International Journal of Multidisciplinary Research and Development
Online ISSN: 2349-4182 Print ISSN: 2349-5979, Impact Factor: RJIF 5.72
www.allsubjectjournal.com
Volume 3; Issue 5; May 2016; Page No. 299-302

Impact of different levels of integrated nutrient and growth regulator on soil health and yield attributes of tomato (*Lycopersicon esculentum* Mill.) Allahabad Uttar Pradesh, India

[1] Asadullahahmadi, [2] Arun Alfred David

[1] Research Scholar, Department of Soil Science, Samhigginbottom Institute of Agriculture, Technology and Science Deemed-to-be-University Allahabad, Uttar Pradesh, India.

[2] Associate Professor, Department of Soil Science, Samhigginbottom Institute of Agriculture, Technology and Science Deemed-to-be-University Allahabad, Uttar Pradesh, India

Abstract
A field experiment was carried out at to assess impact of different levels of integrated nutrient and growth regulator on soil health and yield attributes of tomato (*Lycopersicon esculentum* Mill.), was laid out in (RBD) there were different level of inorganic fertilizer (Urea, SSP, MoP and AR_3) different dose of fertilizers urea the highest plant height fruits, fruit yield, were recorded it was found that the plant growth regulators. The maximum plant height at 120 DAS 95.333cm -number of branch/plant 23.111 number of Leaf per plan147.440 number of flower Plants per plant 62.22 single fruit weight 59.78g and yield 62.69 t ha^{-1} maximum yield and benefit ratio of 190.15 q ha^{-1}, Rs 95156.94 ha^{-1} (B:R) 2.67.

Keywords: Soil Physical and chemical properties, Soil amendment, inorganic fertilizer, farm yard manure, integrated nutrient

Introduction
Tomato (*Lycopersicon esculentum* Mill.), belongs to family Solanaceae having chromosome number (2n=24). It is a self-pollinated crop and Peru-Ecuador region is considered to be the centre of origin. Tomato is cultivated in tropics and subtropics of the world. Tomato is one of the most highly praised vegetables consumed widely and it is a major source of vitamins and minerals. It is one of the most popular salad vegetables and is taken with great relish. Tomato has a significant role inhuman nutrition because of its rich source of lycopene, minerals and vitamins such as ascorbic acid and ß-carotene which are anti-oxidants and promote good health Davies P.J., (1995)[1].

The use of organic matter such as animal manures, human waste, food wastes, yard wastes, sewage sludge's and composts has long been recognized in agriculture as beneficial for plant growth and yield and the maintenance of soil fertility. The new approaches to the use of organic amendments in farming have proven to be effective means of improving soil structure, enhancing soil fertility and increasing crop yields. Organic matter is excellent source of plant-available nutrients and their addition to soil could maintain high microbial populations and activities (Zink and Allen 1998).

Nitrogen (N) is one of the most essential nutrients needed Plants and other organisms, such as water, the plant needs to factor in plant growth is more than other factors. However, Even though N has been appropriated about 79% voluminal of atmosphere but many plants involved to nitrogen shortage due to deficit of organic matter in these soils, specially the plants that grow in dry and semi-dry regions (Rajaei, 2010).

Material and methods
Soil sampling
The soil of experimental area falls in order of Incept sol and in experimental plots is alluvial soil in nature. The soil samples randomly collect from five different sites in the experiment plot prior to tillage operation from a depth of 0-15 cm. The size of the soil sample reduce by conning and quartering the composites soil sample is air dry and pass through a 2 mm sieve by way of preparing the sample for physical and chemical analysis. The experimental details are given below under different heading:

Design and treatment
The experiment was carried out in 3×3 factorial randomized block design with three levels of NPK, two levels of vermicompost. The treatments were replicated three times and were allocated at random in each replication.

Experimental sites
The experiment was conducted on the research farm of Department of Soil Science, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad which situated six km away from Allahabad city on the right bank of Yamuna river, the experimental site is located in the sub – tropical region with 25^0 N *latitude* 81.50^0 E longitude and 95 *M S Laltitude.*

Preparation and analysis of soil sample
Soils samples were collected at different stages were air dried, ground, passed through 2 mm sieve and finally stored in ploy then bags for analysis of different physical and chemical parameters and changes in available phosphorus content. The composite sample was analyzed for pH, EC, water holding capacity, bulk density, particle density, pore space, organic carbon, available nutrient (N, P, K) and mechanical separates (Sand, Slit and Clay).

