Optimizing cow urine application rate at varying fertility and zinc levels on wheat (*Triticum aestivum* L.) productivity under dairy based farming system in Varanasi tract

Abstract

This field investigation was carried out in two consecutive years of 2016-17 and 2017-18 at the Agricultural Research Farm, Banaras Hindu University, Varanasi (U.P.) to assess the effect of cow urine application at varying fertility and zinc levels on growth and yield of wheat (*Triticum aestivum* L.) under irrigated condition of Varanasi. Results showed that application of the fertilizer at 100% recommended dose of fertilizers (RDF) recorded significantly higher growth parameters *viz*. plant height, number of tiller m^{-1} row length; yield attributes *viz*. number of effective tiller m^{-2}, spike length, grains $spike^{-1}$ and test weight as well as grain and straw yield than 75% RDF during both the years. Among the zinc levels, zinc applied at 10 kg ha^{-1} though remained comparable to 5 kg Zn ha^{-1}, recorded significantly higher values of these parameters over control. Cow urine at the rate of 12000 l ha^{-1} applied equally at sowing, CRI (Crown Root Initiation) and spike emergence (SE) stages gave higher values of plant height, number of tiller m^{-1} row length, spike length and number of grain $spike^{-1}$ which being at par with 4000 l ha^{-1} cow urine each at sowing and CRI, both recorded significantly higher values than control. However, with respect to effective tillers m^{-2}, grain and straw yield, significant increase was noticed with each increment of cow urine, recording maximum at 12000 l ha^{-1} during both the years.

Keywords: Cow urine, fertility, CRI, Spike emergence, zinc

1. Introduction

Wheat (*Triticum aestivum* L) is the major staple food crop of the world, occupying maximum area (220.06 m ha) and stands second in production (763.2 m t) after maize and third in the productivity (3.49 m t ha^{-1}) after maize and rice [29]. It is an essential component of food in more than 40 countries, contributes 35 per cent to the world's food basket and meets 19 per cent of calories and 20 per cent of protein requirements of the world population [6] besides being a major source of dietary fibre, carbohydrates, mineral and vitamins in human nutrition since decades. India is the second largest wheat producing country (98.51 m t) after china, contributes 15.36% to the world wheat production. However, with respect to area, it ranks first (30.79 m ha), followed by Russia and China (USDA, 2019). In India, wheat is the second major staple cereal crop after rice and gives a significant contribution to food and nutrition security as well as agricultural development. However, the productivity of wheat is low (3216 kg ha^{-1}) compared to the world average (3490 kg ha^{-1}). India needs to produce wheat about 115 m t by 2030 and 140 m t by 2050 to feed the growing population;

this is equivalent to 46% higher production than the present production level [31]. Declining soil fertility as well as inadequate, unbalanced and inefficient use of fertilizers are the major constraints which lead to low wheat productivity [32, 7]. Though, the application of synthetic fertilizers with intensive agronomic practices had greatly enhanced the wheat productivity [13] during the last 50 years but the extensive and irrational fertilizer use has resulted in negative impact on soil health [10]. Beside this, under increasing world energy crisis, the cost of chemical fertilizers is increasing but it has been established that the renewable sources of plant nutrients *viz*. organic sources integrated with chemical fertilizers increases productivity as well as maintain soil health [16]. Cow urine has been used for various purposes *viz*. medicinal and agricultural from *vedic* period due to its special characteristics and lower cost. Amongst various organic sources, cow urine besides nitrogen, also has good amount of phosphate, potassium, sulphur, sodium, manganese, iron, silicon, chlorine, carbolic acid, salt, enzymes and hormones [22]. The amount of total nitrogen in cow urine ranges from 6.8-21.1 g N litre^{-1} in which urea contribute 69%, hippuric acid 5.8%, allantoin 7.3%, creatine 2.5%, creatinine 3.7%, uric acid 1.3%, xanthin plus hypoxanthin 0.5%, ammonia 2.8% and free amino acid nitrogen 1.3% [4]. Primary plant nutrients play an important role in wheat production. Nitrogen is vital component of the cell and growth components such as chlorophyll, many protein molecules, enzyme particles, DNA structural molecules *viz*. nucleotides, alkaloids and many other substances, contribute significantly in plant growth, development and reproduction. Phosphorus is the key element which plays the important role in basic photosynthesis reactions, energy transfer, transformation of sugar, metabolic processes and starch and nutrient movement in plants. Likewise, potassium is the component of many enzymes, performs major role in carbohydrates synthesis, disease resistance as well as tolerance to adverse environmental conditions in plants through osmotic regulation of the cell. At present, zinc deficiency in Indian soils has been recognised as the widespread micronutrient deficiency and it comes next to N and P. So, nearly 50% soils in north India are low in Zn and likely to respond to its application [23]. Zinc is required in completing basic plant life functions *viz*. chlorophyll synthesis, nitrogen uptake and metabolism, protein quality and photosynthesis etc. [15]. It is the component of many enzymes *viz*. carbonic anhydrase as well as proteins. Hence, the current investigation was carried out to evaluate the performance of cow urine as a potential organic fertilizer source in wheat production along with fertility and zinc levels.

