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Effect of integrated nutrient management on reproductive growth and yield performance of lettuce *(Lactuca Sativa L.)"* in central (Uttar Pradesh)

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Abstract
A field experiment was carried out entitled "Effect of integrated nutrient management on growth and yield performance of lettuce *(Lactuca sativa L.)"*cv. Iceberg and Lollorosso in central (U.P), in Factorial Randomized Block Design with three replications. The experiment was conducted at the Horticulture Research Farm of the Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Vidya-Vihar, Rae Bareli Road, Lucknow (U.P.), India; during rabi season of 2016- 17. The experiment comprises of different doses of Treatments i.e. N P K (100%) (Control), FYM (100%), Vermicompost (100%), Biofertilizer- (100%), FYM +Biofertilizer (50% + 50%), Vermicompost + Biofertilizer (50% + 50%) and N P K + Biofertilizer (50% + 50%). The vegetative growth, yield Performance attributing characters were recorded maximum plant height (24.97 cm), number of leaf (37.00), length of leaves (21.19cm), leaves width (13.98 cm), Plant spreads (East-West) and (North-South) direction,(44.65cm, 41.09cm) yield characters Root length (10.67cm), Root spreads (10.05cm), Root weight in (65.00g) Yield in (746.67g).Varieties iceberg superior than Lollorosso.

Keywords: lettuce, bio fertilizer, performance and yield

Introduction
Lettuce *(Lactuca sativa L.)* belongs to the family Compositae (Asteraceae) with chromosome number 2n = 18. It is the most popular salad crops in the world and is native of Mediterranean region (Kumar and Kumar, 2007). Lettuce is a cool season annual crop of temperate region. Lettuce is a major salad crop in North America, Australia and most countries of Europe and South America. USA is the largest producer and consumer of lettuce. China is first largest producer of lettuce in the world and in India it is grown in the kitchen gardens and to meet the demand of continental hotels (Dhaliwal, 2002) [12]. Growing of lettuce sandy loam or silt loam soil is best, for its commercial cultivation the optimum soil p^H range is 5.8 – 6.6 (Thamburaj and Singh, 2001) [25]. Lettuce is a rich source Vitamin A, C and B complex group of vitamins like thiamine, pyridoxine, and riboflavin. It also provides some dietary fiber, carbohydrates, protein and a small amount of fat. Lettuce also provides calcium, iron and copper and minerals largely found in the leaf (Bhat, 2007) [7]. Per hundred gram of edible portion of lettuce contains moisture 93.4 g, protein 2.1 g, fat 0.3 g, minerals 1.2 g, fiber 0.5 g, carbohydrates 2.5 g, calcium 50 mg, phosphorus 28 mg, iron 2.4 mg, vitamin A 1650 I.U., thiamine 0.09 mg, niacin 0.50 mg, riboflavin 0.13 mg, vitamin C 10 mg and energy 2.1 kcal (Choudhary *et al*., 2003) [9].
Lettuce possesses several medicinal use and health-beneficial components such as antioxidants, flavonoids and phenolic acids. The use of these health beneficial components has been considered in the prevention and treatment of diseases such as cancers and heart diseases lettuce possess anti-inflammatory properties that help in controlling inflammation. It is beneficial in reducing risk of diabetes, helps to improve bone health and metabolism in body. The antioxidant activity of flavonoids can also prevent risk of cancers and cardiovascular diseases. Lettuce is a rich source of nutraceutical and pharmaceutical, antioxidants bioactibephytochemicals compounds which are rich in anticarcinogenic properties (Swarup, 2006, Bhat 2007 [7], Gopalakrishnan *et al.,* 2001). Organic and inorganic sources of fertilizer play an important role in increasing agriculture production and the standardization of the organic farming practices and availability of required nutrients and plant protection measure is becoming important. Bio-fertilizer are natural fertilizer containing carrier based microorganisms which help to enhance productivity by biological nitrogen fixation or solubilization of insoluble phosphate or producing hormones, vitamins, and other growth factors required for plant growth. Farmyard Manure (FYM) refers to the decomposed mixture of dung and urine of the farm animals along with litter and left over material from roughages or fodder fed to the cattle. On an average well decomposed farmyard manure contains 0.5 per cent N, 0.2 per cent P2O5 and 0.5 percent K2O. Vermicompost has a higher level of available nutrients like nitrate or ammonium nitrogen, exchangeable phosphorous and soluble potassium, calcium and magnesium derived from the wastes.

