

Effect of different organic manures and spacing on yield and yield attributes of Kalmegh-Panchang (*Andrographis paniculata* Wall. Ex. Nees.) under middle Gujarat conditions

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SUMMARY

Ayurveda is an ancient science of life. Which has a strong philosophical basis. Ayurveda is a dynamic phenomenon that offers multifaceted approaches for healing. It comprises of knowledge about the plants that are primarily based on the past experiences and present use in India, more as living tradition. The results indicated that the growth attributes such as plant height at harvest and Leaf : stem were significantly higher under application of organic manure, FYM @ 10 t/ha (M_1). Significantly the highest fresh and dry yield of kalmegh (9952 and 4306 kg/ha, respectively) obtained under application of FYM @ 10 t/ha. The growth attributes such as plant height at harvest (71.36cm) and plant breadth at harvest (23.89cm) were significantly higher under treatment of 30cm x 45cm. Significantly the highest fresh (10335 kg/ha) and dry yield (4375 kg/ha) of kalmegh were recorded under treatment (30cm x 45cm).

Key words : Ayurveda, Kalmegh, Organic manure, Spacing, F.Y.M., Vermicompost, Caster cake

Ayurveda is an ancient science of life. Which has a strong philosophical basis. Ayurveda is a dynamic phenomenon that offers multifaceted approaches of healing. It comprises of knowledge about the plants that are primarily based on the past experiences and present use in India, more as living tradition. Kalmegh is one of the important ingredients in various ayurvedic preparations used for fever and liver disease, which are commonly used by ayurvedic physicians. Kalmegh was recommended in “Charak Samhita” in 175 BC for treatments of jaundice alongwith other plants in multi plant preparation. Kalmegh is widely used in Indian traditional system of medicine against different ailments. It is reported that this plant possesses astringent, anodyne, tonic and alexipharmic properties which are useful in curing dysentery, cholera, diabetes, influenza, bronchitis, piles, hepatomegaly, skin disorder, fever and worm. Kalmegh also showed its efficiency to control HIV- AIDS. “Panchang”, the five parts of the plant *i.e.*, stem, leaf, flower, seed and root are being used in the various formulations of Indian system of homeopathic as well as ayurvedic medicines. The plant has properties like bitter acrid, cooling, laxative, antipyretic, anti- inflammatory,

expectorant digestive and stomachic. The major bitter constituent in kalmegh is due to the presence of diterpene lactone called andrographolide. Other important constituent is a non-bitter compound neo andrographolide.

MATERIALS AND METHODS

A field experiment was conducted during, *Kharif* season of the year 2007 at Medicinal and Aromatic Plant Project Research farm, Anand Agricultural University, Anand, The soil of the experimental plot was loamy sand in texture having good drainage with 7.6 pH, soil content low in available nitrogen (185 kg/ha), medium in available phosphorus (43.28 kg/ha) and high in available potash (388.17 kg/ha). There were total sixteen treatment combinations consisting of four levels of organic manures *viz.*, (M_0) control, (M_1) FYM @ 10 t/ha, (M_2) castor cake @ 1 t/ha and (M_3) vermicompost @ 2 t/ha; and four spacing treatments *viz.*, (S_1) 30cm x 15cm, (S_2) 30cm x 30cm, (S_3) 30cm x 45cm and (S_4) 30cm x 60cm were tested under split plot design with four replications.

RESULTS AND DISCUSSION

The results obtained from the present investigation are presented below:

Effect of organic manures:

The results indicated that the growth attributes such as plant height at harvest (72.35 cm) was significantly higher under application of organic manure, FYM @ 10 t/ha (M_1), plant breadth was non – significant but higher

