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A Comparative Study of Various Soil Samples from Conventional and Organic Farming Fields in Dhar District (Madhya Pradesh)

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Abstract : *Organic farming is one of the most successful strategies for improving soil fertility and supporting soil health, whereas conventional farming diminishes soil fertility and increasing the quantity of synthetic chemicals in the soil, which is harmful to soil health. We collected organic and conventional soil samples from farmers' fields in the adjoining village of Manawar Tehsil (District Dhar), and analyzed micro and macronutrients such as nitrogen (N), phosphorus (P), potassium (K), Sulphur (S), organic carbon (OC), pH, electric conductivity (EC), boron (B), copper (Cu), zinc (Zn), manganese (Mn), and iron (Fe). Our research focuses on soil health to better understand the irregularities of soil components caused by conventional farming, but soil fertility, soil conservation and soil improvement can be done through organic farming and crop rotation. The necessity for awareness has been made clear, allowing for soil conservation and discussion of the compounds found in soil. In this study, we will evaluate and contrast organic and conventional farming soils' quality (physio-chemical characteristics) from different locations.*

Keywords : *Organic farming, conventional farming, Soil, and Fertility.*

1. INTRODUCTION:

Several studies in developing and developed countries have focused on the factors affecting farmers' alternatives to switch from conventional to organic farming techniques. Government incentives for organic farming usually play a significant impact [1]. Organic Most researchers think organic farming is more eco-friendly than traditional farming [2]. Organic farming is the best way to enhance the health of living organisms and the quality of the soil. It is now commonly recognised that there is a need for high-quality food that is not dependent on synthetic inputs such as synthetic fertilizers, insecticides, herbicides, and chemicals used in the development of crops. Synthetic fertilizers and pesticides are unnecessary for maintaining a sufficient supply of nutritious food to feed the growing global population [3]. Worse, it may lead to practices that degrade the environment in general and soil quality in particular [4]. Chemical fertilizers, pesticides, and herbicides used in conventional farming have raised crop yields worldwide. However, the capacity of traditional agriculture to maintain soil fertility and environmental quality has been questioned [5]. Using synthetic fertilizer and herbicide-based farming systems is associated with soil structure and aggregation decline. There is a decrease in water infiltration and an increase in soil bulk density, soil salinity, nitrogen leaching, and groundwater contamination [6]. Soil organic matter provides the basis for productive organic farming and sustainable agriculture. It is an essential source of nutrients and can help increase biodiversity, which provides vital ecological services, including crop protection. For example, adding bio-compost and other organic matter reduces crop diseases and increases the number of microbe species in the agroecosystem [7], [8]. Organic farming is a viable choice for small farmers seeking to improve food security and farm income performance in the long term [9]. Although chemical fertilizers are essential for higher crop productivity, over-reliance on chemical fertilizers is associated with a decline in some soil properties and crop quality over time [10].

Over the last several decades, green revolution technologies, including high-yielding crop varieties and complementary inputs such as synthetic fertilizers, pesticides, and irrigation water, have contributed substantially to agricultural productivity growth and global food security improvements [11], [12]. Nonetheless, an estimated 800 million people in Asia and Africa are chronically undernourished [13]. To manage traditional farming, several tools including physical, chemical, and cultural techniques are utilized [14]. Several of the nation's many farming serious

issues with agricultural sustainability may be solved through organic farming [15]. It is an established production technique that reduces the need for costly synthetic inputs like pesticides, herbicides, and chemical fertilizers while improving agriculture's ecological and financial viability. It also reduces chemical fertilizers and increases soil organic matter levels. Moreover, they hold more water than conventionally farmed soils [16], [17]. Additionally, integrated organic methods require greater labor resources [18]. A high-profit margin may also follow from organic certification. More huge agricultural revenues are feasible as a result of declining input costs and high market prices. Expanding farm size could be a possibility if there is an increase in revenue and low input costs [19], [20].

Conventional farming methods and the irrational use of chemical inputs have contributed to a variety of risks, including soil erosion, groundwater depletion, soil salinization, and desertification. They have also caused genetic erosion, adverse environmental effects, reduced food quality, and increased cultivation costs [21].

In most developing countries, demand for organic products is negligible, although it increases in specific high-income segments of the population. Due to the much greater cost of organic products, poor people hardly still can buy them. On average, organic products are priced 50% above conventional products, reflecting higher production, processing, and distribution costs [22]. Price differences between organic and conventional tend to be more pronounced for animal products than for fruits, vegetables, and processed foods [23].

The concept of mixed nutrition management systems is still quite essential, according to reports. Over uninoculated controls, inoculating the seed with a substantial strain of Rhizobium species and *Azotobacter chroococcum* resulted in a considerable increase in nodulation nitrogen content in the root and grain yield [24].