Table 1: Result of mechanical and chemical analysis of composite soil samples

Particular	Result values	Method used
Silt (%)	19.20	Bouyoucos hydrometer-Bouyoucos (1927)
Clay (%)	12.50	Bouyoucos hydrometer-Bouyoucos (1927)
Bulk density (gm/cm^3)	1.44	Core method.-C.A. Black (1965)
Particle density (gm/cm^3)	2.50	Relative density bottle method - C. A. Balk
Soil pH (1:2) soil water suspension (w/v)	7.42	Digital pH meter (Jackon 1958)
EC. (Mill mho/cm) at 25^{0}C of 1:2 soil water	0.334	Digital Conductivity meter (Wilcox 1950)
Organic carbon %	0.42	Rapid titration method (Walkley and Black 1947)
Available Nitrogen (kg / ha^{-1})	235	Alkaline permanganate method (Asija*etal*.1956)
Available phosphorus (kg / ha^{-1})	18.0	Colorimetric method (Olsen *et al*. 1954)
Available potassium (kg/ ha^{-1})	235.20	Flame photometric method (Toth and Price, 1949)

ulk Density (gm cm^{-3})

the maximum bulk density 1.68 was found in treatments T_8 (@ N120 P60K60 Kg ha^{-1} +FYM @10t ha^{-1}+ @ GA0.4litre ha^{-1}) followed by 1.67 in T7 (@ N120 P60K60 Kg ha^{-1} +FYM @10t ha^{-1}+@ GA0.4litre ha^{-1}) and minimum value 1.64 was found in T_0 (control) bulk density was found significant different rate of compaction, Fertilizer, FYM and plant growth GA3 due to interaction, it was also observed that number of flowers of soil was gradually increased with rate of compaction, Fertilizer and FYM. In treatment T_8 (@ N120 P60K60 Kg./ha^{-1} +FYM @10t/ha^{-1}+@ GA0.4litre/ha^{-1}) gradually decrease as the rate of compaction, fertilizer and FYM levels increased number of flowers increased by moderate compaction and decrease by heavy compaction. Similar finding also reported by Mulhol and *et al*. (1999).

pH (w/v)

the maximum pH 7.64 was found in treatments T_8 (@ N120 P60K60 Kg./ha^{-1} +FYM @10t/ha^{-1}+@GA0.4litre ha^{-1}) followed by 7.61in T7 (@ N120 P60K60 Kg./ha^{-1} +FYM @10t/ha^{-1}+@GA0.4litre/ha^{-1}) and minimum value 7.37was found in T_0(control) pH was found significant different rate of compaction, Fertilizer, FYM and plant growth GA3 due to interaction, it was also observed that number of flowers of soil was gradually increased with rate of compaction, Fertilizer and FYM. In treatment T_8 (@ N120 P60K60 Kg ha^{-1} +FYM@10t/ha^{-1}+@GA0.4litre/ha^{-1}) gradually decrease as the rate of compaction, fertilizer and FYM levels increased number of flowers increased by moderate compaction and decrease by heavy compaction. Similar finding also reported by Aphale *et al.*, (2005).

Electrical conductivity (dSm^{-1})

As depicted in table and fig. 4.13 that's the maximum Electrical conductivity (dSm^{-1}) 0.191was found in treatments T_8(@ N120 P60K60 Kg./h^{-1} +FYM@10t/ha^{-1}+@GA0.4litre /ha^{-1}) followed by 0.189 in T7 (@ N120 P60K60 Kg./ha^{-1} +FYM@10t/ha^{-1}+@GA0.4litre/ha^{-1}) and minimum value 0.150was found in T_0(control) Electrical conductivity (dSm^{-1}) was found significant different rate of compaction, Fertilizer, FYM and plant growth GA3 due to interaction, it was also observed that number of flowers of soil was gradually increased with rate of compaction, Fertilizer and FYM. In treatment T_8 (@ N120 P60K60 Kg./ha^{-1} +FYM@10t/ha+@GA0.4litre/ha^{-1}) gradually decrease as the rate of compaction, fertilizer and FYM levels increased number of flowers increased by moderate compaction and decrease by heavy compaction. Similar finding also reported by Aphale *et al.* (2005), Tracy and Zhang (2008).

