Practical-11

# Calculation of the Doses of Fertilizers as per the Recommendation for a Particular Vegetable Crop

**Exercise 11.1: Calculation of fertilizer doses for various vegetable crops as per recommendation for N, P and K**

## OBJECTIVE:

- To learn the calculation of doses of fertilizers based on the recommendation of N, P and K for a particular vegetable crop.

**Delivery schedule:** 01 period.

**Student's expectations/learning objective:**

- To know the procedure to calculate the quantity of fertilizers to be applied at different growth stages of different vegetable crops.

**Pre-learning required:** Recommended doses of N, P and K nutrients for important vegetable crops.

**Handouts/material required:** Paper sheet and pen to note down the calculation procedure.

**Introduction:**

Vegetable crops require nutrients for its growth and development which are absorbed from the soil. The most important nutrients are nitrogen (N), phosphorus (P) and potassium (K) and soils do not have enough of these three nutrients to meet the crop requirement. Hence, these are required in relatively large amounts for plant growth. The recommendation of these nutrients is available from various sources. Recommendations are always made in terms of nutrients and not in terms of fertilizers directly because different fertilizers contain nutrients in different amounts. We have to calculate the amount of a particular fertilizer based on the recommended dose of N-P-K nutrients to a particular crop on the basis of nutrient status of the soil of a particular area/state. It is always advisable to go for soil testing and accordingly N-P-K or other additional nutrient requirement can be made. Fertilizer bags are labelled by providing information with regards to

percentage of nitrogen (N), available phosphate (as $P_2O_5$) and soluble potash (as $K_2O$) and represent nitrogen, phosphorous and potassium, commonly referred to as N-P-K. These elements are symbolically represented as N-$P_2O_5$-$K_2O$. Table 1 represents recommended dose of nutrient for important vegetable crops (the doses may vary according to growing area, varieties and cultural practices).

**Table 1: Recommendation of primary nutrients (NPK) for different vegetable crops**

| Crop | Recommended dose of primary nutrients (kg/ha) | | |
|---|---|---|---|
| | N | $P_2O_5$ | $K_2O$ |
| Solanaceous vegetables | 75-100 | 50-75 | 50-60 |
| Potato | 120 | 80 | 60 |
| Onion | 60-150 | 35-150 | 25-120 |
| Pea | 20-50 | 30-60 | 30-60 |
| Cole crops | 120-180 | 75-80 | 60-75 |
| Cucurbits | 60-100 | 50-75 | 50-85 |
| French bean | 30-50 | 60-100 | 30-60 |
| Root vegetables | 50-90 | 40-80 | 40-80 |
| Leafy vegetables | 40-70 | 30-50 | 30-50 |
| Okra | 60-75 | 50-60 | 50-60 |

## Procedure/methodology:

Before calculating the fertilizer dose, one should have the knowledge about

1. The recommended dose of N-$P_2O_5$-$K_2O$ for a crop for which the fertilizer doses have to be calculated.
2. Different growth stages of the crop at which fertilizers are to be applied.
3. The source of fertilizers from which the N-P-K requirements have to be met e.g. CAN/Urea, SSP, MOP *etc.*
4. Per cent nutrient available in that fertilizer *e.g.* urea contain 46% N.

**Source of fertilizers supplying nutrients:** Different fertilizer grade refers to the guaranteed minimum percentage of N, $P_2O_5$, and $K_2O$ contained in the fertilizer material. For example

**Synthetic fertilizers and their nutrient composition**

| Fertilizer | Composition (%) | | |
|---|---|---|---|
| | N | $P_2O_5$ | $K_2O$ |
| Urea | 46 | - | - |
| Calcium ammonium nitrate | 25 | | |
| Single super phosphate | - | 16 | - |
| Double super phosphate | - | 32 | - |
| Diammonium phosphate | 16 | 48 | - |
| Muriate of potash | - | - | 60 |

## Calculation

If the recommended dose of nutrient and the percentage content of that nutrient in the fertilizer are known, the quantity of fertilizer required can be calculated by using following formula.

$$\text{Quantity of fertilizer required (kg)} = \frac{\text{(Recommended dose of nutrient application)}}{\text{(\% Nutrient content present in the fertilizer)}} \times 100$$

**Example:** Calculate the quantity of urea, single super phosphate (SSP) and muriate of potash (MOP) for one hectare of tomato as per application schedule viz., 1/3$^{rd}$ of N + full P and K at the time of planting and remaining N in two equal splits at one month interval. The recommended dose of nutrients is 120 kg N, 75 Kg $P_2O_5$ and 60 kg $K_2O$.

## Solution:

Recommended dose of nutrients in tomato is 120 kg N, 75 Kg $P_2O_5$ and 60 kg $K_2O$.

Urea contains N = 46%

SSP contains $P_2O_5$ = 16%

MOP contains $K_2O$ = 60%

## Applying the formula

Quantity of urea required (kg/ha) $= \frac{120}{46} \times 100 = 261$ kg/ha

Quantity of SSP required (kg/ha) $= \frac{75}{16} \times 100 = 469$kg/ha

Quantity of MOP required (kg/ha) $= \frac{60}{60} \times 100 = 100$ kg/ha

## Application schedule

1/3$^{rd}$ of N + full P and K at planting time and remaining N in two equal splits at on interval of one month.

At planting time: $= \frac{1}{3}$of N *i.e.* 87 kg urea + 469 kg SSP + 100 kg MOP

After one month of planting $= \frac{1}{3}$ of N = 87 kg urea

After two months of planting $= \frac{1}{3}$ of N = 87 kg urea

## Do yourself

**Exercise 1:** A farmer wants to grow open pollinated brinjal variety in one hectare land. The recommended dose for NPK for brinjal is 100:60:60 kg/ha. Calculate the quantities of urea, single super phosphate and muriate of potash for one acre area along with application schedule. (1 acre = 4000 m$^2$ = 2.5 ha)

**Exercise 2:** Mr. Hakam Chand, a farmer has applied 7.5 kg Urea, 35kg SSP and 4.7 kg MOP at the time of field preparation in an area of one *bigha* to grow tomato and then he top dressed 5 kg of urea twice at one month interval. Work out whether the quantity applied is as per recommendation. The recommended dose is 100:75:60 kg N: $P_2O_5$:$K_2O$/ha. (1 *bigha* = 800 m$^2$ or 1 ha = 12.5 *bighas*)