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Effect of Soil Nutrients on Growth of Triticum Sp.

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Abstract: Soil is a vital component of ecosystem, present 6-12inches 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

Earths'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. Similarily 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, furnance 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 fitrates. 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. Experimantal 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 7^{th} Day, 10^{th} Day and 12^{th} 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 ,slit 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

Garden Compost Farming

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 <0.8dsm^{-1},critical for salt sensitive crops, critical for salt tolerant crops 1.6-2.58dsm^{-1},injurious to most crops >2.58dsm^{-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 156-235Kg/ha in Garden, Farming and Compost soils respectively. P was in the range of 28-38 in Farming Compost and Garden soils. K showed >280Kg/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 adquate 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	4th day
Compost	10	10	3th day
Farming	10	10	4th 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.

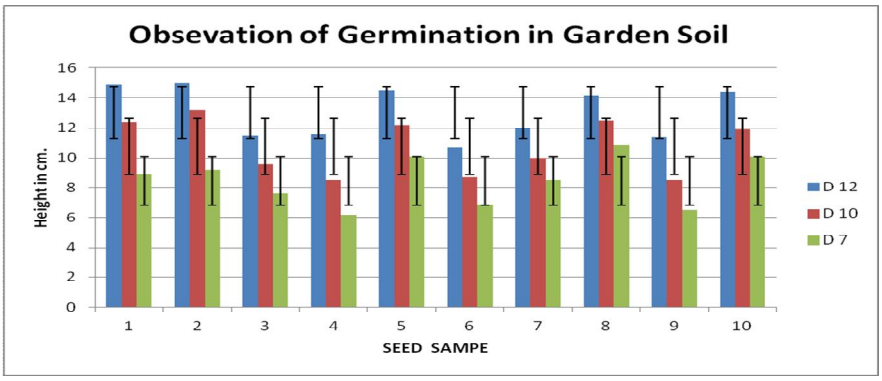

Fig 3 Length of germinated wheat plants in Garden soil
Each value represents mean ±SD of three independent experiments. The values are significant at p <0.05

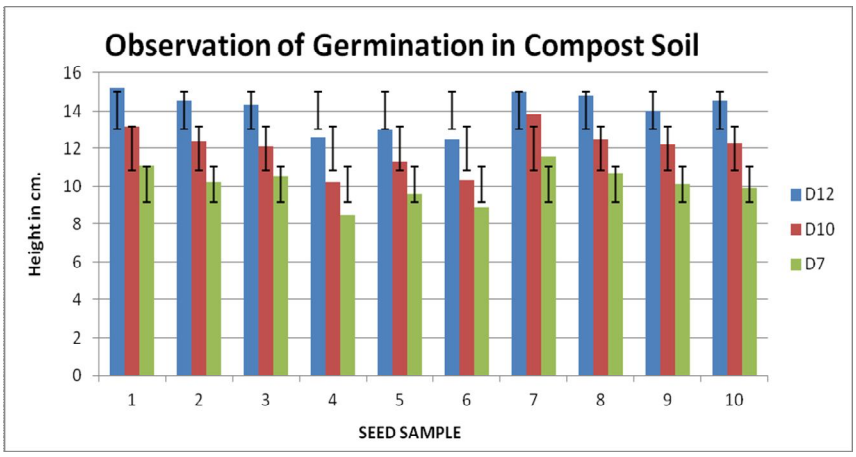

Fig 4 Length of germinated wheat plants in Compost soil
Each value represents mean ±SD of three independent experiments. The values are significant at p <0.05

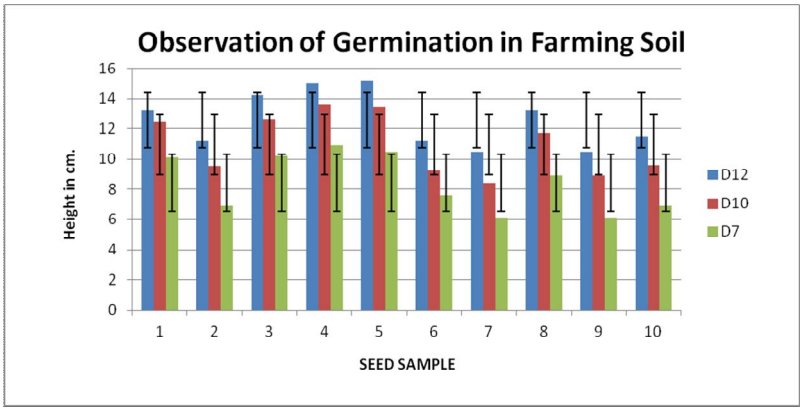

Fig 5 Length of germinated wheat plants in Farming soil
Each value represents mean ±SD of three independent experiments. The values are significant at p <0.05

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(± 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.