2. Materials and Methods

The field study was conducted at the Agricultural Research Farm, Banaras Hindu University, Varanasi (U.P.) in two successive years of 2016-17 and 2017-18. The soil of the experimental site was sandy clay loam in texture with slightly alkaline soil pH (7.35), low organic carbon (0.35%) and available nitrogen (203.49 kg ha^{-1}) and medium available phosphorus (17.77 kg ha^{-1}) and potassium (192.21 kg ha^{-1}). The experiment was laid out in split plot design with three replications. The main plot treatment comprised of combinations of two fertility levels, 100% recommended dose of fertilizers (RDF) and 75% RDF and three zinc levels (0, 5 and 10 kg Zn ha^{-1}) and in sub plots, three cow urine levels (U_2 - 12000 l ha^{-1} equally applied at sowing, CRI (Crown Root Initiation), and spike emergence (SE), U_1 - 8000 l ha^{-1} equally applied at sowing and CRI and U_0 - 0 l ha^{-1}) were taken. In control plot, water was applied @ 4000 l ha^{-1} at all the stages (Sowing, CRI and SE). Similarly in U_1, water @ 4000 l ha^{-1} was applied at spike emergence. Under 100% RDF, 150 kg N, 60 kg P_2O_5 and 60 kg K_2O was applied. The nutrient application was done as per treatment through Urea, DAP, MOP and $ZnSO_4.H_2O$. Half of the recommended dose of nitrogen and full doses of P, K and Zn were applied as basal and rest half dose of nitrogen was top dressed through Urea in two equal splits at CRI and spike emergence stages. The pure cow urine was collected from cattle shed of IFS (Integrated Farming System) model of the Institute of Agricultural Sciences, BHU, Varanasi and stored in plastic cans. The application of the cow urine was done with watering can in the furrow at the time of sowing as basal application and towards the root zone between two rows at CRI and spike emergence stages as per treatment. Wheat variety "HD 2967" was sown at the seed rate of 100 kg ha^{-1} during the first week of December at 22.5 cm row spacing with the help of *kudal*. The crop was irrigated as per requirement of the crop and the need based plant protection measures were adopted. Similarly, all other recommended package of practices was followed. The observations on growth parameters *viz*. plant height and number of tiller m^{-1} row length at 40, 70, 100 DAS (Days After Sowing) and at harvest and maturity characters *viz*. number of effective tiller m^{-2}, spike length, grains $spike^{-1}$, test weight as well as grain and straw yield were recorded during both the years. The data were analyzed by the standard procedure for analysis of variance as described by Gomez and Gomez, 1984 [8].

3. Results and Discussion

3.1 Effect of varying level of fertility, zinc and cow urine on growth parameters

3.1.1 Plant height

Fertility level at 100% RDF statistically improved wheat plant height at all the growth stages than lower RDF of 75% during both the years (Table 1). The reason behind plant height was progressively increased upto 100 DAS and thereafter it seized might be ascribed to senescence when plants progresses from vegetative to reproductive stage thus food material which was being utilized for growth till now was transferred to fruit formation. The balanced and adequate supply of macronutrient *viz*. NPK by fertility levels might have helped in rapid cell division and cell elongation in plant meristemic regions and in more protein synthesis thereby protoplast and cell wall materials which ultimately formed into increased plant height. Rahman *et al*., 2016 [17] and Samimi and Thomas 2016 [20] also observed similar findings.

