

Effect of organic manures and inorganic fertilizer on growth and yield characters of lentil

Abstract

A field experiment was conducted at experimental farm, during Rabi season of 2022-23 to study the effect of organic manures and inorganic fertilizer on growth and yield characters of lentil. Seed rate 40-45 kg/ha of Lentil variety „RLG-5“ was used in this study. The required quantities of fertilizers as per treatments were applied. The experiment was laid out in randomized block design with three replications consisting of nine treatment combinations i.e. T₁-Control, 100% RDF (20:40:20:20 NPKS kg/ha), 50% RDF + 5t FYM, 75% RDF + FYM (2.5 t/ha), 50% RDF + Vermicompost (1 t/ha), 75% RDF + Vermicompost (0.5 t/ha), 50% RDF + Poultry manure (1 t/ha), 75% RDF + Poultry manure (0.5 t/ha), 75% RDF + FYM 2.5t + *Rhizobium*. The increased growth parameter such as plant height (cm), number of branches per plant and dry matter production and yield traits viz., number of pods per plant, number of seeds per pod, test weight Seed yield (q/ha), straw yield (q/ha) harvest index of 75% RDF + Poultry manure (1 t/ha).

Keywords: lentil; vermicompost; Poultry manure; plant height

Introduction

Among overall all pulses lentil (*Lens culineris* Medik) with 2n = 14 is one of the most essential grain legume crops and the most nutritious food in India. It is mostly eaten as 'Pulses'. It is easy to cook and so easily digestible with high biological value. Lentil is also called as Masur and known as 'Poorman's meat'. In India, Lentil crop extensively grown during Rabi season. Lentil. "Being a leguminous crop, it utilizes the atmospheric nitrogen to meet its fragmental nitrogen requirement and thus captures an important place in crop rotation in different regions in country". "In the country lentil is cultivated in an area of about 1.38 million hectares with production average 0.94 million

tones and average yield 685 kg/hac.” Customary consumption of nutrients resources of soil has cause emergence of nutrient deficiencies. This often results in higher yields, higher and faster soil nutrient emissions. The amount of nitrogen in the soil of India is insufficient. Currently, phosphorus deficiency has affected about 65 to 70 percent of the soil in India.

“The indiscriminate use of chemical fertilizers without organic manures is known to degrade physico-chemical as well as biological properties of the soil i.e. soil environment and soil health. On the other hand, the use of different type of organics improves soil properties; its health and fertilizer use efficiency, mitigates short supply of micronutrients, stimulates the proliferation of diverse group of soil microorganisms and improves the ecological balance of rhizosphere. Farmyard manure is well known as a store house of plant nutrients.

Poultry manure is a good source of nutrients and each tonne of deep litter contains 29.40 kg nitrogen, 20.41 kg phosphorus and 20.41 kg potassium together with 6.8 kg magnesium, 6.8 kg sodium and 24.21 kg calcium” (Chakraborty, 2009). “Vermicompost being a rich source of macro and micronutrients and vitamins, plant growth regulators and beneficial microflora appeared to be the best organic source in maintaining soil fertility on sustainable basis towards an eco-friendly environment” (Chandra, 2003). “Vermicompost application to different field crops has been known to reduce the requirement of chemical fertilizers without any reduction in crop yield” (Gedam, 2008). “Similarly, FYM, poultry manure and farm-compost etc. are known for being the store house of plant nutrients with great variation in their nutrient contents and their release pattern after decomposition. Looking to the poor fertility condition of the intensively cropped lands where lentil is generally grown, addition of organics is important for securing sustainable yield potential”. (Gedam, 2008) Since, the information was scanty on these aspects; the present research work was undertaken using lentil as test crop.

