Original Research Article

EFFECT OF ORGANIC MANURE AND INORGANIC FERTILIZER ON GROWTH YEILD AND QUALITY OF ONION (*Alliumcepa* L.)

ABSTRACT

An experiment entitled Effect of Organic manure and inorganic fertilizer on growth, Yield and Quality of Onion (*Allium cepa* L.)" was conducted at Horticulture research farm, Department of Horticulture, Naini Agricultural Unstitute, Sam Higginbottom University of Agriculture,TechnologyandSciences,Prayagraj.Theexperimentframedwasintendedtostudythee ffectofdifferentorganicmanures, inorganic fertilizers on growth, yield and quality of onion.The results of the present investigation indicated that, the combined application of organicmanures and inorganic fertilizers has significant influence the growth, yield and quality parameters ofonion as regards to the treatment T_8 (70% RDN + 30% FYM) was found superior for most of the traitsunder study and it was at with treatment T_7 (70 % RDN + 30 % Vermicompost), T_5 (80 % RDN + 20% FYM) and T_4 (80% RDN+20 %Vermicompost). The maximum values of growth parameters like plant height (91.44 cm) and number of leaves (10.53) at harvest were recorded in treatment (T8). The yieldcontributing characters like diameter of bulb (8.70 cm), number of bulbs (41.33), yield per plot (5.07Kg), yield per hectare (33.77q) were found to be maximum in T_8. The parameters like weight of freshbulb (181.70g), weight of dry bulb (168.07 g) was high in T_6 and T_8 respectively. Hence, it can beconcluded that, for getting optimum growth, higher yields the crop should be supplied with the 70%recommended dose of N, P, K, fertilizers (110:40:60 kg/ha), in which the 30% quantity of N shouldappliedthrough farmyardmanure.

Keywords: Recommended Dose of fertilizer (RDF) Nitrogen – phosphorous – Potassium (NPK), Farm Yard Manure (FYM), Total Soluble Solids (TTS)

INTRODUCTION

Onion (*Allium cepa L.*) is one of the oldest bulb crops, known to mankind and consumed worldwide. It is one of the most important commercial vegetable crops grown in India and believed to be originated in Mediterranean region belongs to the family Alliaceae. Chromosome number is 2n=16. It is a popular bulb vegetable crop cultivated extensively throughout the country under a wide range of climatic condition. The edible portion is a modification of stem and leaves which is known as bulb. Onion food stored in the mature bulb consists primarily of sucrose and the leaves are hallow and tubular structure. Each leaf emerges from inside the previously formed leaf through a hole on the side. The stem remains as a plate-like structure during the vegetative stage. The leafbases (petioles) from a slender cylinder during the early stage of development Under properenvironmental stimulus, the inner leaf bases swell forming the bulb. In India during recent years, the research on organic farming in vegetable crops has beenstarted but still is not carried out in a systematic way. Organic vegetable cultivation offers one ofthe most sustainable farming systems with recurring benefits not only long-term soil health but also provides along-lasting stability in production (Bangali *et al.,*2012). One of the best methods for maximizing the crop yield and its quality is the application of required amount of nutrients.Among the nutrients, nitrogen is the key nutrient, which is the part of protein and improves thephotosynthetic efficiency of the plant and ultimately the yield. It is the most important nutrientwhich contributes to the proper growth and yield of plants. It isanessential component ofprotoplasm and chlorophyll thus having direct effect on the metabolism of plants. It encourages the vegetative growth, imparts deep green colour to the leaves, stimulate root grow than development. Recently emphasis has been given on organic vegetable production which minimizes cost of production, increases quality of product, maintains fertility of soil and the market demandfor organic vegetables is increasing very fast and it is also observed that organic produce gaining more monetary returns. Some attempts have been made in few vegetable crops like tomato, brinjal, cabbage, cauliflower, radish and okra. However, very scanty work has been made on organic farming of onion which is grown on large scale (Meena *et al.*, 2015).

