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Impact of Chemical Fertilizers on Agricultural Soil of Mul Region, Chandrapur District, Maharashtra, India

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Abstract

India is well known for agriculture,soil is part of successful agriculture practices and is the original source of the nutrients that usefulforgrowth of crops.The crop yield is regulated by fertility of soil, nitrogen, potassium, phosphorus for healthy growth. Excess amount of nutrients is utilized its shows adversely effects on soil composition, mostly chemical fertilizers significantly effects on soil quality and reduces the soil fertility. The duration of present investigationfrom October 2023 toOctober 2024. This study investigated impact of chemical fertilizers on agricultural soil in Mul (East side of city),Tadala, Chichala, Haldi, Mul (North side of city) of Mul,District, Chandrapur.There is reduction in soil macronutrient and micronutrient level from normal soil to chemical fertilizer containing soil. To avoid reduction level of nutrients in soil use organic fertilizers, vermicomposting and cow dung for maintaining soil health. The overuse of fertilizers may affects soil health and ultimately it effects on mankind. The future scope to avoid soil pollution to reduce excess use of chemical fertilizers.

Keywords: *Macronutrient, micronutrient, vermicomposting and organic fertilizer.*

Introduction

Soil is great valuable natural resources of our country, it's fulfill the demand of food and fibers, it is necessary to maintain excellent state of soil health. Soil plays significant role in crop production, maintaining soil macronutrients and micronutrients level.The crop yield is regulated by fertility of soil, potassium, phosphorus for healthy growth. If amount of this nutrients is disturbed it effects on plant health.

Adding larger amount of fertilizers can causes pollution of water, soil, and air. Plants absorbs more fertilizers from the soil, their over-application enables these substances to enter the food chain. Certain chemical fertilizers utilized in agriculture contribute significantly to various environmental issues due to their content of heavy metals and elevated levels of radionuclides. Furthermore, greenhouses and aquaculture operations apply substantial quantities of chemical fertilizers, particularly during peak seasons, which results in severely contaminated underground water. This pollution adversely affects water resources and diminishes crop production in both quality and quantity.

Soil micro flora, which includes bacteria, fungi, protozoa, algae, and viruses, plays an significant role in the agro-ecosystem and is responsible for numerous critical soil functions, such as nutrient cycling, maintaining soil fertility, enhancing plant productiveness by improving the availability of limited nutrients, and decomposing both organic and inorganic matter.Additionally, the physical properties of soil, including its structure, porosity, aeration, and water infiltration rate, are positively influenced by soil organisms [1].Some researcher work on above aspects viz. [2], [3], [4], [5] and [6].

Materials and Methods

Study area:

Mul tahsil situated in the Chandrapur district of Maharashtra, India, recognized for its substantial rice production. It is positioned roughly 43.45 km to the north-east of the city of Chandrapur, Maharashtra. Mul serves as a prominent hub for rice, housing 53 rice mills that process nearly 90% of the district's rice. The soil samples were collected from Mul, Chichala, Haldi, Tadala village of Mul region. This area is well known for rice crop production. The research site is located between 20.065'N and 79.67'E.

Soil Analysis:

Table 1.1: Selected sites of soil sample collections

Serial No.	Village name	Site representation
1.	Mul East	M
2.	Tadala	T
3.	Chichala	C
4.	Haldi	H
5.	Mul North	MU

Table 1.2: Analysis of normal soil samples

Village	Nitrogen-N (kg/he)	Potassium-K (kg/he)	Phosphorus-P (kg/he)	Zinc-Z (ppm)	Copper-Cu (mg/kg)	Iron-Fe(%)
M-1	119	160	12.5	52.8	2.8	11.6
T-1	161	181	10.97	0.80	0.42	0.16
C-1	310	138	15.6	54	3.9	15
H-1	280	278	23	21.6	3.2	20.8
MU-1	124	183	16.5	39	4.2	17.8

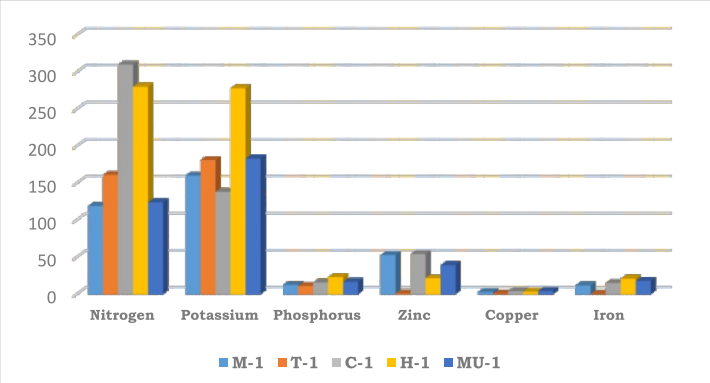

Fig. 1.1 Analysis of normal soil samples

Table 1.3: Analysis of chemical fertilizer containing soil samples

village	Nitrogen-N (kg/he)	Potassium-(kg/he)	Phosphorus-P (kg/he)	Zinc-Z (ppm)	Copper-Cu (mg/kg)	Iron-Fe(%)
M-2	113	155	11.8	48.2	1.5	9.2
T-2	156	178	9.87	0.71	0.32	0.10
C-2	302	130	13.8	49	2.1	11
H-2	275	272	18	18.6	2.6	17.4
MU-2	119	176	14.7	34	3.2	16.8

