PRE-DISSERTATION REPORT

(AGR- 596)

Improving nitrogen use efficiency in a Sunflower - Soybean cropping system by using slow release fertilizers along with organic amendments

Synopsis Submitted

To

Lovely Professional University, Punjab

In Partial Fulfilment of the Requirements for the Degree of

Master of Science (Agriculture)

In

Agronomy

By

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CERTIFICATE

I certified that this synopsis **MOHIT NAIK** with registration no: 11717770, **" Improving nitrogen use efficiency in a Sunflower - Soybean cropping system by using slow release fertilizers along with organic amendments"** has been formulated and finalized by the student on the subject.

(Signature of Student)

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Dr. Premasis Sukul

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DECLARATION

I hereby declare that the project work entitled **" Improving nitrogen use efficiency in a Sunflower - Soybean cropping system by using slow release fertilizers along with organic amendments"** is an authentic record of my work carried out at lovely professional university as requirements of project work for the award of degree of Master of Science in Agronomy, under the guidance of Dr. Premasis Sukul, School of Agriculture, Lovely Professional University, Jalandhar, Punjab, India.

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1.

INTRODUCTION

Cereal, pulses and oilseed are the major agricultural produce, which is the source of food and fulfil the daily energy requirement for growing population. Since from the green revolution, explosive increase in use of the inorganic fertilizer are using as a source of nutrient. The use of cow dung, vermi-compost, green manuring, compost, poultry manure is reduced, due to which soil losses its microbial population, nutrient, structure, soil moisture content, soil moisture reduces (Albiach et al., 2000). Environmental degradation, air pollution, Global warming are the major concern excess use of chemical fertilizer and decreased soil organic matter content in the soil causes soil degradation. Lots of fossil fuel and chemicals used for the formation of inorganic fertilizers releases carbon dioxide and pollutes the water resources as well. Now by only the organic farming and sustainable agriculture, we can change the declining trend (Aveyard,1988; Wani and lee,1992; Wani et al.,1995).

SUNFLOWER:

Sunflower (Helianthus annus) belongs to family Asteraceae, it is the major oilseed which is used for production of edible oil having production of 31.1 Million tonnes annually (FAO, 2005). Sunflower is a large plant and grown all over world because of its short growing seasons. A rich source of both protein as well as oil. Its oil content ranges from 38 - 49%, because of its light colour considered as premium oil. About 28% of protein is present in non-dehulled and 42% in full dehulled seed (Putnam and others 1990). Sunflower is used as food and use for oil extraction. Tea also prepared, also used in high fever, snake bites, spider bites, swelling and diabetes, malaria. Sunflower is used for various treatment like quick recovery of wounds, help in curing the disease of kidney, for chest pain, heart problem and also used in asthma (Saini et al., 2011).

Area and distribution:

Worldwide sunflower is cultivated in Russia, Ukraine, Romania, China, Kazakhstan, Spain, Bulgaria, France, India, Turkey, South Africa, USA and Myanmar with production of 413.35 lakh tonnes 2013-14. In India major producing states are Karnataka, others, Haryana, Telangana, Andhra Pradesh, Maharashtra Uttar Pradesh and Tamil Nadu with production of 4.15 lakh tonnes.

SOYBEAN:

Soybean (Glycine max) of Fabaceae a legume crop, which fixes atmospheric nitrogen in into the soil, addition of a legume crop within a cropping system reduces the dependency on inorganic fertilizer, farmers sows the soybean without giving any fertilizer (Behera et al. 2007). Soybean also known as 'Miracle crop' having more than 38-40% protein and contains 20 % oil content. China known as native place of soybean, cultivated from last 4000 years (Hymowtiz, 1970). After 1st century as the land and the sea trades expanded and developed, soybean moved to other nearby countries like India, Japan, Indonesia, Malaysia, Thailand and Ukraine. Currently soybean is growing in more than 51 countries and consumed world widely (Wilcox, 2004). After groundnut, soybean is mostly used as oilseed, 2nd largest oil producing meal in India. The popularity of the soybean has increased in developing countries like India which fulfil the requirement of the protein. Soybean one the most important commercial crop, rich in nutrient, protein, carbohydrates, mineral, oil. Soybean helps in prevention and cure of the various chronic diseases like hypertension, cancer and diabetes (Craig, 1997). Various soya product which are available in market, like oil, tofu, soy milk, soy sauce, soya curd and protein source. The soybean meal, roasted soybeans feeds to animals and for the industrials purpose like plastics, printing ink, biodiesel, waxes, lubricants, fibres and textiles.

