



## Integrated Nutrient Management in Fruit Crops

**Sonia\*, Sahil and Vikas  
Kumar Sharma**

Department of Horticulture,  
CCS Haryana Agriculture  
University, Hisar (Haryana) -  
125004



Open Access

\*Corresponding Author

**Sonia\***

### Article History

Received: 1. 3.2026

Revised: 5. 3.2026

Accepted: 10. 3.2026

This article is published under the  
terms of the [Creative Commons  
Attribution License 4.0.](#)

### INTRODUCTION

Fruit crops play a vital role in agriculture by providing nutritional security, improving farm income, and contributing to the overall economy. However, achieving high productivity and maintaining fruit quality require balanced and adequate nutrient supply to plants. Continuous use of chemical fertilizers alone often leads to soil degradation, nutrient imbalance, decline in soil organic matter, and reduced soil microbial activity. To overcome these problems and sustain long-term productivity, the concept of **Integrated Nutrient Management (INM)** has gained importance in modern horticulture.

Integrated Nutrient Management refers to the combined and efficient use of chemical fertilizers, organic manures, crop residues, green manures, and biofertilizers to maintain soil fertility and supply essential nutrients to crops. The primary objective of INM is to achieve optimum crop productivity while maintaining soil health and minimizing environmental pollution. In fruit crops, which are perennial in nature and remain in the field for many years, INM plays a particularly important role in sustaining orchard productivity.

### Concept of Integrated Nutrient Management

The concept of Integrated Nutrient Management is based on maintaining a balance between nutrient removal by crops and nutrient addition to the soil. Fruit trees continuously absorb nutrients from the soil for their growth, flowering, and fruit development. If these nutrients are not replenished properly, soil fertility gradually declines, leading to reduced yield and fruit quality.

INM involves the judicious use of different nutrient sources such as chemical fertilizers, organic manures, green manures, compost, vermicompost, and biofertilizers. Each of these sources has its own advantages. Chemical fertilizers provide nutrients in readily available forms and ensure quick plant response, whereas organic manures improve soil structure, increase organic matter, and enhance microbial activity. Biofertilizers help in biological nitrogen fixation, phosphorus solubilization, and improved nutrient uptake by plants.

By integrating these nutrient sources, INM ensures a continuous and balanced supply of nutrients to fruit crops while maintaining soil health and sustainability.

## **Components of Integrated Nutrient Management**

### **1. Chemical Fertilizers**

Chemical fertilizers are an important source of essential nutrients such as nitrogen (N), phosphorus (P), and potassium (K). These nutrients are required in large quantities by fruit crops for proper vegetative growth, flowering, fruit set, and fruit development. However, excessive or unbalanced use of chemical fertilizers can lead to nutrient imbalance, soil degradation, and environmental pollution. In INM systems, chemical fertilizers are applied in recommended doses based on soil testing and crop requirements.

### **2. Organic Manures**

Organic manures such as farmyard manure (FYM), compost, vermicompost, and poultry manure are valuable sources of nutrients and organic matter. These materials improve soil structure, enhance water-holding capacity, and promote microbial activity. Organic manures release nutrients slowly and provide long-term benefits to the soil. In fruit orchards, the regular application of organic manures helps maintain soil fertility and improves plant growth.

### **3. Green Manuring**

Green manuring involves growing specific crops such as dhaincha, sunhemp, or cowpea and incorporating them into the soil while still green. These crops add organic matter and nitrogen to the soil. Green manuring improves soil fertility

and supports better nutrient availability for fruit crops.

### **4. Biofertilizers**

Biofertilizers are living microorganisms that enhance nutrient availability to plants. Examples include **Rhizobium, Azotobacter, Azospirillum, and phosphate-solubilizing bacteria (PSB)**. These microorganisms fix atmospheric nitrogen, solubilize phosphorus, and promote plant growth by producing growth-promoting substances. Biofertilizers are eco-friendly and help reduce the dependence on chemical fertilizers.

### **5. Crop Residues and Mulching**

Crop residues such as straw, leaves, and pruned branches can be incorporated into the soil to increase organic matter content. Mulching with organic materials also helps conserve soil moisture, regulate soil temperature, and gradually release nutrients into the soil.

