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DETERMINATION OF QUALITATIVE EFFECTS ON SOIL BY AQUEOUS EXTRACT OF *Ocimum gratissimum*

Research article

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ABSTRACT

Ocimum gratissimum is an aromatic plant rich in essential oils. The aim of the study was to check the effects of the aqueous leaf extract on soil fertility when treated on fenugreek plants. The fenugreek plant was grown in two-paper pot labeled as CONTROL, treated with just water and SAMPLE, treated with aqueous extracted. It was grown for 25 to 30 days. After harvesting, the soil of both CONTROL and SAMPLE was tested for NPK and pH. The soil of SAMPLE showed good NPK and pH content when compared CONTROL, which is very important for growth of any crop.

INTRODUCTION

O. gratissimum is a shrub up to 1.9 m in height with stems that are branched. The leaves measure up to 10 x 5cm, and are ovate to ovate-lanceolate, sub-acuminate to acuminate at apex, cuneate and decurrent at base with a coarsely crenate, serrate margin, pubscent and dotted on both the sides. The leaves show the presence of covering and glandular trichomes. Stomata are rare or absent on the upper surface while they are present on the lower surface. Ordinary trichomes are few, while the long ones up to 6-celled are present on the margins mostly; the short ones that are 2 celled, are mostly found on the lamina. Petioles are up to 6 cm long and racemes up to 18 cm long. The peduncles are densely pubescent. Calyx is upto 5 mm long, campanulate and 5-7 mm long, greenish- white to greenish-yellow in colour **(K.S. Prabhu *et al.*, 2009).**

It is reported that the presence of important phytochemicals are alkaloids, tannins, flavonoids and phenolic compounds. *Ocimum gratissimum* (OG) is grown for the essential oils in its leaves and stems **(Afolabi C. Akinmoladun *et al.*, 2007).**

Trigonella foenum-graecum (Fenugreek) plant reported to be used for blood lipids and sugar decreasing in diabetic and non-diabetic peoples and has antioxidant and antibacterial activity. This plant use in therapy atherosclerosis, rheumatism, sugar lowering, blood lipids lowering, appetizer and contain antioxidant activity **(Rashmi Yadav *et al.*, 2014).**

Fig 1: *Ocimum gratissimum* (OG)

Fenugreek requires well-drained, good soil of medium texture. Tolerated pH range is 5.3 to 8.2. Seeds are sown directly in the garden in spring, as soon as the danger of frost is past. The plant reaches a height of 0.3 to 0.8 meters and has trifoliate leaves. As a leguminous plant, fenugreek needs little if any nitrogen fertilizer, and the plant can enrich soils with nitrogen. **(Mullaicharam AR *et al.*, 2013).**

Fenugreek seeds were chosen since it was easy to handle, observation and less time consuming. The present experiment was conducting in Harihar Tq,

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Davangere district. The leaves of OG for extraction process were procured from the surrounding area of Harihar. The average atmospheric temperature is around 20^0C to 30^0C and humidity is 76% to 79% through out the study. The purpose of this study is to understand the effects of aqueous leaf extract as fertilizer in growth and development of crops.

MATERIALS AND METHOD: (Nice soil testing kit, 2008)

DETERMINATION OF SOIL – pH

Reagents:

1. pH Reagent – 1 (pH-1)
2. pH Reagent – 2 (pH-2)
3. Decolourizer (D-1) & pH color chart (Chart No – 1)

Test Method

1. Measure 10 cc of soil and transfer into soil mixing tube.
2. Add 25 mL of pH Reagent–1 (pH–1) into the soil and shake well for 5 minutes, then add a pinch of Decolourizer (D-1) into the soil mixture, again shake well. Then filter into the color-developing bottle by using a funnel and filter paper.
3. To the clear filtrate, add 4 – 5 drops of pH – Reagent -2 (pH – 2) and mix well. Wait 2-3 minutes for color to develop. The color that forms is compared with the pH color chart (chart No.1).