“The benefits of using organic fertilizers have been underlined because of the high prices of commercial fertilizers and their bad effect on soil properties, groundwater, environment, and human health. Organic fertilizers also keep soil healthy and increase plant resistance to hard environmental conditions, and improve their properties” [Al-Taey et al., 2019]. “Recently, great efforts have been made to use safe and natural materials to increase plant growth and productivity. Organic agricultural practices aim to enhance biodiversity, biological cycles, and soil biological activity to produce optimal natural systems that are socially, ecologically, and economically sustainable” [Samman et al., 2008]. “Organic farming is a technique that involves the use of organic and biological materials and avoids the use of synthetic substances, aiming to reduce soil and environmental pollution; thus, organic matter

applications to soil are highly desired to reduce the cost and harms of chemicals. The use of these fertilizers at the appropriate ratio may be valuable in increasing crop yields and keeping soil healthy” [Hamza et al. 2010]. “The use of poultry manure and filter mud cake recorded the highest levels of available N, P, and K in the soil without and with biofertilizer addition; microorganism activity also increases the decomposition of the organic waste, resulting

in decreasing soil pH” [Bakretal2016]. Compost (CCB) and filter mud cake (FMC) are examples of organic fertilizers that increase soil fertility, improve porosity, and promote healthy crop production.

Materials and Methods

A field experiment was conducted during Rabi season of 2022-23 at experimental farm, Department of Agronomy, Faculty of Agriculture and Veterinary Sciences, Mewar University Gangrar, Chittorgarh (Rajasthan). Soil of the experimental field was sandy loam in texture, saline in reaction with a pH value of 7.6, poor in organic carbon (0.16%), deficient in available zinc (0.48 ppm) and iron (1.2 ppm) low in available nitrogen (176 kg/ha) and phosphorus (20.2 kg/ha) but medium in available potassium (320 kg/ha). The experiment was laid out in randomized block design with three replications consisting of nine treatment combinations i.e. T₁-Control, 100% RDF (20:40:20:20 N P K S kg/ha), 50% RDF + 5t FYM, 75% RDF + FYM (2.5t/ha), 50% RDF + Vermicompost (1t/ha), 75% RDF + Vermicompost (0.5 t/ha), 50% RDF + Poultry manure (1 t/ha), 75% RDF + Poultry manure (0.5 t/ha), 75% RDF + FYM 2.5t + *Rhizobium*. Seed rate 40-45 kg/ha of Lentil variety „RLG-5” was used in this study. The required quantities of fertilizers as per treatments were applied. The doses of NPK were applied in the form of urea, diammonium phosphate, and muriate of potash respectively. FYM was applied uniformly in soil before sowing. *Rhizobium* culture were applied as seed treatment @ 5 ml/kg seed.

Results and Discussion

The purpose of this study was to determine the extent of performance for several growth and yield traits. These Growth parameters include in present study such as plant height (cm), number of branches per plant and dry matter production and yield traits viz., number of pods per plant, number of seeds per pod, test weight Seed yield (q/ha), straw yield (q/ha) harvest index of Lentil.

Growth Attributes

The highest plant height was recorded at 30 DAS (8.62 cm) treatment T₈-75% RDF + Poultry manure (1 t/ha). The lowest plant height was recorded (6.52 cm) with T₁-Control. The highest plant height was recorded at 60 DAS (22.75 cm) treatment T₈-75% RDF + Poultry manure (1 t/ha). The lowest plant height was recorded (19.76 cm) with T₁-Control. The highest plant height was recorded at harvest (32.62 cm) treatment T₈-75% RDF + Poultry manure (1 t/ha). The lowest plant height was recorded (27.45 cm) with T₁-Control. The results corroborate the finding of Pathak *et al.* (2003), Patel *et al.* (2012) and Singh *et al.* (2013). The significant increase in plant height with these treatments might be due to greater availability and steady release of nutrients.

The highest dry matter accumulation was recorded at 30 DAS (27.55 g/m²) treatment T₈-75% RDF + Poultry manure (1 t/ha). The lowest dry matter accumulation was recorded (10.33 g/m²) with T₁-Control. The highest dry matter accumulation was recorded at 60 DAS (84.50 g/m²) treatment T₈-75% RDF + Poultry manure (1 t/ha). The lowest dry matter accumulation was recorded (50.55 g/m²) with T₁-Control. The highest dry matter accumulation was recorded at harvest (486.15 g/m²) treatment T₈-75% RDF + Poultry manure (1 t/ha). The lowest dry matter accumulation was recorded (325.66 g/m²) with T₁-Control. These results are in close conformity with the results of Mohammad Janloo *et al.*, (2009).

