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LZ Dahake
Department of Vegetable Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Dr. AM Sonkamble
Department of Vegetable Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Dr. SR Patil
Department of Vegetable Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

LT Meshram
Department of Vegetable Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Corresponding Author:
LZ Dahake
Department of Vegetable Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Influence of spacing on yield, quality and economics of watermelon

LZ Dahake, Dr. AM Sonkamble, Dr. SR Patil and LT Meshram

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Abstract
An experiment entitled "Influence of spacing on yield, quality and economics of watermelon" was undertaken at Instructional farm department of vegetable science college of horticulture Dr. PDKV, Akola during summer season of 2018-2019 to study the influence of spacing on yield quality and economics of watermelon. The experiment was laid out in Randomized Block Design (RBD) with four replications and five treatments *viz.* T_1 (0.45 × 2.0 m) T_2 (0.60 m × 2.0 m), T_3 (0.75 m × 2.0 m), T_4 (0.90 m × 2.0 m) and T_5 (1.0 m × 2.0 m). As regard to yield parameter T_5 (1.0 m × 2.0 m) was found superior in respect of days required for edible maturity, number of fruits plant^{-1}, average fruit weight and fruit yield kg plant^{-1}. While yield kg plot^{-1} and yield ha^{-1} were found maximum in treatment T_1 (0.45 × 2.0 m). In respect of quality parameters, treatment T_5 (1.0 × 2.0 m) recorded maximum fruit diameter, fruit length, TSS ^{0}Brix, reducing sugar, non-reducing and total sugar percent. Highest gross, net monetary returns and B:C ratio were obtained with treatment T_1 (0.45 × 2.0 m). Therefore, treatment T_1 (0.45 × 2.0 m) was found to be most remunerative considering B:C ratio.

Keywords: Watermelon, *Citrullus lanatus*, plant spacing, yield, quality and B:C ratio

Introduction
Watermelon (*Citrullus lanatus* thumb.) is one of the important vegetables crop grown extensively in India and in tropical and sub tropical countries of Asia and Africa. Watermelon (*Citrullus lanatus*) is believed to have originated in Africa and spread to other parts of world. Global area under watermelon cultivation is 3,477,285 ha with annual production of 118,413,465 tons. (FAOSTAT 2017). In India current status of area is 100.88 mha^{-1} with production 2479.71 MT. In India, Uttar Pradesh is first in area 13.07 mha^{-1} and production is 588.54 MT and Maharashtra is sixth in number with area 6.12 mha and production is 176.31MT (NHB Database 2017-18).

Watermelon has high nutritive value, rich in vitamin 'C' which is good for health, low in sugar and calories because of high percent of water. A watermelon is a type of edible fruit with 92% water, 7.55 Carbohydrates (g), 30 Calories (kcal), 0.62 Protein (g) and other essential minerals. Watermelon is rich in caretenoids. Caretenoides *viz*. lycopene, phytofluence, phytotene, betacarotene, lutein and neurosporene. Lycopene makes up the majority of the caretenoides in watermelon. The caretenoid content varies depending on the variety of the watermelon. Caretenoides have antioxidant activity, free radical scavenging property. Lycopene may also reduce risks of cardiovascular disease. Watermelon seeds are excellent sources of protein (essential and non- essential amino acids) and oil. Watermelon seed is about 35% protein, 50% dietary fibre. Watermelon seed is also rich in micro and macro - nutrients such as magnesium, calcium, potassium, iron, phosphorous, zinc, etc.

Watermelon varies in shape, from globular to oblong. External rind colour varies from light to dark green and may be solid, striped or marbled. The pulp colour of most commercial varieties is red. It has a very thick and hard rind, with a fleshy centre. Watermelons have very high water content, which make them extremely refreshing. Especially during summers. At the same time, they are low in calories and have almost no fats, making them one of the healthiest fruits.

Crop growth is largely influenced by spacing. Evidence suggested that, spacing affect the yield quality and thereby economics of watermelon. Shorter internodes, thinner branches without epical dominance, fruit setting and tertiary branches were all affected by spacing.

