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Precision Nutrient Management

Vivek Kumar Patel[1], Saipayan Ghosh[2] and Subhashi Kumar[1]

[1]Department of Plant Pathology,
[2]Department of Horticulture,
Post Graduate College of Agriculture, RPCAU, Pusa, Samastipur- 848125 (Bihar)

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Abstract

Precision nutrient management is as one of the highly relevant components of the precision agriculture which regulate various issues for improving profitability, productivity, sustainability and climatic variation related effects. Different strategies related to soil test on the basis of various recommendations on management of nutrients have been applied for overall hike in production of food grain. It has been inferred that evaluation of nutrient status in plants nutrient has been considered to be more efficient strategy. The presence of various rapid and non-destructive measures (including optical sensors, chlorophyll meter and leaf color chart) has been applied for quantification of various spectral characteristics of leaves depending upon the nitrogen application in crops. The various inexpensive and economically feasible tools for farmers including leaf color chart are gaining relevance and will become important tool for payment of the nitrogen fertilizers. The rate of adaptability of various nutrients for precision management is highly demanding in developing countries. However, the management strategies need to be popularized in developed countries of the world based upon the research and adoption of precision management of nutrients other than nitrogen has been on nutrient management models.

Keywords: chlorophyll meter, nutrient, precision, sustainability

Introduction

Precision nutrient management is an essential part of precision agriculture and governs all of the important challenges of increasing productivity, sustainability, profitability, and dealing with climate change-related turbulences. Precision agriculture has already reached extraordinary levels of growth in affluent countries. Asia's developing countries have been comparatively slow to comprehend, develop, and use precision agricultural practices. Furthermore, precision agriculture is sometimes misunderstood in the developed world as a complex technology intervention intended for huge agricultural fields. This is a fallacy concerning precision agriculture, and there is no documentation about the'scale' or'size' requirements for precision farming. Precision agriculture has a various meanings and concepts. Precision agriculture is defined as the science of applying the "right-input" at the "right-time," the "right-amount," the "right-place," and the "right-manner" to improve productivity, conserve natural resources, and avoid any ecological or social difficulties.

Definition and concept

Precision Nutrient Management includes applying nitrogen, phosphorus, and lime in a site-specific manner (using specialised application equipment or multiple application events) based on site-specific recommendations for each GPS-referenced sampling point in order to reduce nutrient entry into surface and groundwater and improve water quality. Precision nutrient management is the science of applying advanced, innovative, cutting-edge, site-specific technology to regulate spatial and temporal variability in natural nutrient supply from soil in order to improve agricultural production systems' productivity, efficiency, and profitability. It needs an understanding of soil spatial variability (Jin and Jiang, 2002). Under agricultural systems, the spatial availability of nutrients in soil is the combined effect of soil chemical, physical, and biological qualities, landscape attributes such as slope and elevation, environmental factors, and management techniques. (**Atreya *et al.*, 2008; Barton *et al.*, 2004, Wang *et al.*, 2009).**

Precision Nutrient Management Tools and Techniques

I. Optical Sensors

There are several types of optical sensors, including multispectral and hyperspectral sensors. Univariate and multivariate regression techniques calculated as spectral indices can be used to interpret spectral reflectance data.

II. Chlorophyll Meters

Chlorophyll meters are reliable alternatives to traditional tissue analysis as plant N nutritional diagnostic tools. Most widely used chlorophyll meter is the hand-held Minolta SPAD-502. There are two approaches used to manage fertilizer N using SPAD meter:

Fixed Threshold Value Approach

Fertilizer-N is applied if the chlorophyll metre reading falls below the predetermined threshold value. The SPAD threshold value, which defines the limit below which yield is reduced, must be pre-determined. Bijay-Singh et al. (2002) used SPAD to determine the need for N topdressing in wheat at the maximal tillering stage.

III. Leaf Color Chart

The leaf colour chart is a high-quality plastic strip with many hues of green ranging from mild yellowish green to dark green. The LCC score of the first completely exposed leaf is evaluated every 7-10 days from 15-20 days after transplanting/sowing till blooming begins, and a specified amount of fertilizer-N is administered whenever the colour of rice leaves falls below the crucial LCC score.

IV. Omission Plot Technique

The omission plot technique is used to estimate the amount of fertiliser needed to meet a yield target. In this strategy, all of the key nutrients are used except the nutrient of interest, which is ignored. The approach estimates the soil's indigenous nutrient supply.

V. Nutrient Management Models

Nutrient Expert (NE) and the QUEFTS model are commonly used computer-based decision support systems in crop production for precision nutrient management. The models are intended to take into account regional and temporal variations in nutrient supply and to ensure need-based nutrient treatments.

VI. Aerial Imagery and Site Maps

Precision nutrient management plans also make use of aerial photography, site maps, and soil survey maps. These tools, which include knowledge of prior land use(s), are utilised to make judgments about nutrient management.

Integrated Plant Nutrient Management

Integrated plant nutrient management (IPNM), which takes use of the recycling of nutrients in manures and crop residues and supplements them with commercial fertilisers, offers numerous opportunities for resource conservation, environmental protection, and more cost-effective farming. In 2000, the overall nutritional (NPK) potential of various organic resources was assessed to be 14.85 Mt, with a projected increase to 32.41 Mt by 2025.

Conclusion

Precision nutrient management practices including the various applications of optical sensors, chlorophyll meter, omission plot technique, leaf color chart and crop models can serve for providing guidance in deciding need- based nutrient applications and thus

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improvement of nutrient use efficiencies for achievement of high yield levels in various crops. The precision practices take care of spatial and temporal variability for supply of nutrients and facilitation of synchronization in plant demand and soil supply. The management of various nutrients can be best done through omission plot technique and crop models.

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