The highest number of branches/plant was recorded at 30 DAS (2.05) treatment T₈-75% RDF + Poultry manure (1 t/ha). The lowest number of branches/plant was recorded (1.50) with T₁-Control. The highest number of branches/plant was recorded at 60 DAS (4.95) treatment T₈-75% RDF + Poultry manure (1 t/ha). The lowest number of branches/plant was recorded (4.02) with T₁-Control. The highest number of branches/plant was recorded at harvest (4.98) treatment T₈-75% RDF + Poultry manure (1 t/ha). The lowest number of branches/plant was recorded (4.05) with T₁-Control. The highest number of branches recorded might be due to greater availability of nutrients. Babu *et al.*, (2007) reported that slow release of nutrients from the organic sources at later stages of crop growth had resulted in increased number of branches. Number of branches increased with the supply of phosphorus is in accordance with the finding of Sharma and Sharma (2004).

YieldAttribute

The highest number of pods/plant was recorded (2.05) with the treatment T₈-75% RDF +Poultry manure (1 t/ha).The lowest number of pods/plant was recorded (30.62)with T₁-Control. The highest number of grains/pod was recorded (1.85) with the treatment T₈-75%RDF + Poultry manure (1 t/ha). The lowest number of grains/pod was recorded (1.32)withT₁-Control. The highest grain yield was recorded (18.55 q/ha) with the treatmentT₈-75%RDF + Poultry manure (1 t/ha). The lowest grain yield was recorded (7.90 q/ha)with T₁-Control. The highest straw yield was recorded (29.21 q/ha) with the treatment T₈-75% RDF +Poultry manure (1 t/ha). The lowest straw yield was recorded (12.33 q/ha) with T₁-Control.These findings are in agreement with the findings of Brahmachari *et al.*, (2004, 2008), Rabbietal.,(2011), Fatimaet al., (2018).

Conclusion

On the basis of above findings, it can be inferred that application of 75% RDF + Poultrymanure (1 t/ha) per hectare gave highest plant height (cm), number of branches per plant anddry matter production and yield traits viz.,number of pods per plant,number of seeds perpod,test weight Seed yield (q/ha),straw yield (q/ha) harvest indexofLentil.

Table.1 Effect of organic manure and inorganic fertilizer at different growth stages of lentil

Treatments	Plant height			Number of branches/plant			Dry matter accumulation (g/m ²)		
	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest
T ₁ -Control	6.52	19.75	27.45	1.50	4.02	4.05	10.33	50.55	325.66
T ₂ -100% RDF (20:40:20:20 N P K S kg/ha)	8.20	22.02	31.85	1.98	4.79	4.85	24.33	78.98	468.63
T ₃ -50% RDF + 5t FYM	7.25	20.78	29.48	1.75	4.48	4.52	19.65	68.66	389.45
T ₄ -75% RDF + FYM (2.5t/ha)	8.02	21.75	30.55	1.92	4.58	4.62	22.65	74.03	435.63
T ₅ -50% RDF + Vermicompost (1t/ha)	7.45	21.12	30.15	1.85	4.48	4.55	20.12	70.12	410.36
T ₆ -75% RDF + Vermicompost (0.5t/ha)	8.35	22.52	32.08	2.01	4.80	4.93	26.36	81.36	478.63
T ₇ -50% RDF + Poultry manure (1t/ha)	7.58	21.50	30.25	1.88	4.45	4.60	21.36	72.36	420.36
T ₈ -75% RDF + Poultry manure (0.5t/ha)	8.62	22.75	32.62	2.05	4.95	4.98	27.55	84.50	486.15
T ₉ -75% RDF + FYM 2.5t + <i>Rhizobium</i>	8.12	21.80	30.59	1.95	4.55	4.56	23.68	75.10	445.36
S.E.m ±	0.15	0.31	0.65	0.02	0.09	0.11	1.25	3.12	12.65
C.D. (at 5%)	0.45	0.93	1.95	0.07	0.27	0.33	3.75	9.35	37.95
CV%	7.72	8.65	7.12	8.65	8.78	7.12	9.36	10.36	8.65