ESTIMATION OF AVAILABLE NITROGEN IN SOIL

Reagents:

1. Nitrogen Reagent – 1 (N – 1)
2. Nitrogen Reagent – 2 (N - 2)
3. Decolourizer (D-1) & Nitrogen color chart (Chart No – 2)

Test Method

1. Measure 5 cc of soil and transfer into soil mixing tube.
2. Add 25 mL of Nitrogen Reagent–1 into the soil and shake for 5 - 10 minutes, then add a pinch of Decolourizer (D-1) into the soil mixture, again shake well. Then filter into the color-developing bottle by using a funnel and filter paper.
3. To the clear filtrate, add 2 drops of Nitrogen reagent-2 (N–2) and mix well. Wait 1-2 minutes for color to develop. The color that forms are compared with the Nitrogen color chart (chart No. 2) and record as Low (L1 & L2), Medium (M1 & M2) or High (H1 & H2). Discard the solution and wash all the tubes well.

ESTIMATION OF AVAILABLE PHOSPHOROUS IN SOIL

Reagents:

1. Phosphorous Reagent – 1 (P – 1)
2. Phosphorous Reagent – 2 (P - 2)
3. Decolourizer (D-1) & Phosphorous color chart (Chart No – 3)

Test Method

1. Measure 5 cc of soil and transfer into soil mixing tube.
2. Add 25 mL of Phosphorous Reagent – 1 (P – 1) into the soil and shake for 15 minutes. Then add a pinch of Decolourizer (D-1) into the soil mixture, again shake well, and then filter into the color-developing bottle (No – 3) by using a funnel and filter paper.
3. To the clear filtrate, add 2ml of Phosphorous reagent -2 (P – 2) and mix well. Wait 1-2 minutes for color to develop. The color that forms are compared with the Phosphorous color chart (chart No. 3) and record as Low (L1 & L2), Medium (M1 & M2) or High (H1 & H2). Discard the solution and wash all the tubes well.

ESTIMATION OF AVAILABLE POTASSIUM IN SOIL

Reagents:

1. Potassium Reagent – 1 (K – 1)
2. Potassium Reagent – 2 (K - 2)
3. Decolourizer (D-1) & Phosphorous color chart (Chart No – 4)

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Test Method

1. Measure 5 cc of soil and transfer into soil mixing tube.
2. Add 25 mL of Potassium Reagent – 1 (K – 1) into the soil and shake for 10-15 minutes. Then add a pinch of Decolourizer (D-1) into the soil mixture, again mix well, and then filter into the color-developing bottle (No – 3) by using a funnel and filter paper.
3. To the clear filtrate, add 1mL of Potassium reagent -2 (K – 2) and mix well. Wait 1-2 minutes for color to develop. The color that a form is compared with the Potassium color chart (chart No. 4) and record as Low (L1 & L2), Medium (M1 & M2) or High (H1 & H2). Discard the solution and wash all the tube

Result:

- Soil falling between pH – 6.5 to 8.0 is generally suitable for most of the common crops. The soil in the SAMPLE showed the medium alkaline which is recommended for good growth of plants where as soil of CONTROL falls in very strongly alkaline, which is not good for growth of plants.

Table 1: Nitrogen content

Amount of available Nitrogen in Soil		Approximate quantity of available Nitrogen present in Kg/Acre
Low (<100 Kg/Acre)	L1	<50 Kg/Acre
	L2	50 – 99 Kg/Acre
	M1	100 – 150 Kg/Acre
	M2	151 – 200 Kg/Acre
High (>200 Kg/Acre)	H1	201 – 300 Kg/Acre
	H2	>300 Kg/Acre

Table 2: Phosphorus content

Amount of available Phosphorous in Soil		Approximate quantity of available Phosphorous present in Kg/Acre
Low (<4 Kg/Acre)	L1	<1 Kg/Acre
	L2	1 – 3 Kg/Acre
Medium (4-10 Kg/Acre)	M1	4 – 7 Kg/Acre
	M2	8 – 10 Kg/Acre
High (>10 Kg/Acre)	H1	11 – 15 Kg/Acre
	H2	>15 Kg/Acre

Table 3: Potassium content

Amount of available Potassium in Soil		Approximate quantity of available Potassium present in Kg/Acre
Low (<50 Kg/Acre)	L1	<25 Kg/Acre
	L2	25 – 49 Kg/Acre
Medium (50-120 Kg/Acre)	M1	50 – 80 Kg/Acre
	M2	81 – 120 Kg/Acre
High (>120 Kg/Acre)	H1	121 – 150 Kg/Acre
	H2	>150 Kg/Acre