Organic carbon %

That's the maximum Organic carbon % 0. 0.551 was found in treatments T_8 (@ N120 P60K60 Kg ha^{-1} +FYM @10t ha^{-1}+@GA0.4litreha^{-1}) followed by 0.521 in T7 (@ N120 P60K60 Kg ha^{-1} +FYM @10t/ha^{-1}+@ GA0.4litre ha^{-1}) and minimum value 0.200 was found in T_0(control) Organic carbon % was found significant different rate of compaction, Fertilizer, FYM and plant growth GA3 due to interaction, it was also observed that number of flowers of soil was gradually increased with rate of compaction, Fertilizer and FYM. In treatment T_8 (@ N120 P60K60 Kg./ha^{-1} +FYM@10t/ha^{-1}+@GA0.4litre/ha^{-1}) gradually decrease as the rate of compaction, fertilizer and FYM levels increased number of flowers increased by moderate compaction and decrease by heavy compaction. Similar finding also reported by Aphale *et al.* (2005), Tracy and Zhang (2008).

Nitrogen (kg/ha)

that's the maximum nitrogen 279.19 was found in treatments T_8 (@ N120 P60K60 Kg ha^{-1} +FYM@10t/ha^{-1}+@GA0.4litre /ha^{-1}) followed by 278.57 in T7 (@ N120 P60K60 Kg./ha^{-1} +FYM@10t/ha+@GA0.4litre/ha^{-1}) and minimum value 230.58 was found in T_0 control nitrogen was found significant different rate of compaction, Fertilizer, FYM and plant growth GA3 due to interaction, it was also observed that number of flowers of soil was gradually increased with rate of compaction, Fertilizer and FYM. In treatment T_8 (@ N120 P60K60 Kg./ha^{-1} +FYM@10t/ha^{-1}+@GA0.4litre/ha^{-1}) gradually decrease as the rate of compaction, fertilizer and FYM levels increased number of flowers increased by moderate compaction and decrease by heavy compaction. Similar finding also reported by Bolding *et al*. (2009).

Available phosphorus (kg/ha)

that's the maximum Available phosphorus 17.86 was found in treatments T_8 (@ N120 P60K60 Kg./ha^{-1} +FYM@10t/ha^{-1}+@GA0.4litre /ha^{-1}) followed by 17.03 in T7 (@ N120 P60K60 Kg./ha^{-1} +FYM@10t/ha+@GA0.4litre/ha^{-1}) and minimum value 11.39 was found in T_0(control) Available phosphorus was found significant different rate of compaction, Fertilizer, FYM and plant growth GA3 due to interaction, it was also observed that number of flowers of soil was gradually increased with rate of compaction, Fertilizer and FYM. In treatment T_8 (@ N120 P60K60 Kg./h^{-1} +FYM@10t/ha^{-1}+@GA0.4litre/ha^{-1}) gradually decrease as the rate of compaction, fertilizer and FYM levels increased number of flowers increased by moderate compaction and decrease by heavy compaction. Similar finding also reported by Bolding *et al.*, (2009).

Available potassium (kg ha^{-1})

that's the maximum Available potassium 363.00 was found in treatments T_8 (@ N120 P60K60 Kg./ha^{-1} +FYM @10t/ha^{-1}+@ GA0.4litre /ha^{-1}) followed by 360.00 in T7 (@ N120 P60K60 Kg./ha^{-1} +FYM @10t/ha^{-1}+@ GA0.4litre/ha^{-1}) and minimum value 339.33 was found in T_0(control) Available potassium was found significant different rate of compaction, Fertilizer, FYM and plant growth GA3 due to interaction, it was also observed that number of flowers of soil was gradually increased with rate of compaction, Fertilizer and FYM. In treatment T_8 (@ N120 P60K60 Kg./ha^{-1} +FYM @10t/ha^{-1}+@ GA0.4litre/ha^{-1}) gradually decrease as the rate of compaction, fertilizer and FYM levels increased number of flowers increased by moderate compaction and decrease by heavy compaction. Similar finding also reported by Bolding *et al*. (2009).

