area index and thereby increased light absorption and increased amount of dry matter accumulation and economic yield (Ravi, Channal, Hebsur, Patil, & Dharmatti, 2008).

Effect of Foliar Application of Zinc on Number and Size of Potato Tubers

The application of foliar zinc increased the tuber number of medium and large graded tubers (Table 4). The highest medium size tuber was found (81.6 and 76.2% for 2013-14 and 2014-15, respectively) in T5 followed by T6 and T4. The lowest medium size tuber (72.2 and 70.6% for 2013-14 and 2014-15, respectively) was noted in the control (Table 4). Sharma, Grewal and Trehan (1988) reported that application of zinc increased the number of medium and large graded tubers which are in agreement with the findings of our result.

Cost and Return

The main objective of the marginal analysis is to determine the profit from investment increase as the amount of investment increases (CIMMYT, 1988). The maximum gross margin (US$. 4410.8 and 4356.8 ha^{-1} for 2013-14 and 2014-15, respectively) was found in T5 (560 ppm Zn) (Table 5), which was followed by T6 (US$. 4341.6 and 4168.8 for 2013-14 and 2014-15,

Table 4
Effect of foliar application of Zinc on number and size of potato tubers

Treatment	Grading by No (%)					
	<28mm		28-55 mm		>55m	
	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15
T1	26.89	28.93	72.18	70.65	0.93	0.42
T2	22.92	27.90	76.20	71.41	0.88	0.68
T3	20.10	26.34	78.72	72.47	1.18	1.18
T4	18.91	24.83	78.27	73.74	2.82	1.42
T5	15.32	22.02	81.60	76.20	3.08	1.78
T6	16.83	22.42	80.53	75.90	2.64	1.66
CV (%)	21.8	4.55	5.69	1.63	17.2	18.7
LSD	8.00	2.10	8.07	2.18	0.60	0.41

respectively) and T4. The lowest gross margin (US$. 3517.2 and 3355.2 ha^{-1} for 2013-14 and 2014-15, respectively) was observed in the control. The MBCR (marginal benefit cost ratio) ranged from 2.90 to 16.8 and 4.71 to 18.8 for 2013-14 and 2014-15, respectively. The highest MBCR (16.8 and 18.8 for 2013-14 and 2014-15, respectively) was recorded in T5 followed by T6 and T4. The lowest MBCR (2.90 and 4.71 for 2013-14 and 2014-15, respectively) was observed in T2 (140 ppm Zn) (Table 5). It was observed that MBCR was increased with increase in zinc concentration up to 560 ppm after that it was decreased. Similar results were also reported by Banerjee et al. (2016) where net income and B:C ratio were increased with increase in Zn rate up to 4.5 kg Zn ha^{-1} but both of these parameters decreased with application dose of 6.0 kg Zn ha^{-1}.

Storage Behavior of Potato Tuber

Weight loss

The weight loss was variable among the different zinc concentration and different days after storing (DASt) (Table 6). The minimum weight loss (2.20%) was recorded in T5 followed by T6 (2.38%) at 30 DASt. The highest weight loss (52.8%) was found in the control at 150 DASt, which was statistically identical to T2 (51.7%) and T3 (51.0%) at 150 DASt (Table 5). At the end of the observation (150 DASt), the minimum weight loss was found in T5 (42.7 %) followed by T6 (44.6 %). The results are in line with the findings of Awad, Emam and Shall (2010) where the lowest weight loss percentage was recorded with foliar application of zinc while tubers of untreated plants showed the highest weight loss. Zinc may reduce weight loss by developing flesh

Table 5
Effect of foliar application of zinc on the cost and return for potato

Treat	Tuber yield (t/ha)		Gross Return (UD$/ha)		TVC (UD$/ha)		Gross margin (UD$/ha)		Marginal gross margin UD$/ ha		MBCR	
	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15	2013-14	2014-15
T1	29.3	27.9	3517.2	3355.2	0.0	0.0	3517.2	3355.2	-	-	-	-
T2	30.8	30.2	3700.8	3624.0	47.0	47.0	3653.8	3577.0	136.6	221.8	2.90	4.71
T3	32.3	32.7	3876.0	3920.4	49.1	49.1	3826.9	3871.3	309.7	516.1	6.31	10.5
T4	34.4	34.3	4130.4	4112.4	51.1	51.1	4079.3	4061.3	562.1	706.1	11.0	13.8
T5	37.2	36.7	4464.0	4410.0	53.2	53.2	4410.8	4356.8	893.6	1001	16.8	18.8
T6	36.6	35.2	4396.8	4224.0	55.2	55.2	4341.6	4168.8	824.4	813.6	14.9	14.7

Note: T1=0 ppm Zn, T2=140 ppm Zn, T3=280 ppm Zn, T4=420 ppm Zn, T5=560 ppm Zn, T6=700 ppm Zn. TVC = Total Variable Cost, MBCR= Marginal Benefit Cost Ratio

Input prices: Zinc Sulphate monohydrate = US$ 2.04/kg.

