EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH, YIELD OF WHEAT AND NUTRIENT STATUS OF THE SOIL

DISSERTATION-II REPORT

Submitted to:

LOVELY PROFESSIONAL UNIVERSITY,
PHAGWARA (PUNJAB)

Submitted by:

Rashpinder Singh
M.Sc Agronomy
Reg. No. 11717086

DEPARTMENT OF AGRONOMY

SCHOOL OF AGRICULTURE

LOVELY PROFESSIONAL UNIVERSITY

PUNJAB 144411

CERTIFICATE

Certified that this synopsis of Rashpinder Singh, registration no. 11717086, entitled **"Effect of integrated nutrient management on growth, yield of wheat and nutrient status of the soil"** has been formulated and finalized by the student himself on the subject.

(Signature of student)

Rashpinder Singh

Red. No. 11717086

School of Agriculture,

Lovely Professional University,

Phagwara, Punjab.

(Signature of Supervisior)

Dr. Manish Bakshi

UID-22187

School of Agriculture,

Lovely Professional University

Phagwara, Punjab

(Signature of Co-Advisor)

Dr. Arun Kumar

UID- 18703

School of Agriculture

Lovely Professional University,

Phagwara, Punjab

(Signature of Co-Advisor)

Dr. Shailesh Kumar Singh

UID- 19105

School of Agriculture

Lovely Professional University,

Phagwara, Punjab

INTRODUCTION

Wheat is a major rabi crop of India which is grown from the north-western plain region to the central India region. It is the staple food crop of majority of Indian population and covers an area of 302.27 lakh hectares with a total production of 93.50 million ton (Anonymous, 2016). With the advent of Green revolution, there was a paradigm shift towards high yielding varieties and increased input in the form of inorganic fertilizers. Since then, there was a continuous increase in fertilizer consumption. Increased nutrient input is vital for optimum performance of high yielding varieties. Moreover, overuse of inorganic fertilizers have resulted in hazards like micro-nutrient deficiencies, nutrient imbalance within soil and plant system, increased infestation of pest, environmental pollution and stagnation of the crop yield. Over a period of time, farmers have become totally dependent on the use of chemical fertilizers. The modern production system that relies on intensive use of inorganic inputs is facing a sustainability crisis. It is estimated that annual agricultural growth has declined from 2.2 percent over the last 30 years to 1.5 percent over the next 30 years (Chen *et* al., 2011). Since last decade, there has been an upsurge in organic farming in India but keeping in view the nutrient availability in organic fertilizers, total dependence on organic fertilizers to fulfill the crop nutrient demands is not possible. Integrated nutrient supply is the systematic approach to nutrient management as the combined application of nutrients, both from organic and inorganic sources, improves the soil fertility and crop productivity (Shree *et* al., 2014). Organic carbon is the main building block of soil fertility and combined application of organic and inorganic fertilizers increases higher soil organic carbon content (Nkonya *et* al., 2005, Marin *et al*., 2007). In this context, it is imperative to adopt those agriculture technologies and methodologies which can improve the production of crop without deteriorating soil health.

PROBLEM BACKGROUND

There has been a non-judicious use on inorganic fertilizers resulting in environmental pollution and degradation of all sorts. Organic fertilizers are being used only as supplements over and above the recommended dose of fertilizers. Organic manures are fairly good source of nutrients which has direct influence on plant growth like other commercial fertilizers. Standardization of integrated nutrient management programme for sustained yield in wheat and improvement of soil health is the need of the hour.

REVIEW OF LITERATURE

Channabasanagowda *et al.* (2008) conducted trials on the combinaed application of different organic sources of nutrients in wheat and reported that combined application of vermicompost @ 3.81 t/ha + poultry manure @ 2.45 t/ha gave higher plant height, leaf number and number of tillers at 90 DAS.

Sarwar *et al.* (2008) studied the effect of application of organic manures with or without chemical fertilizers on rice and wheat crops and concluded that nutrient availability and soil organic matter increased considerably with the application of compost (12 and 24 t/ha) with or without chemical fertilizer.

