STUDIES ON INTEGRATED NUTRIENT MANAGEMENT ON WHEAT

SYNOPSIS

SUBMITTED FOR THE DEGREE OF

MASTER OF SCIENCE (Agriculture)

IN

AGRONOMY

Submitted by:

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CERTIFICATE

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DECLARATION

I hereby declare that the project work entitled **"Studies of Integrated Nutrient Management (INM) on wheat"** is an authentic work carried out at Lovely Professional University as a requirement of project work for the award of degree of Master of Science in Agronomy, under the guidance of **Mr. Vinay Kumar,** Assistant professor, Department of Agronomy, School of Agriculture, Lovely Professional University, Phagwara, Punjab.

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I. INTRODUCTION

Wheat (*Triticum aestivum* L.) is one of the most important food grain crops in area, production and productivity after rice. In the world, wheat is known to be cultivated in at least 43 countries. China is the leading country in wheat cultivation and are followed by India, Thailand, Indonesia and U.S.A. and total production of wheat was 647 million tonnes under area of 218 million hectares with a productivity of 2960 kg/ha (FAO, 2012). It is the staple food for millions of Indians, particularly in north-western and northern parts of the country. It is recorded that the area (lakh/ha), production (million/tonnes) and yield (kg/ha) of India is 433.88, 93.50 and 3093 respectively (Annual Report, 2015-16).

This production is made possible by the use of chemical fertilizers but prolonged use of these fertilizers has negative effect in soil fertility and productivity. Chemical fertilizers have been playing an important role in increasing the yield of crops to meet the needs of increasing population. But they are costly and prolonged use of it causes decline of soil fertility by damaging the physical, chemical characteristics and soil microbial population. The effects include decline in total organic carbon (TOC), basic cation content and pH of the soil. Besides all these it also resulted in population decline of soil microbial biomass, bacteria, actinomycetes and fungi (A. Belay *et al.,* 2002). It also affects soil texture and structure thereby reducing the water holding capacity of soil. But it has been accepted and understood that with the use of organic fertilizers we can avoid these problems even though it has low content of nutrients when compared with chemical fertilizers. To solve the problem of soil fertility decline and environment pollution fertilizers both chemical and organic can be applied to the plants in optimum doses. Following this practice, it has been observed that there has been a significant increase in microbial biomass carbon (MBC) and microbial biomass nitrogen (MBN). Application of organic manure also increases soil dehydrogenase, alkaline phosphatases, β-glucosidasen and urease activity significantly (Enke Liu *et al.,* 2010). Approved organic fertilizers (FYM, Compost, Vermicompost, green manure etc.) can be used for improving soil fertility by substituting the fossil fuel based inorganic fertilizers(up to 50%) to increase productivity of soil without depleting or sacrificing natural resources for future generations.

To meet the demand of the increasing population with limited area and also to protect soil health, we need to supply nutrients through integrated way. Integrated Nutrient Management is the method of supplying nutrients to the soil for plants through chemical fertilizers

combined with organic manures. But this has to be applied in balanced proportion and in optimum quantity. Imbalanced use of fertilizers continuously for a long time will result in deterioration of soil fertility and productivity. For a sustainable agriculture, integrated supply of plant nutrients is the best method.

Considering the importance of the above factors, an experiment in planned during the rabi season of 2017–2018 at the research farm of Lovely Professional University, Phagwara with the following objectives:

- To study the effect of inorganic and bio fertilizer on growth and yield of wheat.
- To identify the best combination of inorganic and bio fertilizer.

II. REVIEW OF LITERATURE

Influence of chemical fertilizers on wheat:

Belay *et al.*,(2002) reported that use of chemical fertilizers resulted in population decline of soil microbial biomass, bacteria, actinomycetes and fungi.

Islam *et al.*,(2014) observed that application of chemical fertilizers based on soil test basis produces the tallest plant height of 90.17cm in wheat.

Ahmad *et at.,* (2015) observed that application of higher dose nitrogen and sulphur i.e. 120 kg N/ha and 45 kg S/ha respectively delayed booting, heading, anthesis and maturity of wheat and triticale.

Aftar *et al.,* (2010) reported that over application of fertilizers and pesticides increases Cd, Pb and As concentration in wheat cultivated soil.

Abedi *et al.,* (2010) reported that with the increase in nitrogen level, yield components such as spikes/plant, seeds/spike, and 1000 kernel weight also increases significantly.

Sun *et al.,* (2015) reported that a significant decrease of bacterial diversity in terms of species richness (i.e. number of unique operational taxonomic units (OTU)), Faith's index of phylogenetic diversity and Chao 1 index was found with the long-term application of NPK chemical fertilizers.

