Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(6): 681-683
Received: 14-09-2020
Accepted: 17-10-2020

Ghogare RB
Assistant Professor, Shriram College of Agriculture, Paniv Tal- Malshiras, Solapur, Maharashtra, India

VV Gabhane
Associate Professor, AICRP for Dryland Agriculture, Dr. PDKV, Akola, Maharashtra, India

AS Thutte
Assistant Professor, Shriram College of Horticulture, Paniv Tal- Malshiras, Solapur, Maharashtra, India

DM Sawant
Assistant Professor, Ratnai Agriculture College, Akluj Tal- Malshiras, Solapur, Maharashtra, India

Corresponding Author:
Ghogare RB
Assistant Professor, Shriram College of Agriculture, Paniv Tal- Malshiras, Solapur, Maharashtra, India

Effect of land configuration and nutrient management on yield of cotton

Ghogare RB, VV Gabhane, AS Thutte and DM Sawant

Abstract
A field study entitled "Effect of land configuration and nutrient module on soil fertility and productivity of rainfed cotton in Vertisols" was conducted during *kharif* season of 2012-13 at Research field of AICRP for Dryland Agriculture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. The experiment comprised of two factors involving land configuration and nutrient module. Land configuration comprised of flat bed, ridges and furrows, opening of furrow after two rows and opening of furrow after each row while nutrient module comprised of five treatments involving RDF 50:25:25 kg NPK ha^{-1} through chemical fertilizers, FYM @ 10t ha^{-1} + PSB + Azotobacter, 50% RDF + FYM @ 5t ha^{-1} + PSB + Azotobacter, vermicompost @2.5t ha^{-1} + PSB + Azotobacter and glyricidia @ 10t ha-1 + PSB + Azotobacter. Twenty treatment combinations were executed in split plot design with three replications.
The results indicated that the opening of furrow in each row at 30-40 DAS and 100% RDF (50:25:25 kg NPK ha^{-1} through chemical fertilizer) recorded higher seed cotton yield and was found to be on par with ridges and furrows with integrated application of 50% RDF + FYM @ 5t ha^{-1} + PSB + *Azotobactor.*
Hence, it is concluded that integrated application of 50% RDF (25:12.5:12.5 NPK kg ha^{-1}) + FYM @5t ha^{-1} + PSB + Azotobactor and opening of furrow after each row at 30-40 DAS resulted in higher cotton productivity of improvement in fertility status of Vertisols under rainfed conditions.

Keywords: Effect of land configuration, nutrient management, cotton, productivity

Introduction
Background information
Cotton (*Gossypium* sp.) is an important cash crop, globally known as 'King of fiber' and play vital role in the economy of the farmers as well as the country and is popularly known as 'White gold'. It generates employment opportunities to millions not only at the production and trade, its contribution in the foreign exchange is tremendous, still there exist large potential for export of raw cotton and value added products.
In India it is grown over an area of 116.14 lakh ha with the production of 334 lakh bales and productivity of 489 kg ha^{-1}. In Maharashtra, the cotton grown area is 41.46 lakh ha with production of 74 lakh bales and productivity is 303 kg ha^{-1}. Vidarbha, which is
Famous specially for cotton crop, occupies an area of 14.9 lakh ha with 27.4 lakh bales and the productivity of 312 kg ha^{-1} (Anonymous, 2013) [1].
In Vidarbha, cotton is grown predominantly as a rainfed crop. As such in Vidarbha region about 89% cultivable land is under rainfed farming and rainfed cotton crop production has direct bearing on agrarian economy of region.
Cotton is mostly grown on black cotton soil i.e., Regur/vertisol. Swelling and shrinkage processes occur in all soils but Vertisols and their intergrades show a greater expression of these phenomenon. Though the cotton is an important cash crop of Maharashtra, the productivity is low because most of the area (96-97%) is under rainfed condition (Kaur *et al.*, 2007).

Importance and need of study
In India, there are nine major cotton growing states in three zones viz., north zone (Punjab, Haryana and Rajasthan), central zone (Maharashtra, Madhya Pradesh and Gujarat) and south zone (Andhra Pradesh, Karnataka and Tamil Nadu). Nearly 65 per cent of the cotton crop is grown under rainfed conditions and provides 65 per cent of the raw material to textile industry and contributes nearly 1/3rd of the total foreign exchange earning of India and 4 per cent of its gross domestic produce (GDP). Thus, it performs a key role in the national economic and trades both in rural and urban sectors of the country. In rainfed areas, the attempt has been made to conserve as much as rain water as possible it fall through land and soil treatment for better in-situ moisture conservation.

Land configuration plays important role in conservation of maximum rainwater in the soil. Land configuration is the mechanical measures for better in-situ moisture conservation as the soil profile acts as reservoir for moisture storage and this facility needs to be exploited to the maximum extent.

