Effect of organic manures and inorganic fertilizer on growth and yieldcharactersof lentil

Abstract

A field experiment was conducted at experimental farm, Department of Agronomy, Facultyof Agriculture and Veterinary Sciences, Mewar University Gangrar, Chittorgarh (Rajasthan)duringRabiseasonof2022-23toEffectoforganicmanuresandinorganicfertilizerongrowth and yield characters of lentil. Seed rate 40-45 kg/ha of Lentil variety „ RLG-5" wasused in this study. The required quantities of fertilizers as per treatments were applied.. Theexperiment was laid out in randomized block design with three replications consisting of ninetreatmentscombinationsi.e.T_1-Control,100%RDF(20:40:20:20NPKSkg/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 asplant height (cm), number of branches per plant and dry matter production and yield traitsviz., number of pods per plant, number of seeds per pod, test weight Seed yield (q/ha), strawyield(q/ha)harvest indexof75%RDF +Poultry manure(1 t/ha).

Keywords:-lentil.;vermicompost;Poultrymanure;plantheight

Introduction

Among overall all pulses lentil (*Lens culineris*Medik) with 2n =14 is one of the mostessential grain legume crops in India. Lentils are one of the most nutritious food in India. It ismostly eaten as 'Pulses'. It is easy to cook and so easily digestible with high biological value.LentilisalsocalledasMasurandknownas'Poorman'smeat.InIndia,Lentilcropextensively grown during Rabi season. Lentil. "Being a leguminous crop, it utilizes theatmosphericnitrogentomeetitsfragmentalnitrogenrequirementandthuscapturesanimportant place in crop rotation in different regions in country". "In the country lentil iscultivatedinanareaofabout1.38millionhectareswithproductionaverage0.94million tones and average yield 685 kg/hac.” Customary consumption of nutrients resources of soilhas cause emergence of nutrient deficiencies. This often results in higher yields, higher andfaster soil nutrient emissions. The amount of nitrogen in the soil of India is insufficient.Currently,phosphorusdeficiencyhasaffectedabout65to70percent ofthe soilinIndia.

The indiscriminate use of chemical fertilizers without organic manures is known todegrade physico-chemical as well as biological properties of the soil i.e. soil environment andsoil 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 theproliferation of diverse group of soil microorganisms and improves the ecological balance ofrhizosphere. Farmyard manure is well known as a store house of plant nutrients.
Poultrymanureisagoodsourceofnutrientsandeachtonneofdeeplittercontain29.40kgnitrogen, 20.41 kg phosphorus and 20.41 kg potassium together with 6.8 kg magnesium, 6.8 kg sodiumand 24.21 kg calcium (Chakraborty , 2009). Vermicompost being a rich source of macro andmicronutrients and vitamins, plant growth regulators and beneficial microflora appeared to bethe best organic source in maintaining soil fertility on sustainable basis towards an eco-friendly environment (Chandra , 2003). Vermicompost application to different field crops hasbeen known to reduce the requirement of chemical fertilizers without any reduction in cropyield (Gedam, 2008). Similarly, FYM, poultry manure and farm-compost etc. are known forbeing the store house of plant nutrients with great variation in their nutrient contents and theirrelease pattern after decomposition. Looking to the poor fertility condition of the intensivelycropped lands where lentil is generally grown, addition of organics is important for securingsustainable yield potential. Since, the information was scanty on these aspects; the presentresearchwork was undertaken using lentil as testcrop.

The benefits of using organic fertilizers have been underlined because of the high pricesof commercial fertilizers and their bad effect on soil properties, groundwater, environment,and human health. Organic fertilizers also keep soil healthy and increase plant resistance tohardenvironmentalconditions,andimprovetheirproperties[AL-Taeyetal.,2019].Recently, great efforts have been made to use safe and natural materials to increase
plantgrowthandproductivity.Organicagriculturalpracticesaimtoenhancebiodiversity,biological cycles, and soil biological activity to produce optimal natural systems that aresocially, ecologically, and economically sustainable [Sammanetal., 2008]. Organicfarmingis a technique that involves the use of organic and biological materials and avoids the use

ofsyntheticsubstances,aimingtoreducesoilandenvironmentalpollution;thus,organicmatter applications to soil are highly desired to reduce the cost and harms of chemicals. The use ofthese fertilizers at the appropriate ratio may be valuable in increasing crop yields and keepingsoil healthy [Hamza et al. 2010]. The use of poultry manure and filter mud cake recorded thehighest 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 indecreasingsoilpH[Bakretal2016].Compost(CCB)andfiltermudcake(FMC)areexamples of organic fertilizers that increase soil fertility, improve porosity, and promotehealthycrop production.