Table 4: Availability of N, P, K in CONTROL and SAMPLE soil

	CONTROL	SAMPLE
pH	pH falls between 8.5-9.0.	pH falls between 7.0-7.5
Nitrogen,N	L1= <50kg/acre	M1= 100-150kg/acre
Phosprous,P	M2= 8-10kg/acre	H1=11-15kg/acre
Potassium,K	H1=121-150kg/acre	M2=81-120kg/acre

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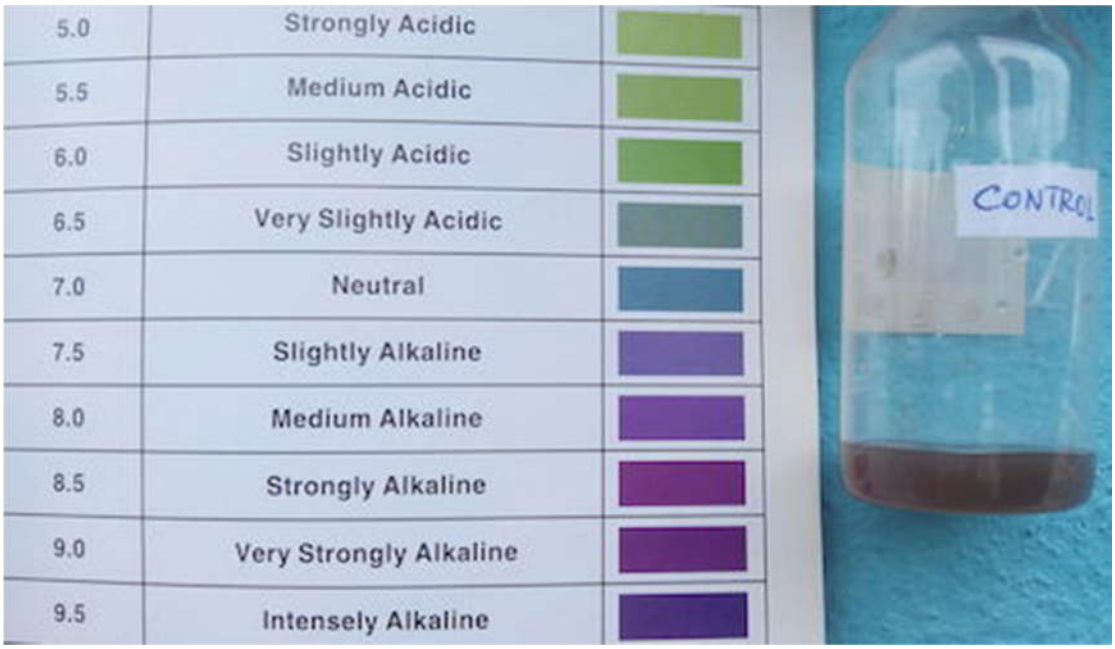

Figure 2: In determination of pH of soil in control, the pH range falls in between strongly alkaline and very strong alkaline

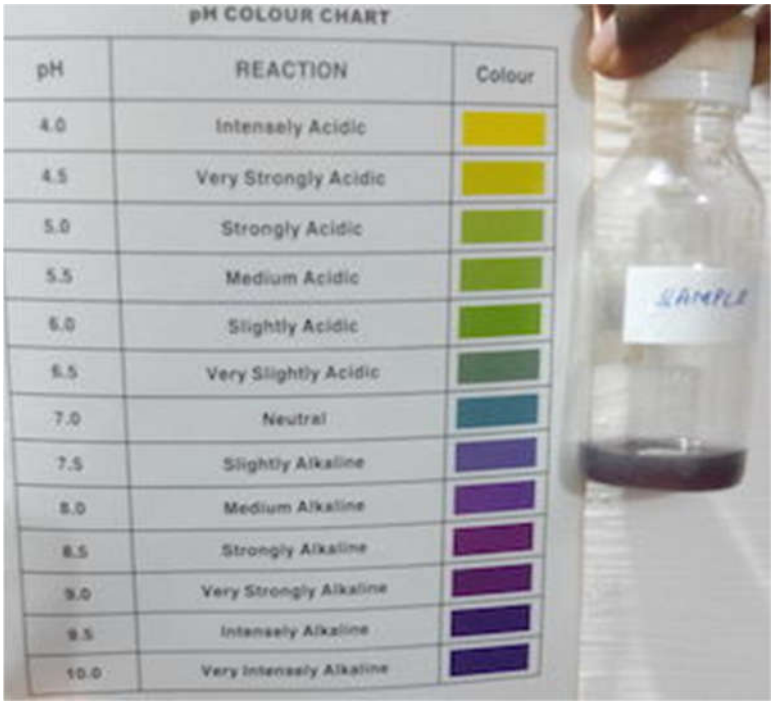

Figure 3: In determination of pH of soil in sample, the pH range falls in slightly alkaline in SAMPLE