Yield and quality parameters are under the influence of spacing. Measurable difference among plants is visible only when plants develop enough and compete for nutrients. Also, the vine length, diameter, number of leaves and number of branches linearly increased with increased in spacing (Dean *et al*. 2011) [5].

Materials and Methods

An experiment entitled "Influence of spacing on yield, quality and economics of watermelon" was undertaken at Instructional farm department of vegetable science college of horticulture Dr. PDKV, Akola during summer season of 2018-2019. The experiment was laid out in randomized block design with four replications on medium black soil with uniform in texture, colour and having good drainage. The treatments constituted of five different plant spacings *viz*. T1 (0.45 × 2.0 m) T_2 (0.60 m × 2.0 m), T_3 (0.75 m × 2.0 m), T_4 (0.90 m × 2.0 m) and T_5 (1.0 m × 2.0 m). Variety of watermelon was planted on 9 th January 2019. Farm yard manure was applied 20 tones per hectare and N:P:K 200:100:100 kg/ha, was applied thorough the cropping period in split applications. The plants were grown randomly in each replication in a total of 20 plots of 10 m × 1.0 m. All the observations of growth and yield characters were taken monthly from 30,60,90 at last harvest days after planting. The harvested watermelons were picked up and were separated and statistically analysed.

Results and Discussion

The result of effect of spacing on yield, quality and economics of watermelon (*Citrullus lanatus* Thumb.) are presented in Table 1, 2 and 3.

The days required for edible maturity (72.22) was found to be superior among all the treatment in spacing T_5 (1.0 m × 2.0 m) and statistically found at par with (73.32) and (75.50) in treatment T_4 (0.90 m × 2.0 m) and treatment T_2 (0.60 m × 2.0 m).

Maximum number of fruits per plant (3.06) were recorded in the treatment T_5 (1.0 m × 2.0 m), which was statistically found at par with (3.00) and (2.95) treatment T_4 (0.90 m × 2.0 m) and treatment T_3 (0.75 m × 2.0 m). The results revealed that, wider spacing provides larger area for development of a plant as well as possibility for more lush growth and development of fruit full branches due to less competition for nutrients, water and light Tuncer *et al*. (2014) [9], in fodder watermelon.

Maximum average fruit weight (3.30) was recorded in the treatment T_5 (1.0 m × 2.0 m), which was statistically found at par with (3.15) and (2.80) treatment T_4 (0.90 m × 2.0 m) and treatment T_3 (0.75 m × 2.0 m). It is well evident from the present findings that, in wider spacing the plant attained more length and branches to accommodate the fruits having larger size. More over the wider spacing also provided more space to the developing fruits to grow into a bigger size. These results are supported by the findings of Maynard and Scott (1998), Kultar *et al*. (2001) [6] in watermelon.

Maximum fruit yield kg per plant (10.09 kg) was recorded in the treatment T_5 (1.0 m × 2.0 m) which was statistically found at par with (9.55 kg) treatment T_4 (0.60 m × 2.0 m). As spacing increased, fruit yield per plant also increased probably because wider spacing created less inter plant competition. These findings are in line with Kultar *et al.* (2001) [6] in muskmelon.

Maximum fruit yield per hectare (74.89 t) was recorded in the treatment T_1 (0.45 m × 2.0 m) which was statistically found at par with (63.08 t) in treatment T_2 (0.60 m × 2.0 m). The results revealed that higher number of plants under closer spacing clearly demonstrated advantage in fruit yield per hectare as compared to wider spacing. Similarly, results were reported by Adlan *et al.* (2018) [1] in watermelon.