Area and distribution:

Worldwide sunflower is cultivated in US, Brazil, Argentina, China, India, Paraguay, Canada, Mexico, European Union and other countries with production of 345 Million Metric Tons 2016-17.). In India sunflower is cultivated in Madhya Pradesh, Maharashtra Rajasthan and others with annual production of 9.5 Million Metric Tons.

Neem Coated Urea:

Ram, Johnson (1999) annually worldwide the loss of 67% about of Rs.10241 Crore loss of Nitrogen in the form of gaseous emission, soil denitrification and also by leaching which accounts for cause of degradation of soil, surface water and ground water. **Singh (2016)** about 80-81 % of nitrogen fertilizer is applied by urea in India. Nitrification inhibitors are applied with urea which reduces the losses of urea, hence resulting in better improved yield. During 1970, Scientist studied that after the oil extraction from neem seeds, he cakes of neem consist of nitrification inhibiting properties. Later on more than 74 field experiment were conducted to compare and check the results of using neem coated urea. In India more than 51% of total urea is applied in rice-wheat and more than 29% is used in rainfed crops, but availability of

neem urea to farmers is very less. Consumption of Nitrogen(N) fertilizer has increasing from 0.6 Million tonnes during initial days of green revolution to 17 Million tonnes (Mt) in 2014-15. India 2nd largest consumer of nitrogen fertilizer among all other countries. From 1970's urea is the main source of nitrogen fertilizer. About 83.1% of nitrogen fertilizer is consumed in India as urea. Nitrogen (N) abundantly used fertilizer nutrient and the demand of nitrogen fertilizer will increase rapidly coming years (Sepaskhah and Baregar 2010).

2. REVIEW OF LITERATURE

2.1 Effect of chemical fertilizer on yield attributes, yield and soil properties:

Abbasi et et al., (2007) reported higher yields with improved grains quality were obtained in combination of FYM and nitrogen fertilizer.

Bhardwaj et al., (2010) observed the significantly increased amount of organic carbon and Cation exchange capacity at 100%NPK level compare to control, indicates that the application of fertilizer improves the condition of soil.

Konthoujam et al., (2015) observed the increased amount of available NPK in the soil were obtained after the harvesting of soybean. application of organic manure resulted in improved pH & soil organic carbon of soil.

Saxena et al., (2001) observed dry matter and vegetative growth of plant increased with the application of nitrogen. The increasing rate of P2O5 (0,40 or 80kh/ha) and FYM (0,15 tonnes/ha) resulted in more dry matter production.

2.2 Effect of organic manure on yield attributes, yield and soil properties:

AKBARI et al. (2011) observed that higher grains and dry matter obtained in the combination of N fertilizer with FYM, also contains high amount of linolenic acid (53%) and oleic acid (40.6) contents.

Kavitha and Swarajy Lakshmi (2002) observed application of 50% RDNF by vermicompost + 50% recommended of nitrogen fertilizer through urea increased sunflower yield (1200kg/ha) compared to control (692kg/ha).

Koushal and Singh (2011) reported the in treatment with 50% Nitrogen through FYM + PSB & lowest were found in control. More plant height more pods/plant (80.4) and high test weight (17g) were recorded

Radia et al., (1998) found increased seed yield, 1000 seed weight and oil content in sunflower seed by the application cow dung compares to cotton waste.