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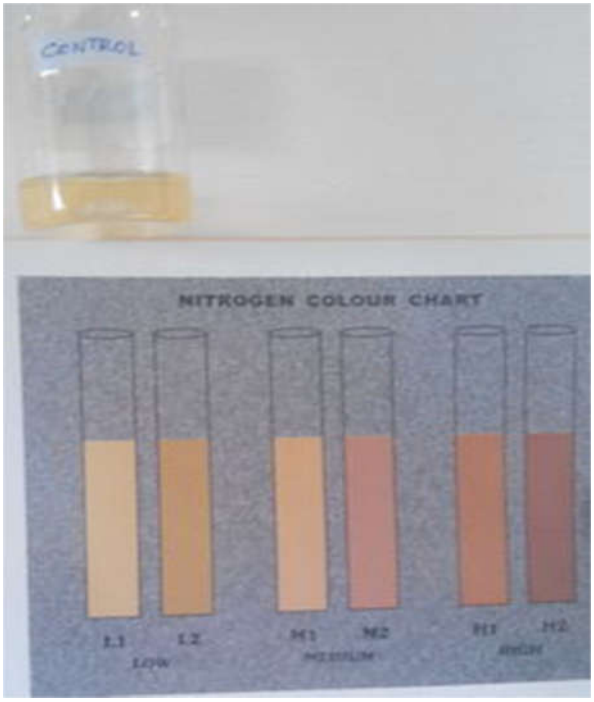

Figure 4: In determination of nitrogen of soil in control, the color range falls in L1 for control

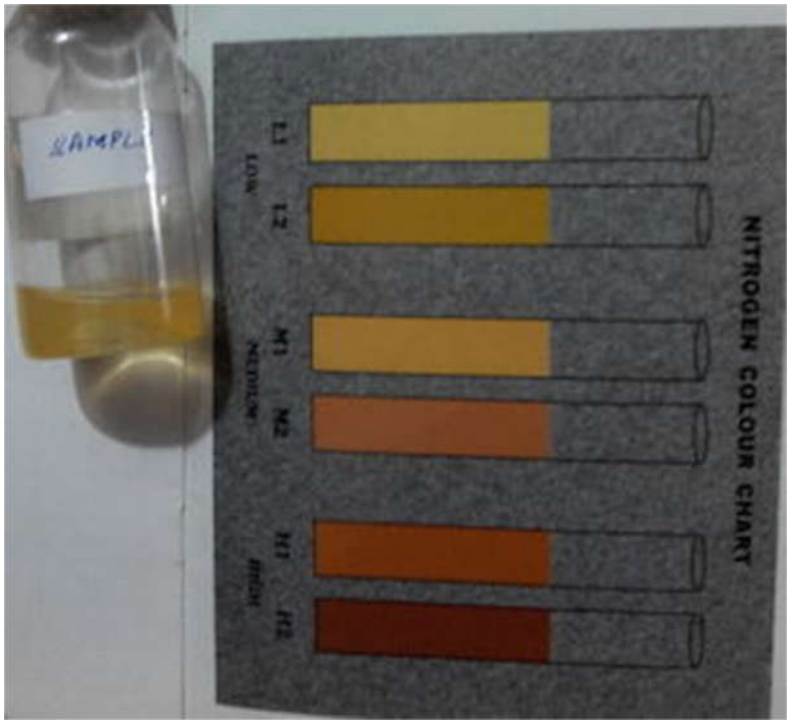

Figure 5: In determination of nitrogen content of soil in sample, the color range falls in M1 for sample

