Available online at
http://agrospheresmagazine.vitalbiotech.org/

ISSN (E): 2582 – 7022

Agrospheres:e- Newsletter, (2023) *4*(5), 14-17

Article ID: 490

Integrated Nutrient Management: A Sustainable Way to Enhance Yield of Vegetables

Ankit Singh[1*], Abhilash Singh[1], Vijay Kumar[1], and Shubham Sahgal[2]

[1]Assistant Professor and [2]Lab assistant, Department of Agriculture, Shivalik Institute of Professional Studies, Dehradun, Uttarakhand

INTRODUCTION

Soil is a valuable natural resource, just like water and air. The ability of a life-support system and the socio-economic development of a country are heavily influenced by the appropriate usage of soil. The agricultural period has shifted from resource-depleting to resource-conserving technology and practices, which will aid in improving crop yield while also preserving soil health for future generations. Aside from achieving food security, the green revolution introduces a number of risks, such as deterioration of the organic carbon in the soil, decreased factor productivity, imbalances in NPK and micronutrient use, and disparities in fertiliser consumption, among others. Integrated Nutrient Management (INM) offers a tremendous potential not only for sustainable soil but also for increased crop output.

Open Access

*Corresponding Author
Ankit Singh*

Article History
Received: 2.05.2023
Revised: 6.05.2023
Accepted: 10.05.2023

ISSN (E): 2582 – 7022

Concept of INM

The continuous and imbalance use of chemical fertilizers is adversely affecting the sustainability of agricultural production besides causing environmental pollution. The major issue for the sustainable agricultural production will be management of soil organic carbon and rational use of organic inputs such as animal manure, crop residues, green manure, sewage sludge and wastes known as integrated plant resource management. However, since organic manure cannot meet the total nutrient needs of modern agriculture, hence integrated use of nutrients from fertilizers and organic sources will be the need of the time.

Principles of integrated nutrient management:

INM is a holistic approach of plant nutrient management by considering the totality of the farm resources that can be used as plant nutrient and is based on three principles:

- Maximize the use of organic material
- Ensure access to inorganic fertilizers
- Improve the efficiency of their use and minimize the loss of plant nutrients.

Objectives of INM

- To maintain or improve soil productivity by combining mineral fertilisers with organic and biological plant nutrients in a balanced manner,
- To increase the stock of plant nutrients into the soil,
- To improve the efficiency of plant nutrients, hence improving environmental health,
- To boost the availability of nutrients from all sources in the soil during growing seasons.
- To balance crop nutrient demand with crop nutrient supply from all sources *via* the labile soil nutrient pool, both in area (the rooting zone) and time (the growing season).
- To optimise the function of the soil biosphere in terms of specific functions such as organic matter decomposition (mineralization), pathogenic organism control by natural enemies (predators), biological soil structure formation, phyotoxic compound decomposition, and so on.

Components of INM

I. **Organic Manure:**

It is organic waste material of plant or animal origin which is used to add fertility of the soil with enhancement of soil health.

a) **Farm yard manure (FYM):** FYM is composed of urine and dung of farm animals along with litter and left over material from greens feed or roughages to the farm animals. It contains, on an average 0.5% N, 0.2 % P_2O_5 and 0.5 % K_2O along with some essential micronutrients.

b) **Compost:** Mass developed Produced after rotting of organic matter is called compost. Farm wastes like paddy straw, Wheat straw, sugarcane trash, mustard stump, weeds or other similar materials are commonly used to make compost. Such types of compost are called farm compost. In contrast, compost made from night soil, street sweeping, dustbin refuse is known as town compost. Farm compost contains 0.5% nitrogen, 0.5 % phosphorus and 0.5% potassium while Town compost contains 1.4% N, 1.00% P and 1.4% K.

c) **Vermicompost:** Vermicompost is produced by using earthworm. The earthworms
consume organic matter and excrete it as a cast. This cast is used as vermicompost. On an average it contains 3.0 % N, 1.0 % P and 1.5 % K.

d) **Green manure:** To restore fertility and productivity of soil, some crops are turned into soil while still they are green. This practice is known as green manuring. Plants of leguminaceae group are generally used for green manuring. These crops being capable of nitrogen fixing, add nitrogen into the soil.

II. **Biofertilizers:** *Azotobacter* and Phosphate solublizers are the main biofertilizers used in vegetable cultivation. *Azotobacter* is free-living nitrogen fixing bacteria which fixes upto 30 kg nitrogen per hectare. It also produces hormones like Indole Acetic Acid (IAA) and Vitamins like biotin, folic acid and different B-groups are also formed. The application of *Azotobacter* along with organic matter and fertilizer ensures good germination, growth, development and production.