Materials and Methods
The present investigation entitled "Effect of integrated nutrient management on growth and yield performance of lettuce *(Lactuca sativa L.)"*cv. Iceberg and Lollorosso in central (U.P) was carried out at the Horticulture Research

Farm- I of the Department of Applied Plant Sciences (Horticulture), Babasaheb Bhimrao Ambedkar University, (A central university), Vidya-Vihar Rae Bareli Road, Lucknow- 226 025 (U.P.) India. The experiment was conducted under Factorial Randomized Block Design with three replications. Factor –A Varieties and Factor-B treatments Details of material used and methodology employed to plan and execute the experiment are described in this chapter. The field experiment was conducted at Horticulture Research Farm-I of the Babasaheb Bhimrao Ambedkar University during Rabi season of 2016-17. Geographically, Lucknow is situated at 26050′ N latitude, 80052′ E longitude and altitude of 111 meter above mean sea level (MSL). Lucknow has humid subtropical climate with an average annual rainfall of about 750 cm. The winter is severe and summer is dry and hot. The maximum temperature generally goes up to (430c) in summer and average minimum up to 20C in winter. Monsoon generally sets in during the third week of June and recedes by the end of September with heavy rainfall during monsoon season. The seed of Lettuce Two varieties *viz*. Iceberg and Lollorosso collected from Central Institute for Temperate Horticulture old Airport, Rengreth Srinagar, Jammu & Kashmir were sown in the nursery beds of Horticulture Research Farm-I, Babasaheb Bhimrao Ambedkar University, Lucknow, by sowing in row method on 22 October 2016. Raised bed about 5-6 meter long, one meter width and 15 cm above ground level, was prepared. The seed beds were covered with compost, mulching, and thatches with polythene paper over the bed to protect the young seedlings from adverse climatic condition, 30 days after sowing, seedlings were ready for transplanting. These healthy seedling uniform shape and size were selected and transplanting in well prepared field. Five plants were randomly selected and tagged before flowering from each line to record the data on the following attributes. The experimental materials included Seven treatment combinations *viz*. T1 N P K (100%) (Control), T2 FYM (100%), T3 Vermicompost (100%), T4 Biofertilizer-(Azospirillum), T5 FYM +Biofertilizer (50% + 50%), T6 Vermicompost + Biofertilizer (50% + 50%), T7 N P K + Biofertilizer- (50% + 50%). The observations were recorded on 10 characters under vegetative growth and yield Performance attributing traits in Lettuce, i.e. height of the plant(cm), number of leaves of per plant, length of leaf(cm), width of leaf (cm.), Plant spreads –(East-West) and (North-South) direction, yield characters Root length (cm), Root spreads (cm), Root weight in (g) and Yield in (g).

Least significant difference at 5% level was used for finding the significant differences among the treatment means. s. Data on growth and yield components were collected using standard procedures and were analyzed statistically as per the procedure given by Panse and Sukhatme, 1967.

Results and Discussion

Regarding the growth parameters *viz*. plant height, number of leaves per plant, leaf length (cm), leaf width (cm), Plant spreads- (East-West) and (North- South) direction, yield characters Root length (cm), Root width (cm), Root weight in (g) and Yield in (g) In the present study, plant height was significantly influenced the growth over control by 50% vermicompost and 50% bio-fertilizers treatment. Data recorded in respect of different tables revealed that the differences with respect to the vegetative growth and yield Performance were significant among different treatment combinations.