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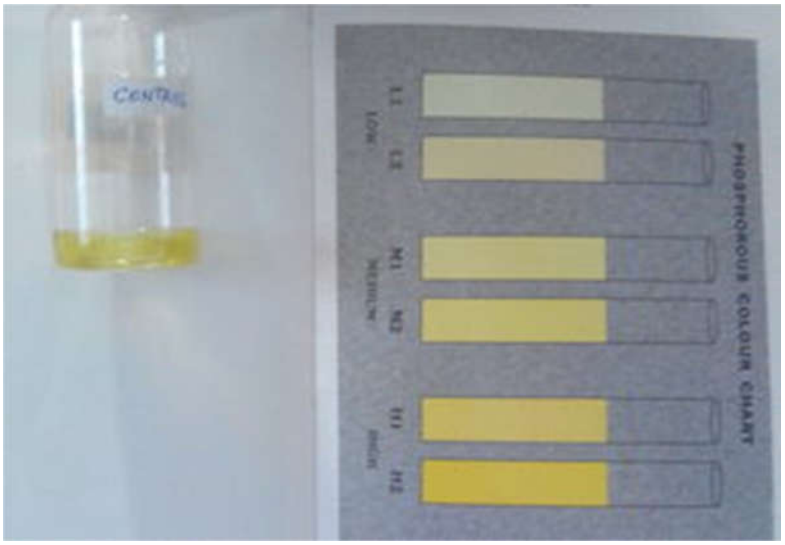

Figure 6: In determination of phosprous content of soil in control, the color range falls in M1 for control

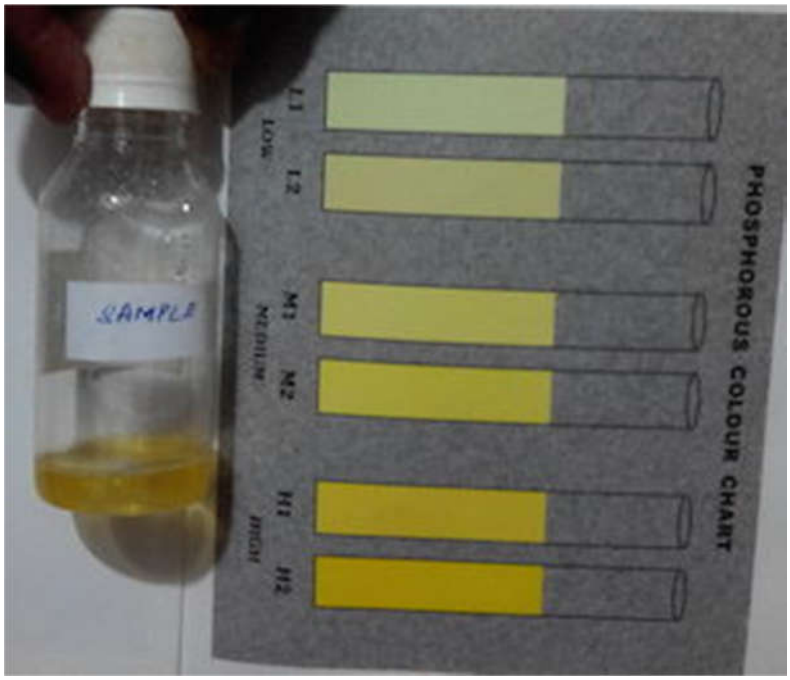

Figure 7: In determination of phosprous content of soil in sample, the color range falls in H1 for sample

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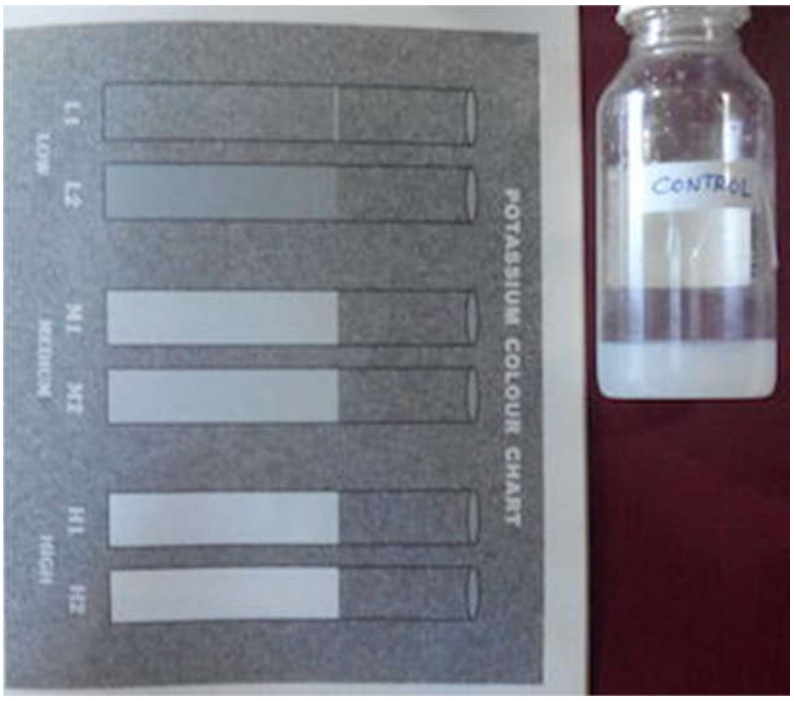