III. **Inorganic fertilizers:** These are chemical substance which is manufactured artificially. Fertilizer is a rich source of plant nutrient and applied in soil to supply particular nutrient to plant in which soil is deficient. It is very quick in releasing the nutrients and help in early establishment and development of plants.

There are mainly three types of fertilizers:

- **Nitrogenous fertilizers**: These types of fertilizers contain only nitrogen. Nitrogen may be found in nitrate (NO_3) or ammonical form (NO_4) in the fertilizers. e.g. Urea (46% N) , Ammonium sulphate (21% N), Ammonium nitrate (34%).
- **Phosphatic fertilizers**: These fertilizers contain only phosphorus and it contains phosphorus in the form of P_2O_5. e.g. Single super phosphate (18% P_2O_5), double super phosphate (32% P_2O_5), Triple super phosphate (46%- 48% P_2O_5).
- **Potassic fertilizers**: Potash is required in relatively larger amount than any other nutrients except nitrogen. Potash is supplied to the plants using potassic fertilizers and it contains potassium in the form of K_2O. e.g. Potassium chloride (MOP) (60% K_2O), Potassium sulphate (SOP) (48% K_2O).

Advantages of INM

- It enhances the availability of applied as well as native soil nutrients
- Synchronizes the nutrient demand of the crop with nutrient supply from native and applied sources.
- Integrated use of organic and inorganic sources provides balanced nutrition to crops and minimizes the antagonistic effects resulting from hidden deficiencies and nutrient imbalance.
- It Improves and sustains the physical, chemical and biological functioning of soil.

  Integrated use of nutrient sources minimizes the deterioration of soil, water and ecosystem by promoting carbon sequestration, reducing nutrient losses to ground and surface water bodies and to atmosphere.

Constraints of INM

- Lack of organic material
- Non-availability of soil testing facilities.
- Non-availability of bio-fertilizers.
- Difficulties in growing green manure crops.
- Lack of knowledge and poor advisory services.
- High cost of chemical fertilizers.
- Non-availability of water.

e) Integrated Nutrient Management in some commercial vegetable crops

Crop	INM Option
Brinjal (*Solanum melongena*)	Incorporation of 50 kg nitrogen through urea and 50 kg nitrogen through poultry manure per hectare help in increasing fruit yield of brinjal and sustained soil health
Okra (*Abelmoschus esculentus*)	1. In Assam application of N, P, K @ 37.5:37.5:37.5 kg per hectare along with vermicompost @ 1.0 t per hectare mixed with microbial consortia @ 3.5 kg per hectare increased fruit yield in okra and also sustaining soil health

	2. Combination of N, P, K @ 50:50:50 kg per hectare along with FYM @ 10 t per hectare increasing yield fruit yield.
Tomato (*Solanum lycopersicum*)	Combination of FYM @ 40 t per hectare and half dose of NPK (75:30:30) kg per hectare substituted 50% of recommended dose of fertilizer and rise the yield compare to only use of fertilizer.
Chilli (*Capsicum annum*)	1. At Dapoli (Maharastra) FYM @ 10 t per hectare + 50% recommended dose of fertilizers found beneficial in increasing yield. 2. Combining a soil test-based recommended fertiliser dose (50 percent) with Azospirillum + PSB was increasing production and return.
Onion (*Allium cepa*)	At Wadura of Jammu and Kashmir application of 52.5 kg nitrogen per hectare with use of *azotobacter* biofertilizer recorded higher onion yield.
Potato (*Solanum tuberosum*)	Application of 75% recommended dose of fertilizer along with FYM @ 20 t per hectare increased tuber yield of potato in clay soils of Palampur.
Radish (*Raphanus sativus*)	Combine application of 75 % R.D.F through chemical fertilizer with 25% through FYM found beneficial in terms of yield and C:B ratio.
Broccoli (*Brassica oleracea* var. *Italica*)	Application of 75 percent NPK + 25 percent Vermicompost + *Azospirillum* performed well in terms of growth, yield and quality of Broccoli compare to solely use of chemical fertilizer.

CONCLUSION

In the view of the importance of INM in vegetable crops which enhances the quantity as well as quality of vegetable crops like Chilli, carrot, Tomato, cabbage, radish, etc. which improves soil health along with nutritional values of vegetables. By combine uses of natural and inorganic fertilizers with bio- fertilizers leads to increase in yield of vegetables and reduces the cries of vegetable crops. By using INM methods input cost may decreases with enhance the output to farmers.