The Andhra Agric. J 60(3): 631-634, 2013

Effect of FYM and Magnesium on Yield and Quality of *Bt* cotton

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ABSTRACT

A field experiment was conducted during *kharif,* 2011 at Agricultural College Farm, Bapatla to study the effect of FYM and magnesium on yield and quality of *Bt* cotton. Results indicated that significantly higher number of bolls per plant, seed cotton yield, stalk yield and biological yield were found with FYM @ 10 t ha^{-1} + soil application of $MgSO_4$ @ 50 kg ha^{-1} followed by sole application of FYM @ 10 t ha^{-1} and FYM @ 10 t ha^{-1}+ foliar application of $MgSO_4$ @ 1 per cent at 50 and 70 DAS as compared to control. Among all the combination FYM 5 or 10 t ha^{-1} with and without magnesium showed superiority as compared to application of inorganics alone. All the quality parameters viz., fibre length, fibre strength, fibre fineness, uniformity ratio and elongation per cent were not influenced markedly by application of FYM and magnesium alone or in combination.

Key words : Organic manure, Secondary nutrients, Seed cotton.

Cotton enjoys a pre-eminent status among all the cash crops in the country and elsewhere by providing principle raw material for textile industry. It provides livelihood to about sixty million people and is an important agricultural commodity providing remunerative income to millions of farmers both in developed and developing countries.

Modern agriculture relies heavily on the intensive cultivation of crops with the use of high analysis N, P and K fertilizers resulting in disparity in the availability and supply of the secondary and micronutrients. At this juncture conjunctive use of organics can increase the productivity of soils as they act as a source of nutrients and modify the soil physical behavior as well as increase the efficiency of applied nutrients (Sahadeva Reddy and Aruna, 2008).

Intensive cropping with high yielding varieties of cotton may result in the deficiency of secondary and micronutrients in deep and medium black soils. Magnesium deficiencies are of common occurrence particularly in calcareous soils and low CEC soils. Magnesium being a constituent of chlorophyll and activator of several enzymes plays an indispensable role in crop production (Chaudhary *et.al.*, 2001). Hence the present study was carried out to see the influence of FYM and magnesium on yield and quality of *Bt* cotton.

MATERIAL AND METHODS

A field experiment was conducted at Agricultural College Farm, Bapatla of Acharya N.G. Ranga Agricultural University during *kharif* 2011. The experiment was laid out in a randomized block design with three replications and nine treatments viz., T_1- Control (RDF); T_2- FYM @ 5 t ha^{-1}; T_3- FYM @ 10 t ha^{-1}; T_4- Foliar application of $MgSO_4$ 1% at 50 and 70 DAS; T_5- FYM @ 5 t ha^{-1}+ foliar application of $MgSO_4$ 1% at 50 and 70 DAS; T_6- FYM @ 10 t ha^{-1}+ foliar application of $MgSO_4$ 1% at 50 and 70 DAS; T_7- Soil application of $MgSO_4$ @ 50 kg ha^{-1}: T_8- FYM @ 5 t ha^{-1} + soil application of $MgSO_4$ @ 50 kg ha^{-1} and T_9- FYM @ 10 t ha^{-1}+ soil application of $MgSO_4$ @ 50 kg ha^{-1}.The soil of the experimental field was clay loam in texture with pH 8.32, EC 0.42 dS m^{-1}, organic carbon 0.52 per cent, available nitrogen 158 kg ha^{-1}, phosphorus 52.18 kg ha^{-1}, potassium 786 kg ha^{-1}, calcium 23.82 cmol kg^{-1}, magnesium 8.40 cmol kg^{-1}, zinc 0.62 ppm, copper 3.62 ppm, iron 13.59 ppm and manganese 9.00 ppm. A rainfall of 604.5 mm was received in 29 rainy days during crop growth period. Cotton hybrid Tulasi *Bt-2* was dibbled at 90 cm x 60 cm spacing on 29th July, 2011. Crop was fertilized with recommended dose of 120:60:60 kg N, P_2O_5 and K_2O ha^{-1}, respectively to all the treatments. FYM was applied 10 days before sowing. $MgSO_4$ (soil application) and phosphorus were applied basally. Nitrogen and potassium were applied in 4 splits. $MgSO_4$ foliar application was done at 50 and 70 DAS. Data was collected on yield and quality parameters.

RESULTS AND DISCUSSION

Yield attributing characters

The results presented table 1 revealed that highest number of bolls (46.27) were observed with FYM @ 10 t ha^{-1}+ soil application of $MgSO_4$ @ 50 kg ha^{-1} (T_9) followed by FYM @ 10 t ha^{-1} (T_3) (45.53)

Table 1. Effect of FYM and magnesium on yield components and seed cotton yield.

