E-ISSN: 2618-0618
P-ISSN: 2618-060X

NAAS Rating (2026): 5.20
www.agronomyjournals.com
2025; 8(12): 1252-1256
Received: 19-10-2025
Accepted: 23-11-2025

K Stella
Department of PSMA, Dr. Y. S. R Horticultural University, Venkataramannagudem, Andhra Pradesh, India

M Padma
Principal Scientist (Hort.), Fruit Research Station, Sangareddy, Telangana, India

T Susila
Scientist (Hort.), Herbal Garden, Rajendranagar, Hyderabad, Telangana, India

V Padma
Associate Professor (Plant Physiology) College of Agriculture, Acharya N. G. Ranga Agricultural University, Rajendranagar. Hyderabad, Telangana, India

Corresponding Author:
K Stella
Department of PSMA, Dr. Y. S. R Horticultural University, Venkataramannagudem, Andhra Pradesh, India

Studies on the effect of fertilizer levels and plant densities on growth of Ambrette (*Abelmoschus moschatus* Medic.)

K Stella, M Padma, T Susila and V Padma

DOI: https://www.doi.org/10.33545/2618060X.2025.v8.i12q.4595

Abstract
A field experiment was conducted at herbal garden, College of Horticulture, Dr. Y. S. R Horticultural University, Rajendranagar, Hyderabad during the year 2010-2011 on Studies on the effect of fertilizer levels and plant densities on growth of Ambrette (*Abelmoschus moschatus* Medic.). The experiment was laid out in Split Plot Design with nine treatments and four replications. It consisted of three different spacings as one factor (50 × 30 cm, 50 × 40 cm, 50 × 50 cm) and three different fertilizer levels as another factor (75-50-40 NPK kg/ha, 100-50-50 NPK kg/ha, 125-50-60 NPK kg/ ha). Among the interaction of spacings and fertilizer levels the combination of spacing at 50 × 30 cm and 125: 50: 60 NPK kg/ha recorded maximum plant height (42.53 cm) and maximum internodal length (4.03 cm). Interaction of fertilizer level of N P and K at 100: 50: 50 kg per ha recorded maximum leaf area (6305.54 cm^2).

Keywords: NPK, seed yield, oil yield, Ambrette, *Abelmoschus moschatus* Medic.

1. Introduction
Ambrette (*Abelmoschus moschatus* Medic.) is used as a medicine and in perfumery industry. Ambrette popularly known as muskmallow yields scented seed possessing an aroma similar to that of musk (kasturi) obtained from the Musk-deer (*Moschatus moschifera*) and valued for its volatile oil. connected to other outer surface by stomium cells. The different grades of essential oil consisting mainly of macrocyclic lactone, ambrettolide and sesquiterpene alcohol, farnesol are isolated from the aromatic substances obtained from its seed (Hegde *et al*., 1994) [12]. The liquid ambrette oil of commerce blends excellently with many other oils including rose, neroli and sandalwood oil.

In medicines, seeds are used as a tonic, aphrodisiac, antispasmodic and carminative. They allay thirst, check vomiting and cure diseases like kapha and vata and are useful in healing intestinal disorders, stomatitis, dyspepsia, urinary discharge, nervous debility, hysteria, and skin diseases like itch and leucoderma and also valued as cardiotonic. Medicinal and aromatic plants play a vital role in the medicine and perfumery industry. In India because of varied climatic conditions, more than 2000 species of medicinal and aromatic plants have been reported. The use of medicinal and aromatic plants and their products is as old as history. Due to harmful side effects associated with the use of synthetic drugs and antibiotics, there is good scope for these plants in Ayurvedic as well as Unani medicines. Among the several medicinal and aromatic plant species, Ambrette has a prominent place and is used in medicinal as well as in the perfumery industry. Ambrette (*Abelmoschus moschatus* Medic.) belonging to the family Malvaceae, is a close relative to okra, a popular vegetable crop. It is universally known as Ambrette and the oil extracted from the seed is called Ambrette oil. It is also known as Musk mallow. The crop is native to India and grows throughout the tropical regions. Sowing dates play an important role in germination, growth and seed yield in many crops.