Ramesh et al., (2008) observed more amount organic present in soil by the application of vermicompost. The application of vermicompost improved the Nitrogen, Phosphorous and Potassium level in soil compared to chemical fertilizer.

Shanwad (2001) observed the improved yield component viz. head diameter, seed yield/ plant, 100 seed weight, number of seed per head by the application of the 100% RDF with vermicompost or 100% RDF.

Hall et al. (1994) setup a model on loss of nitrogen in sunflower from the leaves and reduction in specific leaf nitrogen (SLN) in daylight during photosynthesis which is linked with the grain filling. Sunflower was cultivated with varying nitrogen amount and placement of nitrogen during specific stages of life cycle. Experiment showed that the sunflower plant is affected by the RUE, and model was unable to detect the loss of nitrogen through leaves.

Jaybhay et al. (2015) conducted a field experiment on soybean-wheat and soybean-chickpea. Recorded the higher yield in soybean-wheat cropping system, as compare to soybean-chickpea cropping system with less yield.

3. Objective

The objectives of the proposed study are:

1) To determine the effect of nutrient supplements at their different forms combination and levels on growth attributing characters and yield of crops, sunflower and soybean.
2) To assess the impact of manure and fertilizer application on different physiochemical properties of soil under a cropping sequence of sunflower and soybean.
3) To study the nutrient availability status with application of manure and fertilizer under a cropping sequence of sunflower and soybean.
4) To study the nitrogen use efficiency using coated urea.

4. Technical Program of the work:

4.1 Experimental designs

The proposed study will be carried out in Agriculture farm of Lovely Professional University, Phagwara, Punjab (31.2536° N, 75.7037° E) at altitude of 252 amsl which falls under Trans-Gangetic plain region of agro climatic zone of Punjab. Improving nitrogen use efficiency in a Sunflower- Soybean cropping system by using slow release fertilizers with organic amendments**.**

4.2 Brief information of the work

Crop Used : Sunflower – Soybean

Period of work : 2018

Design of Experiment : RCBD

Topic under discussion : **Improving nitrogen use efficiency in a Sunflower - Soybean cropping system by using slow release fertilizers along with organic amendments**

5. Methodology of Proposed Work:

5.1 Soil Parameters

5.1.1 pH

Determined by using (Jackson, 1973)

5.1.2 Electrical Conductivity

5.1.3 Available Nitrogen

Determined by khejdal (Subbiah, B.V. and Asija, G.L, 1965)

5.1.4 Available Phosphorous (Watanabe and Olsen, 1965)

5.1.5 Total Nitrogen

Determined by using khejdal digestion (Jackson, 1973)

5.1.6 Available Potassium (Jackson, 1973)

5.1.7 Organic Carbon (Walkley and Black, 1935)

5.2 Growth Attributing Characters:

5.2.1 Plant Height Stem Girth

5.2.2 Number of leaves

5.2.3 Number of Buds

5.2.4 Number of flowering Buds

5.2.5 Diameter of Head flower

5.2.6 Inner Diameter of head containing seeds

5.3 Yield Attributing Characters:

5.3.1 Seed Index

5.3.2 Seeds Per head

5.3.3 Weight of seeds Per head

5.3.4 Seed Yield

5.4 Post Harvest Nutritive Analysis:

5.4.1 Protein content

Determined by khejdal digestion (Sadasivan and Manickam, 1996)

5.4.2 Oil content (Sadasivan and Manickam, 1996)

5.4.3 Fat content

6. PLAN OF WORK

The present experiment will conduct in winter season 2017 at agricultural farm of Lovely Professional University, Jalandhar, Punjab. Materials and methods used during this experiment are described below.

6.1 EXPERIMENT SITE

The experiment will conduct at college farm at Lovely Professional University which is located in Punjab state in India at about 252meters above from sea level and this region falls under Trans-Gangetic plain region of agro climatic zone on Punjab India.

6.1.1 DESIGN AND LAYOUT OF THE EXPERIMENT FOR SUNFLOWER AND SOYBEAN.

Randomized Block Design with eight levels of treatment and three levels of replication. The plan is depicted in the figure.