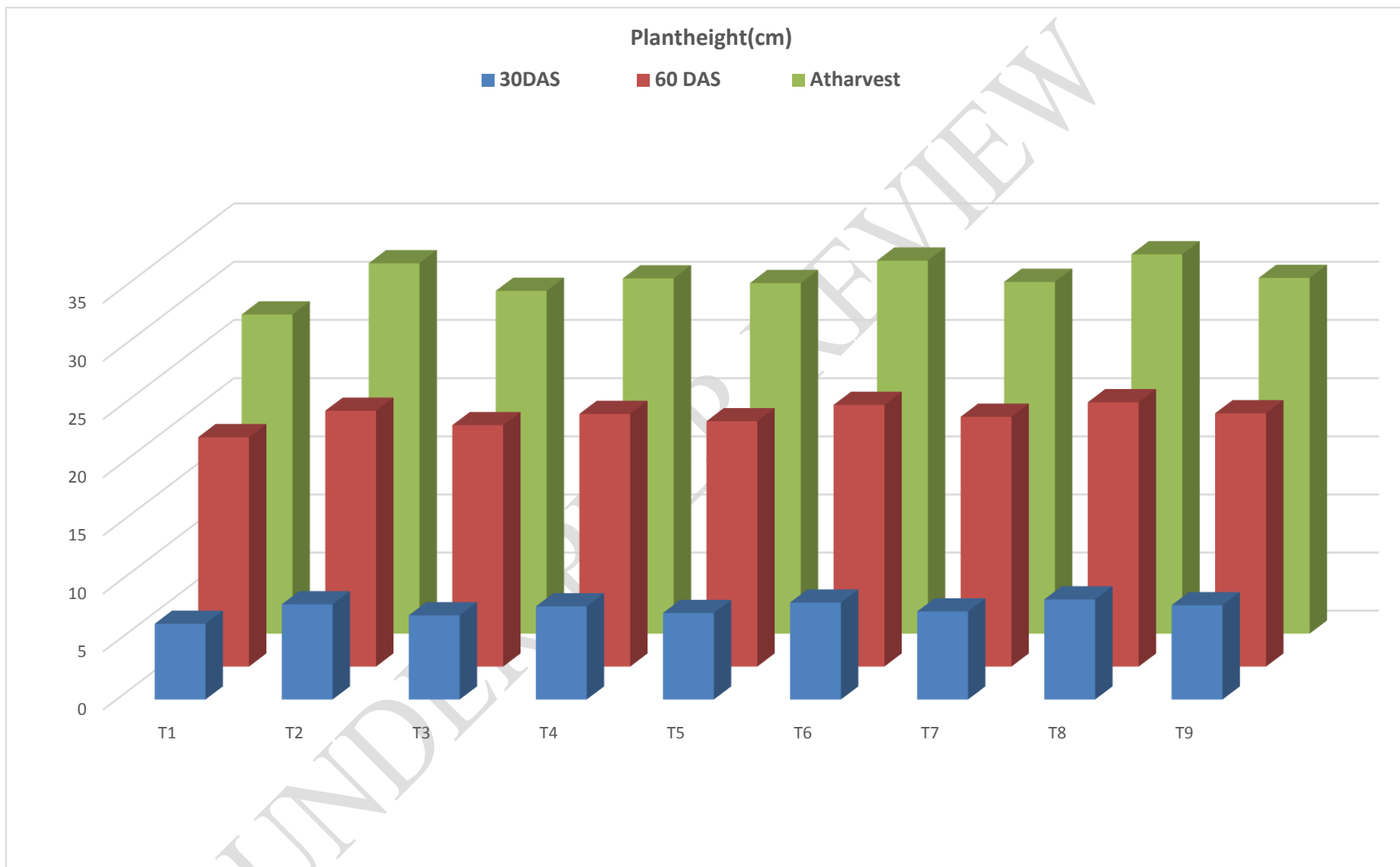


Fig.1 Effect of organic manure and inorganic fertilizer on plant height of lentil