Table 1: Effect of spacing on yield of watermelon

Treatments	Days required for edible maturity	Number of fruits per plant	Average fruit weight (kg)	Fruit yield (Kg/plant)	Fruit yield per hectare (tons)
T_1 - 0.45 m × 2.0 m	77.00	2.91	2.47	6.74	74.89
T_2 - 0.60 m × 2.0 m	75.50	2.77	2.55	7.57	63.08
T_3 - 0.75 m × 2.0 m	78.00	2.95	2.80	8.36	55.69
T_4 - 0.90 m × 2.0 m	73.32	3.00	3.15	9.55	53.05
T_5 - 1.0 m × 2.0 m	72.22	3.06	3.30	10.09	50.46
SE(m)±	1.09	0.07	0.17	0.53	5.21
CD at 5 %	3.36	0.23	0.51	1.63	16.04

The maximum fruit diameter (15.12 cm) was recorded in the treatment T_5 (1.0 m × 2.0 m), which was statistically found at par with (15.07 cm) and (14.95 cm) treatment T_4 (0.90 m × 2.0 m) and T_3 (0.75 m × 2.0 m). Fruit diameter (cm) increased with the plant spacing. Similar result reported Aniekwe *et al*. (2015) [2] in cucumber.

Treatment T_5 (1.0 m × 2.0 m) recorded maximum fruit length (29.33 cm) was recorded in the treatment, which was statistically found at par with (29.15 cm). Length of fruit increased as the plant spacing increased. Similar results were reported by Kultar *et al*. (2001) [6] in muskmelon.

Maximum fruit TSS (11.17^0 Brix) was recorded in the treatment T_5 (1.0 m × 2.0 m), which was statistically found at par with (10.98^0 Brix) by treatment T_4 (0.90 m × 2.0 m). Maximum TSS was obtained from widely spaced than closely spaced plant. Similar results were also reported by Tuncer *et al.* (2014) [9] in fodder watermelon and Sharma *et al*. (2018) [7] in cucumber.

Reducing sugar (3.34%) was maximum in the treatment T_5 (1.0 m × 2.0 m), which was statistically found at par with (3.24%) and (3.16%) by treatment T_4 (0.90 m × 2.0 m) and T_3 (0.75 m × 2.0 m).more reducing sugar was obtained from widely spaced than closely spaced plant due to better translocation and accumulation of nutrients. These results are in conformity with the findings of Siva *et al.* (2018) [8] in pointed gourd.

Maximum non reducing sugar (4.52%) was recorded in the treatment T_5 (1.0 m × 2.0 m), which was statistically found at par with (4.40%) and (4.28%) treatment T_4 (0.90 m × 2.0 m) and T_3 (0.75 m × 2.0 m).

Treatment T_5 (1.0 m × 2.0 m) recorded Maximum total sugar (7.85%) which was followed by (7.63%) in treatment T_4 (0.90 m × 2.0 m). More total sugar (%) was obtained from widely spaced than closely spaced plant due to better translocation and accumulation of nutrients. These results are in conformity with the findings of Siva *et al.* (2018) [8] in pointed gourd.

Table 2: Effect of spacing quality on watermelon

Treatments	Fruit diameter (cm)	Fruit length	TSS ^{0}Brix	Reducing Sugar (%)	Non-Reducing sugar (%)	Total sugar (%)
T_1 - 0.45 m × 2.0 m	14.35	26.99	9.92	2.93	3.99	6.92
T_2 - 0.60 m × 2.0 m	14.62	27.59	10.05	3.11	4.02	7.13
T_3 - 0.75 m × 2.0 m	14.95	28.09	10.13	3.16	4.28	7.45
T_4 - 0.90 m × 2.0 m	15.07	29.15	10.98	3.24	4.40	7.63
T_5 - 1.0 m × 2.0 m	15.12	29.33	11.17	3.34	4.52	7.85
SE(m)±	0.14	0.37	0.13	0.07	0.09	0.04
CD at 5 %	0.43	1.15	0.41	0.20	0.28	0.12

