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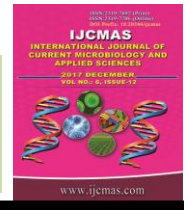

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Effect of INM on Growth and Yield Attributes of Dill Seed (*Anethum graveolens* L.) Under North Gujarat Agro-Climatic Condition

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A B S T R A C T

An experiment was conducted on loamy sand soil of Instructional Farm, Department of Agronomy, Chimanbhai Patel College of Agriculture, S.D. Agricultural University, Sardarkrushinagar (Gujarat) during the *Rabi* season of years 2011-12 and 2013-14 on to study "Integrated Nitrogen Management in Dill Seed (*Anethum graveolens* L.) under North Gujarat Agro-Climatic Condition" in Randomized Block Design (RBD) with three replications and Fourteen treatment combinations comprising urea, FYM, Vermicompost and bio-fertilizer application and Gujarat dill seed 3 was used as test crop. The pooled results of all the growth and yield attributes of dill seed such as plant height, number of branches per plant, number of umbel per plant, number of umbellate per umbel, number of seeds per umbellate and 1000- seed weight were significantly influenced by integrated nitrogen management. Significantly higher values of all the above parameters were recorded with 75 % RDN through urea + 25 % RDN through vermicompost (T_6) which ultimately reflected in higher seed (1651 kg/ha) and stover (2508 kg/ha) yields.

Introduction

Dill (*Anethum graveolens L.*) commonly known as Sowa in India is an annual, glabrous and aromatic herb belonging to the family *Umbelliferae* (*Apiaceae*). The dill fruit is a schizocarp with paired carpel that split apart at maturity to release two mericarps, commonly referred as "seed" (Callan *et al.*, 2007). Spices need no introduction since they have been mentioned in the Vedas and the Bible and the fame of Indian spices is older than the recorded history. Spices are to be integral part of our Indian culture and also India is the world's largest producer, consumer and exporter of spices, that's why India is known as "Seed spice bowl". There are about 63 cultivated spices but only dozen of them are fully important for commercial or large scale cultivation. Among them cumin, dill seed and fennel etc. are vital *Rabi* seed spices, particular for arid and semi-arid regions of the country. Dill seed (*Anethum graveolens L.*) is one of the important medicinal and aromatic crops, belongs to family *Umbelliferae*. Dill fruits are also popularly used as carminative, aromatic stimulant and diuretic in Ayurvedic and Unani medicines. The Indian dill seed are known to contain more dillapiole (36.0%) and less carvone (19.5%) whereas European dill has more carvone (45.9%) and less dillapiole

(7%) (Malhotra and Vashishtha, 2007). In India, Gujarat and Madhya Pradesh are the leading states for dill cultivation and production. Irrigated *Rabi* dill crop can be sown in the month of October. This is mainly because of lack of improved technology in the production of dill in India. Nutrient supply plays an important role in dill production. Under intensive cultivation, indiscriminate use of nitrogen and phosphorus fertilizers alone over long period could result in deficiency of nutrients other than that applied (Singh *et al.,* 1999). Farmyard manure improves the soil properties and finally crop yields (Bhatia and Shukla, 1982). Results generated from series of long -term fertilizer experiments on other cropping systems have revealed that continuous use of high analysis chemical fertilizers increased the crop yield in initial years and adversely affect the sustainability at the later stage (Virmani, 1994). The crop response to inoculation with biofertilizers is known to vary with crop, cultivar, location, seasons, bacterial strain, level of soil fertility and interaction with native soil micro flora (Wani, 1990). At present very limited information is available in the literature on the effect of integrated nutrient management using chemical fertilizers, organic manures and biofertilizers on yield of dill in India. Field study was therefore conducted to study the effect of farmyard manure, biofertlizers and inorganic fertilizers on yield and nutrients uptake of European dill.