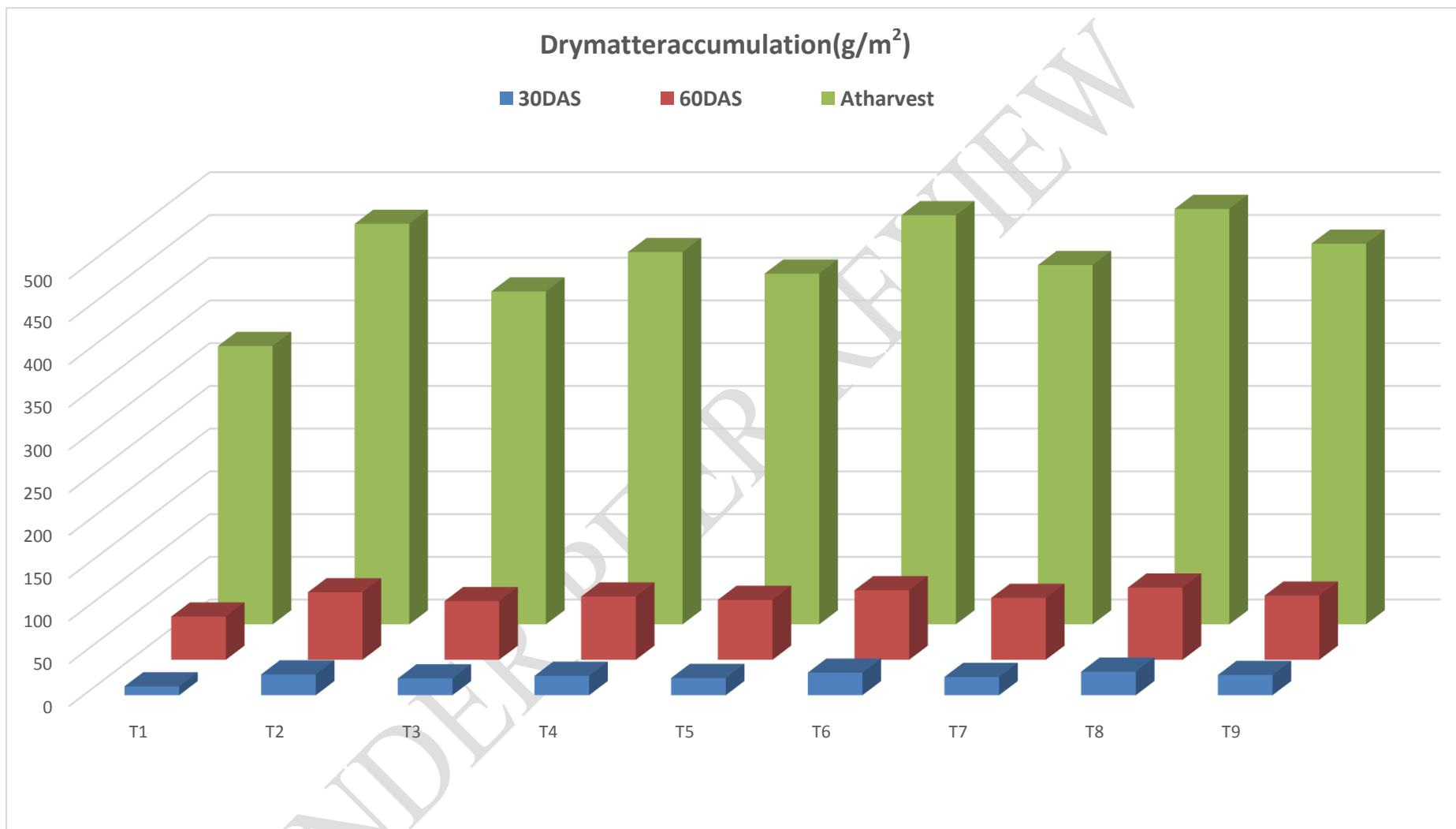


Fig.2 Effect of organic manure and inorganic fertilizer on dry matter accumulation of lentil

