



iJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 Issue: V Month of publication: May 2019

DOI: <https://doi.org/10.22214/ijraset.2019.5207>

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Effect of Soil Nutrients on Growth of Triticum Sp.

Patel Munjal Rajeshkumar¹, S.Deepika², B N Yagnik³, Chirag Shah⁴.

^{1, 2, 3, 4}Government Science College, Khokhora Circle, Maninagar (E), Ahmedabad, Gujarat, India

Abstract: Soil is a vital component of ecosystem, present 6-12 inches underneath our feet. Soil systems have developed over many millions of years. The soil characteristics in a given area at a given point of time are a function of both natural influences and human activities. The physicochemical analysis of Garden, Compost and Farming soils were checked for pH, Electrical Conductivity (EC), Organic Carbon (OC), macronutrients like Nitrogen (N), Phosphorus (P), Potassium (K) and micronutrients like iron, manganese, boron, molybdenum, copper, zinc, chlorine and cobalt using standard procedures. The effect of these nutrients present in the soil was studied by growing of Triticum variety GM-496 in Garden, compost & farming soil samples.

Keywords: GM-496, physicochemical, soil analysis, metals, nutrients

I. INTRODUCTION

Earth's biosphere consists of a key component called soil [1]. Soil consists of organic and inorganic matter which acts as natural medium for the growth of plants [2,3]. The structure of soil changes the characteristics and physiological processes of crop production [4]. Soil texture helps in water retention and improves soil physical properties [5]. Plant species growth, yield and quality depend on the type of soil, presence of soil nutrients and fertilizer management. So a plant needs good quality of soil for higher yields [6,7,8]. The amount and combination of Na, K, Ca, Mg, S, P, Fe. pH and N helps in soil fertility and crop productivity [9,10]. Therefore studies on plant growth characteristics in local soils is crucial for management of higher yield of crops and good quality [11,12,13].

Wheat is one of the leading cereal staple food crops in the World [14]. *Triticum aestivum* (wheat) belongs to the family Poaceae. Wheat production stands second position after maize in 2016 [15,16]. Wheat is main source of Carbohydrate [17], protein content 13%, compared to other major cereals [18]; but low content of essential amino acids. But wheat is a rich source of nutrients and dietary fibers when eaten as whole grain [19,20]. The main part of wheat protein is gluten, which has adhesive properties, facilitating the production of processed food. So global demand for wheat is increased due to westernization of diets [21]. In recent years the crop management techniques have increased the crop yield [22,23]. Wheat research is important for production of yield and good quality in particular, protein, nutrients and nitrogen [24]. Wheat is an important staple crop, which stands next to rice in human consumption.

II. MATERIALS AND METHODS

A. Soil Sample Collection

The soil samples (Garden soil, compost soil & farming soil) were collected from Gandhinagar – Mansa Highway at Gayatri Mandir. A V-Shaped pit of 15 to 20 cm depth and 8 to 10 width was dug. From one side corner the soil sample was collected from its upper crust of 2 to 2.5 cm and stored in sterile plastic bag. This is called farming soil. Similarly compost soil from cattle compost pit of domestic animals and garden soil from garden area were collected.

B. Soil sample preparation

All three soil samples- Garden soil, compost soil & farming soil were air dried, ground and passed through 2mm sieve.

C. Soil Morphology of Soils

The three Garden soil, compost soil & farming soil samples were observed for its color and texture. Texture was determined by hydrometer method [25].

D. Soil Analysis for Metals

The three soil samples- garden, compost and farming were examined and tested by True Double Beam Atomic Absorption Spectrophotometer (Model ICE 3500, furnace GFS 35) to determine its metal content. Each soil sample (1gm) was diluted to 10ml distilled water in a glass covet. Then the rubber tube connected with the suction valve which takes the dilute sample lifted in the spectrophotometer for measurement of metal ions and values obtained is directly shown in attached PC. The results of metals is expressed as (parts per billion) ppb.

E. Physico-Chemical properties determination [26]

Electrical Conductivity: Three samples EC value was determined using saturated paste and extract of soil, respectively[27]. Organic Carbon-Walkey and Black[28] method involving oxidation of organic matter with potassium chromate and sulphuric acid was used to calculate O.C of soil samples. pH-The pH of garden, compost and farming soils were determined by glass electrode pH meter in soil-water and soil-KCl titrates. Nitrogen content was determined by Modified Alkaline Permanganate method [29], Phosphorus by Colorimetric Method [30] and Potassium by Ammonium acetate method [31].