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breadth (23.49cm) was obtained under FYM application (Table 1). Leaf: stem was also significantly higher under treatment M_1 (0.43, FYM @ 10 t/ha). Treatment M_1 (FYM @ 10 t/ha) recorded significantly higher fresh yield of kalmegh (9952 kg/ha) followed by treatment M_2 (Castor cake @ 1t/ha; 8232 kg/ha). Treatment M_0 (control) and M_3 (Vermicompost @ @t/ha) were remained at par with each other. Significantly the lowest fresh yield (7305 kg/ha) was observed under the treatment M_3 (vermicompost @ 2t/ha). Treatment M_1 (FYM @ 10t/ha) increased fresh yield to the tune of 17.28, 18.29 and 26.56 per cent over treatment M_2 (Castor cake @ 1t/ha), M_0 (Control) and M_3 (Vermicompost @ 2t/ha), respectively. Treatment M_1 (FYM @ 10 t/ha) recorded significantly higher dry yield of kalmegh (4306 kg/ha) followed by treatment M_2 (Castor cake @ 1 t/ha, 3482kg/ha). Treatments M_0 (Control) and M_3 (Vermicompost @ 2t/ha) were remained at par with each other. Significantly the lowest dry yield (3108 kg/ha) was obtained under the treatment M_3 (Vermicompost @ 2t/ha). Treatment M_1 (FYM @ 10 t/ha) increased the yield to the extent of 19.85, 23.59 and 27.82 per cent over treatments M_2 (castor cake @ 1 t/ha), M_0 (control) and M_3 (Vermicompost @ 2t/ha), respectively.

Different organic manures represent a remarkably influence on crop growth. Significant difference in leaf : stem ratio, plant height, fresh yield and dry yield of kalmegh were observed. The increase in the plant height under the treatment M_1 (FYM @ 10 t/ha) might be due

to the fact that FYM favourably affected vegetative mass, fresh and dry weight, plant height, photosynthetic potential and consequently dry yield. The other reason for increased yield attributed to solubilisation effect of plant nutrients by the addition of FYM as evidenced by increase in the uptake of N, P, K, Ca and Mg. The another reason for increased the plant growth might be due to the improvement in soil physical condition provided for the plant growth along with increased availability of N,P,K even from the early stage of crop growth especially in FYM. Improvement of soil physical properties such as reduction in bulk density and increase in water holding capacity were noted due to FYM application. These results are in accordance with those reported by Nair and Peter (1990) and Sanjutha *et al.* (2008).

Effect of spacing:

The growth attributes such as plant height at harvest (71.36cm) and average plant breadth at harvest (23.89cm) were significantly higher under treatment of 30cm x 45cm (S_3) and 30 cm x 30 cm (S_2) spacing, respectively . Leaf : stem was found non – significant but higher (0.42) in 30cm x 45cm (S_3) and 30cm x 60cm(S_4). Treatment S_3 (30cm x 45cm) recorded significantly the higher fresh yield (10335 kg/ha) of kalmegh followed by treatment S_1 (30cm x 15cm; 8913 kg/ha). Treatment S_2 and S_4 were remained at par. Treatment S_3 (30cm x 45cm) increased the fresh yield of kalmegh at the extent of 13.75, 21.70 and 39.21 per cent over treatment S_1 (30 x15 cm), S_2 (30

Table 1: Effect of organic manures and spacing on yield and yield attributes of KALMEGH-PANCHANG (*Andrographis paniculata* Wall.Ex. Nees.)

Treatments	Plant height at harvest (cm)	Plant breadth (cm)	Leaf : Stem ratio	Average plant population at harvest	Fresh yield at harvest (kg/ha)	Dry yield at harvest (kg/ha)
Organic manures (M)						
M_0 : (Control)	69.79	23.04	0.39	63.13	8131	3290
M_1 : (FYM @ 10 t/ha)	72.35	23.49	0.43	52.94	9952	4306
M_2 : (Castor cake @ 1 t/ha)	69.56	23.02	0.42	62.94	8232	3482
M_3 : (Vermicompost @ 2 t/ha)	71.10	23.09	0.37	62.75	7305	3108
S.E. \pm	1.36	1.053	0.012	1.819	419	144.257
C.D. (P = 0.05)	2.70	NS	0.038	6.049	1341	461.502
C V %	7.72	18.18	11.90	12.36	19.94	16.27
Spacing (S)						
S_1 : (30 cm x 15 cm)	71.18	20.74	0.41	106.19	8913	3585
S_2 : (30 cm x 30 cm)	71.00	23.89	0.41	65.44	8092	3368
S_3 : (30 cm x 45cm)	71.36	23.83	0.42	42.50	10335	4375
S_4 : (30 cm x 60cm)	68.26	23.18	0.42	30.63	6882	2859
S.E. \pm	0.70	0.585	0.09	1.679	400	140
C.D. (P = 0.05)	2.01	1.678	NS	4.871	1147	401
C V %	3.99	10.11	9.26	10.98	19.03	15.77

