SHORT COMMUNICATION

EFFECT OF UREA SUPER GRANULES ON GROWTH AND YIELD OF SUGARCANE

A.S. Mitu[1]*, K.M. Alam[1], S. Islam[1], M.S. Islam[2], M.A. Haque[1], M.R.U. Rashed[1] and G.M.A. Hossain[1]

ABSTRACT

The effect of urea super granule (USG) on growth and yield of sugarcane was evaluated in a field experiment during 2014-2015 cropping season at Bangladesh Sugarcrop Research Institute (BSRI) farm, Ishudi, Bangladesh. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications and six treatments, viz. T_1= recommended fertilizer dose of N (RDN) (165 kg ha^{-1}) as prilled urea in three splits (basal, and 90 and 150 days after planting (DAP)) as per the Fertilizer Recommendation Guide 2012, T_2= RDN as USG at basal, T_3= RDN as USG in two splits (basal and 150 DAP), T_4= 90% RDN as USG at basal, T_5= 90% RDN as USG in two splits (basal and 150 DAP), T_6 = 80% RDN as USG at basal and T_7= 80% RDN as USG in two splits (basal and 150 DAP). Results on growth parameters and yield revealed that sugarcane responded significantly over control due to application of urea super granule. The highest number of tillers was found in T_2 (185.41 x 10^3 ha^{-1}) wherein RDN as USG was applied as basal. The highest number of millable canes was observed in T_6 (79.79 x 10^3 ha^{-1}) in which 80% of RDN as USG was applied as basal. The pol% cane did not differ significantly among different treatments. The highest yield of cane was observed in T_4 (73.87 t ha^{-1}) wherein 90% RDN as USG was applied as basal.

Keywords : Sugarcane, N fertilization, urea super granules, tillers, millable canes, yield, pol%

Fertilizers, particularly N, are indispensable for luxuriant growth and development as well as yield augmentation of sugarcane. It is a constituent of plant cell components such as amino acids and nucleic acids and its deficiency inhibits plant growth, reduces leaf area and decreases photosynthesis ultimately suppressing yield and quality (Taiz and Zeiger 2002; Sreewarome et al. 2007). Application of nitrogenous fertilizer is mandatory in intensive sugarcane cultivation which requires high amount of nitrogen to produce high biomass (Thornburn et al. 2005). Management of nitrogen fertilization is an important factor in productivity and profitability. Broadcasting and subsequent top dressing of nitrogen fertilizer is

the usual practice in Bangladesh. However, the current system of fertilization causes loss of about 60-70% of the N applied (Morales et al. 2000) through ammonia volatilization, denitritification, leaching, runoff and biological or chemical immobilization (Craswell et al. 1981; Ladha et al. 2005). Researchers all over the world are trying to increase nitrogen fertilizer efficiency through the use of slow release fertilizers, and timing and placement of fertilizers in splits. Among these, deep placement of fertilizer nitrogen as Urea Super Granule (USG) of compacted prilled urea instead of broadcasting is most promising (Hossain 2008). Urea in the form of USG has been proved to be superior to granular urea in all aspects. Depending

A.S. Mitu[1]*, K.M. Alam[1], S. Islam[1], M.S. Islam[2], M.A. Haque[1], M.R.U. Rashed[1] and G.M.A. Hossain[1]

[1] Soils and Nutrition Division, Bangladesh Sugarcrop Research Institute (BSRI), Ishwardi - 6620, Pabna, Bangladesh

[2] BSRI Substation, Joypurhat, Bangladesh

* E-mail: atiyasharmin08@gmail.com

on agro-climate and nitrogen use, deep-placed USG can save up to 65% urea fertilizer (average of 33%) and increase yields up to 50% (average of 15-20%) over the same amount of split-applied nitrogen as prilled urea, especially in the lower range of nitrogen rates in transplanted rice (Savant and Stangel 1990). Deep placement of urea fertilizer has not only a positive agronomic impact but also an environmental benefit through reduced runoff loss, nitrification and denitrification. Being a long duration and high biomass crop, sugarcane needs a continuous and steady supply of nitrogen during the whole growing period which can be ensured by deep placement of USG. Considering these facts, the present experiment was undertaken to evaluate the effect of USG on growth and yield of sugarcane.

The experiment was conducted during 2014-2015 cropping season at Bangladesh Sugarcrop Research Institute (BSRI) farm, Ishudi, with a view to find out the effect of USG on growth and yield of sugarcane. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications and six treatments, viz. T_1= recommended fertilizer dose of N (RDN) (165 kg N ha^{-1}) as prilled urea in three splits at basal, and 90 and 150 days after planting (DAP) as per the Fertilizer Recommendation Guide 2012, T_2=RDN as USG at basal, T_3= RDN as USG in two splits (basal and 150 DAP), T_4=90% RDN as USG at basal, T_5= 90% RDN as USG in two splits (basal and 150 DAP), T_6 = 80% RDN as USG at basal and T_7= 80% RDN as USG in two splits (basal and 150 DAP). Recommended doses of P and K were applied uniformly to all the treatments as basal @ 55 kg P_2O_5 and 120 Kg K_2O ha^{-1}, respectively. The plot size of the experiment was 8 m x 6 m. Two budded soil bed

seedlings of sugarcane variety Isd 37 were used in the experiment. The seedlings were planted in December 2015. Necessary intercultural operations were done throughout the cropping season for proper growth and development of the crop. The crop was harvested in December 2016. Data on number of tillers, millable canes, juice quality and cane yield were recorded and subjected to statistical analysis by using the computer package Statistix 10 program for Windows.