Figure 8: Indetermination of potassium content of soil in control, the color range falls in M2 for sample

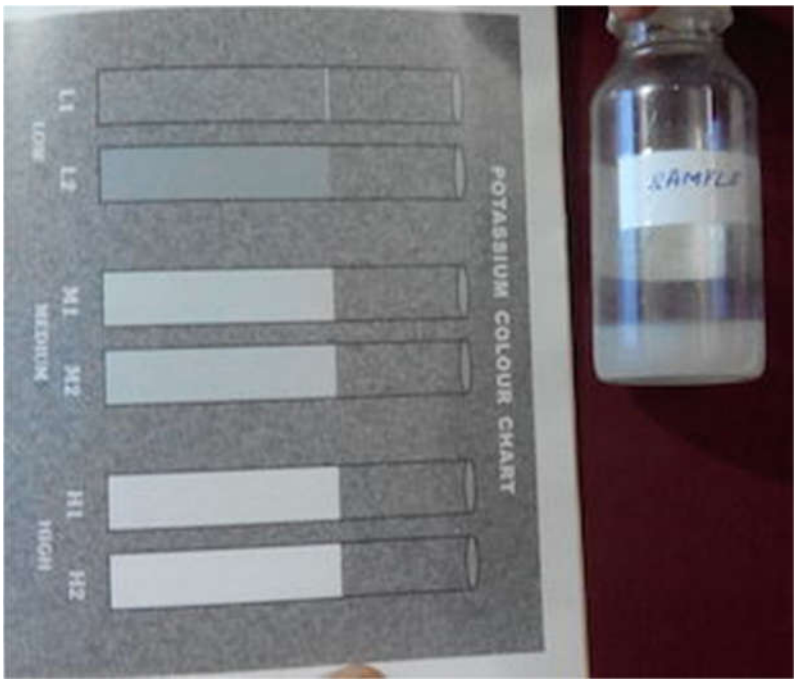

Figure 9: In determination of potassium content of soil in sample, the color range falls in H2 for sample

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DISCUSSION

From the below discussion we will come to know that the quality of the soil has increased in SAMPLE due to the addition of aqueous extract of *O.gratissimum* which lead to the good growth of the plants where as CONTROL showed comparatively poor value of NPK and pH in the soil.

pH: the soil seems to be alkaline in CONTROL (fig 2) and the soil in SAMPLE (fig 3) falls in the recommended pH for good growth of crops.

Nitrogen: The soil falls in L1 range for CONTROL (fig 4) which means availability of nitrogen is very less in CONTROL, 25% more nitrogen to be added with the recommended dosage. Soil of SAMPLE falls in range M1 (fig 5) that means the availability of nitrogen is good in the SAMPLE, recommended dosage mentioned in the fertilizer package is added (table 1).

Phosphorus: The soil falls in M2 range for CONTROL (fig 6) which means availability of phosphorus is medium in CONTROL, recommended dosage mentioned in the fertilizer package is added. Soil of SAMPLE falls in range H1 (fig 7) which means the availability of phosphorus is more, 25% less phosphorus to be added than the recommended dosage (table 2).

Potassium: soil of CONTROL falls in range H1 (fig 8) which means the availability of potassium is more, 25% less potassium to be added than the recommended dosage. The soil of SAMPLE falls in M2 range (fig 9) which means availability of potassium is medium in SAMPLE, recommended dosage mentioned in the fertilizer package is added (table 3).

CONCLUSION

From this study we can conclude that the aqueous leaf extract treated soil showed a good content of NPH and in pH in SAMPLE in comparison to the soil of CONTROL. It can be concluded that *O.gratissimum* can be used as fertilizer in the appropriate manner. Further studies has to be conducted and can be brought into the usable form for the improvement of the crops.

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