MATERIALS AND METHODS

The present investigation was carried out at the Field Experimentation Centre of Naini Agricultural Institute, Sam Higgin bottom University of Agriculture, Technology and Sciences, Prayagraj during *Rabi*-2021. The university is situated on the left side of Allahabad Rewa National Highway, about 5km from Prayagraj city. All types of facilities necessary for cultivation of successful crop including field preparation inputs, irrigation facilities were provided from the Department of Horticulture (Vegetable science), Sam Higgin bottom University of Agriculture, Technology and Sciences, Prayagraj. The experiment was laid out in Randomized block design with three replications. The experiment consists of nine treatments. The seeds are sown on raised bed for transplanting in the field with spacing 10X15. During the course of investigation, data were recorded on various growth, yield and parameters in respect to application of inorganic and organic fertilizer on onion. The experiment was laidout in Randomized Block Design (RBD) with nine treatments of different organic manures, inorganic fertilizers comprise T_0 = Control (with 100% RDN),

T_1 = 90% RDN + 10% vermicompost, T_2 = 90%RDN+10%FYM, T_3=90%RDN+10% Jeevamruth,T_4=80%RDN+20%Vermicompost, T_5 = 80% RDN + 20% FYM, T_6 = 80% RDN + 20% Jeevamruth, T_7 = 70 % RDN +30 % Vermicompost, T_8 = 70% RDN + 30% FYM and T_9 = 70% RDN + 30% Jeevamruth replicated thrice. The periodical observations on growth and yield parameters were recorded.

RESULT AND DISCUSSION

In case of 90 days after sowing, the plant height was maximum in T8 (91.44 cm) which was at par with T7(90.03cm), T5(88.00cm). While, minimum plant height was obtained inT0 (71.53 cm).The plant height was recorded maximum underT8(70%ofrecommendeddoseofnutrients + 30% vermicompost) that give the full opportunity to plant for optimum growth anddevelopment might be due to the increase in cell size and enhancement of cell division,which ultimately resulted in increased plant height. Similar finding were also reported by**Pall and Padda (1972).** The number of leaves per plant was high when 70% RDN + 30% FYM had applied toplant. It also showed high number when applied with vermicompost. Thus it is revealedthat combination of RDN, FYM, vermicompost may complement in increasing growth ofonion. Similar results have been reported by **Reddy *et al*. (2002)** in tomato and **Yadav *et al*. (2003).** The number of days to maturity ranged from 63days to 86days with the mean of 79days.The minimum number of days to maturity was observed in T8 (63.33 days) followed by T7(71days),T9(73days),T4(74days). Rest of the treatment stook more days to maturity when compared with mean. The T0 control (86 days) took maximum number of days to maturity. The bulb diameter ranged from 5.85cm to 8.70 cm with the mean of 6.77cm. the maximum bulb diameter was observed in T8 (8.70 cm) followed by T9 (7.61 cm), T7 (7.55 cm).While the minimum bulb diameter was observed in T0 (5.85 cm). The maximum bulb diameter in T8 (70% RDN + 30% FYM) may be due to contribution to the balanced C:N ratio and enhanced availability of plant nutrients hence increased rate and efficiency of metabolic activities resulting in increasing cell division, high assimilitaion of protein and carbohydrates. The similar results were also reported by **Jayathilake *et al*. (2003).** The results of weight of fresh bulb showed significant difference between the treatment. This trait also followed the similar pattern followed by other traits. Weight off resh bul branged from100.25g to181.70 g with the mean of 144.53 g. Weight of dry bulb ranged from 96.13 g to 168.07 g with the mean of 135.39 g. The weight of fresh bulb was found to be high in T8 (168.07g) followed by T5 (159.59g), T2(147.73g) and T6 (141.86g). The number of bulbs ranged from 29.67 to 41.33 with the mean of 35. The maximumnumber of bulbs were found in the treatment 8 (41.33) followed by T7 (37), T5 (35).Restofthetreatments hadless number ofbulbsthanmean. Yield per plot ranged from 3.08 kg to 5.07 kg with the mean of 3.69 kg. T8 (5.07 kg) highest yield per plot compared to other which was followed by T7(4.18kg), T9(4.07kg). whereas, the minimum yield per plot was observed in T0 (3.08 kg), T3 (3.20 kg),T1(3.27kg). Yield per hectare ranged from 20.53q to 33.77q with mean of 24.57q. The maximumyield per hectare was observed in the treatment T8 (33.77q), followed by T7 (27.88q),T9 (27.13q). whereas, the minimum yield per hectare was observed in T0 (20.53q), T3(21.30q),T1 (21.79q).

