J. Cotton Res. Dev. **32** (2) 231-235 (July, 2018) **ISSN No. 0972-8619**

Nutrient uptake and fibre quality parameters of *Bt* cotton influenced by planting geometry and integrated nutrient management under rainfed conditions

A. T. GACCHE* AND D. N. GOKHALE

Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani -431 503

**E-mail : jyoti.gacche123@gmail.com*

ABSTRACT : A field experiment was conducted for two years during (2011-2012 to 2012-2013) *kharif* at Department of Agronomy, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani to study the effect of planting geometry and integrated nutrient management on major nutrient uptake and fibre quality parameters of *Bt* cotton (*Gossyipium hirsutum*) under rainfed conditions. The average data revealed that in planting geometry 120 x 45 cm recorded significantly highest N P K uptake than rest of the planting geometries. But it was *at par* with 60-120 x 60 cm paired row planting during first year(2011-2012) in P and K uptake and second year (2012-2013) in N uptake. In integrated nutrient management the application of RDF100 percent RDF 120:60;60 NPK kg/ha + 25 kg $ZnSO_4$+ 20 kg $FeSO_4$ + two foliar spray of boron @ 0.1 per cent (F_1) recorded significantly highest N,P and K uptake than rest of all the other INM treatments during both the years . But it was *at par* with 60-120 n 60 cm paired row planting in P uptake. Fibre quality parameters *viz.,* 2.5 per cent span length (mm), bundle strength (g/text), Fibre fineness (ug/inch) , seed index ginning percentage did not showed any significant impact with planting geometry and integrated nutrient managements treatments during both the years of experimentation.

Key words : *B*t cotton , *Gossypium hirsutum*, integrated nutrient management, net returns, plant geometry, rainfed cotton

Cotton “White Gold” is an important raw material for the Indian textile industry and important cash crop of the country and known as “King of Fibres” . The world cotton production during 2014-2015 was 101.10 million metric tonnes and consumption was 24.65 million metric tonnes . India ranks first in area 126.55 lakh ha and second in production 400 lakh bales with an average productivity of 537 kg lint/ ha . Maharashtra is major cotton growing state comprising 41.92 lakh ha area, second in production with 85.00 lakh bales most of which under rainfed condition and the productivity of cotton (345 kg lint/ha) is still lower than national productivity to augument the yield potential of transgenic cotton hybrids , it is necessary to adopt suitable agronomic practices . Among various factors of cotton production proper plant geometry and integrated nutrient management play significant role in getting higher yield. Optimum plant density for *Bt* cotton was studied for black cotton soil of marathwada and 18518 plants /ha were found an optimum for this region (Khargkharate *et al.*, 2008). However , farmers are adopting various plant geometries with wider row spacing as well as closer plant spacing . As

Bt cotton cultivation has resulted in early setting of bolls , ultimately it requires more nutrients . The present study was therefore conducted to find out appropriate plant geometry keeping around same plant population under integrated nutrient managements practices for*Bt* cotton under rainfed condition.

MATERIALS AND METHODS

The fields experiment was conducted at Research Farm Department of Agronomy VasantraoNaikMarathwadaKrishiVidyapeeth , Parbhani, situated in subtropical climate in central part of India in the Maharashtra state at 19^{0}16' north latitude and 76^0 47 ' east longitude and 409 meters above sea levels. The experiment was laid out in split plot design with three replications during *kharif* 2011-2012 to 2012-2013 . consisting of 4 plant geometries (120 x 45 cm) normal planting (P_1); 45-90 x 75 cm paired row panting (P_2) , 60-120 x 60 cm paired row planting (P_3); 75 -150 x 45 cm paired row planting (p_4) in main plot, and 5 integrated nutrient management treatments *i.e.* F_1= 100 (%) RDF 120:60;60 NPK kg/ha + 25 kg $ZnSO_4$+ 20 kg $FeSO_4$ + two foliar spray of boron (0.1%) ; F_2 = (50%) RDF + (50%) FYM+25 kg $ZnSo_4$+ 20 kg $FeSO_4$ + two foliar sprays of boron (0.1%) ; F_3= (50%) RDF + (50%) vermicompost +25 kg $ZnSO_4$+ 20 kg $FeSO_4$ + two foliar sprays of boron (0.1%); F_4=(50%) RDF + (50%) sunnhemp incorporation +25 kg $ZnSo_4$+ 20 kg $FeSO_4$ + two foliar sprays of boron (0.1%) ; F_5= split application of Nitrogen N_6 @ 15 days interval with basal soil application of P and K 25 kg $ZnSO_4$+ 20 kg $FeSO_4$ + two foliar sprays of boron (0.1%).In sub plot.The soil of experimental field was medium deep black ,low in available nitrogen (163.05 kg/ha), medium in available phosphorus (13.75 kg/ha) and high in available potassium (472.85 kg/ha) with medium organic carbon content (0 .52%) and having slightly alkaline pH(8.08). Mallika *Bt* hybrid was sown on 10th July 2011 and 12th July 2012 during the period of experimentation. Half dose of nitrogen, full dose of phosphorus and potassium were applied as basal. Remaining 25 per cent half dose of nitrogen was applied at 30-35 DAS and remaining 25 per cent given at 60 DAS by ring method to *Bt* cotton.

