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Thunam Srikanth
M.Sc. Horticulture, Department of Plantation, Spices, Medicinal and Aromatics crops, College of Horticulture, SKLTSHU, Hyderabad, Telangana, India

Dr. Veena Joshi
Associate Professor, Department of Fruit science, College of Horticulture, SKLTSHU, Mojerla, Telangana, India

Dr. D Lakshmi Narayana
Associate Professor, Department of Horticulture, College of Horticulture, SKLTSHU, Rajendranagar, Hyderabad, Telangana, India

Dr. D Vijaya
Principle Scientist, Department of soil science and Analytical chemistry, Grape Research Station, SKLTSHU, Rajendranagar, Hyderabad, Telangana, India

Corresponding Author:
Thunam Srikanth
M.Sc. Horticulture, Department of Plantation, Spices, Medicinal and Aromatics crops, College of Horticulture, SKLTSHU, Hyderabad, Telangana, India

Influence of integrated nutrient management and plant geometry on growth of ajowan (*Trachyspermum ammi* L. Sprague) in southern zone of Telangana

Thunam Srikanth, Dr. Veena Joshi, Dr. D Lakshmi Narayana and Dr. D Vijaya

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Abstract
A field experiment was conducted to study the "Influence of integrated nutrient management and plant geometry on growth of ajowan (*Trachyspermum ammi* L. Sprague) in Southern zone of Telangana" was carried out during the *late kharif* season of the year 2019-20 at College of Horticulture, Rajendranagar, Hyderabad. The experiment was laid out in a factorial randomized block design with 12 treatments replicated thrice. The treatments include four integrated nutrient management levels [INM_1] 100% NPK (20:40:20 kg/ha) + FYM (12 t/ha) + VC (6 t/ha) + NC (3 t/ha) + AMC (7.5 litres/ha), [INM_2] 75% NPK (15:30:15 kg/ha) + FYM (12 t/ha) + VC (6 t/ha) + NC (3 t/ha) + AMC (7.5 litres/ha), [INM_3] 50% NPK (10:20:10 kg/ha) + FYM (12 t/ha) + VC (6 t/ha) + NC (3 t/ha) + AMC (7.5 litres/ha), [INM_4] 100% NPK + FYM (12 t/ha) (Control), at three plant geometries (S_1) 30 cm x 10 cm, (S_2) 30 cm x 30 cm and (S_3) 45 cm x 30 cm. With respect to the interaction effect of integrated nutrient management and plant geometry on ajowan, maximum plant height (126.49 cm) was recorded at T_1 (INM_1+ S_1), followed by T_2 (INM_1+ S_2) (121.14 cm) and was on par with T_4 (INM_2+ S_1) (119.52 cm), where as T_9 (INM_3+ S_3) observed minimum plant height (99.93 cm), while more number of primary (14.38) and secondary branches per plant (50.16), maximum fresh (142.51 g) and dry weight per plant (44.28 g) was noticed in T_3 (INM_1+ S_3), while minimum was recorded in T_7 (INM_3+ S_1) and maximum crop growth rate was in T_1(INM_1+ S_1) (12.96 g dm^2 day^{-1}), where as T_8 (INM_3+ S_2) recorded minimum crop growth rate (5.10 g dm^2 day^{-1}).

Keywords: Farm yard manure, vermicompost, neem cake, Arka microbial consortium, plant geometry

Introduction
Ajowan or Bishop's weed (*Trachyspermum ammi* L. Sprague) is an annual herb belonging to the family Apiaceae, native of Egypt. In India, it is cultivated on a commercial scale in the states of Rajasthan, Gujarat, Uttar Pradesh, Haryana, Punjab, Andhra Pradesh, Telangana and West Bengal. Ajowan is an annual, aromatic and herbaceous plant. It is profusely branched with a height of 60-90 cm small, erect with soft fine hair. It has many branched leafy stems, feather like leaves 2-3 pinnately divided segments linear with flowers terminal and compound. Spacing is an important factor for better growth and yield of the plant. Optimum number of plants is required per unit area to utilize efficiently the available production factors such as water, nutrient, light and CO_2. Integrated nutrient management including compost, vermi compost and use of bio NPK consortium either alone or in combination of chemical fertilizers not only help to curtail chemical load in the soil, but also improves soil physical condition and augments microbial activities in the soil and thereby enhances sustainable yield potential (Gamar *et al*., 2018) [1].