Treatments	Boll number/ plant	Boll weight (g)	Seed cotton yield (q ha^{-1})	Stalk yield (q ha^{-1})	Biological yield (q ha^{-1})
T_1- Control	37.60	5.27	23.06	42.59	65.65
T_2- FYM @ 5 t ha^{-1}	40.47	5.23	24.81	44.75	69.56
T_3- FYM @ 10 t ha^{-1}	45.53	5.57	28.49	50.00	78.49
T_4- Foliar application of $MgSO_4$ @ 1% at 50 and 70 DAS	38.93	5.23	24.24	43.21	67.45
T_5- FYM @ 5 t ha^{-1}+ foliar application of $MgSO_4$ @ 1% at 50 and 70 DAS	40.93	5.20	25.48	45.37	70.85
T_6- FYM @ 10 t ha^{-1}+ foliar application of $MgSO_4$ @ 1% at 50 and 70 DAS	45.10	5.43	28.30	50.62	78.91
T_7- Soil application of $MgSO_4$ @ 50 kg ha^{-1}	39.20	5.33	24.42	43.52	67.94
T_8- FYM @ 5 t ha^{-1} + soil application of $MgSO_4$ @ 50 kg ha^{-1}	41.07	5.40	25.98	45.99	71.97
T_9- FYM @ 10 t ha^{-1}+ soil application of $MgSO_4$ @ 50 kg ha^{-1}	46.27	5.63	30.05	51.23	81.28
SEm±	1.67	0.34	1.13	1.05	1.64
CD (0.05)	3.54	NS	2.41	2.23	3.47

and FYM @ 10 t ha^{-1}+ foliar application of $MgSO_4$ @ 1% at 50 and 70 DAS (T_6) (45.10), which were found to be at par with one another. The lowest number of bolls (37.60) were recorded in control treatment. The highest boll number in combined application of FYM and magnesium could be due to continuous supply of nutrients from FYM and regulation of biochemical changes in plant by magnesium leading to setting of more number of bolls. The effect of FYM and magnesium either alone or in combination on boll weight was found to be non-significant. Highest boll weight (5.63 g) was recorded in treatment receiving FYM @ 10 t ha^{-1}+ soil application of $MgSO_4$ @ 50 kg ha^{-1} as compared to other treatments. The results are in conformation with the findings of Mandeep Kaur *et al*. (2008) and Jagdish Kumar and Yadav (2010).

Seed cotton yield (q ha^{-1})

The comparison of only FYM treated plots (Table 1) indicated a significant increase in seed cotton yield in T_3 (FYM @ 10 t ha^{-1}) over control and application of FYM @ 5 t ha^{-1}. The sole application of magnesium through soil or foliar application did not show any marked effect on seed cotton yield. The significantly highest seed cotton yield (30.05 q ha^{-1}) was observed in combined treatment i.e. FYM @ 10 t ha^{-1}+ soil application of $MgSO_4$ @ 50 kg ha^{-1} (T_9) followed by FYM @ 10 t ha^{-1}(T_3) (28.49 q ha^{-1}) and FYM @ 10 t ha^{-1}+ foliar application of $MgSO_4$ @ 1% at 50 and 70 DAS (T_6) (28.30 q ha^{-1}), which were found to be at par with one another. The lowest seed cotton yield (23.06 q ha^{-1}) was recorded in control treatment.

Application of magnesium (foliar or soil) along with FYM either @ 5 t ha^{-1}or 10 t ha^{-1} showed marked effect on seed cotton yield. The significantly higher seed cotton yield in combined treatments even at low dose of FYM could be due to the catalytic role of magnesium in several enzymatic reactions that might have enhanced the seed cotton yield. The beneficial effect of magnesium was found to be more in the presence of FYM. However all the treatments which received FYM recorded higher

Table 2. Effect of FYM and magnesium on quality parameters.

Treatments	Fibre length (mm)	Fibres strength (g tex^{-1})	Fibre fineness (µg inch^{-1})	Uniformity ratio	Elongation (%)
T_1- Control	30.95	23.04	3.43	43.86	5.80
T_2- FYM @ 5 t ha^{-1}	30.93	24.30	3.19	45.93	6.08
T_3- FYM @ 10 t ha^{-1}	30.80	23.53	3.74	46.64	6.02
T_4- Foliar application of $MgSO_4$ @ 1% at 50 and 70 DAS	31.40	23.54	3.75	44.36	6.07
T_5- FYM @ 5 t ha^{-1}+ foliar application of $MgSO_4$ @ 1% at 50 and 70 DAS	31.02	23.38	3.83	44.44	5.95
T_6- FYM @ 10 t ha^{-1}+ foliar application of $MgSO_4$ @ 1% at 50 and 70 DAS	30.10	22.30	3.88	42.29	5.85
T_7- Soil application of $MgSO_4$ @ 50 kg ha^{-1}	30.63	22.91	3.67	43.65	5.91
T_8- FYM @ 5 t ha^{-1} + soil application of $MgSO_4$ @ 50 kg ha^{-1}	31.63	23.53	3.21	44.64	5.92
T_9- FYM @ 10 t ha^{-1}+ soil application of $MgSO_4$ @ 50 kg ha^{-1}	31.58	23.05	3.66	45.13	5.98
SEm±	0.47	0.69	0.26	1.32	0.01
CD (0.05)	NS	NS	NS	NS	NS

seed cotton yield over completely inorganic treatments (T_1, T_4, and T_7) due to its favorable effect in improving soil physical environment and supply of nutrients throughout the crop growth. The use of organic manures like FYM might increase the microbial activity which in turn helps in transformations of nutrients making them more available to plants. Similar results were found by Devraj *et al.* (2008) and Tayade *et al.* (2011).