Materials and Methods

A field experiment was conducted at Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar during *Rabi* season of two consecutive years 2011-12 and 2013-14 to study the "Integrated nitrogen management in Dill seed (*Anethum graveolens* L.) under North Gujarat Agro-Climatic condition". Geographically, Sardarkrushinagar is situated at 24°-19' North latitude and 72°-19' East longitude with an elevation of 154.52 meter above the mean sea level. The soil of the experiment site was a sandy loam with pH 7.5, electrical conductivity 0.15 dSm at 25° C, organic carbon 0.18 %, low in nitrogen, medium in phosphorus and potash. The experiment consisting of 14 treatments was laid out in a RBD with three replications with Gujarat dill seed 3 (variety) was used as test crop. These treatments are combinations comprising urea, FYM, vermicompost and bio-fertilizer application *viz.*, T_1 (100 % RDN through urea), T_2 (75 % RDN through urea + *Azospirillum*, T_3 (75 % RDN through urea + *Azotobacter*), T_4 (75 % RDN through urea + *Azospirillum* + *Azotobacter*), T_5 (75 % RDN through urea + 25 % RDN through FYM), T_6 (75 % RDN through urea + 25 % RDN through vermicompost), T_7 (50 % RDN through urea + 50 % RDN through FYM), T_8 (50 % RDN through urea + 50 % RDN through vermicompost), T_9 (25 % RDN through urea + 75% RDN through FYM), T_{10} (25 % RDN through urea + 75% RDN through vermicompost), T_{11} (100 % RDN through FYM), T_{12} (100 % RDN through vermicompost), T_{13} (50 % RDN through FYM + 50 % RDN through vermicompost) and T_{14} (50 % RDN through urea + 25 % RDN through FYM + 25 % RDN through vermicompost).

Results and Discussion

Effect of INM on plant height

Plant height At 30 DAS, treatment T_1 being at par with T_6 and T_8 recorded significantly higher plant height (15.5 cm) during both the year and on pooled basis (Table 3). Among the treatments, application of T_6 recorded significantly higher plant height of (48.93 cm) at 60 DAS which was statically at par with treatments T_1, T_3, T_4, T_8 and T_5 during second year (Table 1). According to pooled data basis significantly higher plant height (48.3 cm) was observed in T_6 treatment which was at par with treatment T_8 and T_5 and similar trend was observed in first year.

At 90 DAS, treatment T_6 showed significantly higher plant height (102.0 cm) which was at par with T_1, T_4, T_5, T_8, $T_{9,}$ T_{10}, T_{13} and T_{14} during first year and second year again treatment T_6 found significantly higher plant height and which was at par with T_4, T_5, T_8, T_9 and T_{10}. According to pooled data significantly higher plant height (102.98 cm) was observed in T_6 which was at par with T_5 and T_6 treatment (Table 1). During first year significantly higher plant height (111.0 cm) was recorded in T_6 which was at par with T_1, T_4, T_5 and T_8 at 120 DAS. Similar trend was observed in second year. According to mean data of both years, significantly higher plant height was recorded in T_6 which was at par with T_5 and T_8 treatment at 120 DAS (Table 2).

At maturity, treatment T_6 observed significantly higher plant height (110 cm) which was at par with T_1, T_4, T_5, $T_{7,}$ $T_{8,}$ T_9 and T_{10} during first year and second year again treatment T_6 found significantly higher plant height and which was at par with T_1 and T_8. According to pooled data the highest plant height (111.06 cm) was recorded in T_6 treatment (Table 2).

This might be due an adequate amount of nitrogen supply which enhanced the cell division and cell enlargement and helped to convert more solar energy in to chemical energy. Application of inorganic with organic manure might have supplied the adequate and continuous amount of nutrient at different stages due to release of sufficient amount of nutrient by mineralization at a constant level that resulted in higher plant growth. The results are conformity with those reported by Selvarajan and Chezhiyan, (2001), Derzi *et al.*, (2005) and Hellal *et al.*, (2011).

Number of branches per plant

Significantly higher number of branches per plant (17.08, branches) was recorded with (T_6), which was being at par with (T_8) and (T_5) on pooled basis (Table 4). Similar trend was observed in both the year.

More availability of nutrients under organic and inorganic fertilizer or integrated nitrogen management system might have enhanced meristematic activities and size of cells as well as formation and functioning of protoplasm which consequently improved the crop growth in terms of number of branches per plant also reported by Kumar *et al.*, (2002)

Days to 50 % flowering

Data on days to 50 per cent flowering of dill seed as influenced by different treatment of integrated nitrogen management during both the year as well as pooled basis are presented in Table 5. The result revealed that integrated nitrogen management treatments did not exert any significant influence on days to 50 per cent flowering during both the years as well as pooled analysis basis.