Plant height (cm)

Height of plant show that the effect of integrated nutrient management i.e. reduced doses of fertilizers with bio-fertilizers and fertilizer on plant height was significantly at all stages of plant growth. Maximum plant height under the treatment T6 V1 (24.97 cm. with 50% vermicompost + 50% bio fertilizer) was observed significantly highest then the rest of the treatments. Minimum plant height was recorded in control T1 V1 (17.72 cm. with 100% NPK) followed by the variety V2 maximum plant height in the treatment T3 V2 (21.82 with 100% FYM) then the minimum plant height under the control treatment T1 V2 (15.08 cm. with 100% NPK). Similar results due to effect of integrated nutrient management were recorded by Masarirambi *et al.*, (2010) Sarhan *et al.*, (2012)

Table 1: Plant height (cm.)

Treatment	15 days			30 days			45 days		
	V1	V2	Mean	V1	V2	Mean	V1	V2	Mean
T1	6.12	5.93	6.03	13.43	12.13	12.78	17.72	15.08	16.40
T2	7.49	8.05	7.77	15.23	18.79	17.01	19.83	21.56	20.69
T3	9.04	7.79	8.41	16.86	17.58	17.22	21.52	21.82	21.67
T4	8.11	6.72	7.42	17.59	14.38	15.99	21.61	18.84	20.23
T5	8.12	6.67	7.40	17.40	14.70	16.05	22.47	19.55	21.01
T6	8.46	6.63	7.55	18.25	12.43	15.34	24.97	15.67	20.32
T7	7.95	7.08	7.52	18.81	13.88	16.35	23.07	17.62	20.35
Mean	7.90	6.98		16.80	14.84		21.60	18.59	
	Variety (V)	Treatment (T)	V × T	Variety (V)	Treatment (T)	V × T	Variety (V)	Treatment (T)	V × T
S.Em.±	0.18	0.34	0.48	0.39	0.74	1.05	0.39	0.74	1.04
CD at 5%	0.53	1.00	1.42	1.15	2.16	3.06	1.15	2.15	3.04
F-value	12.27	4.27	1.44	10.87	4.04	4.74	38.72	6.93	6.67
Sig.	**	**	ns	**	**	**	**	**	**

Number of leaves per plant

Regarding the number of leaves, it was observed that the effect of different treatment of integrated nutrient management indicated that maximum number of leaves with the treatment T4 V1 (37.00 cm. with 100% bio fertilizer) was recorded significantly highest then the rest of the treatments. The minimum number of leaves was recorded in control T1 V1 (23.50 cm. 100% NPK) followed by the variety V2 maximum number of leaves in the treatment T2 V2 (24.42 cm. 100% FYM) then the minimum number of

leaves was under the control treatment T1 V2 (23.33 cm. with 100% NPK).

Increase in number of leaves might be due to the application of inm and bio fertilizer This ultimately helped in increasing the uptake of nitrogen and other nutrients and produced more number of leaves. Similar finding due to integrated nutrient management were reported by Masarirambi *et al.,* (2010) Sarhan *et al.,* (2012)

Table 2: Number of leaves per plant

Treatment	15 days			30 days			45 days		
	V1	V2	Mean	V1	V2	Mean	V1	V2	Mean
T1	5.33	5.25	5.29	14.50	12.75	13.63	23.50	20.92	22.21
T2	7.00	6.58	6.79	18.00	15.92	16.96	29.50	24.42	26.96
T3	7.67	6.08	6.88	20.33	14.83	17.58	34.83	23.33	29.08
T4	8.92	5.92	7.42	22.42	13.83	18.13	37.00	21.00	29.00
T5	8.33	6.17	7.25	21.67	14.08	17.88	36.67	22.75	29.71
T6	8.50	5.50	7.00	22.67	13.03	17.85	34.33	20.00	27.17
T7	7.50	5.83	6.67	21.25	14.25	17.75	34.83	21.58	28.21
Mean	7.61	5.90		20.12	14.10		32.95	22.00	
	Variety (V)	Treatment (T)	V × T	Variety (V)	Treatment (T)	V × T	Variety (V)	Treatment (T)	V × T
S.Em.±	0.17	0.33	0.47	0.44	0.82	1.16	0.57	1.07	1.51
CD at 5%	0.52	0.97	1.38	1.28	2.39	3.38	1.66	3.11	4.40
F-value	44.94	4.29	2.90	93.31	3.67	3.49	183.11	5.60	5.66
Sig.	**	**	*	**	*	*	**	**	**