The present work aimed to evaluate the effect of conventional and organic agriculture technique on soil composition. The study will also be able to find the issues that farmers face due to organic farming. Many past studied resulted that organic manures improve the quantity, complexity, and productivity of the microbial population in the soil, impact structure, nutrients turnover, and many other physiological, chemical, and biological processes in the soil, all of which will be determined by the proposed study. The present study will be able to represent relationship between various physicochemical properties of soil. This study may provide valuable information on some beneficial soil quality outcomes.

2. MATERIALS AND METHODS:

2.1 Experimental Site

The study was conducted at seven different agriculture sites near Manawar tehsil District Dhar (Madhya Pradesh). Manawar tehsil belongs to most of the tribal people. Tribal people are mostly depending on agriculture for their livelihood; due to lack of knowledge these people are unable to use technique in agriculture. The Farmers use harmful or toxic pesticides, insecticide and chemical fertilizer in maximum amount to improve the yield.

Soil Samples were collected from 1-8 different sites or villages, near Manawar. Site 1 is organic farming and Karodiya, Benediya, Karoli, Gopalpura, Andiyab, Karodiya khurd and Vayal are Site 2 to Site 8 simultaneously, represent as conventional sites. Here is a brief description of the proposed material, the methodology that will be used, and the techniques used to carry out these experiments. Here, we will compare organic farming versus conventional farming using soil testing parameters for macronutrients, micronutrients, and physical parameters.

2.2 Physical parameters

The colorimetric approach and the modified Walkely-Black method [25]. are the most accurate techniques for identifying readily oxidizable carbon (Organic Carbon) [26].

The soil pH of the samples was calculated using a glass electrode pH meter at a soil to water ratio of 1:2.5. [27]. A 1:2.5 suspension of soil and water was tested for electrical conductivity using an EC meter [28].

2.3 Macronutrients

Available nitrogen in soil was determined by alkaline potassium permanganate method as described by Subbiah and Asija [29]. Using Olsen's referenced ascorbic acid technique, available phosphorus was determined. Estimation of potassium by the method of Hanway and Heidel [30] using Flame photometer.

2.4 Micronutrient

By using DTPA (Diethyl Triamine Penta Acetic Acid), Lindsay and Novel [31] developed a method for estimating the amount of Zn, Cu, Mn, and Fe that is present in soils. This method was found to be useful for identifying soils into deficient and non-deficient categories for Zn, Cu, Mn, and Fe by using an atomic absorption spectrophotometer.

3. RESULT AND DISCUSSION:

The present work was a comparative study of soil component, between organic and conventional agriculture sites. The result indicated that the variation in Micronutrient, Macronutrient and physical properties. The observation

table 1 represent amount of Macronutrient (N, P, K) of Soil samples. the maximum amount of Nitrogen was 333.66 kg/H at site 4 and Minimum 254.66 Kg/H at Site 5. Amount of nitrogen in organic soil or Site 1 was 291.43 kg/H. maximum amount of Phosphorous in Soil was found 15.88 Kg/H at Site 8 and Minimum was 5.82Kg/H at Site 4. Soil sample of Site 1 has 15.65kg/H Phosphorous. the maximum amount of potassium was found 437.83 kg/H at site 6 and Minimum 245.76 Kg/H at Site 8. Amount of Potassium in soil sample of Site 1 was 253.63Kg/H.

The observation table 2 revealed the impact of conventional and organic farming on micronutrient of soil. The amount of micronutrients in soil sample from site 1 were Cu 0.74, Fe 4.653, Mn 2.433, Zn 0.686, B 0.623 and S 9.733 found. Highest amount of Cu was observed from collected soil samples 1.15 at Site 7 and least amount 0.22 at site 8. Gopalpura or Site 5 represents maximum Fe in soil 5.240 PPM and Site 2 or Karodiya has minimum 2.067. Micronutrients Mn (4.076), Zn (1.956) and Boron (0.766) were found maximum in soil sample of Site number 5. Least amount of Mn (1.166) and Boron (0.2) observed from Site number 8 and Site number 2. Minimum amount of Zn (0.686) was recorded from Soil sample collected from the Site number 1 or Organic Site. Amount of Sulphur in Soil was maximum 13.66 found from the Site Number 3 and minimum 1.66 was found from the Site Number 5.

Physical Parameters of soil samples are shown in Table 1. Site 7 has a maximum pH of 7.14, Site 8 a minimum pH of 6.58, while Site 1 has a pH of 7.41 for organic soil. Site 8 had the highest EC 0.59dS/m, whereas Site 6 had the lowest EC 0.33dS/m in both of convention sites. Soil sample of Site 1 has 0.51dS/m EC. Sites 3 and 4 had the highest levels of organic carbon (1.23%), while Site 5 had the lowest levels organic carbon (0.84%) 1.24 % of organic carbon was found in the soil sample from Site 1.