F. Wheat seed sample collection

Wheat seed GM-496 was collected from Mansa , APMC (Farmer's Market Yard).

G. Experimental area

The growth of wheat seeds in Garden soil, compost soil & farming soil samples were conducted in Government Science College campus.

H. Soil Filling in Clay pots :

The three clay flat pots were equally filled up with 200 to 250 gram of farming , compost and garden soils respectively.

I. Seed sample

10 seeds of *Triticum* variety GM-496 were sown in Garden soil, compost soil & farming soil samples at 2 cm depth from the upper soil surface .

J. Water Supply :

Water was sprinkled daily in all bowls for humidity and moisture required for their germination .

K. Measuring Plant

Plant growth was measured with the help of scale (ruler) to record its shoot height of 7th Day, 10th Day and 12th Day respectively .

L. Statistical analysis

All the experiments were conducted in triplicates. Each sample was analysed in triplicate and data was reported as mean± standard deviation. ANOVA(Analysis Of Variance),a probability $p \leq 0.05$ was considered to be statistically significant.

III. RESULTS AND DISCUSSION

A. Soil Morphology

One of the main characteristic of soil is texture of soil. This helps in knowing water retention capacity, aeration, causes for erosion and drainage, which influences crop production and management. The soil texture comprises of percentage of sand ,silt and clay. The properties of soil -colour and texture of Garden , Compost and Farming were presented in Table 1.The collected soil samples were shown in Fig 1.

Table 1: Soil Morphology

Soil	Colour	Texture
Garden	Brownish Yellow	Sandy , Granular , Dry
Compost	Dark Brownish	Humus , Clay , Moist
Farming	Brownish	Slit , Clay , Moist



Fig 1: Soil Samples

B. Analysis of Soils for metals and Physico-Chemical methods

In the soil analysis physical, chemical and concentration of macro and micronutrients were studied. Three soil samples were subjected to soil analysis and results were represented in Table 2. pH of soil determines whether soil is alkaline or acidic. All the three soil samples were below pH 8.5 indicating alkalinity. The pH of Compost soil was 7.9, Farming soil 8.0 and garden soil 8.2 respectively. Electrical conductivity estimates total soluble salts in aqueous soil extracts. Standard value for soil-normal $<0.8 \text{ dsm}^{-1}$ critical for salt sensitive crops, critical for salt tolerant crops $1.6-2.58 \text{ dsm}^{-1}$, injurious to most crops $>2.58 \text{ dsm}^{-1}$ [32]. The EC of farming soil was 0.3, which lies in normal soil. The Organic Carbon of Compost soil was 0.72 which lies in medium range of standard values. Macronutrients like N, P, K are required by plants for growth and survival. N ranged from 156-235 Kg/ha in Garden, Farming and Compost soils respectively. P was in the range of 28-38 in Farming Compost and Garden soils. K showed $>280 \text{ Kg/ha}$ in all three samples indicating high content of K in soils. Micronutrients like iron, manganese, boron, molybdenum, copper, zinc, chlorine and cobalt in soil has direct impact on crop production and human health. Standard values of micronutrient adequate content of Boron is >0.5 ; Zinc >1.0 ; Copper >0.5 ; Iron >4.5 and Mn >2.0 [33,34].

Table- 2 Soil Analysis

Soil	pH	E.C	O.C	N	P	K	Zn	Fe	S	Mn	Cu	Mg	Ca	B
Garden	8.2	0.98	0.32	156	38	360	1.106	10.46	38	9.300	0.971	7.5	6.5	0.80
Compost	7.9	2.32	0.72	235	37	475	0.481	8.600	8	12.890	7.426	1.5	5.7	1.06
Farming	8.0	0.3	0.5	156	28	483	0.713	6.84	7	12.246	0.780	20	12.9	0.63

E. C-electrical conductivity, O.C-Organic Carbon, N-nitrogen, P-phosphorus, K-potassium, Zn-Zinc, Fe-Iron, S-sulphur, Mn-manganese, Cu-copper, Ca-calcium, B-Boron

C. Germinating Seeds

The Germination of the wheat seed was observed on 3rd day of compost soil and 4th day of Garden & Farming soils, were represented in Table 3. The specimen of sprouting of wheat seeds were shown in Fig 2.

Table 3: Germination of wheat seeds in different soils

Soil Samples	sown Seeds	Germinated seeds	Day
Garden	10	10	4 th day
Compost	10	10	3 th day
Farming	10	10	4 th day



Fig 2: Sprouting of wheat plants

The length of germinated plants of 10 sown seeds for 7th, 10th, 12th day was observed in three soil samples (garden, compost, farming) and was represented in Fig 3,4,5 respectively.

