

Monitoring Of Macronutrients Uptake by Soil and Potato Plants – A Comparative Study

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Abstract: Soil test^{1, 2} is necessary to identify optimal concentrations of essential elements required for plant growth. The fertility of soil is affected by the presence of some essential elements as Macronutrients like N, P & K. This study including the status of Macronutrients in the soil and potato plants. The percentage of nitrogen (N) in soil of potato plant was obtained 5.6% and 1.89% where as nitrogen percentage in plant ash was 17.45% and 16.4% respectively.

But the phosphorus and potassium are present in adequate amount in soil. As it was found that the concentration of phosphorus (P) and potassium (K) in part per million in soil of potato was 62ppm and 148.3ppm and in potato plant ash the concentration was 64.23ppm and 103.3ppm respectively.

Keywords: Optimal concentration, essential elements, fertility, macronutrients,

I. Introduction

The macro and micro nutrients were effect the fertility of soil² and growth of plants. The methods were described for determining Nitrogen, phosphorous & Potassium in plant tissues and soil(humus), Its result indicate a correlation content with nutrients extraction and fertilizer applications. The aim of the paper is to determine the effect of macronutrient in fertility of soil and growth of potato plant.

The concentration of nutrients in plant tissues can be measured in a plant extract obtained from fresh plant material, (i.e., tissue analysis), as well as in whole dried plant material. Total plant analysis is quantitative in nature and is more reliable and useful.

Phosphorus^{1, 5}, Potassium, Nitrogen is an essential element for all plants. Plants will grow slowly with low levels of Phosphorus, Potassium and Nitrogen in the soil; however, for agricultural production purposes, the soil should provide a sufficient concentration of P for optimum plant growth.

While this goal is easily stated, it is difficult to determine whether or not soil P is sufficient for optimum plant production. Consequently, much effort has been dedicated to the development of soil tests that determine the concentration of plant-available P, and whether or not that concentration is sufficient for optimum crop growth. Soil testing has been practiced in one.

Nitrate^{2, 3} in plant tissue are readily water soluble and is extracted by water from samples that have been oven dried and finely ground. Nitrate is quantitatively reduced to nitrite. Soil test extract ants for phosphorus and potassium⁴ (K) were designed to rapidly assess the available nutrient status of soils. They serve as the basis for making recommendations for the addition of plant nutrients needed to achieve optimum yields.

Most extract ants for P were developed to estimate the capacity of the soil to supply P to plants. They were designed to dissolve and/or desorb some fraction of the labile P and thus provide an index of the availability of P to crops over the growing season.

II. Materials & Methods

As the purpose of this study was to investigate the percentage composition of some important element, essential for growth and development of plants thus The resultant weight percentage of macronutrient present in potato plant and their respective soil sample is obtained from following methods all chemical used are 'A' grade, macronutrient were analyzed by different techniques (chemicals, reagent, flame photometry).

NITROGEN^{5, 6, 9}:

5gm of sample was taken in kjeldahl flask, added 1 gm of CuSO₄ and 5ml conc. H₂SO₄. Heated the mixture about 2 hour continue till the color of the mixture become more or less transparent .mixture was cooled and diluted with distilled water mixture was transfer to distillation unit . Neutralized the solution mixture with conc.NaOH solution added a few glass beads.

Taken 25ml of 0.1N.H₂SO₄ solution in a conical flask as a receiver. Heated the mixture, distillate was collect in the receiver, stopped heating and remove the flask. Distillate was titrate with .1N NaOHsolution, observed and total nitrogen calculated.

PHOSPHORUS^{7,10}:

1 gm of dried powered sample was digested with 30 ml of 10% H₂SO₄ for half an hour on a water bath. The content filtrated and filtrate was transferred to beaker and 10 ml of conc. HNO₃ were added to it. Mixture was warmed after stirring .The precipitate of ammonium phosphomolybdate so obtained was filtered through whatman filter paper no.44 and washed with dilute potassium nitrate solution. This precipitate was then dissolved in excess of N/10 standard NaOH solution and the excess alkali was titrated with N/10 standard HCl using phenolphthalein as indicator. Form the titer value, phosphorus content was determined.

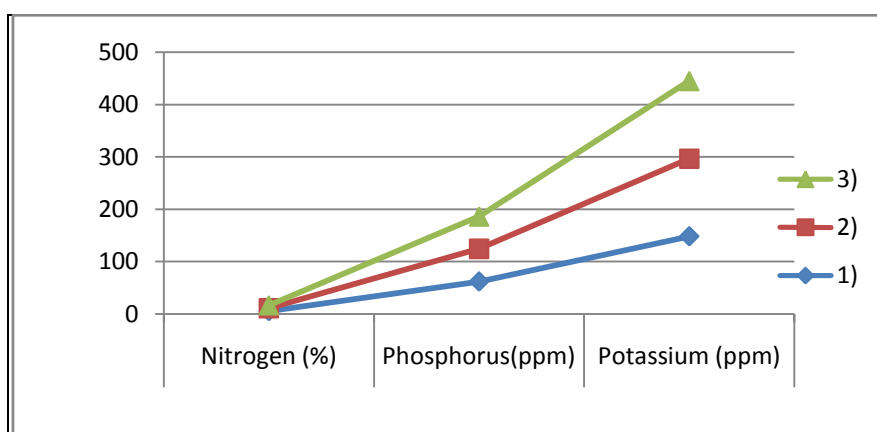
POTASSIUM⁸:

Woodruffs method -5g of soil were taken in 100 ml screw capped bottle and 1.5ml of distilled water was added to it and was kept undisturbed overnight .35ml of 0.01m CaCl₂ solution was added to it and contents were properly shaken for 1 hour and were filtered .K contents in the soil were determine using flame photometer which was calibrated with 0.01m CaCl₂ solution.