Number of days to maturity

Data on days to maturity of dill seed as influenced by different treatment of integrated nitrogen management during both the year as well as pooled basis are presented in Table 6. The result found that integrated nitrogen management treatments did not show any significant influence on days to maturity during both the year as well as in pooled analysis.

Table.1 Effect of integrated nitrogen management on plant height (cm) at 60 and 90 DAS of dill seed

TREATMENTS	Plant height (cm)					
	60 DAS			90 DAS		
	2011-12	2013-14	Pooled	2011-12	2013-14	Pooled
T_1 : 100 % RDN through urea	41.62	42.00	41.81	91.57	92.17	91.87
T_2 : 75 % RDN through urea + *Azospirillum*	35.67	39.00	37.33	84.97	85.00	84.98
T_3 : 75 % RDN through urea + *Azotobacter*	40.20	43.27	41.73	88.17	89.73	88.95
T_4 : 75 % RDN through urea + *Azospirillum* + *Azotobacter*	41.47	44.03	42.75	92.33	94.33	93.33
T_5 : 75 % RDN through urea +25 % RDN through FYM	43.50	45.83	44.67	97.63	97.83	97.73
T_6 : 75% RDN through urea +25% RDN through Vermicompost	**47.70**	**48.93**	**48.32**	**101.97**	**104.00**	**102.98**
T_7 : 50 % RDN through urea +50 % RDN through FYM	40.87	41.17	41.02	80.33	89.33	84.83
T_8 : 50% RDN through urea +50% RDN through Vermicompost	44.60	45.00	44.80	97.20	98.67	97.93
T_9 : 25 % RDN through urea +75% RDN through FYM	40.17	41.40	40.78	93.33	94.93	94.13
T_{10} : 25% RDN through urea+75% RDN through Vermicompost	40.47	41.80	41.13	93.43	94.33	93.88
T_{11} : 100 % RDN through FYM	35.27	35.33	35.30	82.87	83.33	83.10
T_{12} : 100 % RDN through Vermicompost	36.80	36.93	36.87	80.87	85.53	83.20
T_{13} : 50 % RDN through FYM + 50 % RDN through Vermicompost	37.32	40.98	39.15	89.53	89.67	89.60
T_{14} : 50% RDN through urea +25% RDN through FYM +25% RDN through Vermicompost	40.30	41.70	41.00	91.23	92.83	92.03
S.Em. $\pm$	1.932	2.400	1.334	4.372	3.487	2.421
C.D. (P=0.05)	5.617	6.977	3.786	12.708	10.136	6.871
C.V.%	8.28	9.91	9.16	8.38	6.55	7.50

Table.2 Effect of integrated nitrogen management on plant height (cm) at 120 DAS and at maturity of dill seed

TREATMENTS	Plant height (cm)					
	120 DAS			At maturity		
	2011-12	2013-14	Pooled	2011-12	2013-14	Pooled
T_1 : 100 % RDN through urea	104.00	104.73	104.37	105.67	106.13	105.90
T_2 : 75 % RDN through urea + *Azospirillum*	94.33	97.67	96.00	97.00	100.33	98.67
T_3 : 75 % RDN through urea + *Azotobacter*	95.60	96.67	96.13	99.00	99.33	99.17
T_4 : 75 % RDN through urea + *Azospirillum* + *Azotobacter*	102.63	103.08	102.86	102.70	103.63	103.17
T_5 : 75 % RDN through urea + 25 % RDN through FYM	104.73	105.00	104.87	104.00	105.00	104.50
T_6 : 75% RDN through urea + 25% RDN through Vermicompost	**110.00**	**111.19**	**110.60**	**110.15**	**111.97**	**111.06**
T_7 : 50 % RDN through urea + 50 % RDN through FYM	99.33	100.00	99.67	103.00	104.00	103.50
T_8 : 50% RDN through urea + 50% RDN through Vermicompost	104.33	105.67	105.00	106.03	107.73	106.88
T_9 : 25 % RDN through urea + 75% RDN through FYM	100.77	101.23	101.00	103.00	104.67	103.83
T_{10}: 25% RDN through urea + 75% RDN through Vermicompost	100.93	101.50	101.22	103.33	104.67	104.00
T_{11}: 100 % RDN through FYM	92.67	94.33	93.50	98.86	97.67	98.27
T_{12}: 100 % RDN through Vermicompost	94.67	96.87	95.77	98.82	100.00	99.41
T_{13}: 50 % RDN through FYM + 50 % RDN through Vermicompost	93.23	94.67	93.95	97.85	100.33	99.09
T_{14}: 50% RDN through urea + 25% RDN through FYM + 25% RDN through Vermicompost	93.67	94.73	94.20	99.67	99.67	99.67
S.Em. $\pm$	3.170	3.343	1.995	2.545	2.206	1.458
C.D. (P=0.05)	9.215	9.717	5.661	7.397	6.413	4.138
C.V.%	5.53	5.76	5.65	4.32	3.70	4.02