Results presented in Table 1 showed that growth parameters and yield of sugarcane responded significantly over control due to application of urea super granule. The highest number of tillers was found in treatment T_2 (185.41 x 10^3 ha^{-1}) where RDN as USG was applied at basal. The effect of treatment T_2 was statistically on par with treatments T_4 (176.83 x 10^3 ha^{-1}) (90% RDN as USG at basal) and T_6 (176.60 x 10^3 ha^{-1}) (80% RDN as USG at basal) regarding tiller production. All other treatments were, however, statistically on par with treatments T_4 and T_6 but ranked second in position. The highest number of millable canes was found in treatment T_6 (79.79 x 10^3 ha^{-1}) wherein 80% of RDN was applied as USG at basal. The effect of treatment T_6 was statistically on par with treatments T_2 (77.64 x 10^3 ha^{-1}) and T_3 (76.81 x 10^3 ha^{-1}) (RDN as USG in two splits) regarding millable cane production. The effect of treatments T_5 (74.51 x 10^3 ha^{-1}) (90% RDN as USG in two splits) and T_7 (74.30 x 10^3 ha^{-1}) (80% RDN as USG in two splits) was, however, statistically on par with treatments T_2 and T_3 but ranked second in position regarding millable cane production. The lowest number of millable canes was found in control (67.15 x 10^3 ha^{-1}). The pol% cane did not differ significantly among different treatments. The highest yield of cane was

Table 1. Effect of urea super granule (USG) on growth and yield of sugarcane

Treatment	No. of tillers (x 10^3 ha^{-1})	No. of millable canes (x 10^3 ha^{-1})	Pol% cane	Yield of cane (t ha^{-1})
T_1	172.25 b*	67.15 c	12.75 a	67.34 ab
T_2	185.41 a	77.64 ab	12.14 a	62.17 b
T_3	171.53 b	76.81 ab	12.44 a	65.44 ab
T_4	176.83 ab	68.68 c	12.53 a	73.87 a
T_5	171.67 b	74.51 b	12.38 a	67.89 ab
T_6	176.60 ab	79.79 a	13.37 a	67.06 ab
T_7	170.90 b	74.30 b	13.09 a	70.01 ab
CV (%)	9.06	2.93	7.84 a	7.33
LSD (0.05)	5.55	1.77	NS	4.05

* Means followed by uncommon letters are significanlty different at 5% level by DMRT

observed in treatment T_4 (73.87 t ha^{-1}) where 90% RDN was applied as USG at basal. The effect of treatments T_4 was statistically identical with all other treatments except T_2 (62.17 t ha^{-1}) regarding yield of sugarcane. The effect of treatment T_2 was, however, statistically similar with treatments T_1, T_3, T_5, T_6 and T_7 but ranked second in position regarding cane yield.

From the above discussion it may be concluded that growth parameters and yield of sugarcane responded significantly over control due to application of urea super granule. The highest number of tillers was found in treatment T_2 (185.41 x 10^3 ha^{-1}) where RDN was applied as USG at basal. The highest number of millable canes was found in treatment T_6 (79.79 x 10^3 ha^{-1}) where 80% of RDN was applied as USG at basal. The pol% cane did not differ significantly among different treatments. The highest yield of cane was found in treatment T_4 (73.87 t ha^{-1}) where 90% RDN was applied as USG at basal.

References

Craswell ET, De Datta SK, Obcemea WN, Hartantyo M (1981) Time and mode and nitrogen fertilizer application to tropical wetland rice. IRRI Fertil Res 2:247 - 259.

Hossain MQ (2008) Effect of urea super granule on the yield and quality of T–Aman rice. MS thesis, Dept Agron, Sher-e Bangla Agril Univ, Dhaka.

Ladha JK, Pathak H, Krupnik TJ, Six J, van Kessel C (2005) Efficiency of fertilizer nitrogen in cereal production: retrospect and prospects. Adv Agron 87:85 – 156.

Morales AC, Agustin EO, Lucas MP, Marcos TF, Culanay DA and Balasubramanian V (2000) Comparative efficiency of N management practices on rainfed lowland rice in Batac, Philippines. Int Rice Res Notes 25(1):22-23.

Savant NK, Stangel PJ (1990) Deep placement of urea super granules in transplanted rice:

Principles and practices. Nutrient Cycling in Agroecosystems 25(1):1-83.

Sreewarome A, Seansupo S, Prammanee P, Weerathworn P (2007) Effect of rate and split application of nitrogen on agronomic characteristics, cane yield and juice quality. Proc Int Soc SugarCane Technol 26:465- 469.

Taiz L, Zeiger E (2002) Plant Physiology. Sinauer Associates, Sunderland, M.A. pp. 566-567.

Thornburn PJ, Meiera EA, Probert ME (2005) Modelling nitrogen dynamics in sugarcane systems. Recent advantages and applications. Field Crop Res 92:317-351.