Output prices: Potato = UD$ 0.12/kg

Table 6

Weight loss of potato under ambient temperature at different days after storing (DASt) as influenced by organic manure and inorganic fertilizer management

Treat	Cumulative weight loss(%) at different DASt†				
	30	60	90	120	150
T1	4.22 h-j	6.98 hi	15.9 ef	28.4 cd	52.8 a
T2	2.67 h-j	5.97 h-j	17.8 e	31.0 c	51.7 a
T3	3.00 h-j	7.27 gh	14.6 ef	27.3 cd	51.0 a
T4	3.08 h-j	6.52 h-j	15.9 ef	26.7 cd	46.3 b
T5	2.20 j	4.45 h-j	11.9 fg	24.2 d	42.7 b
T6	2.38 ij	6.95 hi	15.4 ef	25.5 d	44.6 b

CV (%) = 14.2 and LSD= 4.65
Means followed by the same or no letter in the same column do not differ significantly each other at the 5% level. Note: T1=0 ppm Zn, T2=140 ppm Zn, T3=280 ppm Zn, T4=420 ppm Zn, T5=560 ppm Zn, T6=700 ppm Zn. DASt† = days after storing

with more combined water which restricts water loss during the early storage periods (Awad et al*.,* 2010; Mohamadi, 2000). Similar results were reported by Saif El-Dein (2005) on sweet potato. Among the four observations, maximum weight loss was found in 150 DASt followed by 120 DASt. 30 DASt showed the minimum weight loss. It was observed that weight loss increased with the increase in days after storing. Similar results were also observed by Kanbi and Bhatnagar (2005) where potato cultivar Kufri Badshah evaluated under integrated nutrient management and the highest weight loss was found in 105 DASt. Weight loss during storage was mainly due to evaporation and contribution of respiratory carbon loss to total weight loss (El-Sayed, El-Morsy, & El-Metwally, 2007; Mehta & Ezekiel, 2010).

Rottage loss

Rottage loss due to *Fusarium* dry rot varied among the treatments and days after storing. After 150 DASt, total rottage loss for *Fusarium* dry rot was the maximum in the control (8.36 %) followed by T2 (8.15 %), T3 (7.27 %) and the minimum loss (5.02 %) was noted in T5. Among days after storing, maximum rottage loss was recorded in 150 DASt followed by 120 DASt while 30 DASt showed the minimum rottage loss (Table 7). Among three observations, Akhter et al. (2014) reported that the maximum rottage loss was noted at 120 DASt followed by 90 DASt which is similar with our result.

Table 7

Rottage loss due to Fusarium dry rot (FDR) of potato under ambient temperature at different DASt

Treat	Rottage loss (%) at different DASt				Total rottage loss (%) at 150 DASt
	30	90	120	150	
T1	1.45 fg	1.88 de	2.21 cd	2.82 a	8.36 a
T2	1.14 gh	1.97 de	2.36 bc	2.68 ab	8.15 a
T3	1.05 hi	1.88 de	1.98 de	2.36 bc	7.27 b
T4	1.01 hi	1.97 de	2.67 ab	0.72 i	6.38 c
T5	0.72 i	0.72 i	1.67 ef	1.91 de	5.02 d
T6	0.72 i	1.45 fg	1.90 de	2.09 cd	6.18 c
CV (%)	12.4				5.40
LSD	0.35				0.68

Means followed by the same or no letter in the same column do not differ significantly each other at the 5% level.

CONCLUSION

Dry matter content and storability are very important for processing purpose and to preserve potato for later use, respectively. More thrust is given to determine the optimum dose of foliar zinc for more dry matter, economics and storage capacity. The tuber yield of potato was significantly influenced by the foliar application of zinc. The highest tuber yield (37.2 and 36.7 t ha^{-1} for 2013-14 and 2014-15, respectively) was found in 560 ppm Zn .The highest dry matter of potato tuber was found in this treatment. The highest gross margin and marginal benefit cost ratio were recorded in the same treatment. In storage behavior, T5 (560 ppm Zn) also showed the minimum weight and rottage loss. Therefore, foliar application of 560 ppm Zn can be recommended for sustainable quality potato production.

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