Significant role is played by fertilizer application. Adequate nutritional supply is essential for higher yield. The nutritional elements like nitrogen, phosphorus and potassium are needed to be applied in the balanced quantity. Nitrogen is necessary for development of vegetative and fruiting branches and thus increase yield. Phosphorus is essential for growth of aerial parts, roots development and it enhances early maturity of crop.

Sulphur is being formally recognized as fourth major nutrient of practical importance. It is the constituent of three amino acids viz., methionine (21%), cystein (26%) and cystine (27%) and other metabolites like co-enzyme A, biotine, thiamine, glutathione and iron sulphate protein called as ferrodoxin, which is indirectly involved in chlorophyll synthesis.

Farm Yard Manure improves physical, chemical and biological environment of soil, thereby increasing the crop yield. Application of FYM significantly increased the soil organic carbon (OC), infiltration rate, water retention, aggregation and aggregate stability in water (Benbi *et al.*, 1998) [3].

Glyricidia (*Glyricidia* sp.) are known to fix atmospheric nitrogen, improve soil structure and recycle of nutrients on decomposition of organic manure resulting in liberation of CO2 which influence on weathering of minerals and ultimate release of plant nutrients. The average nutrient content in Glyricidia accounts for 3% N and 0.5% P2O5 respectively on air dry basis.

Biofertilizer is one of the natural and sustainable nutritional inputs. There are two types of bio-fertilizers, which are used on mass scale, viz., nitrogenous and phosphatic biofertilizer. The beneficial effects of Azotobacter inoculation were recorded on growth, yield and quality of cotton (Khawale and Prasad, 2001) [5].

Material and Methods

With a view to study the "Effect of land configuration and nutrient module on soil fertility and productivity of rainfed cotton in Vertisols", a field experiment was initiated on the research field of AICRP for Dryland Agriculture, Dr. PDKV, Akola since 2008-09. The study was undertaken during 2012-13 with the cotton crop. The details of material used and methods adopted during the course of investigation are described below under appropriate heads.

The experiment was laid out in split plot design with 20 number of treatment combinations viz., the details of various treatment undertaken in the experiment are

A) Main plot: Land configuration L1: Flat bed, L2: Ridges and furrows, L3: Opening of furrow after every two rows*, L4: Opening of furrow after each row* (*30-40 DAS)

B) Sub plot: Nutrient Module M1: RDF 50:25:25 kg NPK ha-1 through chemical fertilizer, M2: FYM @ 10 t ha^{-1} + PSB + Azotobacter, M3: 50% RDF + FYM @ 5 t ha^{-1} + PSB + Azotobacter, M4: Vermicompost @ 2.5 t ha^{-1} + PSB + Azotobacter, M5: Glyricidia @ 10 t ha^{-1} + PSB + Azotobacter.

The quantity of organic manures and chemical fertilizers required for each plot was calculated as per the treatment and were incorporated into soil. Organic manures were incorporated into soil 15 days before sowing of crops, while in chemical fertilizers the 50% nitrogen and full dose of phosphorus and potassium were applied in the form of Urea, SSP, and MOP respectively at the time of sowing as basal dose and remaining half dose of nitrogen was applied as top dressing at 30 DAS.

Results and Discussion

1 Effect of land configuration and nutrient module on productivity of cotton

The data on yield of cotton as influenced by various treatments are presented in Table 1.

1.1 Seed cotton yield

A) Land configuration

The data in respect of seed cotton yield as influenced Byland configuration was found to be significant. The significantly higher seed cotton yield (11.49 q ha-1) was recorded in land treatment opening of furrow after each row followed by ridges and furrows (11.40 q ha^{-1}) which were found to be on par with each other. The lowest seed cotton yield (9.05 q ha^{-1}) was recorded in land treatment flat bed. Similar observations were also reported by Sagare *et al.,* (2001) [7].

B) Nutrient module

The effect of nutrient module on seed cotton yield was found to be significant. The significantly higher seed cotton yield (12.03 q ha^{-1}) was recorded with the application of 50: 25: 25 kg NPK ha^{-1} through chemical fertilizer (RDF) followed by 50% RDF + FYM @ 5 ha^{-1} + PSB+ Azotobacter (11.28 q ha^{-1}) which were found to be on par with each other. The lowest seed cotton yield (9.34 q ha-1) was recorded with application of vermicompost @ 2.5 t ha^{-1} + PSB + Azotobacter. Application of inorganic fertilizer with FYM created maximum nutrient availability to crop, which resulted in higher yield. Similar observations were also reported by Padole *et al.,* (1998) [6], Kaur *et al.,* (2007) [4] and Solonchak and Fatak (2011) [8].

C) Interaction (land configuration x nutrient module)

Interaction effect of land configuration and nutrient module on seed cotton yield was found to be non-significant.