Table.3 Effect of integrated nitrogen management on plant height (cm) at 30 DAS of dill seed

TREATMENTS	Plant height (cm) at 30 DAS		
	2011-12	**2013-14**	**Pooled**
T_1 : 100 % RDN through urea	**15.33**	**15.67**	**15.50**
T_2 : 75 % RDN through urea + *Azospirillum*	9.83	10.13	9.98
T_3 : 75 % RDN through urea + *Azotobacter*	9.63	9.73	9.68
T_4 : 75 % RDN through urea + *Azospirillum* + *Azotobacter*	10.90	11.17	11.03
T_5 : 75 % RDN through urea + 25 % RDN through FYM	11.58	11.67	11.63
T_6 : 75 % RDN through urea + 25 % RDN through vermicompost	13.77	14.80	14.28
T_7 : 50 % RDN through urea + 50 % RDN through FYM	11.47	11.75	11.61
T_8 : 50 % RDN through urea + 50 % RDN through vermicompost	13.37	13.57	13.47
T_9 : 25 % RDN through urea + 75% RDN through FYM	11.23	11.53	11.38
T_{10} : 25 % RDN through urea + 75% RDN through vermicompost	11.33	11.50	11.42
T_{11}: 100 % RDN through FYM	9.83	10.20	10.02
T_{12}: 100 % RDN through vermicompost	10.30	10.40	10.35
T_{13}: 50 % RDN through FYM + 50 % RDN through vermicompost	11.50	11.67	11.58
T_{14}: 50 % RDN through urea + 25 % RDN through FYM + 25 % RDN through vermicompost	11.73	11.83	11.78
S.Em. ±	1.007	1.183	0.673
C.D. (P=0.05)	2.927	3.440	1.909
C.V.%	15.09	17.32	16.27

Table.4 Effect of integrated nitrogen management on number of branches per plant of dill seed

TREATMENTS	Number of branches per plant		
	2011-12	**2013-14**	**Pooled**
T_1 : 100 % RDN through urea	14.20	14.43	14.32
T_2 : 75 % RDN through urea + *Azospirillum*	11.70	12.27	11.98
T_3 : 75 % RDN through urea + *Azotobacter*	13.40	13.73	13.57
T_4 : 75 % RDN through urea + *Azospirillum* + *Azotobacter*	14.37	14.37	14.37
T_5 : 75 % RDN through urea + 25 % RDN through FYM	15.63	16.03	15.83
T_6 : 75 % RDN through urea + 25 % RDN through Vermicompost	**17.03**	**17.13**	**17.08**
T_7 : 50 % RDN through urea + 50 % RDN through FYM	13.53	13.67	13.60
T_8 : 50 % RDN through urea + 50 % RDN through Vermicompost	15.83	16.27	16.05
T_9 : 25 % RDN through urea + 75% RDN through FYM	12.33	12.40	12.37
T_{10} : 25 % RDN through urea + 75% RDN through Vermicompost	13.93	14.20	14.07
T_{11} : 100 % RDN through FYM	11.60	12.13	11.87
T_{12} : 100 % RDN through Vermicompost	13.87	14.37	14.12
T_{13} : 50 % RDN through FYM + 50 % RDN through Vermicompost	14.33	14.60	14.47
T_{14} : 50 % RDN through urea + 25 % RDN through FYM + 25 % RDN through Vermicompost	14.47	14.60	14.53
S.Em. ±	0.710	0.809	0.466
C.D. (P=0.05)	2.065	2.353	1.323
C.V.%	8.78	9.80	9.32

Table.5 Effect of integrated nitrogen management on Days to 50% flowering of dill seed