Rathore *et al*. (2011) studied the effect of INM on soil and crop yield under black gram-wheat cropping system reported that incorporation of FYM @ 5 t/ha decreased the bulk density and elevated the porosity, cation exchange capacity, organic carbon and available N, P & K status of the soil. The same treatment also increased the seeds and stover yield in black gram as well as of the succeeding wheat grown in sequence.

Vidyavathi *et al*. (2012) conducted trials involving application of 50% recommended fertilizer dose through fertilizers and 50% recommended fertilizer dose through 1/3rd FYM, 1/3rd through VC and 1/3rd through GLM. The results indicated higher available N (278.4 kg/ha), P_2O_5 (23.4 kg/ha), K_2O(355.0 kg/ha) and S (18.7 kg/ha) under these treatments as compared to chemical nutrient management practice.

Dhaliwal *et al*. (2014) studied availability of phosphorus in basmati-wheat system and reported that either sole application of organic manures or in conjugation with chemical fertilizers (INM) resulted in better availability of phosphorus in the soil.

Sharma (2015) conducted a trial on response of integrated nutrient supply on yield of wheat and physical-chemical properties of soil and reported that application of 50% NPK + 50% FYM registered higher crop yield relative to control. Soil parameters like OC content, CEC and available N were statistically different from that of control.

Sheoran *et al*. (2017) studied productivity, seed quality and nutrient use efficiency of wheat (*Triticum aestivum*) under different nutrient management regimes and reported that combined application of organic manures alongwith N and P fertilizers significantly increased all the yield parameters.

Tejalben *et al.* (2017) conducted studies on integrated nutrient management in wheat and reported that maximum value for plant height (78.00 cm), no. of effective tillers (82.77) and test weight (33.30 g /1000 seeds) was recorded with the combined application of 75% RDF alongwith 10 t/ha Farm Yard Manure.

PROPOSED RESEARCH OBJECTIVES

The proposed experimental studies "Effect of integrated nutrient management on growth, yield of wheat and nutrient status of the soil" will be carried out with the following objectives:

- To study the effect of integrated nutrient management on growth and yield of wheat
- To study the effect of integrated nutrient management on nutrient status of soil.
- To workout the economics of cultivation

PROPOSED RESEARCH METHODOLOGY

The experiment will be conducted at the main Experiment Station, Department of Agriculture, Lovely Professional University, Phagwara, Punjab, located at latitude of 31.24 º and longitude of 75.70º as map coordinates along with altitude of 232 m above sea level. In Punjab, generally temperature ranges 18-25 ºC from November-December which is suitable for growing Wheat. The soil of the experimental site is sandy loam, well fertile and free from weeds. Has good drainage and rich in nutrients. Soil is acidic in reaction with low level of organic carbon, available nitrogen and available P_2O_5 but a medium level of available K_2O.

- **Year and Session of Experiment -** November 2017, session -2017-18
- **Experimental design –** Random block design (RBD)
- **Number of replication -** 3
- **Number of treatments -** 7
- **Total number of plots -** 21
- **Number of varieties/hybrids -** 1 (HD3086)
- **Seed rate -** 98.8 kg/ha
- **Spacing –** 22.5 cm
- **Size of plots** – 4.5 * 4.5 meter

- **Soil of plot –** Sandy loam

- **Treatment details**

T1. Control

T2: Recommended dose of fertilizer (RDF)

T3: Recommended dose of fertilizer (RDF) + 2.5t/ha vermicompost

T4: RDF @ 125%

T5: RDF @125% + 2.5 t/ha Vermicompost

T6: RDF @ 75% + 2.5 t/ha Vermicompost

T7: RDF@ 50% + 5 t/ha Vermicompost

OBSERVATIONS: Data will be recorded for the following parameters

A. Growth parameters at 90 DAS
i) Plant height (cm)
ii) No of green leaves
iii) No. of tillers/meter row length

B. Yield parameters
i) Number of grains per ear
ii) Number of ear heads per square meter
iii) Test weight (g)
iv) Seed yield (g/m^2)