Yield (t/ha)

As depicted in table and fig. 1. that's the maximum yield 67.99 was found in treatments T_8@ N120 P60K60 Kg./h +FYM @10t/ha+@ GA0.4litre/ha^{-1}) followed by 62.69 in T7 (@ N120 P60K60 Kg./ha^{-1} +FYM @10t/ha^{-1}+@ GA0.4litre/ha^{-1}) and minimum value 48.56 was found in T_0 (control) yield was found significant different rate of compaction, Fertilizer, FYM and plant growth GA3 due to interaction, it was also observed that number of flowers of soil was gradually increased with rate of compaction, Fertilizer and FYM. In treatment T_8 (@ N120 P60K60 Kg./h^{-1} +FYM @10t/ha^{-1}+@ GA0.4litre/ha^{-1}) gradually decrease as the rate of compaction, fertilizer and FYM levels increased number of flowers increased by moderate compaction and decrease by heavy compaction. Similar finding also reported by Siegel-Issem *et al* (2005).

Table 3: Impact of Different Levels of Integrated Nutrient and Growth Regulator on yield (t/ha) of tomato (*Lycopersiconesculentum* Mill.)

	Treatments	Yield (t/ha)
T_0	Control	48.56
T_1	@ N_0 P_0 K_0 Kg/ha^{-1} + FYM@0t /ha^{-1} + @GA 0 liter $_{ha}^{-1}$	49.46
T_2	@ N_0 P_0K_0 Kg ha + FYM @ 0tha^{-1} + @ GA 0 liter $_{ha}^{-1}$	50.03
T_3	@ N60 P30K30 Kg./ha^{-1} +FYM@5t/ha^{-1}+ @ GA0.2litre$_{ha}^{-1}$	51.99
T_4	@ N60 P30K30 Kg ha^{-1}+FYM@ 5t/ha^{-1}+ @ GA0.2litre/$_{ha}^{-1}$	53.96
T_5	@ N60 P30K30 Kg./ha^{-1} +FYM@5t/ha^{-1}+ @ GA0.2litre/$_{ha}^{-1}$	55.13
T_6	@ N120 P60K60 Kg./ha^{-1} +FYM@10t/ha^{-1}+@GA0.4litre/$_{ha}^{-1}$	61.53
T_7	@ N120 P60K60 Kg./ha^{-1} +FYM@10t/ha^{-1}+@GA0.4litre/$_{ha}^{-1}$	62.69
T_8	@ N120 P60K60 Kg./h^{-1} +FYM@10t/ha^{-1}+@GA0.4litre/$_{ha}^{-1}$	67.99
F- test		S
S. Ed.(±)		0.479
C. D. (P = 0.05)		0.989