Layout of Experimental Field

Research farm of Horticulture, Naini Agriculture Institute

SHUATS, Prayagraj (U.P.)

Main irrigation channel (1.0m)				
R1	**Sub irrigation channel (0.5m)**	R2	**Sub irrigation channel (0.5m)**	R3
T0		T6		T9
T1		T7		T8
T2		T8		T7
T3		T9		T6
T4		T_0		T5
T5		T5		T4
T6		T4		T3
T7		T3		T2
T8		T2		T1
T9		T_1		T0

Fig:1 Layout of Experimental Field

Table1: Effect of various organic manure and inorganic fertilizer on plant height in onion

TreatmentCombinations	Plant height (30 DAS)	Plant height (60 DAS)	Plant height(90 DAS)
T0-100%RDN	22.17	56.13	71.53
T1-90%RDN+10%VERMICOMPOST	25.50	62.47	74.17
T2-90%RDN+10%FYM	24.40	66.03	77.30
T3-90%RDN+10%JEEVAMRUT	21.67	67.96	76.17
T4-80%RDN+20%VERMICOMPOST	25.63	69.27	84.00
T5-80%RDN+20%FYM	24.70	71.40	88.00
T6-80%RDN+20%JEEVAMRUTH	23.70	68.23	78.97
T7-70%RDN+30%VERMICOMPOST	25.53	74.83	90.03
T8-70%RDN+30%FYM	28.93	79.63	91.44
T9-70%RDN+30%JEEVAMRUTH	24.50	73.30	87.00
Mean	24.67	68.93	81.86
S.Ed (±)	0.51	0.97	1.43
C.D. at5%	1.51	2.87	4.21
CV	5.721	1.214	1.194

Table2: Effect of various organic manure and inorganic fertilizer on Number of Leaves in onion

TreatmentCombinations	NumberofLeaves
T0-100%RDN	8.17
T1-90%RDN+10%VERMICOMPOST	8.53
T2-90%RDN+10%FYM	8.80
T3-90%RDN+10%JEEVAMRUT	8.33
T4-80%RDN+20%VERMICOMPOST	9.10
T5-80%RDN+20%FYM	9.43
T6-80%RDN+20%JEEVAMRUTH	8.57
T7-70%RDN+30%VERMICOMPOST	9.47
T8-70%RDN+30%FYM	10.53
T9-70%RDN+30%JEEVAMRUTH	8.90
Mean	8.98
S.Ed (±)	0.12
C.D. at5%	0.35
CV	1.829

Table 3: Effect of various organic manure and inorganic fertilizer on days tomaturityinonion

TreatmentCombinations	DaystoMaturity
T0-100%RDN	86.33
T1-90%RDN+10%VERMICOMPOST	83.00
T2-90%RDN+10%FYM	84.67
T3-90%RDN+10%JEEVAMRUT	86.00
T4-80%RDN+20%VERMICOMPOST	77.33
T5-80%RDN+20%FYM	79.00
T6-80%RDN+20%JEEVAMRUTH	81.33
T7-70%RDN+30%VERMICOMPOST	71.00
T8-70%RDN+30%FYM	63.33
T9-70%RDN+30%JEEVAMRUTH	73.67
Mean	78.57
S.Ed (±)	1.06
C.D. at5%	3.14
CV	0.769

Table4:Effectofvarious organicmanureandinorganicfertilizeronbulb diameterin onion