According to research by Rao *et al.* [32], bio fertilizers are made with advantageous microorganisms that release nutrients into the soil and enhance crop growth and product yield without harming the environment. The current study also showed that macronutrients and micronutrients were present in the organic soil sample. The findings of the current investigation showed that the organic soil sample had an adequate level of organic carbon and phosphorus.

Singh *et al.* revealed that soil organic carbon and available phosphorus contents also significantly increased due to organic farming practice over control and chemical fertilizer application [33]. Venugopalan and Tarhalkar also observed that continuous application of farmyard manure and other organic materials to rainfed cotton-based systems in Vertisols improved the organic C in the surface and sub-surface soils [34].

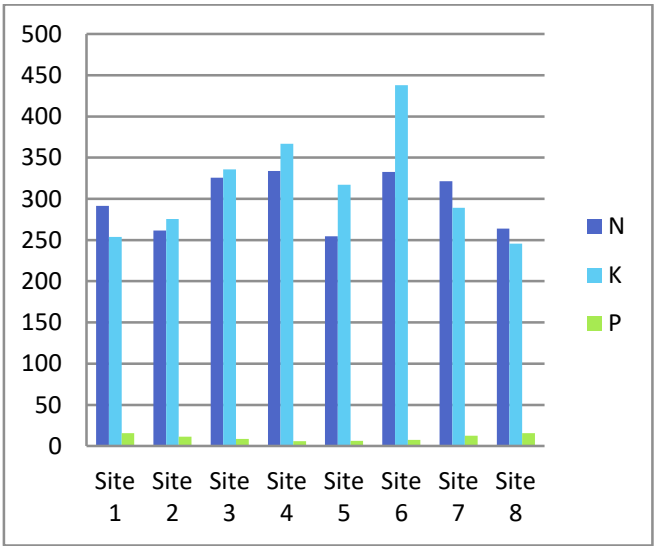
The present study revealed that the amount of Zn in soil sample of conventional site was higher than organic site while previous study of Venugopalan [35] resulted that mean available Zn content was higher in soils under the organic system compared to non-organic system. The results indicated that percentage of organic carbon and nitrogen in soil sample of organic site maximum compared to some conventional site. The same was also observed [36]. The previous study reported that compared the use of chemical fertilizer treatment organic manure increased the soil concentration of organic carbon, nitrogen, potassium and phosphorous [37]. The similar observations were found during this study. Tables and Graphs also represented that the soil sample of some conventional site have some nutrient maximum amount as compare to organic. These sites were uses both organic and chemical fertilizer in farming. The study reported that the mixed use of chemical fertilizer and organic manure increased the fertility of the soil and improved crop productivity [38]. Observation Table no. 3 and Graph 3 showed difference in soil pH of conventional and organic sites, also observed that organic fertilizer increased the soil pH in acidic soil [39].

Table 1: Macronutrients and Physical parameters of soil samples collected from different experiment sites.

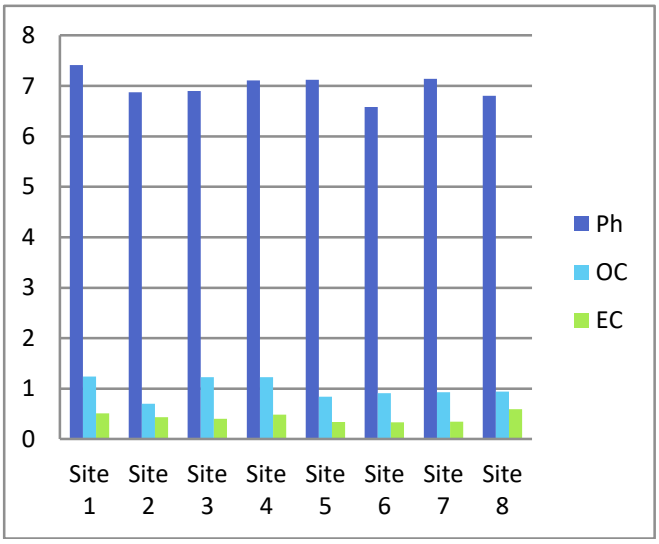
Experimental Site	Macronutrients (Kg/H)			Physical parameters		
	N	K	P	pH	OC %	EC dS/m
Site 1	291.43±24.33	253.63±14.45	15.65±0.61	7.41±0.38	1.24±0.18	0.51±0.05
Site 2	261.66±46.18	275.66±18.87	11.34±0.70	6.873±0.13	0.7±0.17	0.433±0.02
Site 3	325.66±38.68	335.66±8.96	8.773±2.02	6.896±0.06	1.23±0.05	0.4±0.08
Site 4	333.66±32.33	366.66±18.4	5.82±0.26	7.11±0.35	1.23±0.29	0.486±0.09
Site 5	254.66±45.6	317.16±11.56	6.44±1.21	7.12±0.17	0.84±0.16	0.336±0.04
Site 6	332.66±12.74	437.83±17.0	7.56±0.98	6.58±0.03	0.91±0.16	0.33±0.11
Site 7	321.33±17.3	289±20.07	12.7±1.08	7.14±0.12	0.93±0.10	0.343±0.09
Site 8	264±28	245.76±3.36	15.88±1.60	6.80±0.54	0.94±0.10	0.59±0.07

Table 2: Micronutrients of soil samples collected from different experiment sites.