6.1.2 TECHANICAL PROGRAMME:

S. No.	EXPERIMENTAL DETAILS	Description
1.	Year of the experiment	2018
2.	Experimental design	RCBD
3.	Number of treatments	7
4.	Number of replications	3
5.	Total no. of plots	7 x 3 = 21
6.	Plot size	5m x 4m (20 sq. m)
7.	Total Cultivated Area	20sq. m x 21 = 420 sq. m
8.	Sub Irrigation channel	(1m x 29)2 = 58
9.	Main Irrigation Channel	1m x 17m = 17 m
10.	Total area	420+58+17 = 495 sq. m.

6.1.3 COLLECTION OF SOIL SAMPLES:

Soil samples will be taken before crop sowing to check the soil pH, organic carbon, electric conductivity, N, P, K ratio present in soil. After every 15days interval plant samples were taken.

6.1.4 SEED RATE

Crop	Kg/acre
Sunflower	2
Soybean	30

6.1.5 RECOMMENDED DOSE OF FERTILIZERS:

Fertilizer Quantity (kg/ac)	Sunflower	Soybean
Nitrogen (N)	24	12.5
Phosphorus (P2O5)	12	32
Potassium (K2O)	12	24

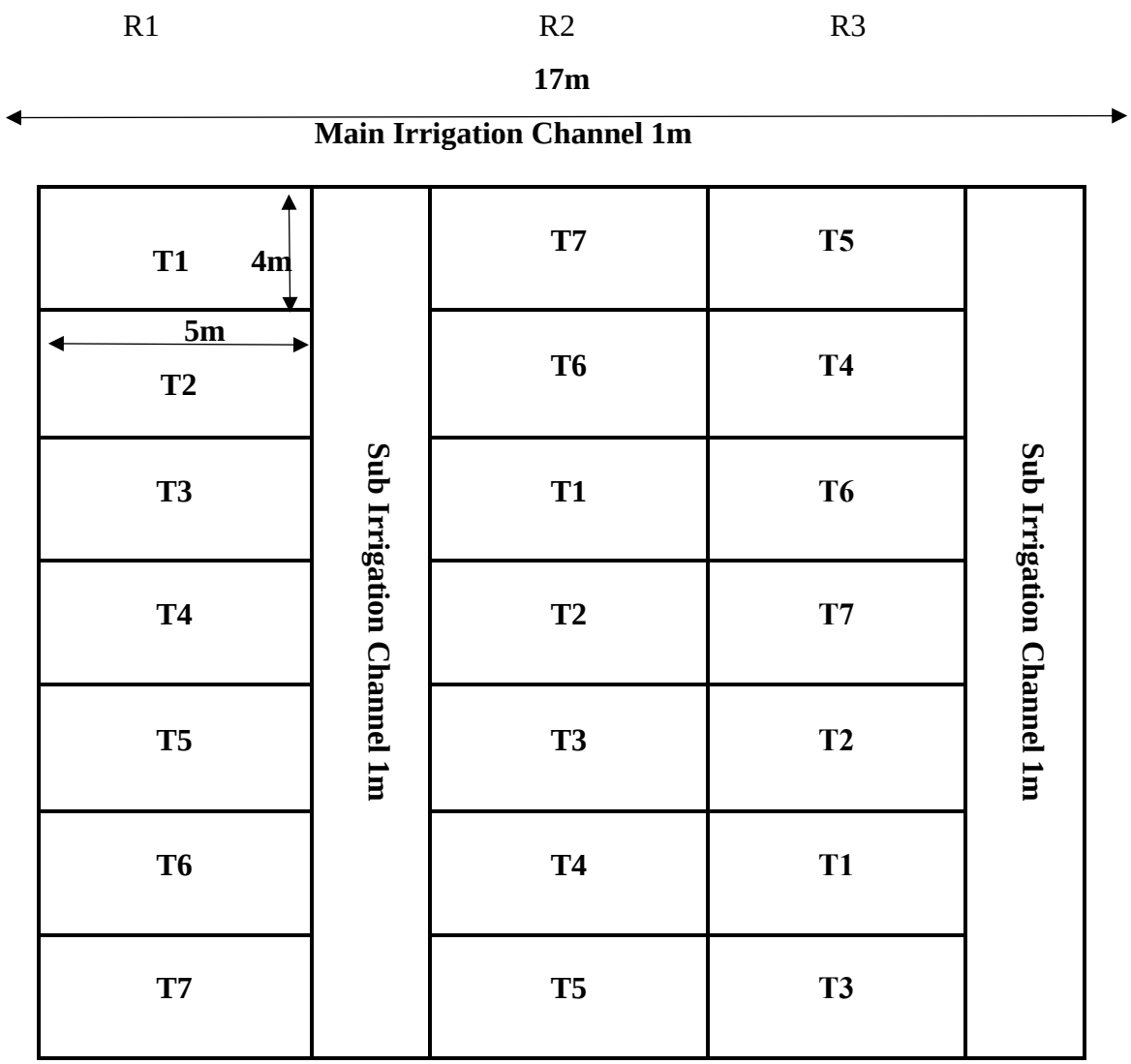
S.No.	Nutrient	Source	
		Inorganic	Organic
1.	Nitrogen(N)	• Neem Coated Urea	• Vermi-compost • Poultry Manure
2.	Phosphorous(P_2O_5)	• Single Super Phosphate	
3.	Potassium(K_2O)	• Murate of Potash	