Materials and Methods
The present investigation was carried out during the *late kharif* season of the year 2019-20 at College of Horticulture, Rajendranagar, Hyderabad. The experiment was carried out with the variety Lam selection-2 which was procured from the Horticultural Research Station, Guntur, Dr. YSRHU. The experiment was laid out in a factorial randomized block design with 12 treatments replicated thrice.

The treatments include four integrated nutrient management levels [INM_1] 100% NPK (20:40:20 kg/ha) + FYM (12 t/ha) + VC (6 t/ha) + NC (3 t/ha) + AMC (7.5 litres/ha), [INM_2] 75% NPK (15:30:15 kg/ha) + FYM (12 t/ha) + VC (6 t/ha) + NC (3 t/ha) + AMC (7.5 litres/ha), [INM_3] 50% NPK (10:20:10 kg/ha) + FYM (12 t/ha) + VC (6 t/ha) + NC (3 t/ha) + AMC (7.5 litres/ha), [INM_4] 100% NPK + FYM (12 t/ha) (Control), at three plant geometries (S_1) 30 cm x 10 cm, (S_2) 30 cm x 30 cm and (S_3) 45 cm x 30 cm.

Plant height (cm)
Five plants were selected randomly from each plot and measured at 30, 60 and 90 DAT. The plant height was measured from the ground level to the tip of the main shoot. The average was computed and expressed in centimetres.

Number of primary and secondary branches per plant
The primary and secondary branches from five randomly selected plants from each plot were counted at 30, 60, and 90 DAT. The average was computed and expressed as number of primary and secondary branches per plant.

Fresh weight of plant (g)
A representative sample (5 plants) was collected from the border rows of each plot at 30, 60 and 90 DAS to record fresh weight, their mean was calculated and expressed in grams.

Above ground dry weight of plant (g)
After recording the fresh weight of the plant, the above ground part was oven dried at 60 ^{0}C. The samples were transferred quickly to desiccators and allowed to cool down to room temperature. The dried samples were weighed. The process of heating and cooling was repeated until constant weight was obtained. This was considered as dry weight of the plant.

Crop Growth Rate (CGR)
Crop growth rate is the rate of dry matter production per unit ground area per unit time. It was calculated by using the following formula and expressed as g dm^{-2} day^{-1}

$$CGR = \frac{(W_2 - W_1)}{(t_2 - t_1)} \times \frac{1}{A}$$

Where,
W_1 = Dry weight of plant at time t_1
W_2 = Dry weight of plant at time t_2
$t_2 - t_1$ = Time interval in days
A = Land area (dm^{-2})

