Practical - 14

MANURING WITH FARM YARD MANURE AND CHEMICAL FERTILIZERS IN FRUIT CROPS

Exercise

Manuring with farm yard manure and chemical fertilizers in fruit crops.

Objectives

- To know about use of manures and chemical fertilizers in fruit crops
- To know about different chemical fertilizers as commercial source of nutrients

Delivery schedule: 01 period

Student expectations/learning objectives

- To know how to apply manures and chemical fertilizers in fruit crops.
- To know time of application of manures and fertilizers in fruit crops.

Handouts/material/equipment's & tools required: Practical note book, pen, and pencil to note down the important points related to application of FYM and fertilizers in fruit crops.

Pre-learning required: Pre-requisite knowledge about important nutrients and their role in plant growth and development.

Introduction

For teachers...

- Show various types of fertilizers to students and explain the nutrients present in the fertilizers.
- Ask students to practice the preparation of micronutrient solutions and

In addition to water, sunlight, and carbon dioxide from the air, plants require 13 mineral nutrients that are typically derived from the soil. The macronutrients nitrogen (N), phosphorus (P), potassium (K) are needed by plants in relatively large amounts and often have to be added to the soil. Intermediate amounts of secondary nutrients magnesium (Mg), calcium (Ca), and sulphur (S) are needed by plants. Trace or micronutrients [boron (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo) and zinc (Zn)] are needed in small amounts. Manures and fertilizers are materials that contain nutrients required by plants. Plants cannot differentiate between nutrients from organic, inorganic, liquid or granular sources. All nutrients are absorbed by plant roots as ions and all ions of a given element are identical regardless of the source. Fertilizers can be applied to the soil and taken up by the roots or applied to the plant as a liquid for uptake by the leaves, stems or fruit (foliar application). Soil application is usually less expensive and is better suited for large application rates of the major nutrients and for pre-plant application. For the most part, soil applications by broadcasting is the most economical and efficient method. Foliar application is best for correcting micronutrient deficiencies.

Chemical composition of manures and important commercial fertilizers

Farm yard manure: This is the traditional manure and is mostly readily available to the farmers. Farm yard manure is a decomposed mixture of Cattle dung and urine with straw and litter used as bedding material and residues from the fodder fed to the cattle. The waste material of cattle shed consisting of dung and urine soaked in the refuse of the shade is collected daily and placed in trenches. It becomes ready to apply after 3-4 months. Well rotten farm yard manure contains 0.4 to 1.5 % N, 0.3-0.9 % P_2O_5 and 0.3-1.9% K_2O.

Fertilizers: Inorganic fertilisers are chemicals, which provide plant-food in ample quantities. Fertilisers also have the advantage of smaller bulk, the resultant easy transport. Inorganic fertilizers are grouped into nitrogenous fertilisers, phosphatic fertilisers, potassic fertilisers and soon.

Nitrogen	**N (%)**
Urea	46
Ammonium suphate	21
Prilled ammonium nitrate	34
Ammonium nitrate/calcium carbonate	21-26
Anhydrous ammonia	81
Liquid ferilizers containing ammonium nitrate, ammonia and urea	20-40
Phosphorus	**P_2O_5 (%)**
Superphosphate	18-21
Triple superphosphate	45-47
Ground mineral phosphate	29-33
Basic slag	8-22
Diammonium phosphate	46+18 (Nitrogen)
Potassium	**K_2O (%)**
Potassium chloride (muriate of potash)	60
Potassium sulphate	50

Method of manures application

The methods of applying manures would depend on the type of manure, i.e. i) Bulky manures and ii) Concentrated manures.

Bulky manures like Farm Yard Manure should be broadcast over the entire area and mixed well with the soil by harrowing. The season of application should be such that the manure is not leached out. In heavy rainfall areas, the manures may be applied after the monsoon; whereas in light rainfall areas, manures can be applied during monsoon.

The Concentrated Manures include organic manures such as oil cakes, blood and bone meal etc. The nutrients in the manures are not available quickly, as they have to be broken down by the action of soil

microorganisms and made available to the plant hence, these manures should be applied well in advance before they are required by the trees.

Methods of application of fertilizers

The commercially adopted methods of application of fertilizers are 1. soil application, 2. foliar spray and 3. fertigation

Soil application: Soil application of fertilizers depends on pattern of distribution of active feeding roots of fruit species and time when these nutrients are required most. Inorganic fertilizers such as ammonium sulphate, urea, ammonium nitrate, sodium nitrate, urea, etc. may be applied in a round strip along the drip of the tree. A light irrigation to dissolve the fertilizer may be given. Phosphorus, when applied to the soil, gets fixed up at the spot where it is applied even if plenty of water is present in the soil, and as such, the application of phosphorus should be made near the roots so as to make it readily available to the plant. In plants having superficial roots, phosphates may be applied in top 5 to 7.5 cm layer. In case of plants having their feeding roots deep as in mango, a trench round the drip of the branches about 15 to 25 cm deep should be dug and phosphates applied in that trench and trench filled in. Potash, like nitrogen is readily soluble and is easily available to the plant and, as such, the method of application of potash is similar to that of nitrogen.

Farm yard manure

Neem cake pack

Bone meal

Urea

Diammonium phosphate

Murate of potash

Foliar application: Nutrients can also be applied through foliar sprays to increase the efficacy of the applied nutrients. Foliar application of nitrogen as urea, phosphorus as calcium phosphate and potassium as potassium chloride is practiced in fruit orchards. Response of foliar application can be seen only when the status for a particular nutrient is in the deficient range. However, many plant nutrients are needed in such great quantities that it is impractical to supply them through the foliage. Fertilizer materials suitable for foliar application must be soluble in water. Most of these are salts and when applied in too high' concentration the solution will cause burning of the plant tissue. Often the safe concentration of the fertilizer material in the solution is so low that repeated applications are required to supply the needs of the plant. This is especially true of nitrogen, phosphorus, and potassium. However, to correct the deficiency of micronutrients in fruit trees foliar application is generally recommended.

Source (formula)	% Nutrient
Copper sulphate ($CuSO_4.5H_2O$)	25-35% Cu
Zinc sulphate ($ZnSO_4.7H_2O$)	22-35% Zn
Borax or Sodium borate($Na_2B_4O_7.10\ H_2O$)	10.6% B
Manganese sulphate ($MnSO_4.4H_2O$)	23% Mn
Ammonium molybdate ($(NH_4)_6Mo_7O_{24}.4H_2O$)	54% Mo
Ferrous sulphate ($FeSO_4.7H_2O$)	20% Fe

Fertigation: Advances in micro-irrigation technologies such as drip and under-tree sprinkler have facilitated more wide adoption of fertigation, especially for perennial fruit crops. It is generally believed that fertigation improves nutrient uptake efficiency and preferred over broadcast application of dry fertilizers. It also increases yield and improves quality and reduced loss of nutrients.

Students Activities

1. Calculate the manure and fertilizer requirement of five fruit trees in your locality and prepare a list of fertilizers and FYM which can be applied to those fruit trees.
2. Make solution of micro-nutrients and spray on fruit trees grown in the locality.
3. Apply solid fertilizers to the drip line basin in few fruit tree in the locality.

Study Material

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- Chattopadhyay, T.K. (2008) A textbook on Pomology, Vol. 1-4 (Fruits), Kalyani publishers, Ludhiana, India.
- Sharma, R. R. (2006). Fruit Production: Problems and Solutions. International Book Distributing Company, ISBN 81-8189-102-3