TreatmentCombinations	BulbDiameter
T0-100%RDN	5.85
T1-90%RDN+10%VERMICOMPOST	6.19
T2-90%RDN+10%FYM	6.29
T3-90%RDN+10%JEEVAMRUT	6.03
T4-80%RDN+20%VERMICOMPOST	6.44
T5-80%RDN+20%FYM	6.61
T6-80%RDN+20%JEEVAMRUTH	6.42
T7-70%RDN+30%VERMICOMPOST	7.55
T8-70%RDN+30%FYM	8.70
T9-70%RDN+30%JEEVAMRUTH	7.61
Mean	6.77
S.Ed (±)	0.10
C.D. at5%	0.31
CV	1.104

Table 5: Effect of various organic manure and inorganic fertilizer on weight of freshbulbinonion.

TreatmentCombinations	WeightofFreshBulb
T0-100%RDN	100.25
T1-90%RDN+10%VERMICOMPOST	129.07
T2-90%RDN+10%FYM	151.57
T3-90%RDN+10%JEEVAMRUT	137.09
T4-80%RDN+20%VERMICOMPOST	144.58
T5-80%RDN+20%FYM	171.27
T6-80%RDN+20%JEEVAMRUTH	146.54
T7-70%RDN+30%VERMICOMPOST	142.82
T8-70%RDN+30%FYM	181.70
T9-70%RDN+30%JEEVAMRUTH	140.38
Mean	144.53
S.Ed (±)	2.05
C.D. at5%	6.06
CV	1.173

Table 6: Effect of various organic manure and inorganic fertilizer on weight ofcured bulbinonion

TreatmentCombinations	WeightofCuredBulb
T0-100%RDN	96.13
T1-90%RDN+10%VERMICOMPOST	120.15
T2-90%RDN+10%FYM	147.73
T3-90%RDN+10%JEEVAMRUT	112.15
T4-80%RDN+20%VERMICOMPOST	134.30
T5-80%RDN+20%FYM	159.59
T6-80%RDN+20%JEEVAMRUTH	141.86
T7-70%RDN+30%VERMICOMPOST	138.17
T8-70%RDN+30%FYM	168.07
T9-70%RDN+30%JEEVAMRUTH	135.72
Mean	135.39
S.Ed (±)	2.22
C.D. at5%	6.55
CV	0.291

Table7:Effectofvarious organicmanureand inorganicfertilizeron numberofbulbs inonion

TreatmentCombinations	Numberof Bulbs
T0-100%RDN	29.67
T1-90%RDN+10%VERMICOMPOST	34.00
T2-90%RDN+10%FYM	33.33
T3-90%RDN+10%JEEVAMRUT	32.67
T4-80%RDN+20%VERMICOMPOST	35.67
T5-80%RDN+20%FYM	36.34
T6-80%RDN+20%JEEVAMRUTH	34.00
T7-70%RDN+30%VERMICOMPOST	37.33
T8-70%RDN+30%FYM	41.33
T9-70%RDN+30%JEEVAMRUTH	35.67
Mean	35.00
S.Ed (±)	0.52
C.D. at5%	1.54
CV	2.654

Table8:Effect of various organic manure and inorganic fertilizer on yield per plot in onion

TreatmentCombinations	Yield per plot
T0-100%RDN	3.08
T1-90%RDN+10%VERMICOMPOST	3.27
T2-90%RDN+10%FYM	3.42
T3-90%RDN+10%JEEVAMRUT	3.20
T4-80%RDN+20%VERMICOMPOST	3.51
T5-80%RDN+20%FYM	3.63
T6-80%RDN+20%JEEVAMRUTH	3.45
T7-70%RDN+30%VERMICOMPOST	4.18
T8-70%RDN+30%FYM	5.07
T9-70%RDN+30%JEEVAMRUTH	4.07
Mean	3.69
S.Ed (±)	0.06
C.D.at5%	0.18
CV	1.567