Results and Discussion
1. Plant height (cm)
Influence of integrated nutrient management and plant geometry on plant height (cm) is illustrated in the table 1 and Fig. 1. The data indicated that among the integrated nutrient management levels evaluated, at all the stages of observation (30, 60 and 90 DAT), significantly maximum plant height (62.38, 88.78 and 121.65 cm) were observed with application of INM_1, while minimum was noticed in INM_3 (43.30, 68.32 and 103.36 cm) at 30, 60 and 90 DAT respectively. Among the different plant geometries (spacing) evaluated, significantly increased plant height was recorded (57.98, 84.17 and 115.23 cm, respectively at 30, 60 and 90 DAT) at S_1 30cm x 10 cm while S_3 45cm x 30cm recorded significantly minimum plant height (44.87, 75.62 and 105.95 cm) at all the stages of observations.
At 30 DAT, with respect to Integrated nutrient management and plant geometry, significantly maximum plant height (77.86 cm) was recorded in T_1 (INM_1+ S_1), followed by T_2 (INM_1+ S_2) (58.77 cm), and was on par with T_4 (INM_2+ S_1) (58.66 cm), where as T_9 (INM_3+ S_3) observed minimum plant height (41.09 cm) which were on par with T_8 (INM_3+ S_2) (41.18 cm) T_{12} (INM_4+ S_3) (41.32 cm) and T_{11} (INM_4+ S_2) (41.35 cm) treatments. At 60 DAT, significantly maximum plant height (93.27 cm) was recorded in T_1 (INM_1+ S_1), which were on par with T_2 (INM_1+ S_2) (93.00 cm) and T_4 (INM_2+ S_1). Where as T_9 (INM_3+ S_3) noticed minimum plant height (65.50 cm).At 90 DAT, with respect to Integrated nutrient management and plant geometry, significantly maximum plant height (126.49 cm) was recorded in T_1 (INM_1+ S_1) followed by T_2 (INM_1+ S_2) (121.14 cm), T_4 (INM_2+ S_1) (119.52 cm), and T_3 (INM_1+ S_3) (117.34 cm), where as T_9 (INM_3+ S_3) recorded minimum plant height (99.93 cm). It was observed that plant height was highest when it was grown under closer plant geometry compared to wider plant geometry due to mutual shading and higher population density. This might have decreased the availability of sun light to the plant. The reduced light intensity at the base of the plant stem might have accelerated elongation of lower internodes resulting in increased plant height. These observations are in also close conformity with findings of Naruka *et al.* (2012) [2] in ajowan.

2. Number of primary branches
Table (2) declared that significantly more number of primary branches was observed with the application of INM_1 found (3.97, 9.34 and 13.75) at 30, 60 and 90 DAT respectively and was followed by INM_2 (3.51, 8.62 and 12.56) at 30, 60 and 90 DAT respectively while minimum was noticed in INM_3 (2.82, 6.64 and 10.44) at 30, 60 and 90 DAT respectively. It was observed that among different plant geometries, at all stages of observations (30, 60 and 90 DAT) significantly higher number of primary branches was recorded (3.72, 8.47 and 12.43) with (S_3) 45cm x 30 cm over the other plant geometries (S_2 and S_1) evaluated.Among the interaction effect at 30 DAT, application of T_3 (INM_1+ S_3) (4.56) recorded significantly higher number of branches over other combinations, followed by T_2 (INM_1+ S_2) (3.75). Where as T_7 (INM_3+ S_1) noticed minimum number of primary branches per plant (2.52). Similar trend were observed in 60 and 90 days after transplanting. Significant improvement in aforesaid parameter in lower plant densities was due to availability of more area per plant which implied that individual planted at wider spacing received higher growth inputs (sunlight, water and nutrients) with least competition resulting in larger canopy as compared to the plants in higher densities. Significant improvement in growth with increase in spacing was observed in the findings of Yadav *et al.* (2002) [3] in fennel, Krishnamurthy *et al.* (2000) [4], Premnath *et al.* (2008) [5] and Naruka *et al.* (2012) [2] in ajowan.

3. Number of secondary branches
The data on number of secondary branches is presented in Table 3 and Fig. 2. The data indicated that among the integrated nutrient management levels evaluated, at all the stages of observation (30, 60 and 90 DAT), significantly higher number of secondary branches (20.54, 31.29 and 48.00) were observed with application of INM_1, followed by INM_2 (18.62, 27.54 and 44.22) at 30, 60 and 90 DAT

respectively while least was noticed in INM_3 (14.57, 23.45 and 34.21) at 30, 60 and 90 DAT respectively. Similarly, at all the stages of observations (30, 60 and 90 DAT), significantly higher number of secondary branches was noticed with (S_3) 45cm x 30cm (19.72, 28.77 and 43.91) plant geometry over the other two plant geometries. Among the interaction effect at 30, 60 and 90 DAT application of T_3 (INM_1 + S_3) recorded significantly higher number of secondary branches (25.44, 35.45 and 50.16 respectively) over other combinations, while minimum was recorded in T_7 (INM_3 + S_1) (13.88, 22.30 and 30.48 respectively). Further, reduced inter-plant competition might have helped the plant to put forth better growth when compared with the plant geometry where more plants were accommodated in unit area. Similar result was reported by Jenny *et al.* (2006) [6].