Leaves length (cm)

Regarding the leaves length (cm), It was observed that the effect of different treatment of inm indicated that the Maximum leaves length under the treatment T3 V1 (21.19 cm. with 100% vermicompost) was recorded significantly highest.

Then the rest of the treatments. Minimum leaves length was recorded in control T1 V1 (15.33 cm. with 100% NPK) followed by the variety V2 maximum leaves length in the treatment T3 V2 (18.23 cm. with 100% vermicompost) then the minimum length of leaves was under the control treatment T1 V2 (14.46 cm. with 100% NPK) Increase in length of leaves might be due to the application of organic manure and bio- fertilizers along with vermicompost. These results are in agreement with the findings of Masarirambi *et al.,* (2010) Sarhan *et al.,* (2012)

Table 3: Leaves length (cm.)

Treatment	15 days			30 days			45 days		
	V1	V2	Mean	V1	V2	Mean	V1	V2	Mean
T1	4.56	4.63	4.59	14.05	13.45	13.75	15.33	14.46	14.90
T2	5.08	5.14	5.11	17.12	17.33	17.22	18.70	17.74	18.22
T3	6.19	5.61	5.90	18.11	17.42	17.76	21.19	18.23	19.71
T4	6.06	4.89	5.47	18.41	14.05	16.23	20.73	15.69	18.21
T5	5.87	4.35	5.11	17.90	14.87	16.38	19.29	15.21	17.25
T6	5.54	4.07	4.81	18.43	11.95	15.19	20.37	13.88	17.13
T7	5.59	4.51	5.05	19.10	13.27	16.18	20.66	14.66	17.66
Mean	5.55	4.74		17.59	14.62		19.47	15.70	
	Variety (V)	Treatment (T)	V × T	Variety (V)	Treatment (T)	V × T	Variety (V)	Treatment (T)	V × T
S.Em.±	0.12	0.23	0.33	0.28	0.53	0.75	0.29	0.55	0.78
CD at 5%	0.36	0.68	0.96	0.83	1.55	2.20	0.86	1.61	2.28
F-value	20.87	3.35	2.06	53.82	6.09	6.30	80.35	6.91	4.17
Sig.	**	*	Ns	**	**	**	**	**	**

Leaves width (cm)

Leaf width was influenced by the application of inm under different treatments, Table 1 indicates that the pattern of increasing leaf width Maximum leaves width with the treatment T7 V1 (13.98 cm with 50% NPK + 50% bio fertilizer) was recorded significantly highest then the rest of the treatments. Minimum leaves width was recorded in control T1 V1 (9.20 cm with 100% NPK) followed by the variety V2 maximum width of leaves in the treatment T2 V2 (13.39 cm 100% FYM) then the minimum leaves width was under the control treatment T1 V2 (9.74 cm with 100% NPK). Under the treatment receiving nitrogen through organic manure couple with nitrogen fixation through Azotobacter supported by additional use of vermicompost leads to more leaf width. Similar results due to effect of inm were recorded by Masarirambi *et al.,* (2010) Sarhan *et al.,* (2012)

Table 4: Leaves width (cm.)