6.1.6 DESIGN AND LAYOUT OF THE EXPERIMENT

The experiment was laid out in Randomized Block Design with eight levels of treatment and three levels of replication. The plan is depicted in the figure

S. No.	TREATMENTS
T-1	CONTROL (NO FERTILIZER)
T-2	100%NEEM COATED UREA
T-3	75% NEEM COATED UREA + 25% VERMICOMPOST
T-4	75% NEEM COATED UREA + 25 % POULTRY MANURE
T-5	50% NEEM COATED UREA + 50% VERMICOMPOST
T-6	50% NEEM COATED UREA + 50% POULTRY MANURE
T-7	50% VERMICOMPOST + 50% POULTRY MANURE

6.1.7 FIELD LAYOUT



7. AGRONOMICAL PRACTICES:

S. No.	Activities Done	Date Of Work Done
1.	Soil Sample before sowing	20-02-2018
2.	Land preparation	20-02-2018
3.	Sowing	26-02-2018
4.	Fertilizer application	26-02-2018
5.	Irrigation	28-02-2018

7.1 Field preparation and sowing:

7.2 Application of fertilizer:

a) **Nitrogen**

- 1st dose of nitrogen of is applied with the sowing 26-02-2018.
- 2nd dose of nitrogen applied after 30 days of sowing on 28-03-2018.

	Nitrogen	**1st Dose**	**2nd Dose**	**Vermicompost and Poultry Manure**
T1	CONTROL	----	-----	------
T2	100% NCU = 270gm	135gm	135gm	-------
T3	75% NCU = 200gm	100gm	100gm	25% VERMI-COMPOST = 1.2kg
T4	75% NCU = 200gm	100gm	100gm	25% POULTRY MANURE = 1.4 kg
T5	50% NCU = 140gm	70gm	70gm	50% VERMI-COMPOST = 2.3kg
T6	50% NCU = 140gm	70gm	70gm	50% POULTRY MANURE = 2.73 kg
T7	-----	------	------	(50% VC = 2.3KG) + (50% PM = 2.73 kg)

b) **Phosphorus:** Phosphorus is applied by Single Super Phosphate in the quantity of 100g for each plot applied at the time of sowing only.