Table9:Effectofvarious organicmanureand inorganicfertilizeron yield perhectareinonion

TreatmentCombinations	Yieldperha
T0-100%RDN	20.53
T1-90%RDN+10%VERMICOMPOST	21.79
T2-90%RDN+10%FYM	22.77
T3-90%RDN+10%JEEVAMRUT	21.30
T4-80%RDN+20%VERMICOMPOST	23.41
T5-80%RDN+20%FYM	24.17
T6-80%RDN+20%JEEVAMRUTH	22.97
T7-70%RDN+30%VERMICOMPOST	27.88
T8-70%RDN+30%FYM	33.77
T9-70%RDN+30%JEEVAMRUTH	27.13
Mean	24.57
S.Ed (±)	0.35
C.D. at5%	1.03
CV	1.563

Table 10: Effect of various organic manure and inorganic fertilizer on

totalsolublesolidsinonion

TreatmentCombinations	TSS
T0-100%RDN	8.47
T1-90%RDN+10%VERMICOMPOST	8.80
T2-90%RDN+10%FYM	9.37
T3-90%RDN+10%JEEVAMRUT	8.83
T4-80%RDN+20%VERMICOMPOST	9.54
T5-80%RDN+20%FYM	9.77
T6-80%RDN+20%JEEVAMRUTH	9.43
T7-70%RDN+30%VERMICOMPOST	10.83
T8-70%RDN+30%FYM	11.33
T9-70%RDN+30%JEEVAMRUTH	10.30
Mean	9.67
S.Ed (±)	0.18
C.D. at 5%	0.54
CV	2.259

Table11:Effectofvarious organicmanureandinorganicfertilizeron ascorbicacidin onion

TreatmentCombinations	AscorbicAcid
T0-100%RDN	12.31
T1-90%RDN+10%VERMICOMPOST	11.50
T2-90%RDN+10%FYM	12.44
T3-90%RDN+10%JEEVAMRUT	13.00
T4-80%RDN+20%VERMICOMPOST	13.34
T5-80%RDN+20%FYM	14.33
T6-80%RDN+20%JEEVAMRUTH	14.00
T7-70%RDN+30%VERMICOMPOST	14.70
T8-70%RDN+30%FYMn	12.47
T9-70%RDN+30%JEEVAMRUTH	11.85
Mean	12.99
S.Ed (±)	0.16
C.D. at5%	0.48
CV	1.23

SUMMARY AND CONCLUSION

The results of the present investigation entitled **"Effect of Organic manure and inorganic fertilizer on growth yield and quality of Onion (*Allium cepa* L.)"** was carried out during the year 2021-2022.

The experiment was laid out in Randomized Block Design (RBD) in three replications with nine treatments viz. T0 = Control (with 100% RDN), T1 = 90% RDN + 10% vermicompost, T2 = 90% RDN + 10% FYM, T3 = 90% RDN + 10% Jeevamruth, T4 = 80% RDN + 20% Vermicompost, T5 = 80% RDN + 20% FYM, T6 = 80% RDN
+ 20% Jeevamruth, T7 = 70 % RDN + 30 % Vermicompost, T8 = 70% RDN + 30% FYM and T9 = 70% RDN + 30% Jeevamruth.

The experiment findings based on observations viz. plant height, number of leaves/plant, days to maturity, bulb diameter, number of bulbs, Yield per plot, yield per hectare, weight of fresh bulb, weight of dry bulb, total soluble solids and ascorbic acid content of bulb. The results obtained from the present research was summarized and concluded below.

CONCLUSION

Among the various combinations, overall performance of the treatment T8 which received 70 percent NPK throught chemical fertilizer along with 30 percent Farmyard manure per hectare as organic manure enhanced yield , vegatitive growth and quality of onion. The treatment T9 which received 70 per cent NPK through fertilizer along with 30 percent jeevamruth receives highest Benfit cost ratio which was suprerior overall treatments. Theses results are based on one season and for confirmation few more experimental trails are needed.

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