Zinc applied at 10 kg ha^{-1} however recorded maximum plant height but statistically not differ with zinc at 5 kg ha^{-1} but both produced taller plants over control. At 40 DAS, plant height with 5 kg Zn ha^{-1} showed statistically no difference with control. The reason behind increase in plant growth with zinc might be due to zinc's vital role in enzyme carbonic anhydrase (which transport CO_2 in photosynthesis, Srivastava and Gupta, 1996) [28], nitrogen metabolism and zinc induced growth regulators such as gibberellins, kinetin and indole-3-acetic acid. These findings are in close conformity to those of Jan *et al*., 2013 [11] and Sharma *et al*., 2016 [23].

Cow urine at 12000 l ha^{-1} equally applied at sowing, CRI and SE however not differing significantly with 8000 l ha^{-1} equally applied at sowing and CRI, recorded tallest wheat plants during entire study period. The beneficial effect of cow urine might be due to the fact that it contains various minerals, enzymes and hormones which might involved in regulations of physiological processes inside plant. Also due to its application microbial activity might enhanced in rhizosphere may leads to better nutrients absorption which impacted on plant growth (Vahanka *et al*., 2010) [30] as also obtained by Sadhukhan *et al*., 2018 [19], Devakumar *et al*., 2014 [5] in maize and Gopakkali and Channanaik, 2010 in rice [9].

3.1.2 Number of tillers m^{-1} row length

As we can see in Table 2 significantly maximum tillers m^{-1} row length at all the growth stages were obtained with fertility of 100 % RDF than fertility of 75% RDF during both the years. However, after 100 DAS tiller mortality slightly increased due to death of late produced tillers resulting from intraspecies competition for higher space and nutrients. Nitrogen applied with phosphorus and potassium in balanced RDF might have influenced protoplasmic content and metabolic processes of the plant also nutritional conditions of the mother culm which in turn helped in expansion of auxillary buds. Also, Ali *et al*., 2003 observed reduced degeneration of tillers with increasing nutrient levels which favour to maintain more number of the effective tillers. Alike results were also reported by Samimi and Thomas, 2016 [20] and Jat *et al*., 2013 [11].

Similarly, the various levels of zinc exerted significant impact on number of tiller m^{-1} row length (Table 2). Application of 10 kg Zn ha^{-1} produced highest number of tiller m^{-1} row length at all the growth stages. Though, it remained comparable to 5 kg Zn ha^{-1}, both proved statistically superior over control during both the years of assessment. The higher number of tiller with increasing zinc application could be attributed to the fact that zinc induces chlorophyll content (Table 3) which accelerates rate of photosynthesis ultimately increased production of assimilates needed for tiller production (Barak and Helmke, 1993) [3]. These findings are in accordance with the observations of Jan *et al*., 2013 [11].

Highest and medium levels of cow urine application being comparable with respect to number of tillers but both were significantly superior over control. The positive impact on tiller number might be viewed as cow urine is a source of primary, secondary and micro nutrients as well as various types of hormones and enzymes which are quickly absorbed by plant might have favoured physiological reaction in plant system towards higher growth and development, ultimately leading to more number of tillers. The similar views were also expressed by Sadhukhan and Bohra, 2017 [18], Singh *et al*., 2014 [24] and Gopakkali and Channanaik, 2010 in rice [9].

3.2 Effect of varying level of fertility, zinc and cow urine on yield attributes

Increasing fertility levels from 75% RDF to 100% RDF significantly improved yield attributes of wheat *viz*. number of effective tiller m^{-2}, spike length, grains $spike^{-1}$ and test weight during both the years of study (Table 3). This could be ascribed to increased sink capacity which was possibly due to better uptake of major nutrients that enhanced dry matter production or source capacity of the plant like leaf area index, net assimilation rate and photosynthetic efficiency leading to the production of favourable growth components and improved yield attributes. Srivastava and Singh, 2014 [27] and Mishra *et al*., 2017 [14], also found similar results on yield attributes of wheat.