MaterialsandMethods

A field experiment was conducted during Rabi season of 2022-23 at experimentalfarm, Department of Agronomy, Faculty of Agriculture and Veterinary Sciences, MewarUniversity Gangrar, Chittorgarh (Rajasthan). Soil of the experimental field was sandy loam intexture, saline in reaction with a pH value of 7.6, poor in organic carbon (0.16%), deficient inavailable zinc (0.48 ppm) and iron (1.2 ppm) low in available nitrogen (176 kg/ha) andphosphorus (20.2 kg/ha) but medium in available potassium (320 kg/ha). The experiment waslaid out in randomized block design with three replications consisting of nine treatmentscombinations i.e. T_1-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 inthis study. The required quantities of fertilizers as per treatments were applied. The doses ofNPKwereappliedintheformofurea,diammoniumphosphate,murateofpotashrespectively. FYM was applied uniformly in soil before sowing. *Rhizobium* culture wereappliedas seed treatment@ 5 ml/kg seed.

ResultsandDiscussion

The purpose of this study was to determine the extent of performance for several growth andyield traits. This 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 podsper plant, number of seeds per pod, test weight Seed yield (q/ha), straw yield (q/ha) harvestindexofLentil.

GrowthAttributes

The highest um plant height was recorded at 30 DAS (8.62 cm) treatment T_8-75% RDF +Poultry manure (1 t/ha). The lowest plant height was recorded (6.52 cm) with T_1-Control.The highest plant height was recorded at 60 DAS (22.75 cm) treatment T_8-75% RDF +Poultry manure (1 t/ha). The lowest plant height was recorded (19.76 cm)with T_1-Control.The highest plant height was recorded at harvest (32.62 cm) treatment T_8-75% RDF + Poultrymanure (1 t/ha). The lowest plant height was recorded (27.45 cm)with T_1-Control. Theresults 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 greateravailabilityand steady releaseof nutrients.

The highest dry matter accumulation was recorded at 30 DAS (27.55 g/m^2) treatmentT_8-75% RDF + Poultry manure (1 t/ha). The lowest dry matter accumulation was recorded(10.33 g/m^2)with T_1-Control. The highest dry matter accumulation was recorded at 60 DAS(84.50g/m^2)treatmentT_8-75%RDF+Poultrymanure(1t/ha).Thelowestdrymatteraccumulationwasrecorded(50.55g/m^2)withT_1-Control.Thehighestdrymatteraccumulationwasrecordedatharvest(486.15g/m^2)treatmentT_8-75%RDF+Poultrymanure (1 t/ha). The lowest dry matter accumulation was recorded (325.66 g/m^2)with T_1-Control. These results are in close conformity with the results of Mohammad Janloo*et al.*,(2009).

Thehighestnumber ofbranches/plantwasrecordedat30DAS(2.05)treatmentT_8-75% RDF + Poultry manure (1 t/ha). The lowest number of branches/plant was recorded (1.50)withT_1-Control. The highest number of branches/plant was recorded at 60 DAS (4.95) treatmentT_8-75% RDF + Poultry manure (1 t/ha).The lowest number of branches/plant was recorded(4.02)with T_1-Control. The highest number of branches/plant was recorded at harvest (4.98)treatment T_8-75% RDF + Poultry manure (1 t/ha).The lowest number of branches/plant wasrecorded (4.05)with T_1-Control. The highest number of branches recorded might be due togreater availability of nutrients. Babu *et al.*, (2007) reported that slow release of nutrientsfrom the organic sources at later stages of crop growth had resulted in increased number ofbranches. Number of branches increased with the supply of phosphorus is in accordance withthefinding of Sharma and Sharma(2004).

