AgriCos e-Newsletter
ISSN: 2582-7049
Volume : 01 Issue : 04 August 2020 Article No: 11

Integrated Plant Nutrient System (IPNS)

Palsande V. N.
Assistant Professor, College of Horticulture, Mulde, Kudal, Sindhudurg, BSKKV, Dapoli, (M. S.)

SUMMARY

The IPNS increase the fertility use efficiency and the return to investment of fertilizers. It uses a balance system of crop nutrition management and accounts for the different amount of plant nutrition, it attempts to keep a balance between crop removal and nutrient additional to the soil. Adequate plant nutrient supply holds the key for improving the food grain production and sustaining soil health. The supply of nutrients in the form of organic manures helps in retaining more moisture, thereby enhancing the water and nutrients use efficiencies. Integrated use of inorganic and organic sources of plant nutrients has a tremendous potential not only in sustaining agricultural productivity and soil health but also in substituting a part of fertilizer requirement by organics for different crops and cropping systems.

INTRODUCTION

Integrated plant nutrient system (IPNS) or Integrated nutrient management (INM) is the combined application of chemical fertilizers along with organic resources materials like organic manures, green manures, biofertilizer and other organic decomposable material for crop production. IPNS is the intelligent and combined use of inorganic, organic and biological resources so as to sustain optimum yields, improve or maintain the soil chemical and physical properties and provide crop nutrition packages which are technically sound, economically attractive, practically feasible and environmentally safe. The principal aim of the integrated approach is to utilize all the possible sources of plant nutrition in a judicious and efficient manner. The basic concept of IPNS is the promotion and maintenance of soil fertility for sustaining crop productivity through optimum use of all possible sources of nutrients like organic, inorganic and biological in an integrated manner appropriate to each farming situation.

Main objectives of IPNS

- To reduce the dependence on chemical fertilizers.
- To maintain productivity on sustainable basis without affecting soil health.
- To conserve locally available resources & utilize them judiciously.
- To reduce the gap between nutrients used & nutrients harvested by the crop.
- To improve physical, chemical & biological properties of soil.
- To make soil healthy by providing balanced nutrients through different nutrient sources.
- To overcome or reduce the ill effects of continuous use of only inorganic chemical fertilizers.
- To improve economical status of farmers.
- To increase the fertilizer use efficiency (FUE).
- Increases soil organic matter through its application.
- Reduces leaching losses of nutrients

Components of IPNS

IPNS mainly emphasizes the integrated use of all the essential nutrients from different sources like chemical fertilizers, organic manures, green manures, bio-fertilizers, legume crops, locally available plant resources in a balanced proportion for sustainable soil health and productivity.

1. Soil Sources:

a. Maintain Physical Properties of Soil

Physical properties such as soil aggregation, soil texture, structure, aeration, water holding capacity (WHC), infiltration rate, etc., should be maintained regularly through better cultivation practices and organic manure applications to maintain soil fertility & nutrient availability.

b. Management of Problematic Soil

Problematic soils such as acid soils, saline and alkaline soils, water logged soils are known to decrease the productivity of the soil. These soils should be regularly managed and reclaimed through the application of soil amendments such as lime for acid soil, gypsum for alkali soils and other organic and inorganic materials based on soil test results. It helps to improve soil fertility and productivity and sustain the yield.

2. Use of Inorganic Fertilizers

They are very important for sustaining and increasing food production. Different kinds of fertilizers are commercially available in the market for all the major and micronutrients. However, they are costly inputs and their excessive use may deteriorate the soil quality and food quality. Hence, there is a need to improve their use efficiency through efficient and balanced fertilizer management and essentially follow the four R's formula for judicious and effective fertilizer management. They are

- Right Type of fertilizers.
- Right Dose of fertilizers.
- Right Method of application.
- Right Time of application.

3. Use of Organic Manures/ Materials:

Due to intensive cultivation of soil and less organic manure application, the soils are low in organic matter status. A decrease in soil organic matter results in compact soil, poor aeration and low infiltration and water holding capacity and also low fertility status. The organic matter status in soils can be improved and maintained by constant addition of organic manures such as FYM, compost, green manures, poultry manures, vermicompost, oilcakes etc. Organic matter is good source of macro and micro nutrients, and more over improves physical, chemical and biological properties soil.