4. Fresh weight (g)

It is evident from the Table.4 that with change in plant geometry or INM there was corresponding change in fresh weight. The fresh weight was significantly higher with the application of INM_1 at 30, 60 and 90 DAT (54.72, 81.68 g and 135.43 g at 30, 60 and 90 DAT, respectively), followed by INM_2 (52.70, 78.18 and 131.51 g at 30, 60 and 90 DAT, respectively) while minimum was noticed in INM_3 (43.80, 72.09 and 120.54 g) at 30, 60 and 90 DAT respectively. Regarding plant geometry, at 30 DAT, maximum fresh weight was recorded with plant geometry (S_3) 45cm x 30cm (52.02 g) followed by (49.82 and 47.97 g) at (S_2) 30cm x 30cm and (S_1) 30cm x 10cm respectively which were on par with each other. However, at 60 DAT and 90 DAT, significantly maximum fresh weight was recorded (79.85 and 131.34 g at 60 and 90 DAT, respectively) at (S_3) 45cm x 30cm. Regarding the interaction between in m and plant geometry, the fresh weight (g) was significantly higher with the application of T_3 (INM_1 + S_3) (57.73, 84.30 and 142.51 at 30, 60 and 90 DAT, respectively), while minimum was observed in T_7 (41.45, 41.45 and 119.91) at 30, 60 and 90 DAT respectively. The improvement in morphological parameters under the influence of NPK application might have resulted in larger canopy development and presumably higher chlorophyll content of leaves as nutrient actively participate in its formation (Krishnamoorthy and Madalageri (2002) [7].

5. Dry weight (g)

The results indicated that significantly higher dry weight was recorded with the application of INM_1 (15.16, 25.57 and 42.60 g/plant at 30, 60 and 90 DAT, respectively) followed by INM_2 (11.90, 20.45 and 37.66 g/plant at 30, 60 and 90 DAT, respectively) while minimum was noticed in INM_3 (4.90, 16.42 and 29.30 g/plant) at 30, 60 and 90 DAT respectively. At all stages of observations, significantly maximum dry weight was recorded with (S_3) 45cm x 30cm (12.01, 22.93 and 37.94 g/plant at 30, 60 and 90 DAT, respectively) plant geometry over the two other plant geometries, followed by (10.84, 20.38 and 37.28 g/plant at 30, 60 and 90 DAT, respectively) (S_2) 30cm x 30cm. Among the interaction effects between inm and plant geometry, significantly increased dry weight (17.37, 30.48 and 44.28 at 30, 60 and 90 DAT respectively) was noticed with the application of T_3(INM_1 + S_3) followed by T_2 (INM_1 + S_2): (15.72, 24.69 and 43.20 g at 30, 60 and 90 DAT, respectively), while minimum was observed in T_7 (INM_3 + S_1) (3.84,14.61 and 28.20 g/plant) at 30, 60 and 90 DAT respectively (Table 5). The above results found that when plants grown under wider spacing increase in larger canopy development, increase in more number of primary and secondary branches and having less plant population compared to closer spacing which leads to more number of dry matter accumulation leads to more dry weight (Yadav *et al*. (2002) [3] in fennel).

6. Crop growth rate (g dm^2 day^{-1})

Regarding integrated nutrient management At 30 and 60 DAT, application of INM_1 recorded significantly the highest crop growth rate (5.77 and 4.91 respectively) over other combinations, while minimum was recorded in INM_3 (1.78 and 2.96 respectively). At 90 DAT, application of INM_4 (9.42) recorded significantly highest CGR over other combinations, while minimum was recorded in INM_3 (6.26 g dm^2 day^{-1}) (Tabulated in the table.6). Among the different plant geometries evaluated, at 30 and 60 DAT, significantly higher CGR was observed with plant geometry of (S_1) (4.48 and 3.95 g dm^2 day^{-1} respectively), followed by (S_3) (4.23 and 3.82 g dm^2 day^{-1} respectively). At 90 DAT, significantly higher CGR was observed with plant geometry of (S_1) (10.38 g dm^2 day^{-1}), followed by (S_2) (6.97 g dm^2 day^{-1} respectively). Among the interaction effect at 30 and 90 DAT, application of T_1: (INM_1+ S_1) (6.48 and 12.96 respectively) recorded significantly maximum crop growth rate over other combinations, while minimum was recorded in T_8: (INM_3+ S_2) (2.49 and 5.10 respectively).