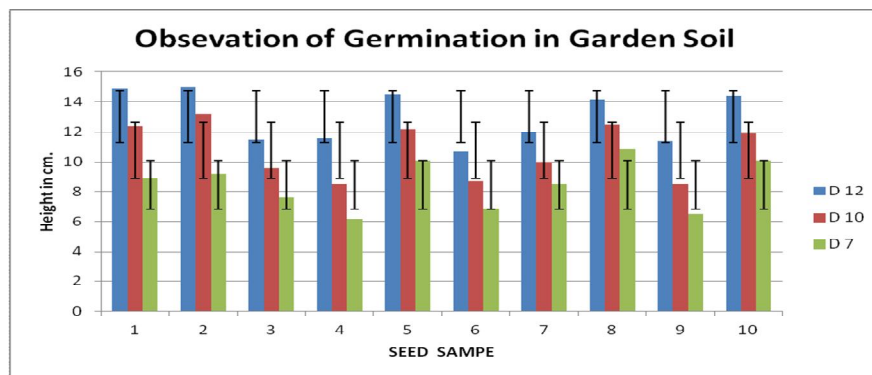


Fig 3 Length of germinated wheat plants in Garden soil

Each value represents mean \pm SD of three independent experiments. The values are significant at $p < 0.05$

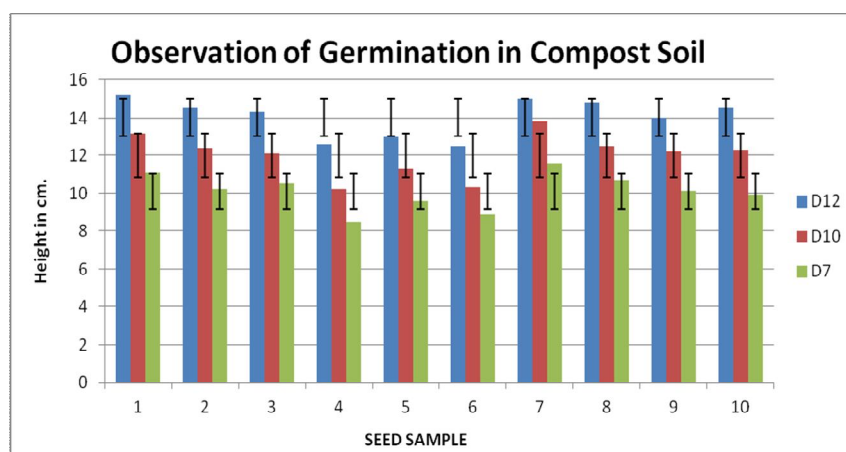


Fig 4 Length of germinated wheat plants in Compost soil

Each value represents mean \pm SD of three independent experiments. The values are significant at $p < 0.05$

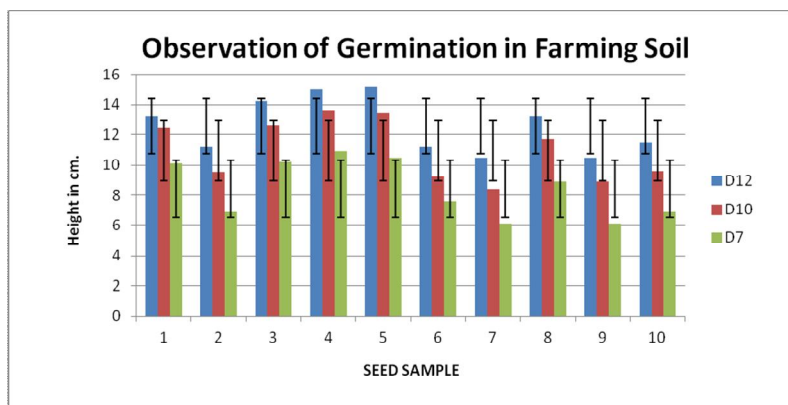


Fig 5 Length of germinated wheat plants in Farming soil

Each value represents mean \pm SD of three independent experiments. The values are significant at $p < 0.05$

IV. DISCUSSION

Wheat Plant requires at least 17 elements for its growth. These include carbon(C), hydrogen(H), oxygen(O), manganese (Mn), iron(Fe), sodium(Na) etc. The compost soil shows the effective growth than garden soil and farming soil. Compost soil has high O.C. (0.72%) , Nitrogen (235Kg/ha) which shows faster germination in 3 days with maximum Growth of Height(\pm 0.35 Cm) after 12 days of sowing . The seed of *Triticum sp.* GM-496 shows good germination in all soil types. Also showed stable plant growth in height which lead this variety most favorable variety in all over India.