N.S.-Non significant

Table 2 : Fresh and dry yield (kg/ha) of kalmegh as influenced by interaction of organic manures x spacing (M x S)

Treatment organic manures (M)	Fresh yield (kg/ha)				Dry yield (kg/ha)			
	Spacing (S)							
	S ₁ 30cm x 15cm	S ₂ 30cm x 30cm	S ₃ 30cm x 45cm	S ₄ 30cm x 60cm	S ₁ 30cm x 15cm	S ₂ 30cm x 30cm	S ₃ 30cm x 45cm	S ₄ 30cm x 60cm
M ₀ : Control	8833	6839	10638	6214	3473	3075	4198	2413
M ₁ : FYM @ 10 t/ha	10517	11263	11518	6509	4102	4326	4958	3839
M ₂ : Castor cake @ 1t/ha	8227	7478	11680	5534	3246	3340	5017	2326
M ₃ : Vermicompost @ 2t/ha	8073	6786	7493	6869	3519	2729	3324	2858
C.D. (P = 0.05)			293.61				801.96	
C V %			19.03				15.77	

x 30 cm), and S₄ (30 x 45 cm), respectively. Treatment S₃ (30cm x 45cm) recorded significantly higher dry yield (4375 kg/ha) of kalmegh followed by treatment S₁ (30cm x 15cm, 3585 kg/ha). Treatment S₂ (30cm x 30cm) and S₄ (30cm x 60cm) remained at par. Treatment S₃ (30cm x 45cm) increased the dry yield of kalmegh to the extent of 18.05, 23.74 and 34.56 per cent over treatment S₁ (30cm x 15 cm), S₂ (30cm x 30cm) and S₄ (30cm x 60cm), respectively. Higher plant height and breadth under wider spacing (30 cm x 45 cm) might be due to less competition for light, water and nutrients because of lesser number of plants per unit area. Leaf : Stem ratio was not affected by different spacing. This might be because the number of branches was inversely related to the plant population. The results are in accordance with those reported by Ramchandran and Subbiah (1981).

The fresh and dry yield significantly increased due to different spacing. Among different spacing treatments, treatment S₃ (30cm x 45 cm) recorded significantly the highest fresh yield (10335 kg/ha) and dry yield (4375 kg/ha). The increase in fresh and dry yield might be due to optimum plant population, better nourishment and less population in wider spacing, (30 cm x 45 cm) could have caused this. The results are in confirmity with those of reported by Ramchanran and Subbian (1982).

For securing higher dry yield of kalmegh crop variety Anand Kalmegh – 1 raised in loamy sand soils of middle

Gujarat conditions, it is advisable to apply organic manure FYM @ 10 t/ha with row spacing of 30cm x 45cm.

Among different treatment combinations (Table 2), treatment M₂S₃ (Castor cake @ 1t/ha with spacing 30cm x 45cm) recorded significantly higher fresh yield (11680 kg/ha) but it was at par with the treatments M₁S₃ (FYM @ 10 t/ha with spacing 30cm x 45cm), M₁S₂ (FYM @ 10 t/ha with spacing 30cm x 30cm) and M₀S₃ (control with spacing 30cm x 45cm). Significantly the lower fresh yield (5534 kg/ha) was observed under treatment M₂S₄ (Castor cake @ 1t/ha with spacing 30cm x 60cm) being at par with treatment M₀S₄ (control with spacing 30cm x 60cm).

Organic manures and spacing interaction significantly influenced the dry weight. Treatment combinations M₂S₃ (castor cake @ 1 t/ha with spacing 30cm x 45cm) recorded significantly higher dry yield of kalmegh (5017 kg/ha) being at par with treatments M₁S₃ (FYM @ 10 t/ha with spacing 30cm x 45cm, 4958 kg/ha) and M₁S₂ (FYM @ 10 t/ha with spacing 30cm x 30cm 4326 kg/ha). Significantly lower dry yield (2326 kg/ha) was observed under treatment M₂S₄ (Castor cake @ 1t/ha with spacing 30cm x 60cm) being at par with treatment M₀S₄ (control with spacing 30cm x 60cm). The increase in dry yield by treatment combination M₂S₃ and M₁S₃ to the extent of 53.64 and 53.08 per cent over treatment M₂S₄.

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