TREATMENTS	Days to 50% flowering		
	2011-12	2013-14	Pooled
T_1 : 100 % RDN through urea	78	79	79
T_2 : 75 % RDN through urea + *Azospirillum*	79	79	79
T_3 : 75 % RDN through urea + *Azotobacter*	80	81	81
T_4 : 75 % RDN through urea + *Azospirillum* + *Azotobacter*	76	78	77
T_5 : 75 % RDN through urea + 25 % RDN through FYM	87	87	87
T_6 : 75 % RDN through urea + 25 % RDN through Vermicompost	84	85	85
T_7 : 50 % RDN through urea + 50 % RDN through FYM	79	80	80
T_8 : 50 % RDN through urea + 50 % RDN through Vermicompost	86	87	86
T_9 : 25 % RDN through urea + 75% RDN through FYM	86	86	86
T_{10} : 25 % RDN through urea + 75% RDN through Vermicompost	82	83	83
T_{11} : 100 % RDN through FYM	83	83	83
T_{12} : 100 % RDN through Vermicompost	81	82	81
T_{13} : 50 % RDN through FYM + 50 % RDN through Vermicompost	81	81	81
T_{14} : 50 % RDN through urea + 25 % RDN through FYM + 25 % RDN through Vermicompost	80	80	80
S.Em. $\pm$	2.99	2.97	1.83
C.D. (P=0.05)	NS	NS	NS
C.V.%	6.34	6.27	6.30

Table.6 Effect of integrated nitrogen management on Days to maturity of dill seed

TREATMENTS	Days to maturity		
	2011-12	2013-14	Pooled
T_1 : 100 % RDN through urea	122	124	123
T_2 : 75 % RDN through urea + *Azospirillum*	123	123	123
T_3 : 75 % RDN through urea + *Azotobacter*	125	125	125
T_4 : 75 % RDN through urea + *Azospirillum* + *Azotobacter*	122	122	122
T_5 : 75 % RDN through urea + 25 % RDN through FYM	136	137	137
T_6 : 75 % RDN through urea + 25 % RDN through Vermicompost	135	136	135
T_7 : 50 % RDN through urea + 50 % RDN through FYM	124	125	125
T_8 : 50 % RDN through urea + 50 % RDN through Vermicompost	135	135	135
T_9 : 25 % RDN through urea + 75% RDN through FYM	134	134	134
T_{10} : 25 % RDN through urea + 75% RDN through Vermicompost	128	129	129
T_{11} : 100 % RDN through FYM	130	130	130
T_{12} : 100 % RDN through Vermicompost	126	128	127
T_{13} : 50 % RDN through FYM + 50 % RDN through Vermicompost	126	127	127
T_{14} : 50 % RDN through urea + 25 % RDN through FYM + 25 % RDN through Vermicompost	124	125	124
S.Em. $\pm$	3.72	3.49	2.21
C.D. (P=0.05)	NS	NS	NS
C.V.%	5.03	4.70	4.87

Table.7 Effect of integrated nitrogen management on number of umbels per plant (Effective and Non-effective) of dill seed

TREATMENTS	Number of umbels per plant (Effective)			Number of umbels per plant (Non-effective)		
	2011-12	2013-14	Pooled	2011-12	2013-14	Pooled
T_1 : 100 % RDN through urea	11.13	11.20	11.17	4.80	4.93	4.87
T_2 : 75 % RDN through urea + *Azospirillum*	9.80	10.20	10.00	4.67	4.77	4.72
T_3 : 75 % RDN through urea + *Azotobacter*	9.73	10.43	10.08	3.87	3.99	3.93
T_4 : 75 % RDN through urea + *Azospirillum* + *Azotobacter*	11.33	12.10	11.72	4.03	4.27	4.15
T_5 : 75 % RDN through urea +25 % RDN through FYM	12.63	13.23	12.93	5.27	5.67	5.47
T_6: 75% RDN through urea +25% RDN through vermicompost	13.88	14.20	14.04	5.44	5.68	5.56
T_7: 50% RDN through urea +50 % RDN through FYM	10.33	10.53	10.43	4.20	4.40	4.30
T_8: 50% RDN through urea +50% RDN through vermicompost	13.00	13.20	13.10	4.87	5.13	5.00
T_9 : 25 % RDN through urea +75% RDN through FYM	9.67	10.13	9.90	4.43	4.50	4.47
T_{10}: 25% RDN through urea+75% RDN through vermicompost	9.85	10.40	10.13	5.10	5.23	5.17
T_{11}: 100 % RDN through FYM	9.03	9.57	9.30	5.23	5.37	5.30
T_{12}: 100 % RDN through vermicompost	10.47	10.90	10.68	3.67	3.78	3.73
T_{13}: 50% RDN through FYM +50% RDN through vermicompost	10.67	10.80	10.73	3.91	4.00	3.95
T_{14}: 50% RDN through urea +25% RDN through FYM + 25% RDN through vermicompost	10.77	11.23	11.00	4.10	4.17	4.13
S.Em. ±	0.620	0.685	0.400	0.211	0.228	0.135
C.D. (P=0.05)	1.802	1.990	1.135	0.614	0.664	0.382
C.V.%	9.87	10.50	10.20	8.05	8.41	8.24