2. Materials and Methods
The present investigation was carried out at the herbal garden, Rajendranagar, Hyderabad during the kharif season from August 2010 to March 2011. The experimental site is situated at

an altitude of 542.3m above the mean sea level on 17.9 latitude and 78.23 east longitudes. Good quality bold seeds of Ambrette were obtained from Medicinal and Aromatic Research Station, Rajendranagar. The seeds were soaked in water for 24 hours. At the time of sowing, the seeds were dibbled at a depth of 2.5 cm. After the preparation of land and formation of plots, the recommended dose of fertilizers. During the initial stages of growth, irrigation was given at three to four days interval and once in eight to ten days at the later stages and it varied based on the weather and soil moisture conditions. A total of three earthing up was done at 45 days interval to provide better anchorage to the plants. The harvesting stage of the pods was identified when the pods turned blackish and with the appearance of white strips on pods, the harvesting was done regularly at 6-7 days intervals before the pods split and shed the seeds. Seeds were separated and dried. The experiment was laid out in a split plot design with 9 treatments in Kharif replicated four times which comes to a total of 36 plots. The treatments included three plant densities S_1 (50 × 30 cm), S_2 (50 × 40 cm), S_3 (50 × 50 cm) and three different fertilizer levels F_1 (75 kg N, 50 kg P, 40 kg K), F_2 (100 kg N, 50 kg P, 50 K), F_3 (125 kg N, 50 kg P, 60 kg K). The total number of treatments comprise as 9 treatments with 4 replications laid out in 36 plots. The different treatments are T_1= 75 kg N + 50 kg P + 40 kg K and 50 × 30cm, T_2= 100 kg N + 50 kg P + 50 kg K and 50 × 30cm, T_3= 125 kg N + 50 kg P + 60 kg K and 50 × 30cm, T_4= 75 kg N + 50 kg P + 40 kg K and 50 × 40cm, T_5= 100 kg N + 50 kg P + 50 kg K and 50 × 40cm, T_6= 125 kg N + 50 kg P + 60 kg K and 50 × 40cm, T_7= 75 kg N + 50 kg P + 40 kg K and 50 × 50cm, T_8= 100 kg N + 50 kg P + 50 kg K and 50 × 50cm, T_9= 125 kg N + 50 kg P + 60 kg K and 50 × 50cm. Each plot is of 5 × 4 cm size and laid as flat beds. After complete preparation of the experimental plots, seeds of ambrette were sown on August 25th, 2010 by dibbling method.

3. Results and Discussion

3.1 Plant height

Among different spacings, plant height at 75 days after sowing decreased with increase in spacing. Significantly highest plant height (37.06 cm) was recorded with 50 × 30 cm spacing followed by 50 × 40 cm (33.15 cm) and 50 × 50 cm (27.24 cm).

Among the different fertilizer levels N, P and K at 125: 50: 60 kg per ha recorded significantly maximum plant height (36.37 cm) at 75 days after sowing followed by N, P and K 100: 50: 50 kg per ha (32.65 cm) and 75: 50: 40 kg per ha (28.43).

The interaction between different fertilizer levels and planting densities was also significant with plant height at 75 days after sowing. Among different interactions, it was found that, planting distance of 50 × 30 cm and fertilizer level of N, P and K at 125: 50: 60 kg per ha recorded significantly highest plant height (42.53 cm).