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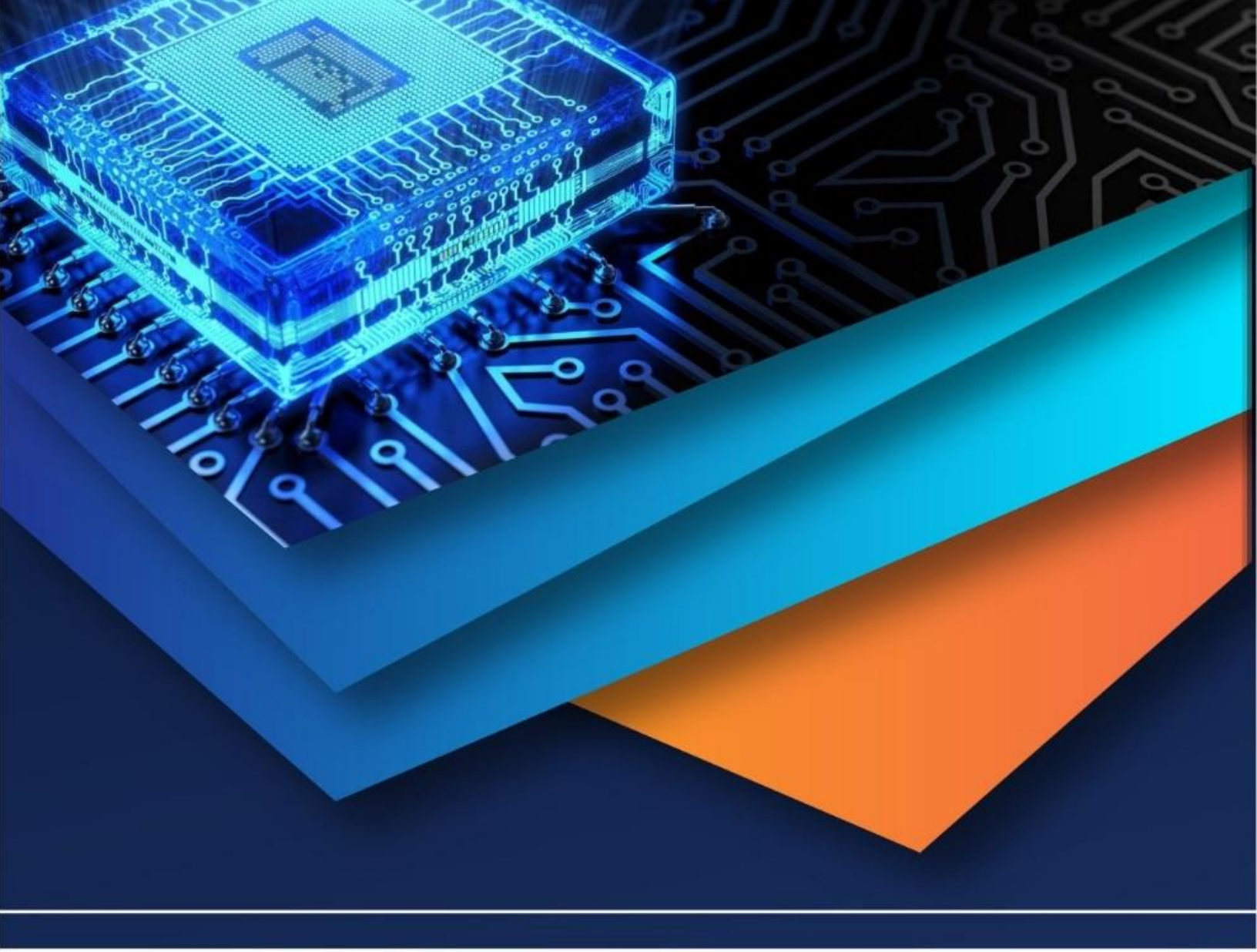

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