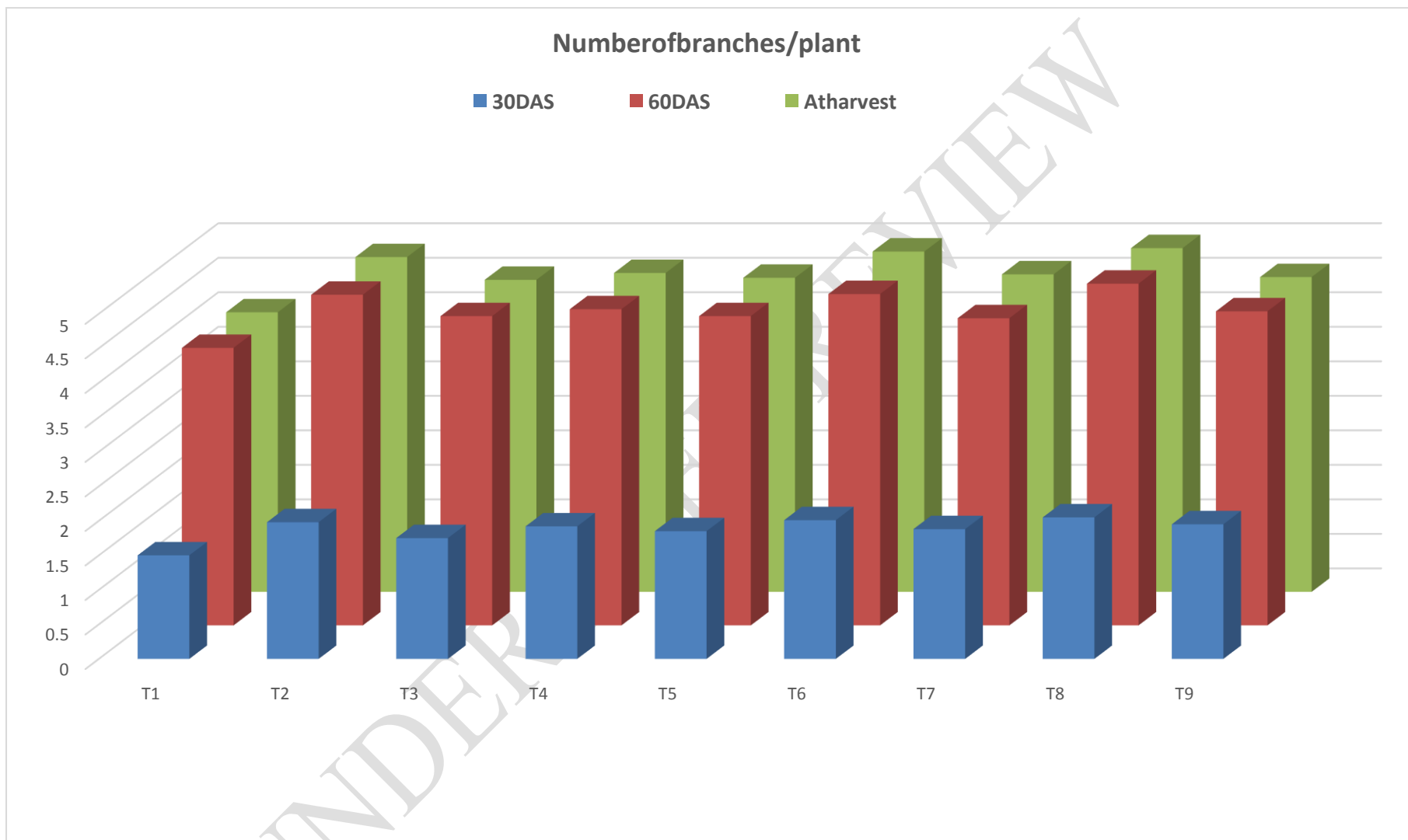


Fig.3Effectoforganic manureandinorganicfertilizeronnumberof branches/plantoflentil

Table.2 Effect of organic manure and inorganic fertilizer on Yield attributes of lentil

Treatments	Number of pods/plant	Grains/ pod	Test weight(g)	Grain yield (q/ha)	Straw yield(q/ha)	Harvest index(%)
T₁: Control						
T₂	30.62	1.32	18.78	7.90	12.33	39.05
T₃	38.14	1.70	36.48	15.96	25.36	38.63
T₄	31.10	1.48	28.63	11.45	18.35	38.42
T₅	34.15	1.60	35.45	15.10	23.63	38.99
T₆	31.45	1.50	30.36	13.12	20.14	39.45
T₇	39.15	1.75	40.15	16.65	27.52	37.70
T₈	33.66	1.50	32.14	14.02	22.65	38.23
T₉	41.25	1.85	40.36	18.55	29.21	38.84
SE.m.±	35.12	1.55	33.41	15.45	25.02	38.18
CD	1.45	0.06	0.78	0.75	1.10	1.18
CV	4.36	0.18	NS	2.26	3.30	NS
	8.98	8.58	6.35	8.36	9.15	6.98

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