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PROFICIENCY AND PROFITABILITY OF POTATO AS AFFECTED BY UREA SUPER GRANULE (USG) AS A SOURCE OF NITROGEN IN HIGH GANGES RIVER FLOOD PLAIN OF BANGLADESH

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ABSTRACT

Azam MG, Mahmud JA, Ahammad KU, Gulandaz MA, Islam M (2012) Proficiency and profitability of potato as affected by Urea Super Granule (USG) as a source of nitrogen in high ganges river flood plain of Bangladesh. *Int. J. Sustain. Crop Prod.* 7(3), 28-30.

A field experiment was conducted at the multilocation testing (MLT) site, On Farm Research Division, BARI, Jhikargacha, Jessore under High Ganges River Floodplain (AEZ-11) during rabi seasons 2008-09 and 2009-10 to investigate the effect of urea super granule (USG) on the growth and yield of potato. The experiment was laid out in RCB design with six dispersed replications with the unit plot size 5m x 4m. Five treatments were the same in two rabi seasons. *viz.* T_1 = Recommended dose of nitrogen as prilled urea (PU), T_2 = Recommended dose of nitrogen as urea super granule (USG), T_3 = 10% less of recommended dose of nitrogen as USG, T_4 = 20% less of recommended dose of nitrogen as USG and T_5 = Farmers practice (average of 20 farmers N dose used as PU) Significant variation was observed in different treatments. The highest yield of potato 33.21 t/ha were obtained from the recommended N dose of USG followed by USG 10% less than recommended dose of N (31.51 t/ha) during 2008-09. In the year 2009-10 higher yield was obtained from the T_2 treatment (32.33 t/ha) followed by T_3 (30.87 t/ha). By reducing 10% N losts through USG application more or equal returns can be obtained over prilled urea application. Cost and return analysis revealed that the treatment T_2 was obtained higher gross returns as well as BCR (2.74) followed by T_3 treatment (2.64).

Key words: *USG, yield, potato*

INTRODUCTION

Potato (*Solanum tuberosum* L.) is the 3rd largest food and vegetables crop in Bangladesh after rice and wheat. It is also a world leading vegetables crop that furnishes appreciable amount of vitamin B and vitamin C as well as minerals. As an industrial crop, potato is a raw material of various foods and confectionaries. Potato is a staple food in the developed countries and which account for 37% of the total potato production in the world (FAO and CIP, 1995). In Bangladesh, area under potato crops was 520 thousand ha with annual production of 7800000 ton and average yield 15 t/ha (Anon. 2008).

Nitrogen requirement of potato is very high. It is an essential plant nutrient element and is the most limiting due to its high mobility and different types of losses like leaching, volatilization and mobilization (Zaman *et al*. 1993; Bhuiyan *et al*. 1990; De Dalta and Crasswell, 1982). Eusof *et al.* (1993) observed USG as an alternative source of nitrogen than prilled urea in terms of efficiency in wet land rice. Nitrogen requirement of potato and rate of urea is very high. Farmer's of Bangladesh grown potato in different regions through prilled urea with other fertilizers. The efficiency of the prilled urea is very low (Chowdhury and Khanif, 2001).

Several research results showed the USG is more efficient than that of prilled urea. When prilled urea applied in the soil by broadcast method causes loss up to 50%, while the point placement method of USG in 8-10 cm depth showed negligible loss (De Dalta and Crasswell, 1982). So, during last 2-3 years, farmers are applying USG in upland vegetables and fruit due to it's minimizes of N fertilizer can increased through deep placement in the form of USG (Sanvant *et al*. 1991). Some research report on different crops especially vegetables revealed that by using of USG substantial amount of urea fertilizer can be saved (Anon. 2003). Much kind of vegetables were grown in Jessore region such as cabbage, cauliflower, eggplant, summer tomato, winter season tomato and country bean etc. However, these are no recommendation of USG for upland crops. The efficiency of USG in this AEZ 11 is not yet to be ascertained. There fore, the experiment was deigned to evaluate the efficiency of USG on the yield of potato and to find out the optimum and economic cost analysis in potato production.

MATERIALS AND METHODS

The experiment was carried out in the medium high land of AEZ 11 (High Ganges River Flood pain) at multiplication testing (MLT) site, Jhikargacha, Jessore during the two consecutive years in rabi season of 2008-9 and 2009-2010. The soil was analyzed for different properties before the start the experiment from SRDI, Jenaidha (Table 1). The experiment was laid out in RCB design with six dispersed replications with the unit plot size 5m x 4m. Treatments were T_1 = Recommended dose of nitrogen as prilled urea, T_2 = Recommended dose of nitrogen as urea super granule (USG), T_3 = 10% less of recommended dose of nitrogen as USG, T_4 = 20% less of recommended dose of nitrogen as USG and T_5 = Farmers practice. The recommended dose of nitrogen was 190 kg/ha. Other fertilizers were used as per recommended dose @ 20-110-15-4-1 kg PKSZn and B/ha in the form of triple super phosphate, murate of potash, gypsum, zinc sulphate and boric acid, respectively (Table 2).

Half of murate of potash was applied at 15 days after planting (DAP) and remaining half at 30 DAT. USG was applied at 15 DAT as ring method, 9-10 cm apart from plant stalk and 7-8 cm depth covering with soil. Potato was planted in 2 December, 2008 and 25 November 2009 and harvested in 4 March 2009 and 10 March 2010 respectively. The collected data were analyzed statistically following the ANOVA technique with the help of MSTA-C software package and means were separated by DMRT at 5% level of significance. Cost and return of all inputs and outputs were noted down and economic analysis of different treatments was done for benefit cost ratio (BCR). Gross return was calculated from two years mean yield of potato.