In continuation, Zinc at 10 kg ha^{-1} also gave maximum yield attributes of wheat however it remained statistically similar to 5 kg Zn ha^{-1} but both proved significantly superior over control. Favourable zinc application impact on growth components (Table 1&2) perhaps due to the fact that it plays an important role in basic photosynthesis reactions, chlorophyll synthesis, growth hormones formation, auxin and nitrogen metabolism etc. which persuade the plant to enhance the photosynthetic activity resulting into increased sink capacity, ultimately enhanced yield component and yield. Similar results were also reported by Zeidan *et al*., 2010 [33] and Jan *et al*., 2013 [11].

With respect to cow urine, for spike length and grains $spike^{-1}$, the differences did not differ significantly between 8000 and 12000 l ha^{-1} cow urine. All the cow urine levels differ significantly with respect to number of effective tiller m^{-2}. The test weight was slightly increased with increasing levels of cow urine application but the differences were not varied statistically. Increased availability of major as well as secondary and micro nutrient elements, hormones and enzymes in cow urine might helpful in plant growth and development leading to higher dry matter production and increased supply of photosynthates for formation of yield components of wheat. Similar observations were also reported by Sadhukhan *et al*., 2018 in wheat [19].

3.3 Effect of varying level of fertility, zinc and cow urine on yield

Grain and straw yield of the wheat showed marked variation under two fertility levels (Table 4). Fertility level of 100% RDF found statistically superior over 75% RDF and recorded higher grain and straw yield of wheat. Increased availability and assimilation of fertilizer elements might have promoted higher growth parameters *viz*. plant height and number of tiller (Table 1, 2 and 3) leading to more shoot dry matter production m^{-1} row length (100 % RDF produced 334.50 g in 2017 and 339.09 g in 2018 and 75% RDF produced 306.28 g in 2017 and 310.04 g in 2018) which resulted into better source and sink relationship and thereby yield. The findings are also agreed with those of Samimi and Thomas, 2016 [20] and Rahman *et al.,* 2016 [7].

Significantly highest yield of grain and straw were recorded with zinc at 10 kg ha^{-1} followed by 5 kg Zn ha^{-1} but both remained at par. This might be assigned to favourable impact of zinc on the vegetative growth which positively impacted the reproductive growth of the plant and finally improved yield. Singh *et al.*, 2004a [25]; Singh *et al.*, 2004b [26] and Ahmadi *et al.*, 2016 [1], also supported the above results.

Similarly, significant differences were noticed between any two levels of cow urine with respect to grain and straw yield. As compared to control, application of 12000 and 8000 l ha^{-1} cow urine caused 13.05 and 8.25% increase in grain yield during first year and 11.45 and 8.07% increment during second year, respectively. The higher growth and yield attributes (Table 3) due to good major and micro nutrient, minerals and enzymatic profile of cow urine ultimately leading to increased yield of winter wheat. These reportings are similar to reportings of Devakumar *et al.*, 2014 in maize [5] and Sadhukhan *et al.*, 2018 in wheat [19].

3.4 Harvest Index

The increasing levels of fertility, zinc and cow urine application from lowest to highest levels though showed increasing trend of harvest index but the differences failed to touch the level of significance (Table 3). This shows that fertilizer, zinc and cow urine application contributed almost equally to both the grain as well as straw production.

4. Recommendation

On the basis of two years study it is recommended that application of 100% RDF (150-60-60 kg ha^{-1} N P K) and 10 kg Zn ha^{-1} and cow urine @ 12000 l ha^{-1} equally applied at sowing, CRI and spike emergence stages may be followed for higher yield of wheat under irrigated condition of Varanasi.

5. Conclusion

On the basis of data obtained in current field investigation, fertility level at 100% RDF and zinc level at and 10 kg Zn ha^{-1} showed significant superiority with respect to growth parameters (plant height, number of tillers m^{-1} row length), yield attributes (number of effective tiller m^{-2}, spike length, grains $spike^{-1}$ and test weight) and subsequently grain and straw yield of winter wheat variety HD 2967. Cow urine at the rate of 12000 l ha^{-1} equally applied at sowing, CRI and spike emergence stages found significantly superior in growth and yield parameters and finally yield of HD 2967.

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Table 1: Effect of varying levels of fertility, zinc and cow urine application on plant height at different stages.