RESULTS AND DISCUSSION

Effect on uptake of NPK Nutrient : The uptake of nitrogen, phosphorus and potassium by cotton (Table 1) indicated that the planting geometry of 120 x 45 cm recorded the significantly highest NPK (71.99 ,25.10 and 79.34 uptake) during 2011-2012 and (60.72, 21.08 and 66.62) during 2012-2013 than rest of all the treatments during both the years of experimentation. However it was at par with 60-120 x 60 cm (P_3) paired row planting during first year in P, K uptake and with N uptake during second year of experimentation. P_3 and (P_4)75 - 150 x 45 cm paired row planting at par with each other in K uptake during 2011-2012 and in N and P uptake during 2012-2013. The uptake of nutrient is a product of dry matter accumulation and nutrient concentration. The cotton dibbled with 120 x 45 cm plant geometry accumulated more dry matter, seed cotton yield and thus have removed more NPK compared to remains plant geometry this results are conformity with Rao and Janawade (2009). Among integrated nutrient management the application of 100 per

Table 1. NPK uptake ofduring 2011-2012 and 2012-2013 and pooled uptake

Treatments	2011-2012			2012-2013		
	N	P	K	N	P	K
Planting geometry (cm)						
P_1-120 x 45	71.99	25.10	79.34	60.72	21.08	66.62
P_2-45 – 90 x 75	63.26	18.38	69.01	52.03	14.68	56.25
P_3-60 – 120 x 60	69.62	23.00	75.38	58.39	19.09	62.36
P_4-75 – 150 x 45	66.64	21.20	72.76	55.68	17.32	60.10
SE	0.55	0.87	1.65	1.52	0.38	1.45
CD (p=0.05)	1.54	2.41	4.59	4.21	1.05	4.02
Integrated nutrient management						
F_1-(100%RDF)	72.72	23.92	79.75	61.73	19.10	66.37
F_2-(50%RDF+50%FYM)	68.37	22.42	74.67	57.21	18.57	61.88
F_3-(50%RDF+50%V.C)	67.69	21.40	72.99	55.80	17.69	60.54
F_4-(50%RDF+GM)	63.56	19.90	69.06	52.20	16.80	56.46
F_5-(Split application of $N_{6)}$	67.05	21.95	74.12	56.59	18.05	61.42
SE	1.20	0.64	1.44	1.29	0.14	1.40
CD (p=0.05)	3.32	1.78	4.00	3.58	1.14	3.89
Interaction effect						
SE	2.40	1.29	2.89	2.59	0.82	2.81
CD (p=0.05)	NS	NS	NS	NS	NS	NS
G M	**67.88**	**21.92**	**74.12**	**56.71**	**18.04**	**61.33**

cent RDF 120:60:60 NPK kg/ha + 25 kg $ZnSO_4$+ 20 kg $FeSO_4$ + two foliar sprays of boron @ 0.1 per cent (F_1) showed highest NP K uptake(72.72, 23.92, 79.75 and 61.73, 19.10 66.37) during both the years, respectively . But in P uptake it was found *at par* with (F_2) 50 per cent RDF + 50 per cent FYM+25 kg $ZnSO_4$+ 20 kg $FeSO_4$ + two foliar sprays of boron @ 0.1 per cent during both the years. Similarly it was *at par* with (F_5)split application of N_6 @ 15 days interval with basal soil application of P and K 25 kg $ZnSO_4$+ 20 kg $FeSO_4$ + two foliar sprays of boron @ 0.1 per cent during 2012-13. The remains treatment F_2,F_3 and F_5 *at par* with each other during both the years. This might be due to optimum availability of nutrients in soil it was reflected in the improvement in various growth characters ultimately enhance production of photosynthates, dry matter, seed cotton yield/ plant, biological yield and finally reflected in the higher uptake of N,P, and k by cotton similar results reported by Tayade *et al* ., (2012).