Table 1. Soil analysis values of different samples collected from Jhikargacha, Jessore

Elements	pH	OM (%)	K meq/100g	Total N (%)	P	S	B	Zn
					µg/g			
Soil test value	7.8	1.39	0.15	0.07	30.5	18.4	0.12	0.95
Interpretation	-	-	Low	Very low	Optimum	Medium	Very low	Medium

Table 2. Fertilizer doses of different treatments for the performance of potato during 2008-10

Treatments	Nutrient (Kg/ha)						CD (kg/ha)
	N	P	K	S	Zn	B	
T_1	190	20	110	15	4	1	3
T_2	190	20	110	15	4	1	3
T_3	170	20	110	15	4	1	3
T_4	152	20	110	15	4	1	3
T_5	220	30	90	20	8	2	4

RESULT AND DISCUSSION

The results showed that plant height, plant populations/m^2, tuber/hill, tuber weight/hill and tuber yield of potato were significantly affected by the treatments (Table 3). In both years, the highest plant height (67.20 cm and 71.21 cm) was recorded from T_2 but T_2 and T_3 were significantly identical in 2008-09 and significantly difference in 2009-10. The treatment T_2 produced maximum number of plant per m^2 (38.62) in 2008-09 and in 2009-10, similar trend was observed which was statistically similar with T_5 treatment in both the years. The highest tuber per hill was observed from T_2 treatment, which was statistically similar with T_3 & T_4 treatments in 2008-09. The highest Tuber per hill was recorded from T_3 treatment followed by T_2 treatment but there was no significance difference among the T_1, T_4 and T_5 treatments in 2009-10. Higher tuber weight/hill (335.01 and 325.25 gm) were found in treatment T_2, that were statistically identically with T_5 (325.25 and 314.34 gm) followed by T_3 (300.15 and 305.95 gm) for both the years, respectively.

In 2008-09, maximum tuber yield was observed from T_2 treatment (33.21 t/ha) which was statistically identical with T_3 (31.51 ha) and statistically dissimilar with T_4 (29.89 t/ha) and T_5 (29.56 t/ha) treatments. In 2009-10, significantly maximum tuber yield was found from T_2 (32.33 t/ha) treatment closely followed by T_5 (30.21 t/ha) and T_3 (30.49 t/ha) treatments. It can be assumed from the better performance of USG that N loss from this fertilizer was remarkably less than that of prilled urea. Similar results have been found by Patrick (1982) and Mishra *et al.* (1999). Haque (2005) found maximum yield of potato with point placement of USG. The treatments T_1 gave the lowest yield (26.56 t/ha and 27.52 t/ha) in both years. However, avarage yield of the two years revealed that maximum yield (32.77 t/ha) was found in T_2 followed by T_3, T_5 and T_4 treatments. T_2, T_3 and T_4 treatments gave 21.19, 14.64 and 7.69% higher yield over T_1 treatment which was PU of urea fertilizer.

Table 3. Effect of USG and PU on the yield contributing characters of potato during 2008-10

Treatment	Plant height (cm)		Plant population/m^2 (no.)		Tuber/hill (no.)	
	2008-09	2009-10	2008-09	2009-10	2008-09	2009-10
T_1	57.93c	70.03b	34.52c	35.45b	10.04c	10.30
T_2	67.20a	71.21a	38.62a	37.91a	12.03a	12.07
T_3	65.06ab	69.05b	37.52b	36.66ab	11.53ab	12.27
T_4	57.02c	67.89bc	35.25c	35.55b	11.20ab	11.17
T_5	62.15b	66.23c	39.10a	37.73a	11.02b	11.83

Cont'd table 3

Treatment	Tuber weight/hill (g)		Tuber yield (t/ha)		Mean yield (t/ha)	% increased over
	2008-09	2009-10	2008-09	2009-10	2008-10	
T_1	289.61b	296.50bc	26.56c	27.52a	27.04	-
T_2	335.01a	325.25a	33.21a	32.33a	32.77	21.19
T_3	300.15b	305.95b	31.51a	30.87a	31.00	14.64
T_4	295.50b	287.15c	29.89b	28.35c	29.12	7.69
T_5	315.25a	304.34b	29.56b	30.45b	30.21	11.72

ECONOMIC ANALYSIS

The economic performance of potato production (Table 4) the highest gross return (Tk 294930/ha) was obtained from T_2 treatment followed by T_3 (Tk 79000/ha) and T_5 (Tk 271890/ha). Highest total cost was obtained from the treatments T_5 (Tk 111525/ha) and lowest (Tk 99493/ha) from T_4 treatment. The highest benefit cost ratio (BCR) was obtained from T_2 (2.74) followed by T_3 (2.64) and T_4 (2.63) treatments.

Table 4. Cost and return analysis of the effect on potato production. Cost of analysis (Average of 2 years)

Treatment	Gross return	Total cost	G.M	BCR
T_1	243360	106636	136724	2.28
T_2	294930	107646	187284	2.74
T_3	279000	105588	173412	2.64
T_4	262080	99493	162587	2.63
T_5	271890	111525	160365	2.42

Market price (Tk./kg): Potato-9.00, Urea-6.50, USG-7.00, TSP-30.0, MP-30.0, Gypsum-5.0, Zinc sulphate-120.0 and Boric acid-110.0

CONCLUSION

On the basis of two years results, it can be concluded that yield and income might be increased through using USG, on an average 10% use N application as USG which can be saved on compared among the treatments. So, the increased price of N fertilizer and the nation can save 10% fertilizer in potato production.

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