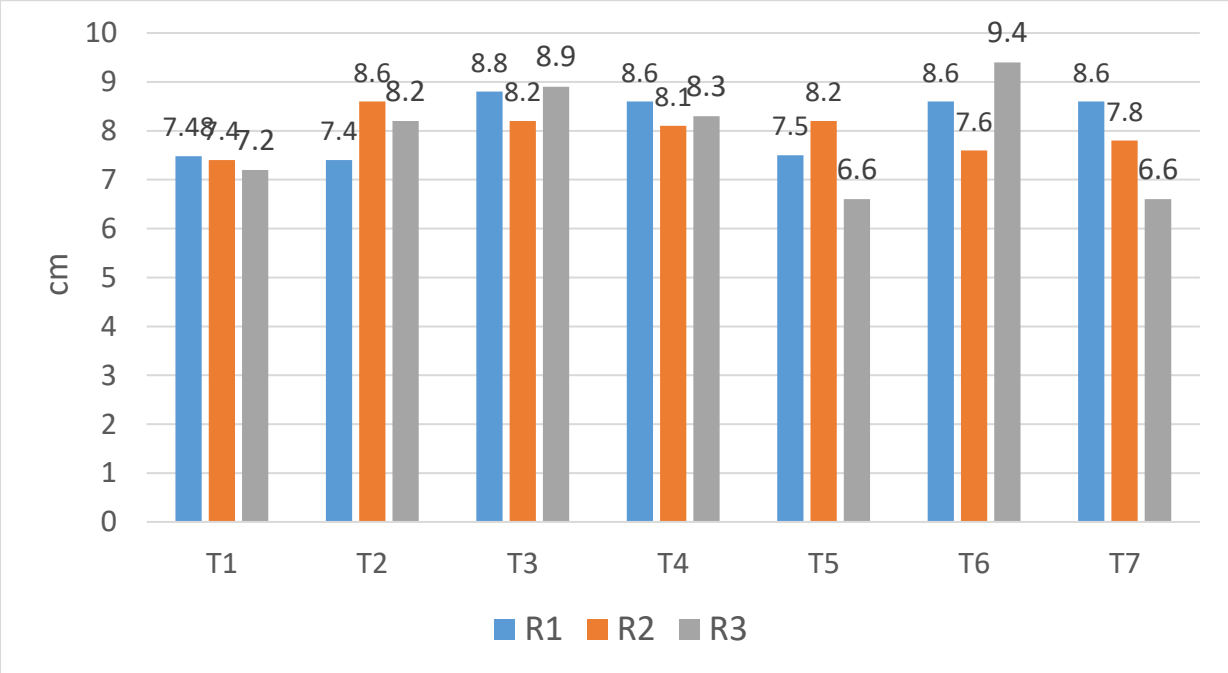
c) **Potassium:** Potassium is applied by Muriate of Potash in the quantity of 380g for each plot. The whole dose is applied at the time of sowing only.

8.OBSERVATIONS

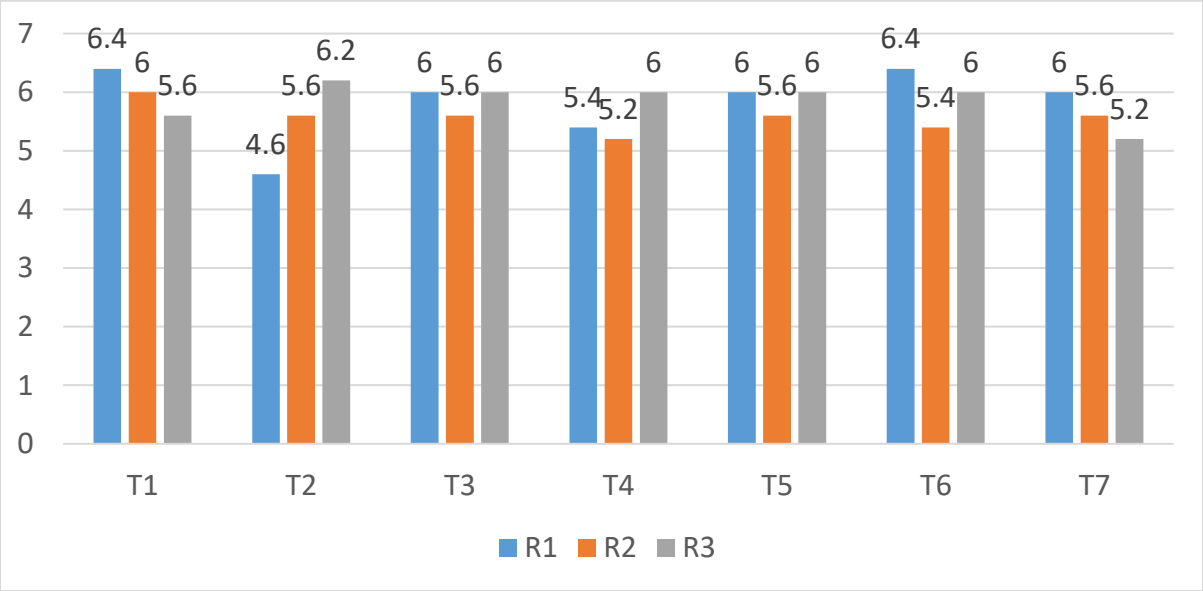
8.1 Soil Analysis (before Sowing)