Treatment	15 days			30 days			45 days		
	V1	V2	Mean	V1	V2	Mean	V1	V2	Mean
T1	3.12	2.57	2.85	8.73	9.33	9.03	9.20	9.74	9.47
T2	3.29	3.81	3.55	10.14	12.87	11.51	10.86	13.39	12.13
T3	3.66	3.45	3.55	12.16	12.29	12.23	12.67	12.86	12.77
T4	3.69	3.36	3.53	11.55	10.36	10.95	12.73	11.65	12.19

T5	3.56	2.90	3.23	11.52	10.18	10.85	12.58	11.37	11.98
T6	3.41	2.78	3.09	11.33	8.66	9.99	12.06	9.81	10.94
T7	3.59	3.01	3.30	11.88	10.39	11.14	13.98	11.10	12.54
Mean	3.47	3.13		11.04	10.58		12.01	11.42	
	Variety (V)	Treatment (T)	V × T	Variety (V)	Treatment (T)	V × T	Variety (V)	Treatment (T)	V × T
S.Em.±	0.03	0.07	0.10	0.06	0.12	0.18	0.19	0.36	0.52
CD at 5%	0.11	0.21	0.29	0.19	0.37	0.52	0.57	1.07	1.51
F-value	39.54	13.46	8.28	23.01	66.23	48.64	4.49	9.69	6.14
Sig.	**	**	**	**	**	**	*	**	**

Canopy spreads (cm)

Regarding the canopy spreads, it was observed that the effect of different treatment of integrated nutrient management indicated that Maximum increase in canopy spreads East-West and North-South direction in treatment T4V1 (23.63 cm and 22.71 cm) was recorded significantly highest then the rest of the treatments. Minimum increase in canopy spreads East-West and North-South direction was recorded in control T1 V1 (13.53 cm and 14.62 cm with100% NPK) followed by the variety V2 maximum increase in canopy spreads East-West and North-South direction in the treatment T2 V2, (17.98 cm and 17.75 cm with 100% FYM &100%NPK). Minimum increase in canopy spreads was under the control treatment T1 V2 (12.30 cm, 11.16cm with 100% NPK) at 15 days after transplanting.

Table 5: Averages no of canopy spreads at 15 days

Treatment	East-West			North-South		
	V1	V2	Mean	V1	V2	Mean
T1	13.53	12.30	12.92	14.62	11.16	12.89
T2	17.28	17.98	17.63	15.70	17.75	16.73
T3	21.59	17.22	19.40	21.67	15.61	18.64
T4	23.63	14.23	18.93	22.71	15.21	18.96
T5	20.52	14.91	17.72	20.84	15.72	18.28
T6	20.95	13.73	17.34	21.14	13.18	17.16
T7	19.94	14.76	17.35	18.73	14.70	16.72
Mean	19.63	15.02		19.34	14.76	
	Variety (V)	Treatment (T)	V × T	Variety (V)	Treatment (T)	V × T
S.Em.±	0.24	0.45	0.64	0.30	0.56	0.80
CD at 5%	0.71	1.33	1.88	0.88	1.65	2.34
F-value	177.48	21.08	14.04	113.15	12.94	8.73
Sig.	**	**	**	**	**	**

Regarding the canopy spreads, it was observed that the effect of different treatment of integrated nutrient management indicated that Maximum increase in canopy spreads East-West and North-South direction in treatment T7V1,T4V1 (30.91 cm and 31.66 cm with 50%NPK+50% bio fertilizer) was recorded significantly highest then the rest of the treatments. Minimum increase in canopy spreads East-West and North-South direction was recorded in control T1 V1 (24.59 cm and 25.26 cm with100% NPK) followed by the variety V2 maximum increase in canopy spreads East-West and North-South direction in the treatment T3 V2, (26.35 cm and 26.07 cm with 100% FYM).Minimum increase in canopy spreads was under the control treatment T1 V2 (17.05 cm 17.69 cm with 100% NPK) at 30 days after transplanting