V. CONCLUSION

From the above study it was concluded that Indian wheat variety GW- 496 germinated in all 3 different soil samples in spite of variable nutrients and mineral in the soils. The growth was observed for 7-12 days, it showed good germination capacity of all 10 sown seeds. Also the height of each plant was good without any addition of fertilizer or nutrients. Regular water supply and photosynthesis proves well defined growth in all 3 soil samples (garden, compost, farming). The plant growth in compost soil was comparatively more than garden soil and farming soil due to its high nutritive values which resulted into faster germination with highest plant growth. Hence this study conclude that wheat GM – 496 variety has highly germinating strength in all type of different soils. Further testing of wheat plants for its yield, quality should be carried to know the effect of nutrients present in soil for the overall growth of wheat.

REFERENCES

- [1] J.T Glanz, *Saving Our Soil: Solutions for Sustaining Earth's Vital Resource*. Johnson Books, Boulder, CO., USA, 1995.
- [2] L.J Wylan, L.E. Jackson, W.E. Chaney, K. Klonsky, S.T. Koike and B. Kimple, "Winter cover crops in a vegetable cropping system: Impacts on nitrate leaching, soil water, crop yield, pests and management costs", *Agric. Ecosyst. Environ.*, Vol. 59, pp.1-17, 1996.
- [3] C.Den Biggelaar, R. Lal, K. Wiebe, H. Eswaran, V. Breneman and P. Reich, "The global impact of soil erosion on productivity: II: Effects on crop yields and production over time", *Adv. Agron.*, Vol. 81, pp.49-95, 2003.
- [4] I.Hakansson, "Machinery-Induced Compaction of Arable Soils: Incidence-Consequences Counter-Measure", Swedish University of Agricultural Sciences, Sweden, 2005; pp. 153.
- [5] R.A. Sial, E.H. Chuadhary, S. Hussain and M. Naveed, "Effect of organic manures and chemical fertilizer on grain yield of wheat", *Soil and Environmen*, Vol.26, pp.130-133, 2007.
- [6] H. Akamine, M.A. Hossain, Y. Ishimine, K.Yogi, K. Hokama, Y. Iraha, & Y. Aniya, "Effects of application of N, P and K alone or in combination on growth, yield and curcumin content of turmeric (*Curcuma longa* L.)", *Plant Production Science*, Vol.10, pp.151-154, 2007.
- [7] A. H. M. R. H. Chowdhury, G. M. M. Rahman, B. K. Saha, & M. A. H. Chowdhury, "Addition of some tree leaf litters in forest soil and their effect on the growth, yield and nutrient uptake by red amaranth", *Journal of Agroforestry and Environment*, Vol. 2, pp.1-6, 2008.
- [8] M.A. Hossain, & Y. Ishimine, "Growth, yield and quality of turmeric (*Curcuma longa* L.) cultivated on dark-red soil, gray soil and red soil in Okinawa, Japan", *Plant Production Science*, Vol.8, pp.482-486, 2005.
- [9] M. A. Hossain, M.Yamanishi, T.Yara, S.Chibana, H.Akamine, & M.Tamaki, "Growth characteristics, yield and mineral content of red flower rag leaf (*Crassocephalum crepidioides* (Benth.) S. Moore) at different growth stages, and in dark-red soil, red soil and gray soil in Okinawa", *Science Bulletin of the Faculty of Agriculture, University of the Ryukyus*, Vol.58, pp.1-11, 2011.
- [10] M. M. Islam, A. J. M. S. Karim, M.Jahiruddin, N.M.Majid, M.G. Miah, M.M.Ahmed, & M.A.Hakim, "Effects of organic manure and chemical fertilizers on crops in the radish-stem amaranth-indian spinach cropping pattern in homestead area", *Australian Journal of Crop Science*, Vol.5, pp.1370-1378, 2011.
- [11] M. Broadley, P. Brown, I.Cakmak, Z. Rengel, & F.Zhao, Functions of macronutrients: Micronutrients. In P. Marschner (Ed.), *Marschner's mineral nutrition of higher plants* (pp. 191- 248). Amsterdam: Elsevier, 2012a.
- [12] M. Broadley, P.Brown, I.Cakmak, J.F.Ma, Z. Rengel, & F.Zhao, Beneficial elements: In P. Marschner (Ed.), *Marschner's mineral nutrition of higher plants* (pp. 249-269). Amsterdam: Elsevier, 2012b.