Stalk and biological yield (q ha^{-1})

Application of FYM @ 5 t ha^{-1} was found to be on a par with control, while a high dose of FYM @ 10 t ha^{-1} was significantly superior over both the treatments (T_1 and T_2). Magnesium alone either foliar or soil applied did not show any marked effect on stalk yield. The effect of combined use of FYM and magnesium (foliar and soil) on stalk yield was significant even with application of FYM @ 5 t ha^{-1} (T_5 and T_8) over control. The treatments T_6 and T_9 recorded further marked increase in yield over T_5 and T_8.

The highest stalk yield (51.23 q ha^{-1}) was observed in FYM @ 10 t ha^{-1}+ soil application of $MgSO_4$ @ 50 kg ha^{-1}(T_9) followed by FYM @ 10 t ha^{-1}+ foliar application of $MgSO_4$ @ 1% at 50 and 70 DAS (T_6) (50.62 q ha^{-1}) and FYM @ 10 t ha^{-1}(T_3) (50.00 q ha^{-1}), which were found to be at par with one another. The lowest yield (42.59 q ha^{-1}) was recorded in control treatment.

The biological yield was significantly influenced by sole application of FYM either @ 5 or 10 t ha^{-1} over control. Magnesium alone did not show any marked effect. The combined treatments including both levels of FYM and both methods of magnesium application were significantly superior over control or sole application of magnesium. Overall higher values of biological yield recorded in combined treatments may be due to the synergistic interaction between FYM and magnesium.

The yield increase may be attributed to FYM which might have acted as a source of additional nutrients and moisture supply. Organics are known to have a favourable effect on soil structure, texture, tilth and thus facilitate quick and greater availability of plant nutrients and thus provides a better

environment for root growth and proliferation, thereby creating more absorptive surface for uptake of nutrients. Das and Prasad (2005) reported similar findings and attributed to higher and continuous nutrient availability from combined sources up to the maturity. This higher nutrient availability improved the growth attributes, yield attributes and photosynthetic activities of plant.

Quality parameters

The data presented in table 2 revealed that the sole or combined application of FYM and magnesium did not show much influence on seed cotton quality expressed as span length, fibre strength, fibre fineness, uniformity ratio and elongation per cent. The fiber length values ranged from 30.10 to 31.63 mm, while fibre strength varied from 22.30 to 24.30 g tex^{-1}. The values for fibre fineness, uniformity ratio and elongation per cent were 3.19 to 3.88 µg $inch^{-1}$, 42.29 to 46.64 and 5.80 to 6.08 per cent, respectively. Similar findings in cotton were reported by Solunke and Sangita (2010). Studies with other organics like panchagavya also did not show any significant impact on fibre quality. However highest values were obtained with the use of organics as compared to control (Narayana *et al*, 2009).

LITERATURE CITED

Chaudhary C S, Pawar W S, Mendhe S N, Nikkam R R and Ingole A S 2001 Effect of land confirmation and nutrient management on yield of rainfed cotton. *Journal of soils and crops,* 11: 125-127.

Das and Prasad M 2005 Impact of nitrogen, FYM and biofertilizer on dry matter accumulation, yield and NPK removal by cotton. *Agronomy Journal,* 92(7-9): 387-391.

Devraj Sharma A P, Duhan B S and Promila Kumari 2008 Effect of organic and inorganic source of nutrients on cotton productivity and nutrient use efficiency under irrigated condition. *Journal of Cotton Research and Development,* 22(1):69-73.

Jagadish Kumar and Yadav M P 2010 Effect of foliar application of nutrients on seed cotton yield and economics in Hirsutum cotton. *Journal of Cotton Research and Development*, 24(1): 71-72.

Mandeep Kaur, Maninder Kaur and Brar A S 2008 Effect of NPK with and without farm yard manure on the growth and yield of hirsutum cotton (*Gossypiumhirsutum* L.). *Journal of Cotton Research and Development,* 22(1): 34 – 37.

Narayana E, Aparna D, MallikarjunaRao Ch and Prasad D H D 2009 Effect of panchagavya on productivity and quality of Bt cotton (*Gossypiumhirsutum* L.) in black cotton soils of coastal Andhra Pradesh. *Journal of Cotton Research and Development,* 23(2): 265-269.

Sahadeva Reddy B and Aruna E 2008 Integrated nutrient management in hybrid cotton. *Journal of Cotton Research and Development,* 22(2):153-156.

Solunke P S and Sangita U Fatak 2010 Effect of organic manures, inorganic fertilizers and plant protection on quality and economics of *desi* cotton. *Journal of Cotton Research and Development,* 24(2):174-181.

Tayade A S, Gupta R R, Mesharam M K and Venugopalan M V 2011 On farm evaluation of nutrient management based interventions in rainfed cotton production system. *Indian journal of fertilizers*.

(Received on 06.06.2012 and revised on 30.09.2012)