Table 6: Averages no of canopy spreads at 30 days

Treatment	East-West			North-South		
	V1	V2	Mean	V1	V2	Mean
T1	24.59	17.05	20.82	25.26	17.69	21.48
T2	29.56	24.51	27.04	28.03	25.48	26.76
T3	27.63	26.35	26.99	28.27	26.07	27.17
T4	28.88	20.55	24.72	31.66	20.92	26.29
T5	30.22	21.40	25.81	29.02	22.61	25.82
T6	30.37	18.75	24.56	30.41	19.96	25.19
T7	30.91	22.05	26.48	31.34	22.31	26.83
Mean	28.88	21.52		29.14	22.15	
	Variety (V)	Treatment (T)	V × T	Variety (V)	Treatment (T)	V × T
S.Em.±	0.35	0.66	0.94	0.57	1.07	1.51
CD at 5%	1.04	0.94	2.75	1.66	3.12	4.41
F-value	211.26	10.56	6.11	73.19	3.29	2.56
Sig.	**	**	**	**	*	*

Regarding the canopy spreads, it was observed that the effect of different treatment of integrated nutrient management indicated that Maximum increase in canopy spreads East-West and North-South direction in treatment T7V1 (44.65 cm and 41.09 cm with 50%NPK+50% bio fertilizer) was recorded significantly highest then the rest of the treatments. Minimum increase in canopy spreads East-West and North-South direction was recorded in control T1

V1 (34.88 cm and 31.02 cm with100% NPK) followed by the variety V2 maximum increase in canopy spreads East-West and North-South direction in the treatment T2 V2, T1V2 (35.93 cm and 36.31 cm with 100% FYM &100%NPK). Minimum increase in canopy spreads was under the control treatment T1 V2 (35.14 cm 36.31 cm with 100% NPK) at 45 days after transplanting

Table 7: Averages no of canopy spreads at 45 days

Treatment	East-West			North-South		
	V1	V2	Mean	V1	V2	Mean
T1	34.88	35.14	35.01	31.02	36.31	33.66
T2	36.48	35.93	36.20	35.48	33.98	34.73
T3	37.71	35.59	36.65	34.20	33.18	33.69
T4	39.27	32.24	35.76	36.19	31.29	33.74
T5	36.36	32.91	34.64	37.43	30.72	34.08
T6	41.67	27.00	34.34	40.30	26.59	33.45
T7	44.65	26.37	35.51	41.09	26.17	33.63
Mean	38.72	32.17		36.53	31.18	
	Variety (V)	Treatment (T)	V × T	Variety (V)	Treatment (T)	V × T
S.Em.±	0.23	0.43	0.61	0.11	0.21	0.30
CD at 5%	0.68	1.27	1.80	0.33	0.62	0.87
F-value	391.48	3.65	68.48	1101.69	4.07	284.10
Sig.	**	*	**	**	**	**

Root length and root width (cm)

Regarding the root length and root width it was observed that the effect of different treatment of integrated nutrient management indicated that Maximum root length and root width in treatment T6 V1, T4V1 (10.67 cm with 50%vermicompost + 50% bio fertilizer, 100%NPK) was recorded significantly highest then the rest of the treatments. Minimum root length and root width was recorded in control T1 V1 (9.15 cm and 8.92 cm with100% NPK) followed by the variety V2 maximum root length and root width in the treatment T3 V2, T6 V2 (10.05 cm and 8.40 cm with 100% vermicompost and 50% vermicompost + 50% bio fertilizer) then the minimum root length and root width was under the control treatment T1 V2 (9.29 cm and 7.67 cm with 100% NPK). Islam *et al.*, (2012) observed that the average maximum number of leaves, root length and root width was observed by using organic manure.