a. Vermicompost

The use of earthworms in organic waste management has been termed as vermicomposting and the compost is generally called as vermicompost. The much interact in vermicomposting has been notified due to the fact that earthworms play an important role in soil improvement, organic matter decomposition and in enhancing plant growth. The worm commonly used for this purpose is *Eisenia foetida* and *Eudrillus eugeniae* which is potential reagent in breaking down animal waste. On an average, it contains 1.6 % N, 5.04 % P_2O_5 and 0.8 % K_2O. Apart from this it also contains hormones like auxins and cytokinins, enzymes, vitamins and useful micro-organisms like bacteria, actinomycetes, protozoa's, fungi and others.

b. Green Manuring

Green manuring is the cheapest resource for building up soil fertility and supplementing plant nutrients, especially N. The practice of ploughing in of undecomposed green plant material into the soil for improving the physical condition as well as fertility of the soil is called as green manuring. Green manures may be grown *in situ* by raising a legume such as *Sesbania aculeata* (dhaincha), *Crotolaria junica* (sunhemp) and *Vigna unguiculata* (cowpea) are capable of accumulating 4-5 t ha^{-1} of dry mass and about 100 kg N ha^{-1} in 50-60 days. Integrated use of green manures with recommended chemical fertilizers increases the yields of field crops.

4. Use of Biological Biofertilizers:

Biofertilizers are cultures of microorganisms (bacteria, fungi, algae). Their use benefits the soil and plants growth by providing N & P and also brings about the rapid mineralization of organic materials in soils. They are capable fixing N, solubilizing and mobilizing the phosphorus and mineralizing organic matter in soil. Their incorporation improves the physical and biological properties of soil.

No	Name of organism	Crops for which used	Use
1. Symbiotic N fixation			
a.	*Rhizobium*	Leguminous, pulses, fodder crops & groundnut	Seed treatment
2. Non symbiotic N fixation			
a.	*Azotobacter*	Cereals, vegetables, millets and cotton	Seed treatment

b.	*Azospirillium*	Cereals and millets,	Seed treatment
		Vegetable crops	Soil application
c.	Blue green algae	Paddy	Soil application
d.	Azola	Paddy	Soil application
3.	**PSB**	Millet, Groundnut, Wheat and Paddy	Seed treatment

5. Crop Residues

Residues left out after the harvest of the economic portion is called as crop residues on an average, it contains 0.5 per cent N, 0.6 per cent P_2O_5 and 1.5 per cent K_2O. Crop residues mostly are staple food of cattle and dry fodder for animal. In certain regions where mechanical harvesting is done the crop residues are left behind in the field which act as a source of nutrient supply. Crop residues improve the soil physical properties, micronutrient supply and productivity. The major advantages of residue incorporation is the increase of the soil organic carbon, total N and available K. The incorporation of crop residues on a long form basis also increased the DTPA extractable Zn, Cu, Fe and Mn content in soil. Judicious use of crop residues is an important consideration in reducing the nutrient losses through leaching, volatization or fixation especially under adverse soil conditions.

CONCLUSION

Integrated Plant Nutrient Management aims to optimize the condition of the soil, with regard to its physical, chemical, biological and hydrological properties, for the purpose of enhancing farm productivity, whilst minimizing land degradation. There is now greater awareness that IPNM can, not only provide tangible benefits in terms of higher yields, but simultaneously and almost imperceptibly conserve the soil resource itself. The field level management practices considered under the heading of IPNM would include the use of farmyard manures, natural and mineral fertilizers, soil amendments, crop residues and farm wastes, agroforestry and tillage practices, green manures, cover crops, legumes, intercropping, crop rotations, fallows, irrigation, drainage, plus a variety of other agronomic, vegetative and structural measures designed to conserve both water and soil. The underlying principles on how best to manage soils, nutrients, water, crops and vegetation to improve and sustain soil fertility and land productivity and their processes are derived from the essential soil functions necessary for plant growth.

REFERENCES

Das D. K. Introductory Soil Science, 3rd revised and Enlarged Ed, Kalyani Publisher, Ludhiana. 2011.

Gopal Krishan and Saha S.K. (2008). Integrated plant nutrient system (IPNS) – A practices for sustainable agriculture resource management. Indian Journal of Environment and Ecoplanning 15(1-2): 15-28.

Gupta P. A. A Handbook of Soil, Fertilizer and Manure. 2nd Enlarge Ed, Jodhapur, Agribios (India). 2012.

http://ecoursesonline.iasri.res.in

http://www.fao.org

Singh R.N., Singh Surendra, Prasad S.S., Singh V.K. and Pramod Kumar (2011). Effect of integrated nutrient management on soil fertility, nutrient uptake and yield of rice-pea cropping system on an upland acid soil of Jharkhand. Journal of the Indian Society of Soil Science, 59 (2): 158-163.