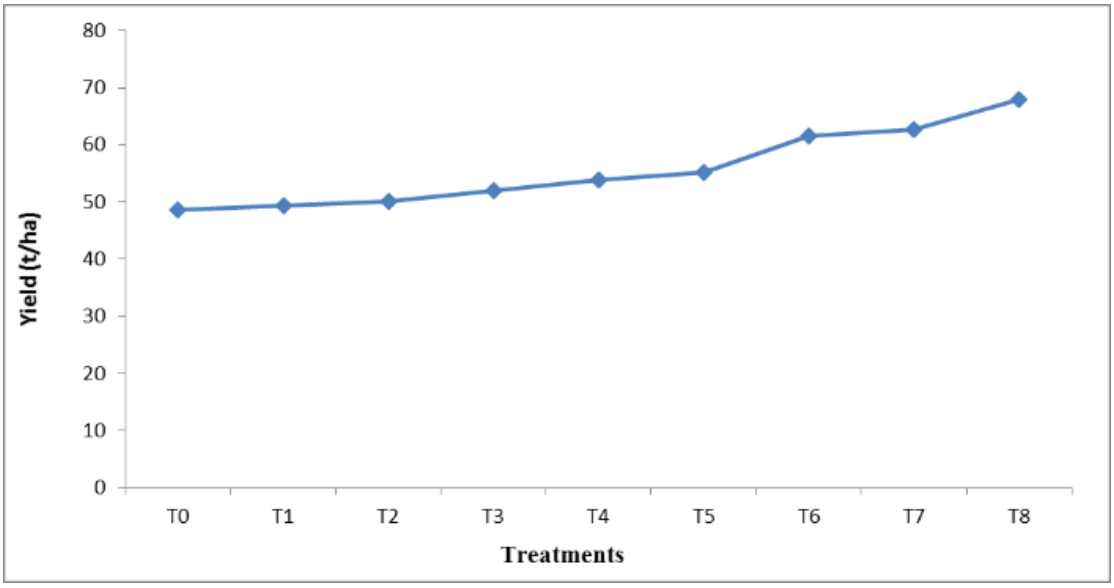

Fig 1: Impact of Different Levels of Integrated Nutrient and Growth Regulator on yield (t/ha) of tomato (*Lycopersicon esculentum* Mill.)

Results and discussion

In this chapter, data of different parameters are presented in terms of the "Impact of different levels of integrated nutrient and growth regulator on soil health and yield attributes of Tomato-(*Lycopersicon esculentum* Mill.) "The parameters on observation of plant were recorded under pre-harvesting (plant height, No. of leaves per plants) were recorded under post-harvest (Number of stem, Number of flower, Number of fruits, total number of fruits per plant, Fruit yield tones ha^{-1}, total soluble solids in fruit percent). And observation of soil sample were recorded at sowing and under post harvesting (Soil texture, Particle density, Bulk density, Pore-space, soil pH, Carbon(%), Organic carbon, Available N,P and K.). They were analyzed by RBD designs. It was found that the such as soil texture, bulk density, particle density, moisture content, pore space water holding capacity, pH electrical conductivity, organic carbon, available nitrogen, phosphorus, potassium were found to be significant than any other treatment in T5

(@ N60 P30K30 Kg ha^{-1} +FYM@ 5t ha+ @ GA0.2litr $_{ha}^{-1}$) the highest plant height, root length, total no. of tomato fruits, fruit yield, ascorbic acid, total soluble solids percentage in tomato fruits were recorded in treatments T_8(@ N120 P60K60 Kg ha^{-1} +FYM@10t ha+@GA0.4litre$_{ha}^{-1}$) was found to be at par over all other treatments.

References

1. Aphale, S.L., Stijesm T.S., Black, A.H., Taylor, C. R. and Roberts, J.A. (2005). The role of root to shoot signaling in coordinating resonse to soil compaction. Proceeedings of the 32nd annul Meeting of the Plant Growth Regulation Society of America.
2. Mulholand, B.J., Hussain,A., Black, C.R., Tylore, I.B and Roberts, J.a. (1999) Does root sourced ABA have a role in mediating growth and stomatal responses to compaction in tomato (*Lycopersicon esculentum*). Physiologia Plantarum. 107: 3, 267-276.
3. Rajaei, and Salardini, AA. 2010. Soil fertility. Tehran University Press, p. 44. (In Persian).
4. Siegel-Issem, C.M. Burger, J.A., Powers, R.F., Ponder, F. and Patterson, S.C. (2005). Seedling root growth as a function of soil density and water content. Soil science Society of America Journal. 69: 1, 215-226.
5. Bolding, M.C., Kellogg, L.D. and Davis, C.T. (2009). Soil compaction and visual disturbance following an integrated mechanical forest fuel reduction operation in southwest Oregon. International Journal of Forest Engineering. 20 : 2, 47-56.
6. Davies PJ. Plant Hormones, Physiology, Biochemistry and Molecular Biology. Kluwer Academic Publishers, Dordrecht, 1995.
7. Olsen SRCV, Watnaha FS, Dean LA. Estmation of available phosphorous in soil by extraction with sodium bicarbonate US Deptt. Agri, Cire, 1954, 939.
8. Toth SJ, Prince AL. Estimation of cation exchange capacity and exchangeable Ca, K and Na content of soil by flame photometer techniqueSoil Sci.1949; 67:439-445.
9. Walkely A. critical examination of rapid method for determination organic carbon in soil, effect of variation in digestion condition and of inorganic soil constituents". Soil Sci.1947, 632-251.
10. Zink, T.A., Allen, M.F., 1998. The effects of organic amendments on the restoration of a disturbed coastal sage scrub habitat. Restoration- Ecology 6 (1), 52-58.