Table.8 Effect of integrated nitrogen management on number of umbellets per umbel of dill seed

TREATMENTS	Number of umbellets per umbel		
	2011-12	2013-14	Pooled
T_1 : 100 % RDN through urea	16.30	16.67	16.48
T_2 : 75 % RDN through urea + *Azospirillum*	14.51	15.21	14.86
T_3 : 75 % RDN through urea + *Azotobacter*	16.17	16.39	16.28
T_4 : 75% RDN through urea + *Azospirillum* + *Azotobacter*	17.57	17.73	17.65
T_5 : 75% RDN through urea + 25% RDN through FYM	17.60	18.24	17.92
T_6 : 75% RDN through urea + 25% RDN through Vermicompost	18.56	19.97	19.27
T_7 : 50% RDN through urea + 50% RDN through FYM	16.17	16.73	16.45
T_8 : 50% RDN through urea + 50% RDN through Vermicompost	17.91	18.20	18.06
T_9 : 25% RDN through urea + 75% RDN through FYM	15.80	16.88	16.34
T_{10} : 25% RDN through urea + 75% RDN through Vermicompost	16.13	16.37	16.25
T_{11} : 100 % RDN through FYM	13.59	14.40	13.99
T_{12} : 100 % RDN through Vermicompost	14.10	14.97	14.53
T_{13} : 50% RDN through FYM + 50% RDN through Vermicompost	15.51	16.49	16.00
T_{14} : 50% RDN through urea + 25% RDN through FYM + 25 % RDN through Vermicompost	16.20	16.57	16.38
S.Em. ±	0.782	0.881	0.510
C.D. (P=0.05)	2.274	2.560	1.448
C.V.%	8.39	9.10	8.76

Table.9 Effect of integrated nitrogen management on number of seeds per umbellets of dill seed

TREATMENTS	Number of seeds per umbellets		
	2011-12	**2013-14**	**Pooled**
T_1 : 100 % RDN through urea	12.63	13.03	12.83
T_2 : 75 % RDN through urea + *Azospirillum*	10.93	11.87	11.40
T_3 : 75 % RDN through urea + *Azotobacter*	11.85	12.05	11.95
T_4 : 75% RDN through urea + *Azospirillum* + *Azotobacter*	12.92	13.40	13.16
T_5 : 75% RDN through urea + 25% RDN through FYM	13.00	13.50	13.25
T_6 : 75% RDN through urea + 25% RDN through Vermicompost	**13.73**	**14.57**	**14.15**
T_7 : 50% RDN through urea + 50% RDN through FYM	11.77	11.99	11.88
T_8 : 50% RDN through urea + 50% RDN through Vermicompost	13.33	13.63	13.48
T_9 : 25% RDN through urea + 75% RDN through FYM	10.80	11.27	11.03
T_{10} : 25% RDN through urea + 75% RDN through Vermicompost	11.16	11.37	11.26
T_{11} : 100 % RDN through FYM	10.70	11.07	10.88
T_{12} : 100 % RDN through Vermicompost	11.58	11.73	11.66
T_{13} : 50% RDN through FYM + 50% RDN through Vermicompost	12.37	12.45	12.41
T_{14} : 50 % RDN through urea + 25 % RDN through FYM + 25 % RDN through Vermicompost	12.33	12.50	12.42
S.Em. ±	0.590	0.436	0.318
C.D. (P=0.05)	1.715	1.267	0.901
C.V.%	8.46	6.06	7.32

Table.10 Effect of integrated nitrogen management on 1000-seed weight of dill seed