## **Importance of Integrated Nutrient Management in Fruit Crops**

Fruit crops require a continuous supply of nutrients throughout their growth period. Integrated Nutrient Management ensures balanced nutrient availability and improves the efficiency of nutrient use. Some of the important roles of INM in fruit crops are described below.

### **Improvement of Soil Fertility**

INM helps maintain soil fertility by adding organic matter and replenishing nutrients removed by crops. Organic manures improve soil structure and increase microbial activity, which enhances nutrient cycling.

### **Increased Yield and Productivity**

Balanced nutrient supply promotes healthy plant growth, better flowering, improved fruit set, and higher yields. Fruit crops grown under INM systems generally produce higher yields compared to those receiving only chemical fertilizers.

### **Improved Fruit Quality**

Nutrient balance plays an important role in determining fruit quality parameters such as size, color, taste, and shelf life. INM helps improve these quality characteristics by providing essential nutrients in balanced proportions.

### Enhanced Nutrient Use Efficiency

The combined use of organic and inorganic nutrient sources improves the efficiency of fertilizer use. Organic matter helps retain nutrients in the soil and reduces nutrient losses through leaching or volatilization.

### Environmental Sustainability

Excessive use of chemical fertilizers can cause soil pollution and water contamination. INM reduces the dependence on chemical fertilizers and promotes eco-friendly nutrient management practices.

### Application of INM in Major Fruit Crops

Integrated Nutrient Management practices can be successfully applied in various fruit crops.

- **Mango:** Application of FYM along with recommended doses of nitrogen, phosphorus, and potassium fertilizers improves tree growth and fruit yield. Biofertilizers such as Azotobacter and PSB further enhance nutrient availability.
- **Citrus:** Regular application of organic manures combined with chemical fertilizers improves fruit size, juice content, and overall yield.
- **Banana:** Banana requires high nutrient input. The integration of organic manures, chemical fertilizers, and biofertilizers significantly increases productivity.
- **Guava:** Application of compost, vermicompost, and biofertilizers along with balanced fertilizer doses improves fruit quality and yield.
- **Pomegranate:** Integrated nutrient management improves flowering, fruit set, and fruit quality in pomegranate orchards.

### Challenges in Integrated Nutrient Management

Although INM offers numerous benefits, certain challenges may affect its adoption.

1. **Limited availability of organic manures:** In some regions, sufficient quantities of organic manures may not be available.
2. **Lack of awareness among farmers:** Many farmers still rely heavily on chemical fertilizers and may not be fully aware of the benefits of INM.

3. **Additional labor requirement:** Application and management of organic inputs may require additional labor.

4. **Slow nutrient release:** Organic sources release nutrients slowly, which may not meet the immediate nutrient demand of crops.

Despite these challenges, proper training, extension services, and government support can promote the adoption of INM practices among farmers.

### Role of Integrated Nutrient Management in Sustainable Horticulture

Sustainable horticulture aims to produce high-quality fruits while maintaining soil health and protecting the environment. Integrated Nutrient Management plays a key role in achieving this goal. By improving soil fertility, increasing nutrient use efficiency, and reducing chemical fertilizer dependency, INM helps maintain long-term orchard productivity.

Furthermore, INM enhances soil biodiversity and promotes beneficial microorganisms that contribute to nutrient cycling and plant health. These benefits ultimately lead to improved resilience of fruit crops against environmental stresses.

### CONCLUSION

Integrated Nutrient Management is an essential strategy for sustainable fruit crop production. It involves the combined use of chemical fertilizers, organic manures, green manures, biofertilizers, and crop residues to provide balanced nutrition to plants while maintaining soil fertility. The adoption of INM in fruit orchards helps improve yield, enhance fruit quality, and promote efficient use of resources.

Although certain challenges exist, the long-term benefits of INM far outweigh its limitations. By adopting integrated nutrient management practices, farmers can ensure sustainable productivity, improved soil health, and environmental conservation. Therefore, promoting INM in fruit crop production is essential for achieving sustainable horticultural development and meeting the growing demand for nutritious fruits in the future.