Table 1: Effect of land configuration and nutrient module on yield of cotton

Treatment		Cotton yield (q ha^{-1})	
A] Land	**Configuration**	**Seed cotton**	**Cotton stalk**
L1	Flat bed	9.05	18.52
L2	Ridges and Furrows	11.40	23.01
L3	Opening of furrow after every two Rows	9.38	23.44
L4	Opening of furrow after each row	11.49	25.62
	SE (M) ±	0.22	1.03
	CD at 5%	0.76	3.58

B]	Nutrient Module		
M1	RDF 50:25:25 kg NPK ha-1 through chemical fertilizer	12.03	25.97
M2	FYM @ 10 t ha-1 + PSB + Azotobacter	9.51	20.82
M3	50% RDF + FYM@5 t ha-1 + PSB + Azotobacter	11.28	24.80
M4	Vermicompost @ 2.5 t ha-1 +PSB + Azotobacter	9.34	20.70
M5	Glyricidia @10 t ha-1 + PSB + Azotobacter	9.50	20.94
	SE (m) ±	0.41	1.45
	CD at 5%	1.19	4.19
C]	Interaction		
	SE (M) ±	0.83	2.90
	CD at 5%	NS	NS

1.2 Cotton stalk yield
A) Land configuration
The effect of land configuration on cotton stalk yield was found to be significant. The significantly higher cotton stalk yield (25.62 q ha^{-1}) was noticed in land treatment opening of furrow after each row followed by land treatment opening of furrow after every two rows
(23.44 q ha-1) and land treatment ridges and furrows (23.01 q ha^{-1}) which were found to be on par with each other. The lowest stalk yield (18.52 q ha^{-1}) was recorded in land treatment flat bed.

B) Nutrient module
The effect of nutrient module on cotton stalk yield was found tobe significant. The significantly higher cotton stalk yield (25.97 q ha^{-1}) was recorded with the application of 50: 25: 25 kg NPK ha-1 through chemical fertilizer (RDF) followed by 50% RDF + FYM @ 5 t ha^{-1} + PSB+ Azotobacter (24.80 q ha^{-1}) which were found to be on par with each other. The lowest cotton stalk yield (20.70 qha^{-1}) was recorded with the application of vermicompost @ 2.5 t ha^{-1} + PSB + Azotobacter. Similar findings were also reported by Padole *et al*. (1998) [6] and Badole and More (2000).

C) Interaction (land configuration x nutrient module)
Interaction effect of land configuration and nutrient module on cotton stalk yield was found to be non-significant.

Summary
Among the various land treatments significantly highest seed cotton yield (11.49 q ha-1) was recorded in opening of furrow after each row followed by ridges and furrows (11.40 q ha-1) which were found to be on par with each other. The higher cotton stalk yield (25.62 q ha-1) was recorded in land treatment opening of furrow after each row followed by opening of furrow after every two rows (23.44 q ha-1) which were on par with each other. Among the various nutrient modules, significantly higher seed cotton yield (12.03 q ha-1) and cotton stalk yield (25.97 q ha-1) was recorded with the application of 50:25:25 kg NPK ha-1 through chemical fertilizer (RDF) and was found to be on par with 50% RDF +FYM @ 5 t ha-1 + PSB + Azotobacter in respect of seed cotton (11.28 qha-1) and cotton stalk yield (24.80 q ha-1) respectively.

Conclusions
It is concluded that integrated application of 50% RDF (25:12.5:12.5 NPK kg ha-1) + FYM @ 5t ha-1 + PSB + Azotobactor and opening of furrow after each row at 30-40 DAS resulted in higher cotton productivity of Vertisols under rainfed conditions.

References

1. Anonymous. Area and production of cotton. www.cci.co.in. 2013.
2. Badole SB, More SD. Yield and nutrient uptake as influenced by integrated nutrient supply system in cotton. J Indian Soc. Cotton improvement 2000;161-165.
3. Benbi DK, Biswas CR, Bawa SS, Kumar K. Influence of farmyard manure, inorganic fertilizers and weed control practices on some soil physical properties in a long term experiment. Soil Use and Management 1998;14:52-54.
4. Kaur M, Kaur M, Brar AS. Effect of NPK with and without farm yard manure on the growth and yield hirsutum cotton (*Gossypium hirsutum* L.). J Cotton Res. Dev 2007;22(1):34-37.
5. Khawale VS, Prasad M. Effect of nitrogen, biofertilizers and growth regulator on growth, yield and quality of cotton. Fertilizer news 2001;46(5):57-58.
6. Padole VR, Deshmukh PW, Nikesar RJ, Bansode NV. Effect of organics and inorganics on yield and quality of cotton grown on Vertisol. PKV Res. J 1998;22(1):6-8.
7. Sagare BN, Rewatkar SS, Babhulkar VP. Effect of land configuration and gypsum levels on dynamics of soil properties and productivity of cotton grown in sodic Vertisols. J Indian Soc. Soil Sci 2001;49(2):377-379.
8. Solunkhe PS, Fatak SU. Influence of organic and inorganic sources of nutrients on production of desi cotton under different plant protection measures. J Cotton Res. Dev 2011;25(1):42-45.