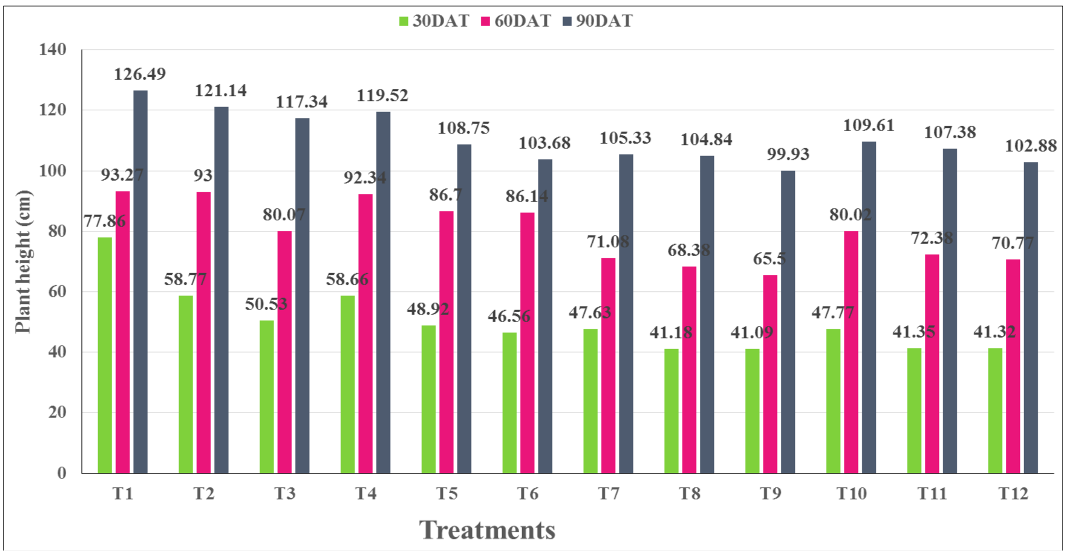

Fig 1: Influence of integrated nutrient management (INM) and plant geometry (S) on plant height (cm) in Ajowan

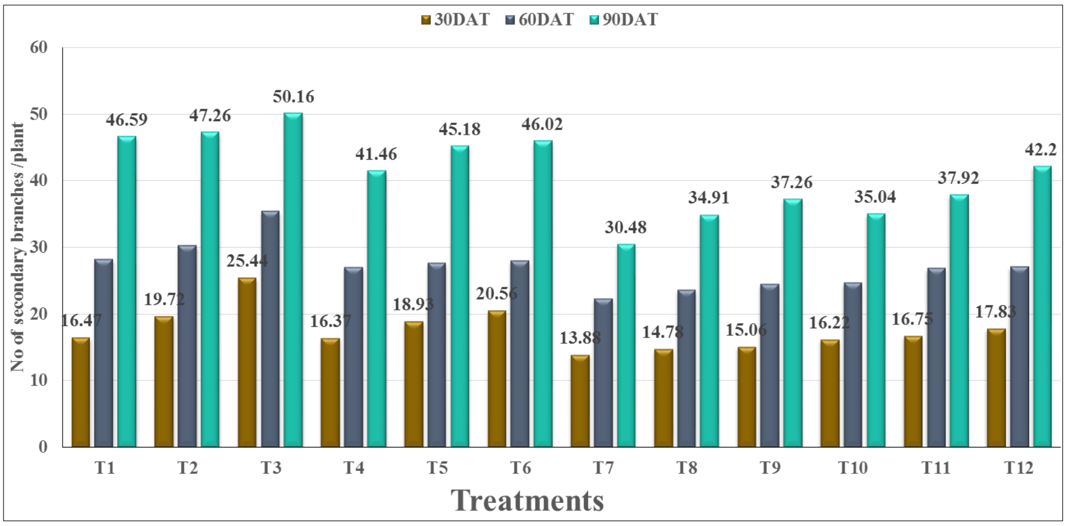

Fig 2: Influence of integrated nutrient management (INM) and plant geometry(S) on number of secondary branches per plant in Ajowan