- [13] M.Hawkesford, W.Horst, T. Kichey, H. Lambers, J. Schjoerring, And, M.Skrumsager, & P.White, Functions of macronutrients. In P. Marschner (Ed.), *Marschner's mineral nutrition of higher plants* (pp.135-189). Amsterdam: Elsevier, 2012.
- [14] R.Shewry Peter, "Wheat", *Journal of Experimental Botany*, Vol.60, pp.1537-53, 2009.
- [15] World food situation: FAO cereal supply and demand brief" Rome, Italy: United Nations, Food and Agriculture Organization. 8 December 2016.
- [16] Crops/World Total/Wheat/Production Quantity/2014 (pick list)" United Nations, Food and Agriculture Organization, Statistics Division (FAOSTAT), 2014.
- [17] PR.Shewry, SJ.Hey, "Review: The contribution of wheat to human diet and health", *Food and Energy Security*, Vol. 4, pp. 178-202, 2015.
- [18] European Community, Community Research and Development Information Service (CORDIS) Genetic markers signal increased crop productivity potential, (24 February 2016).
- [19] J. K. Chaven, and S. S. Kadam, "Nutritional improvement of cereals by fermentation", *CRC Critical Reviews in Food Science and Technology*, Vol. 28, pp.349, 1989.
- [20] Dietary protein quality evaluation in human nutrition (PDF). Food and Agriculture Organization of the United Nations. 2013.
- [21] L. Day, MA. Augustin, IL. Batey, CW.Wrigley, "Wheat-gluten uses and industry needs", *Trends in Food Science & Technology (Review)*, Vol.17, pp.82-90, 2006.
- [22] D.F. Calderini, and G.A. Slafer, "Change in yield and yield stability in wheat during the 20 Century", *Field crops Res*, Vol.57, pp.335-347, 1998.
- [23] G.A. Slafer, E.H. Storre and F.H. Rade, Increases in grain yield in bread wheat from breeding and associated physiological changes. pp: 1-68. In G.A.Slafer (ed) *Genetic improvement of field crops*, Marcel Dekker, Newyork, 1994.
- [24] D.W.Franzon, and R.J. Crops, (1997) *Fertilizing hard Sci.*, Vol.34, pp.118-124. Red spring wheat durum. winter wheat and rye. North Dakota state university Extension service (www.ag.ndsu.nodac.edu).
- [25] C.D. Moodie, H.W. Smith and R.A. McCreery. 1959, *Laboratory Manual for Soil Fertility*. Washington State College, Mimeograph, USA.
- [26] USDA, (1996). *Natural Resources Conservation service, National soil survey centre (1996) soil survey Laboratory methods, manual soil survey investigations Report No.42 Version 3.0*. U.S Dept. Agric. Washington. D.C.
- [27] US Salinity Lab. Staff. 1954. *Diagnosis and improvement of saline and alkali soils*. USDA Handbook. No. 60. Washington, D.C., USA.
- [28] A.Walkley, and C.A. Black, "An estimation of Degtareff methods for determining soil organic matter and a proposed modification of the chromic acid titration
- [29] B. V. Subbiah, and G.L. Asija, "A rapid procedure for the estimation of available nitrogen in soils", *Curr Sci*, Vol.25, pp.259-60, 1956.



- [30] S.R.Olsen, C.V.Cole, F.S.Waternade and L.A. Dean, "Estimation of available phosphorus in soil by extraction with sodium bicarbonate", USDA Cir, Vol.939, pp.19,1954.
- [31] Piper C S (1966) Soil and plant analysis, pp. 368. Hans Publisher, Bombay.
- [32] Swanti.A.Jain, M.S.Jagtap, K.P.Patel, "Physico-Chemical Characterization of farmland Soil used in some villages of Lunawada Taluka. Dist : Mahisagar (Gujarat)", India International Journal of Scientific and Research Publications, Volume 4, Issue 3, March 2014.
- [33] A. Rashid, and N. Ahmad (1993) Soil testing in Pakistan – a country report. p. 39–53, In: Proc.FADINAP Regional Workshop on Cooperation in Soil Testing for Asia and the Pacific, 16–18 August 1993, Bangkok, Thailand. United Nations, New York.
- [34] J. Ryan, G. Estefan, and A. Rashid (2001) Soil and Plant Analysis Laboratory Manual, 2nd ed. International Center for Agricultural Research in the Dry Areas (ICARDA), Aleppo and National Agricultural Research Center (NARC), Islamabad, Pakistan.



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