Table 3: Economics of watermelon as influenced by spacing

Treatments	Yield per hectare (tons)	Cost of cultivation	Gross monetary return	Net monetary return	B : C ratio
T_1 – 0.45 m × 2.0 m	74.89	145373.58	524258.00	378884.42	3.60
T_2 – 0.60 m × 2.0 m	63.08	140775.58	441567.00	300791.42	3.13
T_3 – 0.75 m × 2.0 m	55.69	138179.58	389858.00	251678.42	2.82
T_4 – 0.90 m × 2.0 m	53.05	135583.58	371350.00	235766.42	2.73
T_5 – 1.0 m × 2.0 m	50.46	133383.58	353241.00	219857.42	2.64

The data presented in table 3, showed that, the highest gross monetary return (524258.00 Rs/ha), net monetary return (378884.42Rs/ha) were obtained from treatment T_1 (0.45 m × 2.0 m) which was followed by gross return (441567.00Rs/ha) and net return (300791.42 Rs/ha) treatment T_2 (0, 60 m × 2.0 m). But the highest benefit cost ratio (3.60) was recorded in T_1 (0.45 m × 2.0 m). Higher number of plants under closer spacing might have resulted in increased yields. The results of the present investigation are in agreement with Ban *et al*. (2011) in watermelon.

Conclusion

On the basis of present findings, it can be concluded that, spacing influenced yield, quality and economics of watermelon. Regarding yield parameters watermelon days required for edible maturity, Number of fruits per plant, average fruit weight and fruit yield per plant were superior in treatment T_5 - 1.0 m × 2.0 m. While, fruit yield per hectare was found maximum in treatment T_1 – 0.45 m × 2.0 m. With respect to the quality parameters *viz*., fruit diameter, fruit length, TSS, reducing sugar (%), non reducing sugar (%) and Total sugar (%) were found to be maximum in spacing 1.0 m × 2.0 m. Considering the economics, the highest net monetary return and the highest B:C ratio were obtained with spacing of 0.45 m × 2.0 m and thus treatment T_1 (0.45 m × 2.0 m) was found to be more remunerative.

References

1. Adlan AMA, Abu-Sarra AF. Effects of plant density on yield and quality of watermelon (*Citrullus lanatus* thumb) under Gezira conditions Sudan. Net J Agric. Sci 2018;6(1):1-5.
2. Aniekwe NL, Anike NT. Effects of different mulching materials and plant densities on the environment, growth and yield of cucumber. J Agric. Vet. Sci 2015;8:64-72.
3. Anonymous. FAOSTAT data, FAO Statistical databases. Agriculture, 2019. http.www.opps.fao.org.
4. Ban Goreta DS, Borosic J. Plant spacing and cultivar affect melon growth and yield components. Sci. Hort. 2006;109:238-243.
5. Dean B, Smilijana GB, Milan O, Josipa H, Bruno N, Katja Z, *et al*. Growth and yield response of watermelon to in-row plant spacing and mycorrizha. Chilean J Agric. Res 2011;71(4):497-502.
6. Kultur F, Harrison HC, Staub JE. Spacing and genotype affect on fruit sugar concentration yield and fruit size of muskmelon. Hort. Science 2001;40(2):274-278.
7. Sharma D, Sharma VK, Kumari A. Effect of spacing and training on growth and yield of polyhouse grown hybrid cucumber (*Cucumis sativus* L.). Int. J Curr. Microbiol. App. Sci 2018;7(05):1844-1852.
8. Siva M, Kiran Patro TSKK, Dayeswari D, Swami DV, Emmanuel N, Laksminarayana Reddy M. Studies on the Effect of N, P, K levels and plant densities on growth, yield and quality of pointed gourd (*Trichosanthes dioica* Roxb.). Int. J Curr. Microbiol. App. Sci 2018;7(12):1315-1331.
9. Tuncer Hakan Y, Geren K, Aleksandar SIMIĆ. Effect of different plant densities on the fruit yield and some related parameters and storage losses of fodder watermelon (*Citrillus lanatus* var. citroides) fruits. Turkish Journal 2014;19(2)s:226-230.