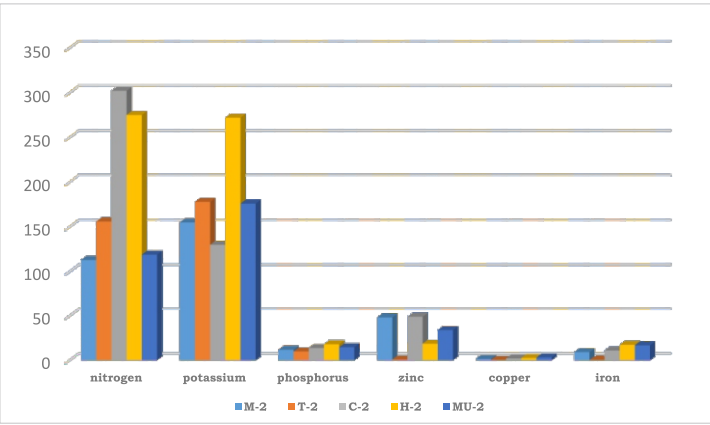

Fig. 1.2 Analysis of chemical fertilizer containing soil samples

Soil Sampling:

The duration of present investigation from October 2023 to October 2024. It was conducted in and around Mul Tahsil,The samples were collected from 0-15 cm depth from surface of soil. Samples were collected in polythene pouches. Soil samples collected, dried, and for further determinationcarry to laboratory. Determination of soil parameters by standard methods by [7].

Result and Discussion

The importance of fertilizers is crucial for the agricultural crop yield, as it replenishes soil nutrients and enhances crop growth and yield. However, to mitigate the various hazards arising from the excessive use of fertilizers, it is essential to adopt a judicious and sustainable approach. This begins with proper soil testing and analysis, followed by the appropriate application of fertilizers to the soil [8].

In the present study, the analysis of normal soil samples and fertilizers containing soil samples is carried out using various methods. The nitrogen amount in normal soil sample contain is ranges from 119 kg/he to 310 kg/he. The amount of nitrogen is reduced from 113 kg/he to 272 kg/he in fertilizers containing soil samples. Similarly the amount of potassium in normal soil is ranges from 160 kg/he to 278 kg/he. The amount is reduced to 130 kg/h to 272 kg/he in fertilizers containing soil samples. The amount of phosphorus in normal soil samples is ranges from 10.97 kg/he to 23 kg/he. In fertilizers containing soil samples that amount is reduced to 9.7 kg/he to 14.7 kg/he. Zinc amount in normal soil samples is ranges from 0.80 ppm to 54 ppm. In fertilizers containing soil samples this range is reduced to 0.71 ppm to 49 ppm. The amount of copper obtained in normal soil samples is ranges from 0.42 mg/kg to 4.2 mg/kg. This ranges of copper is reduced to 0.32 mg/kg to 3.2 mg/kg in fertilizers containing soil samples.

Iron amount in normal soil samples is ranges from 0.16 % to 20.8 %. The amount in fertilizers containing soil samples is reduced from 0.10 % to 17.4 %. All the values of soil composition shows fluctuation from normal soil samples contents to fertilizers containing soil samples. The overuse of fertilizers may affects soil health and ultimately it effects on mankind. Similar study noted by, [9, 10] Indicated that the nitrogen content available in the soils of the semi-arid region of northern Marathwada was classified as low to medium, ranging from 78.42 to 266.96 kg/he. The differences observed in the available nitrogen of the soil may be attributed to variations in organic carbon content.[11]Reported that the available phosphorus content in the soils of the Majalgoan command area ranged from 9.6 to 24.0 kg/he.[12,13] Conducted an analysis of the soils in the Marathwada region and found that the available potassium ranged from 303 to 512 Kg/ he [14, 15].

Conclusion

Above study was for conservation of soil areas. The use of cow dung and organic fertilizers like vermicomposting can reduces the negative impact of fertilizers on soil composition. The proper amount of fertilizers uses is also reduced negative effects on soil composition. The organic farming is good option formaintaining soil macronutrients and micronutrients level. The proper care of agricultural land is taken before and after harvesting is helps to gives good yields of crops and maintaining soil health.Chemical fertilizers undoubtedly disrupt the microbial communities within the soil, affecting both structural and functional diversity, along

with the predominant soil species. It has been documented that excessive use of chemical fertilizers leads to alterations in microbial activity and diversity.

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