Table 1: Influence of integrated nutrient management (INM) and plant geometry(S) on plant height (cm) in Ajowan

Treatments	Plant height (cm)											
	30 days after transplanting				60 days after transplanting				90 days after transplanting			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean	S_1	S_2	S3	Mean
INM_1	77.86	58.77	50.53	62.38^a	93.27	93.00	80.07	88.78^a	126.49	121.14	117.34	121.65^a
INM_2	58.66	48.92	46.56	51.38^b	92.34	86.70	86.14	88.39^a	119.52	108.75	103.68	110.65^b
INM_3	47.63	41.18	41.09	43.30^c	71.08	68.38	65.50	68.32^c	105.33	104.84	99.93	103.36^d
INM_4	47.77	41.35	41.32	43.48^c	80.02	72.38	70.77	74.39^b	109.61	107.38	102.88	106.62^c
Mean	57.98^a	47.56^b	44.87^c		84.17^a	80.11^b	75.62^c		115.23^a	110.52^b	105.9^c	
	S Em ±		CD at 5%		S Em ±		CD at 5%		S Em ±		CD at 5%	
INM	0.40		1.19		0.34		1.00		0.31		0.93	
S	0.35		1.03		0.29		0.87		0.27		0.81	
INM x S	0.70		2.07		0.59		1.74		0.55		1.62	

INM = Integrated nutrient management
INM_1: 100% NPK (20:40:20 kg/ha)+ FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
INM_2: 75% NPK (15:30:15 kg/ha) + FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
INM_3: 50% NPK (10:20:10 kg/ha)+ FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
INM_4: 100% NPK (20:40:20 kg/ha) + FYM (12 t/ha) (Control)

S= Plant geometry (spacing)
S_1 (30X10 cm)
S_2 (30X30 cm)
S_3 (45X30 cm)

Table 2: Influence of integrated nutrient management (INM) and plant geometry (S) on number of primary branches per plant in ajowan

Treatments	Number of primary branches											
	30 days after transplanting				60 days after transplanting				90 days after transplanting			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean	S_1	S_2	S3	Mean
INM_1	3.62	3.75	4.56	3.97^a	9.12	9.27	9.63	9.34^a	13.21	13.67	14.38	13.75^a
INM_2	3.40	3.51	3.63	3.51^b	8.43	8.61	8.82	8.62^b	12.3	12.45	12.93	12.56^b
INM_3	2.52	2.83	3.12	2.82^d	6.42	6.69	6.81	6.64^d	10.2	10.5	10.62	10.44^d
INM_4	3.32	3.50	3.59	3.47^c	8.1	8.43	8.62	8.38^c	11.16	11.4	11.82	11.46^c
Mean	3.21^c	3.39^b	3.72^a		8.01^c	8.25^b	8.47^a		11.71^c	12.00^b	12.43^a	
	S Em ±		CD at 5%		S Em ±		CD at 5%		S Em ±		CD at 5%	
INM	0.012		0.037		0.003		0.010		0.017		0.051	
S	0.011		0.032		0.003		0.009		0.015		0.044	
INM x S	0.022		0.064		0.006		0.018		0.030		0.088	

INM = Integrated nutrient management
INM_1: 100% NPK (20:40:20 kg/ha)+ FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
INM_2: 75% NPK (15:30:15 kg/ha) + FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
INM_3: 50% NPK (10:20:10 kg/ha)+ FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
INM_4: 100% NPK (20:40:20 kg/ha) + FYM (12 t/ha) (Control)

S= Plant geometry (spacing)
S_1 (30X10 cm)
S_2 (30X30 cm)
S_3 (45X30 cm)

Table 3: Influence of integrated nutrient management (INM) and plant geometry (S) on number of secondary branches per plant in Ajowan