Effect on fibre quality parameters : Ginning percentage, seedindex and other quality parameter *viz.,* 2.5 per cent span length (mm), bundle strength (g/text), fibre fineness (ug/inch) (Table 2) it is revealed that all fibre quality parameter were not affected significantly due to either planting geometry or integrated nutrient management during both the years of experimentation. It might be due to the fact that the quality parameter was more controlled by genetic make up of the plant these results are conformity with Aruna and Reddy (2010) Narayana *et al.,* (2007) and Srinivasulu *et al.,* (2007).

Table 2. Fibre quality of during 2011-2012 , 2012-2013 and pooled data

Treatments	2011-2012			2012-2013			2011-2012		2012-2013	
	2.5 per cent span length (mm)	Bundle strength (g/text)	Fibre fineness (ug/inch)	2.5 per cent span length (mm)	Bundle strength (%)(g/text)	Fibre fineness (ug/inch)	Ginning outturn (%)	Seed index	Ginning outturn	Seed index
Planting geometry (cm)										
P_1-120 x 45	29.94	21.84	4.13	29.58	21.64	4.06	34.66	7.72	34.63	7.56
P_2-45 – 90 x 75	29.31	20.61	3.95	28.94	20.26	3.88	34.01	7.31	33.63	7.16
P_3-60 – 120 x 60	29.62	21.70	4.05	29.25	21.32	3.99	34.41	7.55	34.16	7.39
P_4-75 – 150 x 45	29.48	21.56	4.02	29.11	21.19	3.96	33.88	7.44	33.76	7.28
SE+	0.38	0.96	0.30	0.40	0.81	0.30	0.46	0.34	0.46	0.34
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Integrated nutrient management										
F_1-(100%RDF)	29.94	22.31	4.10	29.29	21.79	4.01	34.84	7.85	34.45	7.55
F_2-(50%RDF+50%FYM)	29.80	21.85	4.07	29.28	21.49	4.00	34.40	7.62	34.09	7.43
F_3-(50%RDF+50%V.C)	29.40	21.42	4.01	29.24	21.16	3.96	34.06	7.40	33.89	7.31
F_4-(50%RDF+GM)	29.15	19.80	3.97	29.04	19.70	3.93	33.54	7.12	33.43	7.05
F_5-(Split application of $N_{6)}$	29.65	21.77	4.05	29.25	21.38	3.99	34.35	7.55	34.07	7.41
SE+	0.71	0.94	0.39	0.71	0.86	0.39	0.84	0.54	0.84	0.54
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Interaction effect (PX I)										
SE+	1.43	1.89	0.79	1.43	1.72	1.79	1.69	1.09	1.69	1.09
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
General Mean	**29.58**	**21.43**	**4.04**	**29.22**	**21.10**	**3.97**	**34.24**	**7.50**	**33.99**	**7.35**

REFERENCES

Aruna, E. and Reddy, K.S. 2010. Effect of soil moisture conservation techniques and nutrient management on growth yield and fibre quality of *Bt* cotton. *J. Res. ANGRAU*, **38 :** 15-22.

Khargkharate, V. K., Pandagale, A.D. Deosarkar, D.B., and Awasarmal,V.B. 2008. sresponse of *Bt* cotton hybrid under varied plant densities and fertilizerlevels. National seminar on *"Second Green Revolution : Necessity Compulsion".* 19-21 Oct., 2008, A.R.S Adilabad, pp.153

Narayana, E., Hema, K., Srinivasulu, K., Prasad, N.V. and Rao, N.H.O. 2007. Agronomic evaluation of *G. hirsutum* hybrid for varied spacing and nitrogen level in vertisol under rainfed condition. *J. Cotton Res. Dev.*, **21 :** 197-200.

Rao, S. and Janawade, A.D. 2009. Nutrient uptake and fibre quality parameters as influenced by integrated nutrient management practices in irrigated hybrid cotton. *J. Cotton Res. Dev.*, **23 :** 237-39.

Srinivasulu, K., Hema, K., Naratana, E., Prasad, N.V.S.D. and Rao, N.H.P. 2007. Agronomic evaluation of *Bt* hybrid (NCS-207 *Bt*) in vertisols of Andhra Pradesh under rainfed condition. *J. Cotton Res. Dev.*, **21 :** 191-93.

Tayade, A.S., Raju, A.R. and Dhoble, M.V. 2012. Response of *Bt* and non *Bt* cotton (*G. hirsutum* L.) hybrids to nutrient and pest management. *J. Cotton Res. Dev.*, **26 :** 194-98.

Received for publication : December 16, 2016
Accepted for publication : May 19, 2018