TREATMENTS	1000-seed weight (g)		
	2011-12	**2013-14**	**Pooled**
T_1 : 100 % RDN through urea	3.62	3.80	3.71
T_2 : 75 % RDN through urea + *Azospirillum*	3.34	3.37	3.35
T_3 : 75 % RDN through urea + *Azotobacter*	3.38	3.44	3.41
T_4 : 75 % RDN through urea + *Azospirillum* + *Azotobacter*	3.43	3.57	3.50
T_5 : 75 % RDN through urea + 25 % RDN through FYM	3.83	4.02	3.93
T_6 : 75 % RDN through urea + 25 % RDN through vermicompost	**4.05**	**4.15**	**4.10**
T_7 : 50 % RDN through urea + 50 % RDN through FYM	3.35	3.37	3.36
T_8 : 50 % RDN through urea + 50 % RDN through vermicompost	4.00	4.03	4.01
T_9 : 25 % RDN through urea + 75% RDN through FYM	3.32	3.34	3.33
T_{10} : 25 % RDN through urea + 75% RDN through vermicompost	3.28	3.32	3.30
T_{11} : 100 % RDN through FYM	3.23	3.28	3.25
T_{12} : 100 % RDN through vermicompost	3.26	3.28	3.27
T_{13} : 50 % RDN through FYM + 50 % RDN through vermicompost	3.61	3.67	3.64
T_{14} : 50 % RDN through urea + 25 % RDN through FYM + 25 % RDN through vermicompost	3.62	3.68	3.65
S.Em. ±	0.140	0.115	0.079
C.D. (P=0.05)	0.408	0.334	0.223
C.V.%	6.89	5.54	6.24

Number of umbels per plant (Effective or non-Effective)

The data on number of effective umbels per plant as influenced by integrated nitrogen management treatments during both the year as well as pooled basis are given in Table 7. During first year and second year significantly higher number of effective umbels per plant (13.88 and 14.20 umbels) was recorded with (T_6), which was being at par with (T_8) and (T_5). According to pooled data basis treatment T_6 recorded significantly higher number of effective umbels per plant (14.04, umbels) which was at par with treatment T_8 and T_5. Similar result observed during both the year.

The data pertaining to number of non-effective umbels per plant recorded at maturity of crop growth during both the years as well as pooled basis are presented in Table 1. According to pooled data basis treatment T_{11} recorded significantly higher number of non-effective umbels per plant (5.6, umbels) which was at par with treatment T_{12}, T_{10}, T_3. This result is might be owing to the beneficial effect of vermicompost and FYM influencing the growth and yield attributes favorably supported by findings of several researchers Meena *et al.,* (2007) and Darzi *et al.*, (2012).

Number of umbellates per umbel

The mean data on number of umbellates per umbel recorded at maturity as affected by different integrated nitrogen management treatment along with both the year as well as pooled basis statistical inferences are presented in Table 8. During the year 2011-12, treatment (T_6) recorded significantly higher number of umbellates per umbel (18.56, umbellates) which was being at par with (T_1), (T_4), (T_8) and (T_5). During second year (2013-14) again treatment T_6 recorded significantly higher number of umbellates per umbel (19.97, umbellates) which was being at par with treatment T_4, T_5 and T_8. According to pooled data basis treatment $T_{6,}$ recorded significantly higher number of umbellates per umbel (19.27, umbellates), which was at par with treatment T_8 and T_5.

Number of seeds per umbellates

During first year significantly maximum number of seeds per umbellates (13.73 seeds) was recorded with T_6 which was at par with treatments T_8, T_5, T_4, T_1, T_{13} and T_{14}. During the year 2013-14, significantly higher number of seeds per umbellates (14.57 seeds) was recorded with T_6which was at par with application of treatments T_8, T_4 and T_5 (Table 9). According to pooled data basis treatment T_6 recorded significantly higher number of seeds per umbellates (14.15, seeds) which was at par with treatment T_8 and T_5. The increased photosynthesis might have enhanced number of flower and their fertilization resulting in number of flowers and their fertilization resulting in higher number of seeds per umbellate and agreed with the findings of several researchers by Meena *et al.,* (2007) and Darzi *et al.*, (2012).

1000 seed weight (g)

Significantly higher 1000 seed weight (4.10g) was recorded with (T_6), which was being at par with (T_8) and (T_5) during the both year and on pooled basis (Table 10).

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