Table 1: Effect of spacings and fertilizer levels on plant height (cm) at 30 DAS and 45 DAS In ambrette

Treatments Spacings	Plant height (cm)							
	Fertilizers							
	30 das				45 das			
	F_1	F_2	F_3	Mean	F_1	F_2	F_3	Mean
S_1	5.65	5.85	6.55	6.02	8.34	8.94	9.33	8.87
S_2	5.15	5.75	6.25	5.72	8.06	8.56	8.99	8.54
S_3	4.95	5.55	5.85	5.45	7.96	8.38	9.33	8.56
Mean	5.25	5.72	6.22		8.12	8.62	9.22	
Factors	S	F	S×F	F×S	S	F	S×F	F×S
S.Em±	0.028	0.042	0.066	0.049	0.077	0.052	0.106	0.133
C.D. (5%)	0.098	0.126	0.203	0.224	0.264	0.154	0.342	0.289

Table 2: Effect of spacings and fertilizer levels on plant height (cm) at 60 DAS and 75 DAS In ambrette

Treatments spacings	Plant height (cm)							
	Fertilizers							
	60 das				75 das			
	F_1	F_2	F_3	Mean	F_1	F_2	F_3	Mean
S_1	14.78	17.08	20.72	17.53	32.08	36.58	42.53	37.06
S_2	15.18	16.28	17.73	16.39	27.68	34.25	37.53	33.15
S_3	16.48	14.98	16.70	16.05	25.55	27.13	29.05	27.24
Mean	15.48	16.11	18.38		28.43	32.65	36.37	
Factors	S	F	S×F	F×S	S	F	S×F	F×S
S.Em±	0.310	0.461	0.723	0.538	0.488	0.671	1.067	0.845
C.D. (5%)	1.072	1.371	2.212	2.446	1.684	1.994	3.570	3.277

3.2 Plant spread (cm) at 75 days after sowing

Among different spacings, plant spread at 75 days after sowing increased with increase in spacing. Significantly highest plant spread was recorded with 50 × 50 cm spacing (85.25 cm) while 50 × 30 cm (78.59 cm) was on par with 50 × 40 cm (79.09 cm)

Among the different fertilizer levels N, P and K at 125: 50: 60 kg per ha recorded maximum plant spread (85.85 cm), while N, P and K 100: 50: 50 kg per ha (79.23 cm) and 75: 50: 40 kg per ha (77.86 cm) were on par.

The interaction between different planting densities and fertilizer levels was also significant with plant spread at 75 days after sowing. Among different interactions, it was found that planting distance of 50 × 50 cm and fertilizer level of N, P and K at 125: 50: 60 kg per ha recorded significantly highest plant spread (93.45 cm).

Table 3: Effect of spacings and fertilizer levels on plant spread (cm) at 30 DAS and 45 DAS In ambrette

Treatments spacings	Plant spread (cm)							
	Fertilizers							
	30 das				45 das			
	F_1	F_2	F_3	Mean	F_1	F_2	F_3	Mean
S_1	32.45	31.28	35.10	32.94	42.60	42.18	42.28	42.35
S_2	30.65	33.63	34.43	32.90	36.70	40.18	42.58	39.82
S_3	34.45	32.83	33.70	33.66	40.35	39.33	43.48	41.05
Mean	32.52	32.58	34.41		39.88	40.56	42.78	
Factors	S	F	S×F	F×S	S	F	S×F	F×S
S.Em±	1.201	0.856	1.705	2.080	1.535	1.117	2.202	2.658
C.D. (5%)	NS	NS	NS	NS	NS	NS	NS	NS

Table 4: Effect of spacings and fertilizer levels on plant spread (cm) at 60 DAS and 75 DAS In ambrette

Treatments Spacings	Plant spread (cm)							
	Fertilizers							
	60 das				75 das			
	F_1	F_2	F_3	Mean	F_1	F_2	F_3	Mean
S_1	63.45	67.63	69.53	66.87	74.95	78.93	81.90	78.59
S_2	71.65	72.83	73.30	72.59	75.73	79.35	82.20	79.09
S_3	74.20	76.65	83.83	78.23	82.90	79.40	93.45	85.25
Mean	69.77	72.37	75.55		77.86	79.23	85.85	
Factors	S	F	S×F	F×S	S	F	S×F	F×S
S.Em±	0.515	0.519	0.897	0.892	0.615	0.544	0.984	1.065
C.D. (5%)	1.778	1.543	2.808	2.815	2.122	1.616	3.109	2.974

3.3 Number of branches at 75 days after sowing

The number of branches in the experimental plants was counted at an interval of 15 days right from 30 days after sowing and is presented in the table 15.

