Journal Crop and Weed, 11(Special Issue):124-126(2015)

Effect of crop geometry on yield and quality of seed and essential oil of dill (*Anethum sowa*)

A. BHATTACHARJYA, [1]N. CHATTOPADHYAY, [2]J. K. HORE AND W. SIDDIQUI

Institute of Horticulture Technology, Greater Noida-201309, New Delhi
[1]AICRP on Agroforestry, RRS, BCKV, Jhargram, W.B
[2]Dept. of Spices & Plantation Crops, BCKV, Mohanpur, Nadia
[3]Bihar Agricultural University, Sabour, Bhagalpur, Bihar

Received : 14-08-2014; Revised : 20-12-2014; Accepted : 02-01-2015

ABSTRACT

Dill has been identified as an important spice crop having tremendous medicinal properties and has ubiquitous use in many types of industries like essential oils, pharmaceuticals, cosmetics, perfumery etc. There is entire scope to work on standardize yield and quality attributing character of dill. Following the objective of optimizing plant spacing to optimize the yield of quality seeds and essential oil, the present investigation was made out with the variety SSK, sown at nine different spacing viz. 60x15cm, 60x20cm, 60x25cm, 45x15cm, 45x20cm, 45x25cm, 30x15cm, 30x20cm and 30x25cm. The maximum plant height was observed with 30x15cm, whereas higher number of branches was found with 60x25cm. The spacing 45x20 cm yielded plant with highest umbels plant^{-1} (139.84), umbelletes umbel $^{-1}$ (35.98), flowers umbel $^{-1}$ (716.65) and seed setting percentage (93.56). The highest production of seed (698.56kg ha^{-1}), essential oil (6.21%) and B:C ratio (1.81:1) was also found superior with the same spacing. The results from the investigation revealed that the spacing 45x20cm promotes the penetration of required sunlight inside the crop canopy and also encourages a crop competition which ends with a sustainable yield of seed and essential oil with higher return.

Keywords : Dill, essential oil, spacing, yield.

Dill (*Anethum sowa*) commonly known as 'Sowa' is an annual herb belonging to the family *Apiaceae*. Dill herb as well as seed is very well known in culinary for having strong odour and its use as flavourant. Dill seed usually contains 2.5-5.0% essential oil. Dill oil is extensively used in food, flavour and perfume industries. The dill volatile oil is used in Gripe water and given to babies and children for colic disorders. In the recent past various scientific literatures reported the pharmacological importance, such as antibacterial (Singh, *et al.*, 2001), anti-mycobacteriul (Stavri and Gibbons, 2005), anti-microbial etc. (Badar *et al*., 2008). In spite of having tremendous importance in culinary and medicinal point of view, dill is still considered as a minor spice due to less production and lack of proper agro-techniques. Hence, a novel approach was made and a field experiment was carried out to determine the effect of crop geometry to maximise the quality yield.

MATERIALS AND METHODS

The experiment was conducted at Horticultural Research Station, Mondouri, Mohanpur, Nadia, West Bengal (23.5° N and 89° E, 9.75 meters above MSL). The variety SSK was chosen and sown at nine different spacing *viz.* 60x15cm, 60x20cm, 60x25cm, 45x15cm, 45x20cm, 45x25cm, 30x15cm, 30x20cm and 30x25cm. The plot size was maintained 3x1.2m. The uniform application of FYM @ 20 tons per hectare along with NPK @ 80:40:40kgha^{-1} was done. During last ploughing FYM was incorporated with soil. Half amount of N and full amount of P and K were applied at the time of sowing and remaining N was applied at 45DAS (Krishnamoorthy, 2005). The experiment was laid out in randomized block design with 3 replications. Sowing was done on 30th October during 2008-2010 and harvested in third week of March. All the cultural operations were performed as and when required. Metric observations like growth yield and yield attributing parameters were taken from 5 randomly selected plants from each replication. Seed essential oil was extracted in Soxhlet extractor at 60^{0}C with Hexane. Average data was analyzed statistically, by using *MSTAT-C programme* and means of essential oil was compared using Duncan's Multiple Range Test, by SPSS (Version 16.0, Windows 2007, SPSS).