YieldAttribute

The highest number of pods/plant was recorded (2.05) with the treatment T_8-75% RDF +Poultry manure (1 t/ha).The lowest number of pods/plant was recorded (30.62)with T_1-Control. The highest number of grains/pod was recorded (1.85) with the treatment T_8-75%RDF + Poultry manure (1 t/ha). The lowest number of grains/pod was recorded (1.32)withT_1-Control. The highest grain yield was recorded (18.55 q/ha) with the treatmentT_8-75%RDF + Poultry manure (1 t/ha). The lowest grain yield was recorded (7.90 q/ha)with T_1-Control. The highest straw yield was recorded (29.21 q/ha) with the treatment T_8-75% RDF +Poultry manure (1 t/ha). The lowest straw yield was recorded (12.33 q/ha) with T_1-Control.These findings are in agreement with the findings of Brahmachari*et al.*, (2004, 2008), Rabbi*etal.*,(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.1Effectoforganicmanureandinorganicfertilizeratdifferentgrowthstages oflentil

Treatments	Plantheight			Number of branches/plant			Drymatteraccumulation(g/m^2)		
	30 DAS	60DAS	At harvest	30 DAS	60 DAS	At harvest	30DAS	60DAS	Atharvest
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(20:40:20:20NP 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 + Poultrymanure(1t/ha)	7.58	21.50	30.25	1.88	4.45	4.60	21.36	72.36	420.36
T_8-75% RDF + Poultrymanure(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+FYM2.5t + *Rhizobium*	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.(at5%)	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