Among different spacings, significantly highest number of branches (13.4) was recorded with 50 × 50 cm spacing followed by 50 × 40 cm (11.87) and 50 × 30 cm (9.85).

Among the different fertilizer levels of N, P and K at 100: 50: 50

kg per ha recorded significantly maximum number of branches (12.71) followed by 125: 50: 60 kg per ha (11.46) and 75: 50: 40 kg per ha (10.95).
The interactive effect of spacings and fertilizers failed to bring significant response on the number of branches per plant in ambrette.

Table 5: Effect of spacings and fertilizer levels on number of branches at 60 DAS and 75 DAS In ambrette

Treatments spacings	Number of branches							
	Fertilizers							
	60 das				75 das			
	F_1	F_2	F_3	Mean	F_1	F_2	F_3	Mean
S_1	2.30	3.03	2.35	2.56	9.03	11.20	9.33	9.85
S_2	2.25	3.25	2.43	2.64	10.98	12.73	11.90	11.87
S_3	2.35	3.45	2.78	2.86	12.85	14.20	13.15	13.40
Mean	2.30	3.24	2.52		10.95	12.71	11.46	
Factors	S	F	S×F	F×S	S	F	S×F	F×S
S.Em±	0.044	0.034	0.065	0.076	0.584	0.591	1.016	1.023
C.D. (5%)	0.151	0.101	0.208	0.189	1.429	1.241	1.249	2.150

3.4 Internodal length (cm) at 75 days after sowing

The effect of different fertilizers and spacings on internodal length at 75 days after sowing of ambrette is presented in the table 19. Internodal length at 75 days after sowing was significantly influenced by spacings and fertilizer levels.
Among different spacings, internodal length at 75 days after sowing decreased with increase in spacing. Significantly highest internodal length (3.52 cm) was recorded with 50 × 30 cm spacing followed by 50 × 40 cm (3.27 cm) and 50 × 50 cm (3.06 cm).
Among the different fertilizer levels N, P and K at 125: 50: 60 kg per ha recorded significantly maximum internodal length (3.83 cm) at 75 days after sowing followed by 100: 50: 50 kg per ha (3.29 cm) and 75: 50: 40 kg per ha (2.73 cm). The interaction between different fertilizer levels and planting densities had not shown any significance with internodal length at 60 days after sowing.

Table 6: Effect of spacings and fertilizer levels on internodal length (cm) at 30 DAS and 45 DAS In ambrette

Treatments spacings	Internodal length (cm)							
	Fertilizers							
	30 das				45 das			
	F_1	F_2	F_3	Mean	F_1	F_2	F_3	Mean
S_1	1.40	1.68	1.88	1.65	1.59	1.80	1.98	1.79
S_2	1.31	1.57	1.77	1.55	1.44	1.66	1.87	1.65
S_3	1.29	1.53	1.63	1.48	1.40	1.68	1.84	1.64
Mean	1.33	1.59	1.76		1.47	1.71	1.89	
Factors	S	F	S×F	F×S	S	F	S×F	F×S
S.Em±	0.039	0.043	0.071	0.074	0.030	0.042	0.067	0.052
C.D. (5%)	0.097	0.090	0.156	0.156	0.103	0.126	NS	NS

Table 7: Effect of spacings and fertilizer levels on internodal length (cm) at 60 DAS and 75 DAS In ambrette