Macronutrients in plant ash were analyzed by digestion followed by distillation of dry plants. N, P & K were analyzed by kjeldahl method, Spectrophotometric method & by flame photometer respectively

Table 1: macro nutrients of soil samples of potato plant

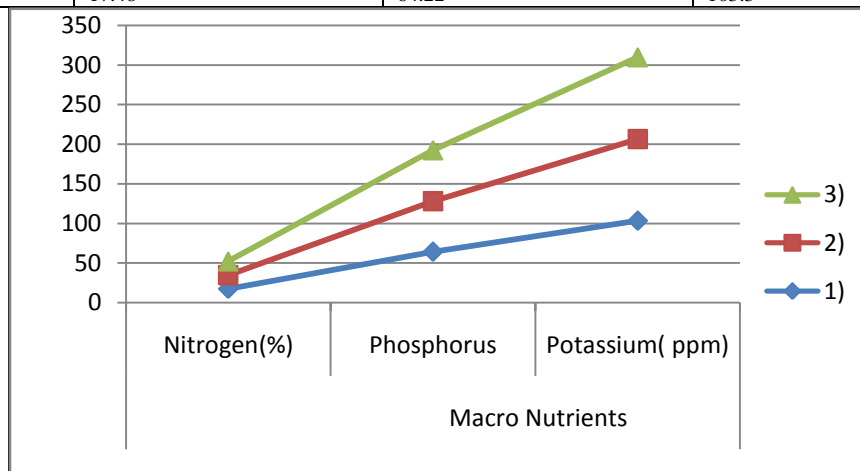
Industries	Macro Nutrients		
	Nitrogen (%)	Phosphorus(ppm)	Potassium (ppm)
R I I	4.88	60.2	148.3
S E M L	5.8	62.6	148
N I C O	4.6	61.9	148.2



Graph-1 macro nutrients of soil samples of potato plant

Table 2: macro nutrient of samples potato plant ash

S . no.	Macro Nutrients		
	Nitrogen (%)	Phosphorus	Potassium(ppm)
1)	17.45	64.23	103.3
2)	17.36	64.01	103.2
3)	17.48	64.22	103.3



Graph-2 macro nutrients of samples of potato plant ash

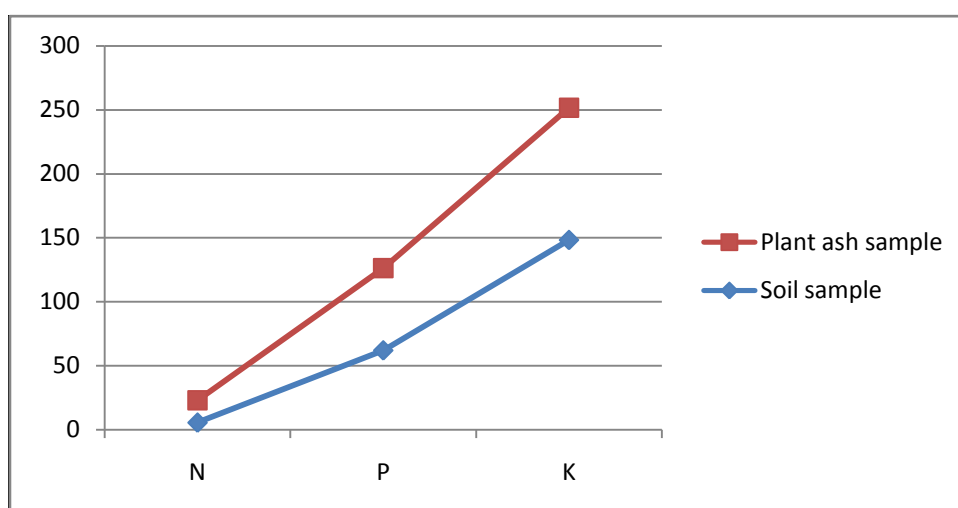
III. Results And Discussion

In collected soil samples of potato plants and their respective plant ash were analyzed by different method and procedure. After analyzing it was found that from macro nutrients the percentage of available nitrogen in soil sample was less than that of in their plant sample.

- The percentage of nitrogen (N) in soil of potato plant was obtained 5.6% and where as nitrogen percentage in plant ash was 17.45%.
- But the phosphorus and potassium are present in adequate amount in soil. As it was found that the concentration of phosphorus (P) and potassium (K) in part per million in soil of potato was 62ppm and 148.3ppm and in potato plant ash the concentration was 4.23ppm and 103.3ppm respectively.

Table-3 comparative data of macro nutrients of soil samples of potato plant & plant ash

Macronutrient	POTATO PLANT	
	Soil sample	Plant ash sample
N	5.6	17.45
P	62	64.23
K	148.2	103.3



Graph-3 macro nutrients of samples of soil of potato plant & potato plant ash

IV. Conclusion

Considering the concept of “soil, plant nutrient index” the soil sample of their respective plant tomato and potato were found in category of moderate fertility status for potassium and phosphorus but having low fertility status for Nitrogen. Deficiency of nitrogen leads to sever disorder in crops such as narcosis. urea can be use to remediate the low fertility power of soil.

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