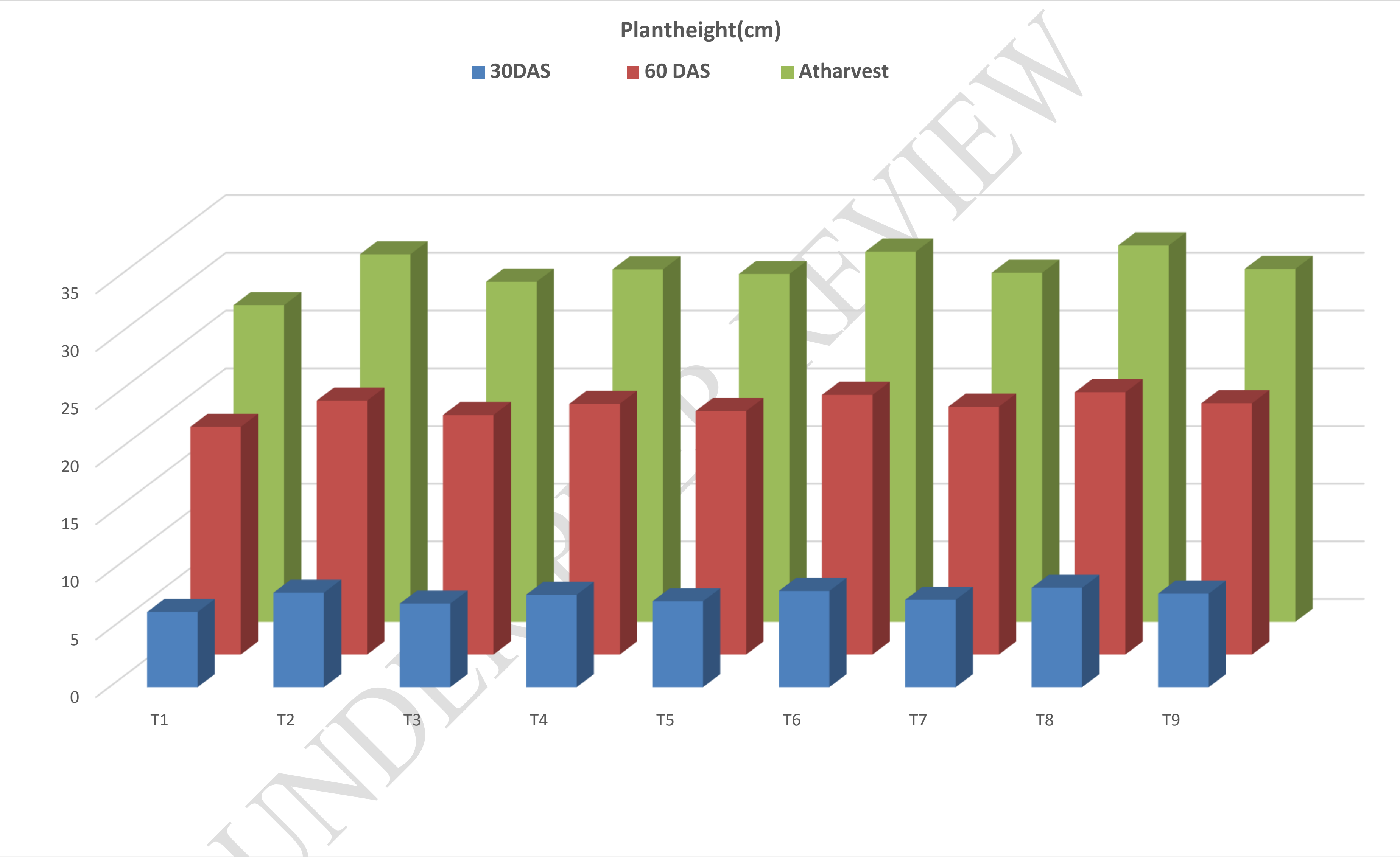

Fig.1Effectoforganicmanureandinorganic fertilizeronplantheightoflentil

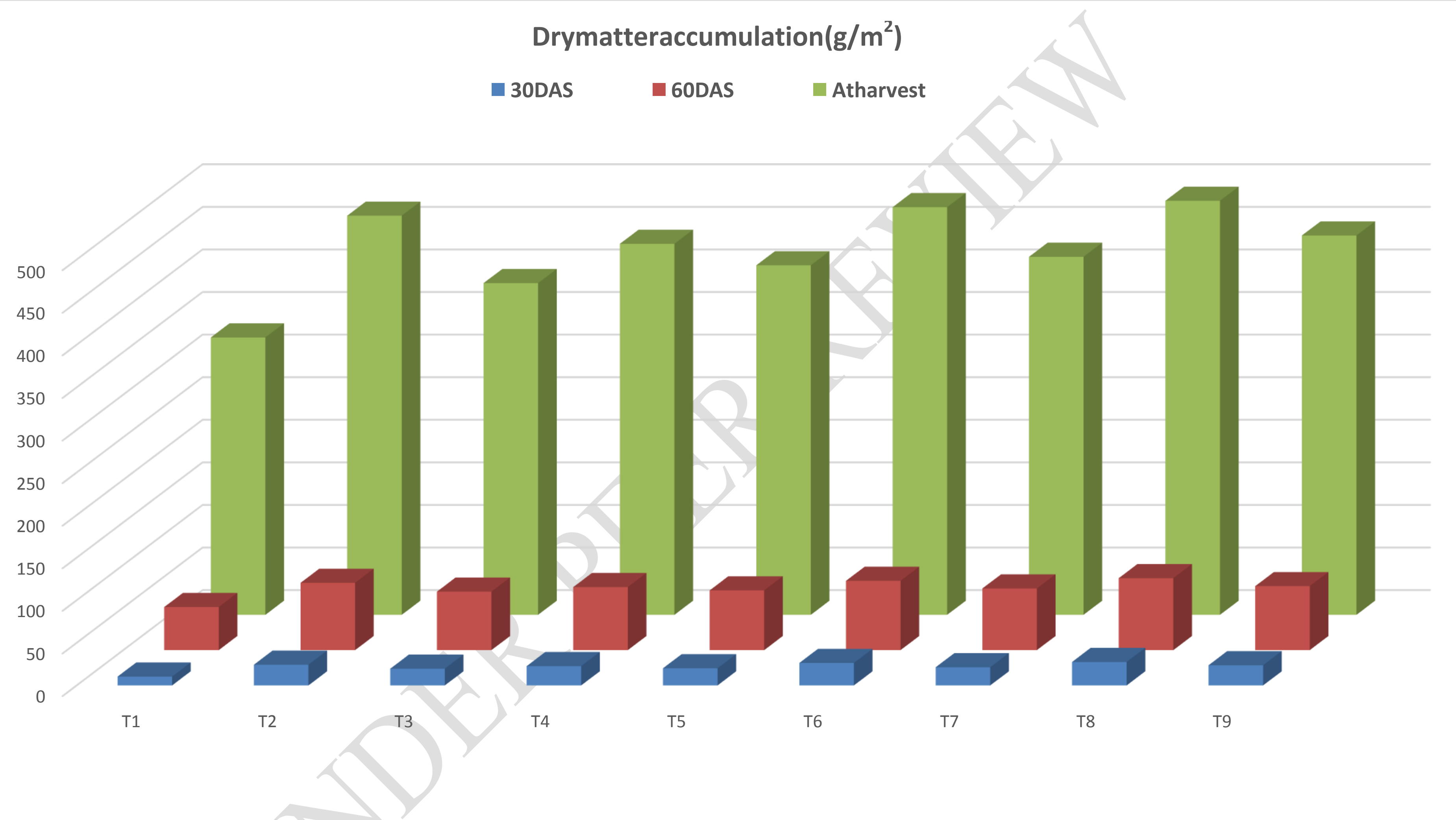

Fig.2Effectoforganic manureandinorganicfertilizerondrymatter accumulationof lentil