Treatments spacings	Internodal length (cm)							
	Fertilizers							
	60 das				75 das			
	F_1	F_2	F_3	Mean	F_1	F_2	F_3	Mean
S_1	1.87	2.05	2.24	2.05	2.98	3.56	4.03	3.52
S_2	1.76	1.94	2.17	1.96	2.65	3.28	3.87	3.27
S_3	1.63	1.87	2.02	1.84	2.54	3.04	3.60	3.06
Mean	1.75	1.95	2.14		2.73	3.29	3.83	
Factors	S	F	S×F	F×S	S	F	S×F	F×S
S.Em±	0.045	0.043	0.076	0.079	0.054	0.133	0.196	0.093
C.D. (5%)	0.157	0.129	NS	NS	0.186	0.396	NS	NS

3.5 Number of leaves per plant at 75 days after sowing

The effect of different spacing and fertilizers on number of leaves at 75 days after sowing of ambrette is presented in the table 23. The number of leaves at 75 days after sowing was significantly influenced by spacings and fertilizers.
Among different spacings, number of leaves at 75 days after sowing increased with increase in spacing. Significantly highest number of leaves (45.98) was recorded with 50 × 50 cm spacing followed by 50 × 40 cm (39.38) and 50 × 30 cm (35.68).
Among the different fertilizer levels N, P and K at 125: 50: 60 kg per ha recorded significantly maximum number of leaves (44.07) at 60 days after sowing followed by 100: 50: 50 kg per ha (40.04) and 75: 50: 40 kg per ha (36.93).
The interactive effect of spacings and fertilizer levels failed to bring significant response on the production of leaves per plant in ambrette. However, the maximum number of leaves was produced when the plants were fertilized with N, P and K at 125: 50: 60 kg per ha keeping the sowing distance of 50 × 50 cm (50.05).

Table 8: Effect of spacings and fertilizer levels on number of leaves at 30 DAS and 45 DAS In ambrette

Treatments spacings	Number of leaves							
	Fertilizers							
	30 das				45 das			
	F_1	F_2	F_3	Mean	F_1	F_2	F_3	Mean
S_1	5.65	5.75	5.80	5.73	8.75	9.15	9.45	9.12
S_2	5.75	5.85	5.90	5.83	8.95	9.25	9.65	9.28
S_3	5.85	5.95	6.15	5.98	9.25	9.45	9.85	9.52
Mean	5.75	5.85	5.95		8.98	9.28	9.65	
Factors	S	F	S×F	F×S	S	F	S×F	F×S
S.Em±	0.030	0.036	0.060	0.051	0.039	0.036	0.064	0.067
C.D. (5%)	0.103	0.107	NS	NS	0.133	0.108	NS	NS

Table 9: Effect of spacings and fertilizer levels on number of leaves at 60 DAS and 75 DAS In ambrette

Treatments spacings	Number of leaves							
	Fertilizers							
	60 das				75 das			
	F_1	F_2	F_3	Mean	F_1	F_2	F_3	Mean
S_1	21.88	24.48	26.75	24.37	32.85	35.05	39.15	35.68
S_2	22.68	25.33	27.23	25.08	36.05	39.08	43.00	39.38
S_3	23.03	25.53	30.33	26.29	41.90	46.00	50.05	45.98
Mean	22.53	25.10	28.10		36.93	40.04	44.07	
Factors	S	F	S×F	F×S	S	F	S×F	F×S
S.Em±	0.314	0.438	0.624	0.759	0.502	0.543	0.893	0.940
C.D. (5%)	0.767	0.921	1.354	1.596	1.228	1.140	1.970	1.974

3.6 Leaf area (cm²) at 75 days after sowing:

The effect of different spacings and fertilizers on leaf area at 75 days after sowing of ambrette is presented in the table 27 and graphically represented in fig 2. The leaf area at 75 days after sowing was significantly influenced by spacings and fertilizers.