Treatments	Plant height (cm)							
	40 DAS		70 DAS		100 DAS		At harvest	
	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18
Main plot **Fertility level**								
F_1- 100% RDF	**41.02**	**42.56**	**71.55**	**73.57**	**103.57**	**105.71**	**103.62**	**104.61**
F_2- 75% RDF	**38.48**	**40.33**	**68.81**	**70.16**	**98.71**	**100.22**	**98.44**	**99.26**
SEm±	**0.41**	**0.39**	**0.79**	**0.64**	**1.27**	**1.04**	**1.11**	**1.01**
CD 5%	**1.29**	**1.24**	**2.49**	**2.02**	**4.02**	**3.29**	**3.48**	**3.18**
Zinc level (kg Zn ha^{-1})								
Zn_0- 0	**38.76**	**40.29**	**67.47**	**69.90**	**97.44**	**99.83**	**97.30**	**98.77**
Zn_1- 5	**39.68**	**41.54**	**70.67**	**72.63**	**102.38**	**103.98**	**101.82**	**103.03**
Zn_2- 10	**40.81**	**42.51**	**72.39**	**73.07**	**103.60**	**105.07**	**103.97**	**104.01**
SEm±	**0.50**	**0.48**	**0.97**	**0.79**	**1.56**	**1.28**	**1.35**	**1.24**
CD 5%	**1.59**	**1.52**	**3.05**	**2.48**	**4.92**	**4.03**	**4.27**	**3.90**
Sub plot **Cow urine (l ha^{-1})**								
U_0- 0 (Control)	**38.60**	**40.16**	**68.17**	**69.94**	**98.33**	**100.33**	**98.75**	**99.16**
U_1-4000 each at Sowing and CRI	**39.96**	**41.71**	**70.65**	**72.32**	**101.53**	**103.33**	**101.52**	**102.41**
U_2-4000 each at Sowing, CRI and SE*	**40.70**	**42.46**	**71.72**	**73.34**	**103.56**	**105.23**	**102.82**	**104.24**
SEm±	**0.27**	**0.27**	**0.78**	**0.54**	**0.95**	**0.98**	**0.68**	**0.92**
CD 5%	**0.80**	**0.78**	**2.29**	**1.58**	**2.78**	**2.85**	**2.00**	**2.68**

* Spike Emergence

Table 2: Effect of varying levels of fertility, zinc and cow urine application on tiller production at different stages.

Treatments	Number of tiller^{-1} m row length							
	40 DAS		70 DAS		100 DAS		At harvest	
	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18
Main plot **Fertility level**								
F_1- 100% RDF	**96.56**	**99.37**	**127.74**	**131.89**	**125.81**	**129.33**	**122.78**	**124.30**
F_2- 75% RDF	**87.15**	**90.70**	**121.89**	**124.33**	**114.89**	**118.56**	**111.22**	**114.52**
SEm±	**1.87**	**1.48**	**1.75**	**1.45**	**1.77**	**1.73**	**2.17**	**2.11**
CD 5%	**5.89**	**4.67**	**5.51**	**4.57**	**5.59**	**5.46**	**6.83**	**6.66**
Zinc level (kg Zn ha^{-1})								
Zn_0- 0	**86.39**	**89.72**	**119.22**	**123.33**	**112.28**	**116.17**	**110.39**	**112.83**
Zn_1- 5	**93.67**	**96.22**	**126.50**	**129.61**	**123.67**	**126.94**	**119.39**	**121.11**
Zn_2- 10	**95.50**	**99.17**	**128.72**	**131.39**	**125.11**	**128.72**	**121.22**	**124.28**
SEm±	**2.29**	**1.82**	**2.14**	**1.78**	**2.17**	**2.12**	**2.66**	**2.59**
CD 5%	**7.21**	**5.72**	**6.75**	**5.60**	**6.85**	**6.69**	**8.37**	**8.15**
Sub plot **Cow urine (l ha^{-1})**								
U_0- 0 (Control)	**87.06**	**89.61**	**119.89**	**123.50**	**115.78**	**119.50**	**111.44**	**114.33**
U_1-4000 each at Sowing and CRI	**92.28**	**96.00**	**125.61**	**129.11**	**120.56**	**124.50**	**118.00**	**120.61**
U_2-4000 each at Sowing, CRI and SE*	**96.22**	**99.50**	**128.94**	**131.72**	**124.72**	**127.83**	**121.56**	**123.28**
SEm±	**1.71**	**1.24**	**1.62**	**1.40**	**1.57**	**1.49**	**2.24**	**2.16**
CD 5%	**5.00**	**3.61**	**4.73**	**4.09**	**4.59**	**4.36**	**6.55**	**6.31**

Table 3: Effect of varying levels of fertility, zinc and cow urine application on yield attributes.