Table 8: Root length and root width at 60 days

Treatment	Root length (cm)			Root width (cm)		
	V1	V2	Mean	V1	V2	Mean
T1	9.15	9.29	9.22	8.92	7.67	8.30
T2	9.05	8.75	8.90	7.97	7.86	7.91
T3	8.84	10.05	9.44	7.47	8.21	7.84
T4	9.67	9.81	9.74	8.75	8.23	8.49
T5	9.56	9.62	9.59	8.36	7.91	8.14
T6	10.67	9.16	9.91	8.24	8.40	8.32
T7	9.67	7.94	8.81	7.80	7.42	7.61
Mean	9.52	9.23		8.22	7.96	
	Variety (V)	Treatment (T)	V × T	Variety (V)	Treatment (T)	V × T
S.Em.±	0.08	0.15	0.21	0.05	0.10	0.15
CD at 5%	0.24	0.44	0.63	0.16	0.30	0.43
F-value	5.97	7.34	10.97	10.56	8.54	8.39
Sig.	*	**	**	**	**	**

Root weight (gm)

Regarding the, root weight it was observed that the effect of different treatment of integrated nutrient management indicated that Maximum root weight in treatment T4 V1 (65.00 gm with 100% bio fertilizer) was recorded significantly highest then the rest of the treatments. Minimum root weight was recorded in control T1 V1 (50.00 gm 100% NPK) followed by the variety V2 maximum root weight in the treatment T6 V2 (73.00 gm with 100% FYM) then the minimum root weight was under the control treatment T1 V2 (49.00 gm with 100% NPK).

Root weight (g.) 60 days

Table 9

Treatment	Root weight (g)		
	V1	V2	Mean
T1	50.00	49.00	49.50
T2	46.67	41.67	44.17
T3	34.00	24.67	29.33
T4	65.00	36.67	50.83
T5	38.67	32.67	35.67
T6	44.67	73.00	58.83
T7	61.00	33.67	47.33
Mean	48.57	41.62	
	Variety (V)	Treatment (T)	V × T
S.Em.±	0.92	1.73	2.45
CD at 5%	2.69	5.04	7.13
F-value	28.07	32.32	29.91
Sig.	**	**	**

Yield per plot (gm)

Regarding the yield per plot (gm), it was observed that the effect of different treatment of integrated nutrient management indicated that The maximum yield in the treatment T1 V1 (749.17 gm with 100% Biofertilizer) was recorded significantly highest then the rest of the treatments. The minimum yield was recorded in control T1 V1 (525.83 gm with100% NPK) followed by the variety V2 maximum yield in the treatment T2 V2 (716.67 gm with 100% FYM) then the minimum yield was under the control treatment T1 V2 (714.67 gm with 100% NPK). Sepat *et al.*, (2012) conducted that the to determine the influence of fertility level and organic manure on vegetative growth and quality of tomato, Shams *et al.*, (2013) on lettuce, Singh *et al.*, (2016) [25] observed that the effect of integrated nutrient management on vegetative growth and yield of baby corn they significantly increase plant height, number of leaves, leaves length, leaves width and ultimately yield. Sarhan *et al.*, (2012) [12] observed that the effect of bio fertilizer on growth yield quality of lettuce the result showed that there was significant increase in studied characteristics plan height, number of leaves, leaves length.

Table 10: Yield

Treatment	Yield (g)		
	V1	V2	Mean
T1	525.83	714.67	636.25
T2	595.42	716.67	656.04
T3	475.00	421.67	448.33
T4	749.17	487.50	618.33
T5	665.83	352.50	509.17
T6	485.83	310.00	397.92
T7	686.67	335.17	510.92
Mean	569.11	481.45	
	Variety (V)	Treatment (T)	V × T
S.Em.±	14.65	27.42	38.78
CD at 5%	42.60	79.71	112.73
F-value	17.88	11.54	14.90
Sig.	**	**	**

Conclusion

The overall results obtained from the present investigation clearly revealed that among various combinations of integrated nutrient management, responded well as substitute to sole fertilizer for vegetative growth of plant i.e the combination of Vermi-compost, Bio fertilizer and N, P, K giving better result. They increased the plant height, number of leaves, leaves length, Leaves width, canopy spreads, root length, root spreads, root weight and ultimately yield in lettuce under central Utter Pradesh. Production as well as nutrient to human health from lettuce under inm condition can be studied. Complete inm production technology for lettuce is may be developed for better production and human health.

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