RESULTS AND DISSCUSSION

The different spacing of planting resulted in significant variation in plant growth (height, number of branches, plant biomass). The maximum plant height (136.67cm) was observed with 30x15cm, whereas higher number of primary branches (9.61) was found with 60x25cm. Dill prefers sunny condition (Chattopadhyay *et al.*, 2014) and as growth advances in closer spacing, sunlight hindered to enter at the lower part of plant, which causes enthusiastic growth of plant shoots, at the same time wider spacing provided more

Email: amrita_b1607@yahoo.co.in

Table 1 : Effect of crop geometry on plant height, number of branches, number of umbels plant^{-1} and dry matter recovery of dill

Spacing(cm)	Plant height at harvest (cm)	No. of primary branches	No. of umbels plant^{-1} at 140 DAS	Shoot dry matter(g)	Root dry matter(g)
60X15	112.51	8.32	131.08	22.67	22.20
60X20	115.57	9.26	133.88	22.34	21.80
60X25	118.31	9.61	133.56	22.93	21.61
45X15	124.13	7.13	129.95	23.19	22.29
45X20	127.80	8.43	139.18	22.93	22.78
45X25	128.16	8.47	132.84	22.94	22.35
30X15	136.67	5.88	128.09	22.40	21.02
30X20	129.25	6.37	127.43	22.22	21.05
30X25	119.82	7.47	129.87	21.75	21.06
SEm(±)	**0.74**	**0.23**	**1.12**	**0.29**	**0.44**
LSD(0.05)	**2.14**	**0.67**	**3.22**	**0.84**	**1.28**

Table 2 : Effect of crop geometry on reproductive and quality parameters of dill with B:C ratio

Spacing (cm)	No. of umbelletes umbel^{-1}	No. flowers umbel^{-1}	Projected yield (kg ha^{-1})	Test weight (g)	Essential oil (%)	B:C ratio
60X15	26.16	481.36	531.08	1.63	5.63^{bc}	1.44
60X20	33.85	650.72	533.65	1.64	5.50^{bc}	1.44
60X25	28.80	609.75	456.95	1.65	5.68^{b}	1.23
45X15	32.34	425.48	687.88	1.58	5.37^{c}	1.78
45X20	35.98	716.65	698.56	1.60	6.21^{a}	1.81
45X25	27.04	538.91	542.73	1.60	4.75^{d}	1.42
30X15	24.36	320.39	577.57	1.53	4.53^{d}	1.46
30X20	32.19	346.26	626.11	1.57	4.53^{d}	1.58
30X25	26.96	351.08	458.02	1.59	3.54^{e}	1.16
SEm(±)	**0.90**	**5.96**	**4.98**	**0.01**	**-**	**-**
LSD(0.05)	**3.77**	**17.16**	**14.34**	**0.02**		

space around each plant, reduced crop competition and better use of light, water and nutrients resulted higher number of branches. This result was in harmony with those of Bali, (1988); Tripathi *et al.*, (2009) and Fraszczak (2009). Highest dry matter recovery from shoot (23.19%) and root (22.78%) were recorded with 45x15cm and 45x20cm spacing respectively. Regarding the yield and yield attributing characters like number of umbels per plant (139.18), number of umbelletes per umbel (35.98), number of flowers per umbel (716.65) and projected yield (698.56kgha^{-1}) was maximum under 45x20 cm spacing. The test weight (1.65g) was found maximum with 60x25cm, but due to lesser plant population projected yield was found higher with 45x20cm. Quantity of essential oil in seed was significantly influenced by different level of spacing. Maximum essential oil of 6.21% was divulged with 45x20cm spacing as compared to the lowest value with 30x25cm (3.54%) spacing. The B:C was maximum with 45x20 cm (1.81), followed by 1.78 (45x15cm) and lowest (1.16) was observed with 30x25cm spacing.

Taking into consideration the above result it can be concluded that, to get maximum return it is necessary to increase plant population up to that extent where all plants can get ample quantity of sunlight, moisture nutrients.

REFERENCES

Badar, N., Arshad, M. and Farooq, U. 2008. Characteristics of *Anethum graveolens* (umbelliferae) seed oil: extraction, composition and antimicrobial activity. *Int. J. Agri. Biol.*, **10**: 329-32.

Bali, A. S. 1988. Response of dill (*Anethum graveolens* L.) to row spacing and nitrogen. *Indian J. Agron*. **33**: 337-38

Chattopadhyay, N., Bhattacharjya, A and Hore, J.K. 2014. Performance of dill germplasm as intercrop and monocrop in the gangetic plains of west Bengal. *J. Crop Weed*, **10:** 495-96

Fraszczak, B. 2009. Comparison of eight dill cultivars grown in containers in different light conditions. *Herba Polonica* **55**: 76-83

Krishnamurthy, B. 2005. Dill. *Spice India,* **3:** 42-44.

Singh G., Kapoor I.P.S., Pandey S.K., Singh U.K. and Singh R.K. 2001. Studies on essential oils: part 10, antibacterial activity of volatile oils of some spices, *Phytother. Res*., **16:** 680-82

Stavri M. and Gibbons S. 2005. The antimycobacterial constituents of dill (*Anethum graveolens*), *Phytother. Res.,* **19**: 938-41

Tripathi, S. M., Dwivedi, A. K., Singh, S. K. and Dutta, S. D. 2009. Impact on yield of dill (*Anethum graveolens* L.) as influenced by nitrogen and row spacing. *Ann. Hort.* **2**: 214-16.