Among different spacings, leaf area at 75 days after sowing increased with increase in spacing. Significantly highest leaf area (5657.34 cm²) was recorded with 50 × 50 cm spacing. Leaf area produced by 50 × 40 cm (4757.68 cm²) and 50 × 30 cm (4398.37 cm²) were at on par.

Among the different fertilizer levels N, P and K at 100: 50: 50 kg per ha recorded significantly maximum leaf area (5418.43 cm²) at 75 days after sowing, while 75: 50: 40 kg per ha (4954.31 cm²) was on par with 125: 50: 60 kg per ha (4440.65 cm²).

The interactive effects of spacings and fertilizer levels also showed significant difference on leaf area at 75 days after sowing. The maximum leaf area (6305.54 cm^2) was observed with the combination of fertilizer level N, P and K at 100: 50: 50 kg per ha and at spacing 50 × 50 cm.

Table 10: Effect of spacings and fertilizer levels on leaf area at 60 DAS and 75 DAS In ambrette

Treatments spacings	Leaf area (cm^2)							
	Fertilizers							
	60 das				75 das			
	F_1	F_2	F_3	Mean	F_1	F_2	F_3	Mean
S_1	2440.38	2192.33	2350.95	2327.88	4490.30	4702.35	4002.45	4398.37
S_2	2282.58	2517.95	2273.15	2357.89	4760.80	5247.40	4264.85	4757.68
S_3	2620.75	2803.08	2380.63	2601.48	5611.823	6305.54	5054.65	5657.34
Mean	2447.90	2504.45	2334.91		4954.31	5418.43	4440.65	
Factors	S	F	S×F	F×S	S	F	S×F	F×S
S.Em±	26.008	33.979	54.640	45.047	44.650	49.241	82.723	77.336
C.D. (5%)	89.763	100.974	168.311	181.288	154.103	146.331	257.388	265.371

3.7 Dry matter production (g) at 75 days after sowing

The effect of different spacings and fertilizers on dry matter production at 75 days after sowing of ambrette is presented in the table 31 and graphically represented in fig 3. The dry matter production at 75 days after sowing was significantly influenced by spacings and fertilizers.

Among different spacings, dry matter production at 75 days after sowing increased with increase in spacing. Significantly highest dry matter production (42.73 g) was recorded with 50 × 50 cm spacing followed by 50 × 40 cm (39.92 g) and 50 × 30 cm (35.79 g) at 60 days after sowing.

Among the different fertilizer levels of N, P and K at 125: 50: 60 kg per ha recorded significantly highest dry matter production (52.34 g) at 75 days after sowing followed by 100: 50: 50 kg per ha (37.55 g), 75: 50: 40 kg per ha (28.54 g).

The interaction of spacings and fertilizer levels also showed significant difference. The highest dry matter production (60.80 g) was observed with the combination of fertilizer level of N, P and K at 125: 50: 60 kg per ha and at spacing 50 × 50 cm.

Table 11: Effect of spacings and fertilizer levels on dry matter production at 30 DAS and 45 DAS In ambrette

Treatments spacings	Dry matter production (g)							
	Fertilizers							
	30 das				45 das			
	F_1	F_2	F_3	Mean	F_1	F_2	F_3	Mean
S_1	2.81	3.18	3.47	3.15	7.00	7.85	11.00	8.62
S_2	3.08	3.26	3.90	3.41	7.00	8.90	12.68	9.53
S_3	3.10	3.30	4.08	3.49	7.03	9.63	13.68	10.11
Mean	2.99	3.25	3.82		7.01	8.79	12.45	
Factors	S	F	S×F	F×S	S	F	S×F	F×S
S.Em±	0.068	0.051	0.099	0.118	0.189	0.403	0.600	0.328
C.D. (5%)	0.234	0.152	NS	NS	0.653	1.196	NS	NS

Table 12: Effect of spacings and fertilizer levels on dry matter production at 60 DAS and 75 DAS In ambrette