Treatments	Number of secondary branches											
	30 days after transplanting				60 days after transplanting				90 days after transplanting			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean	S_1	S_2	S3	Mean
INM_1	3.62	3.75	4.56	3.97^a	9.12	9.27	9.63	9.34^a	13.21	13.67	14.38	13.75^a
INM_2	3.40	3.51	3.63	3.51^b	8.43	8.61	8.82	8.62^b	12.3	12.45	12.93	12.56^b
INM_3	2.52	2.83	3.12	2.82^d	6.42	6.69	6.81	6.64^d	10.2	10.5	10.62	10.44^d
INM_4	3.32	3.50	3.59	3.47^c	8.1	8.43	8.62	8.38^c	11.16	11.4	11.82	11.46^c
Mean	3.21^c	3.39^b	3.72^a		8.01^c	8.25^b	8.47^a		11.71^c	12.00^b	12.43^a	

	S Em ±	CD at 5%	S Em ±	CD at 5%	S Em ±	CD at 5%
INM	0.012	0.037	0.003	0.010	0.017	0.051
S	0.011	0.032	0.003	0.009	0.015	0.044
INM x S	0.022	0.064	0.006	0.018	0.030	0.088

INM = Integrated nutrient management
INM_1: 100% NPK (20:40:20 kg/ha)+ FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
(15:30:15 kg/ha) + FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
INM_3: 50% NPK (10:20:10 kg/ha)+ FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
INM_4: 100% NPK (20:40:20 kg/ha) + FYM (12 t/ha) (Control)

S= Plant geometry (spacing)
S_1 (30X10 cm) INM_2: 75% NPK
S_2 (30X30 cm)
S_3 (45X30 cm)

Table 4: Influence of integrated nutrient management (INM) and plant geometry (S) on fresh weight (g plant^{-1}) in ajowan

Treatments	Fresh weight (g plant^{-1})											
	30 days after transplanting				60 days after transplanting				90 days after transplanting			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean	S_1	S_2	S3	Mean
INM_1	51.75	54.70	57.73	54.72^{a}	77.79	82.96	84.30	81.68^{a}	130.3	133.49	142.51	135.43^{a}
INM_2	51.2	52.32	54.59	52.70^{b}	76.94	78.25	79.37	78.18^{b}	126.69	132.97	134.88	131.51^{b}
INM_3	41.45	43.38	46.58	43.80^{d}	68.47	70.16	77.66	72.09^{d}	119.91	120.66	121.06	120.54^{d}
INM_4	47.51	48.91	49.18	48.53^{c}	75.95	77.13	78.08	77.05^{c}	123.84	124.88	126.9	125.20^{c}
Mean	47.97^{c}	49.82^{b}	52.02^{a}		74.78^{c}	77.12^{b}	79.85^{a}		125.18^{c}	128.00^{b}	131.3^{a}	
	S Em ±		CD at 5%		S Em ±		CD at 5%		S Em ±		CD at 5%	
INM	0.11		0.33		0.24		0.72		0.33		0.98	
S	0.09		0.29		0.21		0.62		0.28		0.85	
INM X S	0.19		0.58		0.42		1.25		0.57		1.70	

INM = Integrated nutrient management
INM_1: 100% NPK (20:40:20 kg/ha)+ FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
(15:30:15 kg/ha) + FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
INM_3: 50% NPK (10:20:10 kg/ha)+ FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
INM_4: 100% NPK (20:40:20 kg/ha) + FYM (12 t/ha) (Control)

S= Plant geometry (spacing)
S_1 (30X10 cm) INM_2: 75% NPK
S_2 (30X30 cm)
S_3 (45X30 cm)

Table 5: Influence of integrated nutrient management (INM) and plant geometry (S) on dry weight (g plant^{-1}) in ajowan