Treatments	Number of effective tiller m^{-2}		Spike length (cm)		Number of grain $spike^{-1}$		Test weight (g)	
	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18
Main plot **Fertility level**								
F_1- 100% RDF	**398.96**	**403.11**	**13.37**	**13.48**	**51.48**	**52.06**	**41.97**	**42.13**
F_2- 75% RDF	**360.41**	**364.63**	**12.42**	**12.57**	**49.22**	**49.85**	**41.08**	**41.40**
SEm±	**5.99**	**5.49**	**0.13**	**0.14**	**0.55**	**0.54**	**0.25**	**0.23**
CD 5%	**18.88**	**17.29**	**0.40**	**0.44**	**1.74**	**1.70**	**0.79**	**0.72**
Zinc level (kg Zn ha^{-1})								
Zn_0- 0	**358.11**	**362.83**	**12.19**	**12.35**	**47.31**	**47.78**	**39.73**	**40.06**
Zn_1- 5	**383.72**	**386.67**	**13.01**	**13.14**	**51.09**	**51.79**	**42.22**	**42.40**
Zn_2- 10	**397.22**	**402.11**	**13.49**	**13.57**	**52.65**	**53.30**	**42.64**	**42.84**
SEm±	**7.34**	**6.72**	**0.16**	**0.17**	**0.68**	**0.66**	**0.31**	**0.28**
CD 5%	**23.12**	**21.17**	**0.49**	**0.54**	**2.13**	**2.08**	**0.96**	**0.89**
Sub plot **Cow urine (l ha^{-1})**								
U_0- 0 (Control)	**364.11**	**370.00**	**12.39**	**12.21**	**48.25**	**48.71**	**41.07**	**41.28**
U_1-4000 each at Sowing and CRI	**380.28**	**385.67**	**12.98**	**13.38**	**50.68**	**51.23**	**41.54**	**41.83**
U_2-4000 each at Sowing, CRI and SE*	**394.67**	**395.94**	**13.32**	**13.58**	**52.12**	**52.92**	**41.98**	**42.19**
SEm±	**4.54**	**3.25**	**0.13**	**0.12**	**0.58**	**0.49**	**0.28**	**0.26**
CD 5%	**13.26**	**9.49**	**0.39**	**0.34**	**1.68**	**1.42**	**NS**	**NS**

Table 4: Effect of varying levels of fertility, zinc and cow urine application on yield.

Treatments	Grain yield (kg ha^{-1})		Straw yield (kg ha^{-1})		Harvest index (%)	
	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18
Main plot **Fertility level**						
F_1- 100% RDF	**4813**	**4916**	**7142**	**7244**	**40.30**	**40.47**
F_2- 75% RDF	**4382**	**4476**	**6520**	**6645**	**40.09**	**40.22**
SEm±	**62**	**49**	**113**	**112**	**0.57**	**0.50**
CD 5%	**194**	**154**	**355**	**354**	**NS**	**NS**
Zinc level (kg Zn ha^{-1})						
Zn_0- 0	**4353**	**4456**	**6501**	**6607**	**40.02**	**40.23**
Zn_1- 5	**4662**	**4744**	**6958**	**7041**	**40.17**	**40.29**
Zn_2- 10	**4777**	**4888**	**7033**	**7185**	**40.40**	**40.51**
SEm±	**75**	**60**	**138**	**138**	**0.70**	**0.62**
CD 5%	**237**	**189**	**435**	**433**	**NS**	**NS**
Sub plot **Cow urine (l ha^{-1})**						
U_0- 0 (Control)	**4292**	**4409**	**6494**	**6601**	**39.94**	**40.06**
U_1-4000 each at Sowing and CRI	**4646**	**4765**	**6862**	**7017**	**40.09**	**40.44**
U_2-4000 each at Sowing, CRI and SE*	**4854**	**4914**	**7136**	**7215**	**40.57**	**40.54**
SEm±	**56**	**48**	**66**	**65**	**0.44**	**0.33**
CD 5%	**162**	**141**	**192**	**189**	**NS**	**NS**