- **pH** : 7.86
- **Electric conductivity** : 2.2(200µ)
- **Nitrogen** : 313.6kg/ha(medium)
- **Phosphorous** : 19.8kg/ ha(medium)
- **Potassium** : 33.6kg/ha (low**)**
- **Organic Carbon** : 0.507(low)

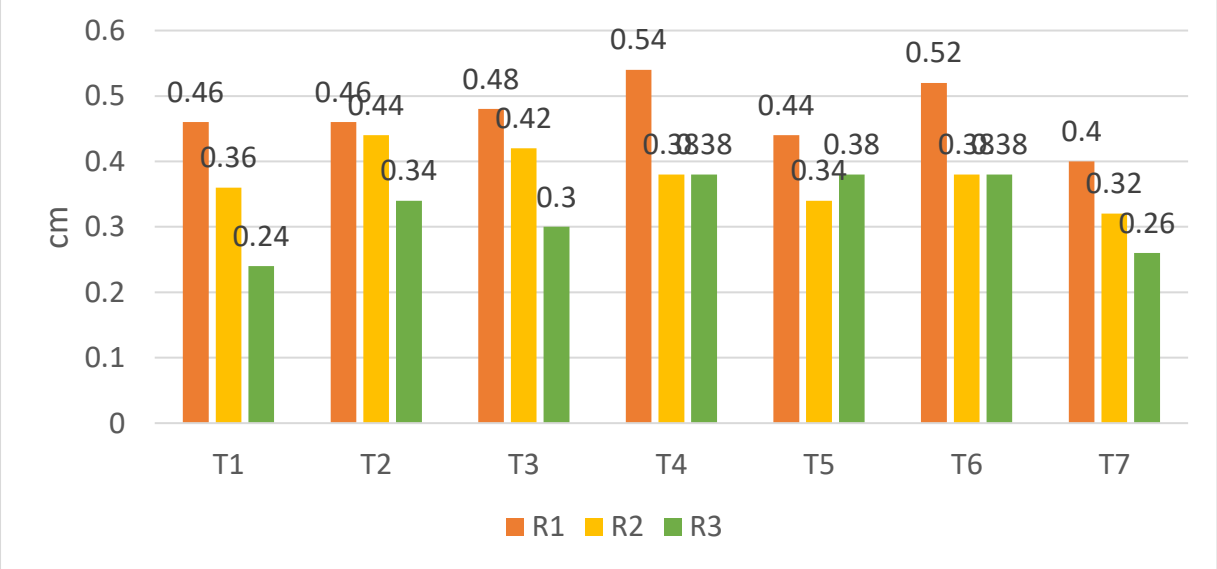
8.2 Plant Parameters:



Plant height (in cm): 15 DAS



Number of leaves (per plant)



Stem girth (in cm): 15 DAS

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