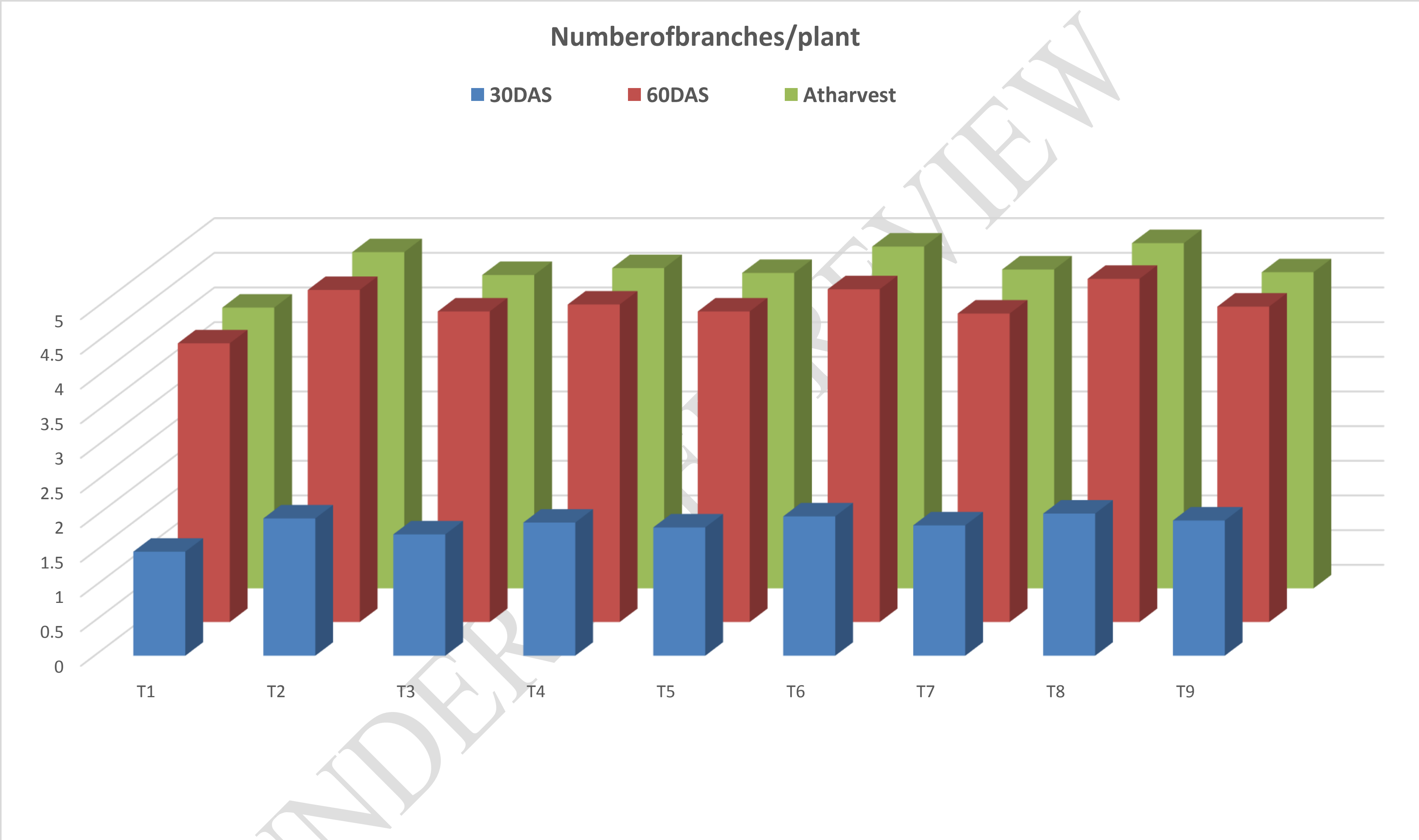

Fig.3Effectoforganic manureandinorganicfertilizeronnumberof branches/plantoflentil

Table.2Effectoforganicmanure andinorganicfertilizeronYield attributes oflentil

Treatments	Numberof pods/plant	Grains/ pod	Test weight(g)	Grainyield (q/ha)	Straw yield(q/ha)	Harvest index(%)
T_1: Control						
T_2	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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