Treatments spacings	Dry matter production (g)							
	Fertilizers							
	60 das				75 das			
	F_1	F_2	F_3	Mean	F_1	F_2	F_3	Mean
S_1	10.50	16.55	23.50	16.85	28.05	36.75	42.58	35.79
S_2	14.20	19.05	25.73	19.66	28.55	37.55	53.65	39.92
S_3	15.78	20.13	27.68	21.19	29.03	38.35	60.80	42.73
Mean	13.49	18.58	25.63		28.54	37.55	52.34	
Factors	S	F	S×F	F×S	S	F	S×F	F×S
S.Em±	0.456	1.024	1.521	0.805	1.076	1.973	2.991	1.864
C.D. (5%)	1.605	3.042	NS	NS	3.715	5.863	NS	NS

4. Conclusion

From the results of research experiment based on these findings it is concluded that the maximum plant height and internodal length was recorded with fertilizer dose of N P and K at 125: 50: 60 kg per ha. A spacing of 50 × 30 cm recorded maximum plant height and internodal length. The interaction of spacing of 50 × 30 cm and fertilizer dose of 125: 50:60 kg per ha recorded maximum plant height and internodal length.

5. Acknowledgments

Thanks to the Dr. M. Padma, Head of the Medicinal and Aromatic Plant Research Station, Rajendranagar, Hyderabad, for providing land facilities for carryout experiments.

References

1. Adelena BO. Effect of N, P and K fertilizers on the yield of okra in south-western Nigeria. Samaru J Agric Res. 1985;3(1-2):67.
2. Anonymous. News and views. Indian Perfumer. 1998;42:5.
3. Anonymous. Cultivation of muskdana (*Abelmoschus moschatus*) in India. Lucknow: Central Institute of Medicinal and Aromatic Plants; 2000.
4. Ahmed N, Tanki MI. Effect of nitrogen and phosphorus on growth and seed yield of okra. Indian J Hortic. 1997;54(2):156-159.
5. Ahmed F, Ishtiaq M, Muhammad S. Effect of different levels of nitrogen alone and in combination with constant doses of phosphorus and potassium on growth and yield of okra cv. T-13. Sarhad J Agric. 1999;15(5):405-407.
6. Birbal BK, Nehra YS, Malik. Effect of spacing and nitrogen on fruit yield of okra (*Abelmoschus esculentus* (L.) Moench) cv. Varsha Uphar. Haryana Agric Univ J Res. 1995;25(1-2):47-51.
7. Chauhan DS, Gupta ML. Effect of nitrogen, phosphorus and potash on growth and development of okra (*Abelmoschus esculentus* (L.)). Indian J Hortic. 1973;30(1-2):401-406.
8. Dahatonde BN. Studies on response of ambrette (*Abelmoschus moschatus* Medic.) to nitrogen and phosphorus. PKV Res J. 1988;12(2):158-159.
9. Farooqi AA, Sreeramu BS. Cultivation of medicinal and aromatic crops. Bengaluru: Universities Press, UAS; 2001. p. 295.
10. Gupta A, Srinivas K, Shukla A. Response of okra to plant spacing and nitrogen and phosphorus fertilization. Indian J Hortic. 1981;38(4):218-222.
11. Hegde M, Farooqi AA, Suresh NS. Studies on the effect of nitrogen, phosphorus and potassium on growth and yield of ambrette (*Abelmoschus moschatus* Medic.). Indian Perfumer. 1984;28(2):112-115.
12. Hegde M, Farooqi AA, Suresh NS. Structure of oil-containing glands in ambrette (*Abelmoschus moschatus* Medic.). Indian Perfumer. 1994;28:116-118.
13. Kurumkar AJ, Mahorkar VK, Paithankar DH, Warade AD. Effect of nitrogen and phosphorus levels on growth and seed yield of ambrette (*Abelmoschus moschatus* Medic.). Crop Res (Hisar). 2005;29(2):292-295.