Influence of Farm Yard Manure (FYM) on wheat:

Integrated use of urea and FYM at 75:25 or 50:50 ratios (N basis) has produced maximum yields and is therefore recommended for profitable wheat yield and sustainable soil fertility. (Zahir Shah and Mian Ishaq Ahmad, 2006)

FYM applied to wheat crop has carry over effect on maize crop in wheat-maize cropping system and can restore the crop productivity of eroded lands. (Ali *et al.,*2008)

Foliar application of micro nutrients (B, Mo and Zn) along with FYM gives the highest qualitative yield characteristics in wheat crop. (Ghamry *et al.,*2009)

Application of FYM at 9 tons/ha and phosphorus @120kg/ha improves yield and yield components on wheat. (Aatif *et al.,*2017)

Influence of Azotobacter on Wheat:

Inoculation with salinity tolerant *Azotobacter* strains caused significant increase in total nitrogen, biomass and grain yield of wheat. (Chaudhary *et al.,* 2013)

Inoculation of *Azotobacter chroococcum* along with the application of N @90kg/ha increases the grain yield of wheat by 19.2%, (Zambre *et al.,* 1984)

Azotobacter and Pseudomonas inoculation plus fertilization reduced chemical fertilizers application (25-50 %) in wheat cultivation. (Abdol amir Yousefi and Abdol Rahman Barzegar., 2014)

The inoculation of Azotobacter alone or in combination with urea in wheat cultivation has beneficial effect on the yield of which results in saving of 20% urea. (Kader *et al.,* 2002)

The highest yield increase (74%) was recorded when wheat cultivar Zlatka when inoculated with *Azotobacter* and treated with 50 kg ha-1 of urea. (Milosevic *et. al.,* 2012)

Influence of Azospirillum on wheat:

Inoculation of wheat plant with *Azospirillum brasilense* produced higher biomass, grain yield and N content and a higher grain protein concentration than the uninoculated plant. (Saubide *et al.,* 2002)

Seed inoculation of with *Azospirillum* or *Azotobacter* significantly increases the wheat growth and yield over control. (Sushila *et al.,* 2000)

In a field trial on clay loam soil, seed of wheat Cv. HD-2428 and DL-153-2 were inoculated with *Azospirillum brasilence*. Result indicated that inoculation increased the grain yield and NPK uptake significantly over control. (Panwar *et al.,* 2000)

Inoculation of wheat with *Azospirillum brasilense* increase N uptake after anthesis with no contribution to grain yield but on increase in straw biomass. (Dibonet *et al.,* 1996)

III. DETAILED TECHNICAL PROGRAMME:

I. Treatment details

Treatment	Symbol
1. Control	T1
2. 100% RDF	T2
3. Azospirillum	T3
4. Azotobacter	T4
5. 5 tonnes FYM/ha	T5
6. 50% RDF + Azospirillum	T6
7. 50% RDF + Azotobacter	T7
8. 50% RDF + 5 tonnes FYM/ha	T8
9. 50% RDF + 5 tonnes FYM/ha + Azospirillum	T9
10. 50% RDF + 5 tonnes FYM/ha + Azotobacter	T10
11. 50% RDF + 5 tonnes FYM/ha + Azospirillum + Azospirillum	T11

II. Treatment combinations and design:

1. Design : R.B.D.
2. Number of treatment combinations : 11
3. Replications : 3
4. Total number of plots : 33
5. Total area : 429m^2
6. Net plot area : 12m^2
7. Irrigation channel : 33m^2
8. Crop : wheat (*Triticum aestivum* L.)
9. Variety : HD-2967

III. Observations:

1. **Growth components:**
    a. Plant height
    b. Number of tillers/ half m row at 30, 60, 90 DAS and at harvest.
    c. Dry matter accumulation (g/half m row length) at 30, 60, 90 AS and at harvest.
    d. Days to 50% flowering and days to maturity.

2. **Yield and yield attributing characters:**
    a. Number of ears/ half meter raw
    b. Weight of ears/ half meter raw
    c. Ear length (cm)
    d. Weight of 1000 seeds (g)
    e. Seed yield (kg/ha)
    f. Straw yield (kg/ha)
    g. Harvest index (%)

3. **Chemical analysis:**

a. Soil analysis

Before sowing and after harvest each crop:

a) Organic matter of the soil
b) Electrical conductivity (Ec)
c) Available N, P and K content of the soil
d) pH of the soil
e) Soil texture

b. **Plant analysis**

1) N, P and K content
2) N, P and K uptake (Kg/ha)
3) Agronomic efficiency (AE)
4) Apparent N recovery (AR)
5) Protein content

4. Statistical Analysis

All the data recorded during the course of experimentation will be statistically analysed as per the standard practice for analysis of variance (ANOVA) for randomized block design as given by Gomez and Gomez (1987).

IV. Expected outcome:

- Increase the nutrient content in both soil and plant.
- Increase the yield and yield productivity.
- Reduce environmental pollution due to excessive use of chemical fertilizers.
- Increase the microbial population in the soil.
- Reduction in cost of cultivation.
- To find out the best treatment among the twelve treatments.

V. JUSTIFICATION OF THE PROPOSED STUDY

Since India's independence there has been a significant increase in agricultural production and has received self-sufficiency in food grain production. But comparing with the developed nations, we are still poor in productivity and production. India being the 2nd largest populated country, the requirement of food grain is huge. So keeping in view the requirement of food grain by this huge population in next few years and also the limited cultivable land, we need to increase the total production by increasing the productivity. This can be achieved only through adoption of modern and appropriate agro-techniques, proper management of available resources viz. good quality of seeds, judicious use of water and nutrient supply through proper management of fertilizers, recycling of organic wastes, organic manures and bio-fertilizers.

In recent years one concept is evolved i.e. integrated plant nutrient system (IPNS), in which bio-fertilizers and compost are some of them. They can be used to supplement chemical fertilizers and have a positive effect on production of legume crops as well as other crops also. Besides having nutrient supplying capacity, it also has positive effect on soil health and does not create any hazardous effect on soil, water tributaries and ground water and environmental pollution.

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