Treatments	Dry weight (g plant^{-1})											
	30 days after transplanting				60 days after transplanting				90 days after transplanting			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean	S_1	S_2	S3	Mean
INM_1	12.41	15.72	17.37	15.16^{a}	21.54	24.69	30.48	25.57^{a}	40.32	43.2	44.28	42.60^{a}
INM_2	10.89	11.73	13.08	11.90^{b}	19.77	20.61	20.97	20.45^{b}	37.35	37.62	38.01	37.66^{c}
INM_3	3.84	4.92	5.94	4.90^{d}	14.61	15.72	18.93	16.42^{d}	28.20	29.49	30.21	29.30^{d}
INM_4	8.22	11.01	11.67	10.30^{c}	18.81	20.52	21.36	20.23^{c}	37.14	38.82	39.27	38.41^{b}
Mean	8.84^{c}	10.84^{b}	12.01^{a}		18.68^{c}	20.38^{b}	22.93^{a}		35.75^{c}	37.28^{b}	37.94^{a}	
	S Em ±		CD at 5%		S Em ±		CD at 5%		S Em ±		CD at 5%	
INM	0.03		0.10		0.03		0.10		0.03		0.10	
S	0.03		0.09		0.03		0.08		0.03		0.08	
INM X S	0.06		0.18		0.06		0.17		0.06		0.17	

INM = Integrated nutrient management
INM_1: 100% NPK (20:40:20 kg/ha)+ FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
(15:30:15 kg/ha) + FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
INM_3: 50% NPK (10:20:10 kg/ha)+ FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
INM_4: 100% NPK (20:40:20 kg/ha) + FYM (12 t/ha) (Control)

S= Plant geometry (spacing)
S_1 (30X10 cm) INM_2: 75% NPK
S_2 (30X30 cm)
S_3 (45X30 cm)

Table 6: Influence of integrated nutrient management (INM) and plant geometry (S) on crop growth rate (g dm^{2} day^{-1}) in ajowan

Treatments	Crop growth rate (g dm^{2} day^{-1})											
	30 days after transplanting				60 days after transplanting				90 days after transplanting			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean	S_1	S_2	S3	Mean
INM_1	6.48	5.16	5.67	5.77^{a}	5.43	4.02	5.28	4.91^{a}	12.96	7.08	5.08	8.37^{b}
INM_2	5.64	4.86	5.16	5.22^{b}	2.46	3.09	4.86	3.47^{c}	10.8	6.6	6.45	7.95^{c}
INM_3	2.04	1.35	1.95	1.78^{d}	3.87	2.49	2.52	2.96^{d}	8.22	5.1	5.46	6.26^{d}
INM_4	3.78	4.08	4.14	4.00^{c}	4.05	4.71	2.64	3.80^{b}	9.54	9.12	9.6	9.42^{a}
Mean	4.48^{a}	3.86^{c}	4.23^{b}		3.95^{a}	3.57^{c}	3.82^{b}		10.38^{a}	6.97^{b}	6.64^{c}	
	S Em ±		CD at 5%		S Em ±		CD at 5%		S Em ±		CD at 5%	
INM	0.03		0.10		0.03		0.10		0.04		0.13	
S	0.03		0.08		0.03		0.08		0.03		0.11	
INM X S	0.06		0.17		0.06		0.17		0.07		0.23	

INM = Integrated nutrient management
INM_1: 100% NPK (20:40:20 kg/ha)+ FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
(15:30:15 kg/ha) + FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
INM_3: 50% NPK (10:20:10 kg/ha)+ FYM(12t/ha) +VC(6t/ha) +NC (3t/ha) + AMC (7.5 l/ha)
INM_4: 100% NPK (20:40:20 kg/ha) + FYM (12 t/ha) (Control)

S= Plant geometry (spacing)
S_1 (30X10 cm) INM_2: 75% NPK
S_2 (30X30 cm)
S_3 (45X30 cm)

Conclusion
Based on the results discussed above, a conclusion can be drawn that maximum plant height (126.49 cm) was recorded at T_1 (INM_1+ S_1), where as T_9 (INM_3+ S_3) observed minimum plant height (99.93 cm), while more number of primary (14.38) and secondary branches per plant (50.16), maximum fresh (142.51 g) and dry weight per plant (44.28 g) was noticed in T_3 (INM_1+ S_3), while minimum was recorded in T_7 (INM_3+ S_1), and maximum crop growth rate was in T_1(INM_1+ S_1) (12.96 g dm^2 day^{-1}), where as T_8 (INM_3+ S_2) recorded minimum crop growth rate (5.10 g dm^2 day^{-1}).

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