C. Soil parameters
i) pH
ii) EC (mmhos/cm)
iii) Organic carbon %
iv) Available nitrogen
v) Available phosphorus
vi) Available potassium

D. Economics of the treatments
i) Seed yield (kg/ha)
ii) Net returns (Rs.)

iii) B:C ratio

Research Outcome till date

The crop was sown on 26th of November, 2017 after thoroughly preparing the land. The seeds for the wheat variety (HD3086) were sown using line sowing method as per the seed rate prescribed by Package of Practices for Rabi crops, Punjab Agricultural University, Ludhiana. Soil samples were taken from the experimental field at different corners and a composite sample was drawn for analysis. Fertilizer application as per the treatment details was done before sowing. Half of the urea alongwith full dose of phosphorus, potassium was incorporated in to the experimental field alongwith vermicompost as per the treatments. Remaining half doze of urea was applied in the month of January, 2018. Uniform spray of weedicide was done to control the weeds in the field. Data on growth parameters and yield parameters was recorded. The quality parameters are being evaluated and the data is being analyzed statistically to find out the level of significance among the treatments.

LAYOUT

R1T1(CONTROL)	**WATER CANAL**	**R2T4**	**R3T7**	**WATER CANAL**
R1T2		**R2T5**	**R3T1(CONTROL)**	
R1T3		**R2T6**	**R3T2**	
R1T4		**R2T7**	**R3T3**	
R1T5		**R2T1(CONTROL)**	**R3T4**	
R1T6		**R2T2**	**R3T5**	
R1T7		**R2T3**	**R3T6**	

Field preparation

Line sowing of Wheat

Application of 2nd Dose of Urea

Spray of weedicide

Maturity stage

Harvesting of ripe wheat crop

Observations recorded:

The data on plant growth was recorded as per the standard parameters

(A) GROWTH PARAMETER (90 DAS)

1. **Plant height:** Plant height was recorded on healthy plants from the base of the plant to the highest leaf on the plant using a meter scale.
2. **No. of green leaves:** Number of green leaves appearing on crop plant was counted manually.
3. **No. of tillers/m row:** Number of tillers was counted in every treatment per meter length of the crop row measured with the help of measuring tape.

(B) YIELD PARAMETERS

1. **No. of grains/ear.** : Grains of wheat ear were counted at the time of harvesting.
2. **No. of ear heads /m^2:** Length of the crop row was marked with the help of a measuring tape and total number of ears per square meter was counted two days before harvesting.
3. **Test weight/1000 seeds (g):** Seeds will be counted after harvesting and threshing and weighing of the sample.
4. **Seed yield/m^2 (g):** An area of one meter square was marked with the help of a measuring tape and total seed yield from one meter square was calculated after weighing the seed yield.

(C) SOIL PARAMETERS

After harvesting, soil samples from every field plot treatments in transparent polythene bags were collected randomly for recording the following observations in the agricultural lab.

1. Soil PH
2. Soil EC
3. Organic carbon%
4. Available N, P_2O_5 , K_2O.

ECONOMICS OF THE TREATMENT

1. **Seed yield (kg/ha.):** After harvesting, crop seed yield per hectare will be calculated.
2. **Net returns:** The yield data generated during the course of the trial will be analyzed for calculation of the net returns per hectare as per the prevailing market rates for wheat crop for each treatment.

3. **B:C ratio:** At the end benefit cost ratio will be worked out according to the input expenditure and output income.

Expected Research Outcomes

The research trial is expected to come up with a economically viable integrated nutrient management programme that will address to the extravagant use of inorganic fertilizers. The trial will give a standardized integration schedule of inorganic and organic fertilizer for wheat crop for Phagwara region which can be further evaluated for other regions of Punjab. The trials will also help in evaluating the soil fertility parameters and best economical combination of inorganic and organic fertilizers so that the farmer may get the maximum returns per hectare.