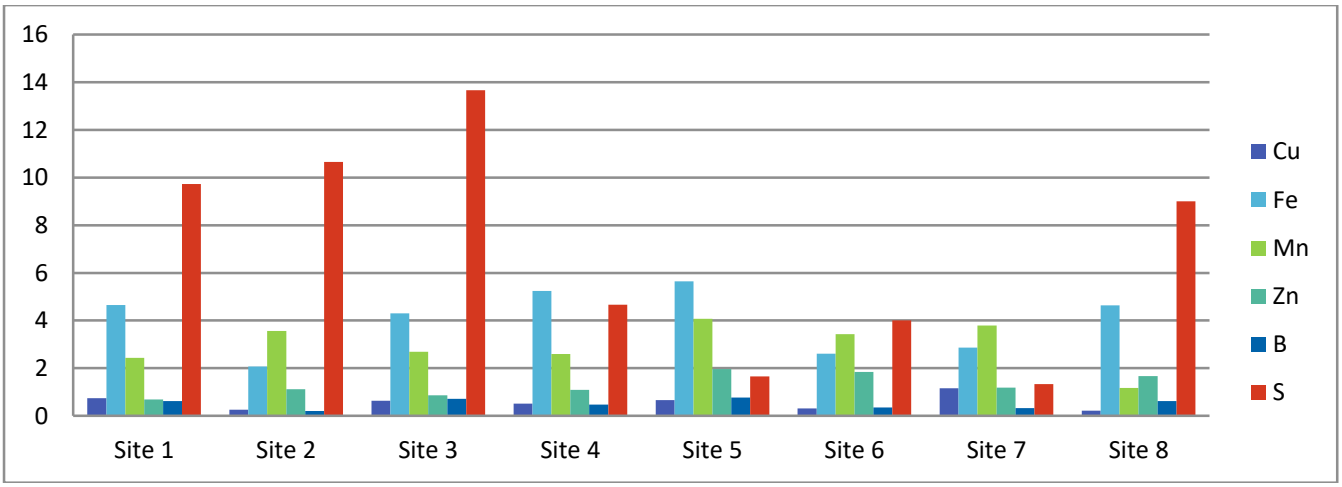
Experimental site	Micronutrients (ppm)					
	Cu	**Fe**	**Mn**	**Zn**	**B**	**S**
Site 1	0.74±0.84	4.653±0.16	2.433±1.91	0.686±0.68	0.623±0.62	9.733±0.64
Site 2	0.2533±0.01	2.067±0.44	3.562±0.275	1.122±0.20	0.2±0.04	10.66±1.52
Site 3	0.6286±0.13	4.300±0.13	2.687±0.17	0.867±0.07	0.713±0.04	13.66±2.88
Site 4	0.507±0.02	5.240±0.63	2.596±0.81	1.092±0.23	0.473±0.08	4.66±2.51
Site 5	0.664±0.2	5.646±0.30	4.076±0.09	1.956±0.5	0.766±0.135	1.66±0.5
Site 6	0.307±0.05	2.606±0.39	3.426±0.33	1.838±0.5	0.353±0.18	4±1
Site 7	1.15±1.48	2.865±0.44	3.788±0.42	1.188±0.16	0.323±0.07	1.33±0.57
Site 8	0.22±0.02	4.643±0.13	1.166±0.06	1.67±0.05	0.616±0.09	9±1



Graph 1: Macronutrients of Soil (in Kg/H)



Graph 2: Physical Parameters of Soil



Graph 3: Micronutrients of Soil (in ppm)

4. CONCLUSION :

The present study concluded that the amount of macro and micronutrients of agriculture soil was changed due to excessive use of chemical fertilizer and pesticides. Some soil samples of conventional sites were found rich in some elements, but other elements were poor or negligible. Conventional farming causes an imbalance of micro and

macronutrients in the soil, whereas the soil sample from an organic site has a balanced amount of all the nutrients. It becomes stable and the amount of synthetic chemicals present in the soil also decreases. The farmers of sites 3 and 4 use both organic and chemical fertilizers in their farming, due to which some chemicals in the soil are in very high quantity and some nutrients can be seen in balanced amounts.

Significance – The study was represented that the conventional farming method have adverse effect on soil, as compare to organic farming.

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