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Effect of different organic sources on yield and yield attributing character of watermelon (*Citrullus lanatus* Thunb.)

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Abstract
The experiment on effect of different organic sources on yield and yield attributing character of watermelon (*Citrullus lanatus* Thunb.) was carried out at Organic Research and Training Centre, Vasantarao Naik Marathwada Krishi Vidyapeeth, Parbhani. during summer season in year 2018-19. The experiment was laid out in Randomized Block Design in nine treatments with three replications. The treatments were T_1 [RDF 100% through FYM], T_2 [RDF 100% through vermicompost], T_3 [RDF 50% through FYM + RDF 50% through Vermicompost], T_4 [RDF 100% through FYM + Jeevamrut 3 Application], T_5 [RDF 100% through vermicompost + Jeevamrut 3 Application], T_6 [RDF 100% through FYM + Biofertilizer (*Azotobacter*)], T_7 [RDF 100% through Vermicompost + Biofertilizer (*Azotobacter*)], T_8 [RDF 100% through FYM + Panchagavya 3 Application] and T_9 [RDF 100:50:50 N:P:K (Control) Kg/ha].
In respect of yield attributing character it was also observed that in treatment T_6 [RDF 100% through FYM + biofertilizer (*Azotobacter*)] was found with high fruit weight of watermelon (1.81 kg), maximum weight of pulp per fruit (1.47 kg), maximum length of fruit (25.67 cm) of watermelon, maximum diameter of fruit (15.27 cm), minimum days required for first harvest of fruit of watermelon (78.00 days) and minimum days for total harvest of fruit of watermelon (97.93 days) as compared with other treatment and also in case of yield the treatment T_6 [RDF 100% through FYM + biofertilizer (*Azotobacter*)] was found with high number of fruits per vine (1.80), high yield and of fruits per vine (3.258 kg) and high yield of fruits per hectare (57.9175 t/ha) as compared to other organic sources and control.

Keywords: Organic sources, FYM, vermicompost, biofertilizer (*Azotobacter*), Jeevamrut, Panchagavya, fruit yield)

Introduction
The watermelon production done worldwide and China rank 1st with total area of 1,892,570 ha and production of 79,244,271 tones. India rank 25th with an area of 30,110 ha and production of 427,105 tones, (Anonymous 2018) [3]. In India the state Uttar Pradesh rank 1st in production and productivity with 619.65 tonnes and 24.60% share of total production respectively and Maharashtra rank 10th in production and productivity with 46.99 tonnes and 1.87% share of total production respectively (Anonymous 2018) [4].
After the period of green revolution farmer started use of high amount of chemical fertilizer but heavy use leading in depreciation of fertility of soil and heavy use of chemical pesticide also lead many health issues. So, people getting aware about their health and nutrition. Due to this demand organic cultivation getting momentum and started knowing the importance of organically grown vegetables and fruit and because of this farmer also changing their cultivation habit from chemical to organic. Considering the above facts present investigation was undertaken to study the effect of different organic sources on yield and yield attributing character of watermelon (*Citrullus lanatus* Thunb.).

Materials and Methods
The present investigation was carried out during *summer* season of the year 2018-19 at Organic Farming Research and Training Center, VNMKV, Parbhani to study the effect of different organic sources on yield and yield contributing attributes of watermelon (*Citrullus lanatus* Thunb.). A field experiment was laid out with nine treatments *viz.*, T_1 [RDF 100% through FYM], T_2 [RDF 100% through vermicompost], T_3 [RDF 50% through FYM + RDF 50% through Vermicompost], T_4 [RDF 100% through FYM + Jeevamrut 3 Application], T_5 [RDF 100% through vermicompost + Jeevamrut 3 Application], T_6 [RDF 100% through FYM + Biofertilizer (*Azotobacter*)], T_7 [RDF 100% through Vermicompost + Biofertilizer(*Azotobacter*)], T_8 [RDF 100% through FYM + Panchagavya 3 Application] and

T_9 [RDF 100:50:50 N:P:K (Control) Kg/ha].

The treatments were replicated three times in a Randomized Block Design. The hand dibbing of healthy seeds was done in summer season at spacing of 150 cm X 37.5 cm by dibbling method. Recommended dose Nitrogen, phosphorus and potash were applied to control through urea, single superphosphate and murate of potash, respectively at 100 kg N/ha, 50 kg P_2O_5/ha and 50 kg K_2O/ha. Full dose of P_2O_5 and K_2O were applied respectively to control. Farmyard manure was applied at the rate of 25 tons per hectare and vermicompost at the rate of 4 t/ha at the time of land preparation as per treatment. Jeevamrut (500 liter/ha), panchagavya (200 liter/ha) and biofertilizer (*Azotobacter*) (2.5 liter/ha) was applied as per treatments in three application. First applied by drenching and other two by spraying at 15 DAS, 30 DAS and 45 DAS respectively to the treatment.

Observations on average fruit weight (kg), average weight of pulp per fruit (kg), average weight of rind per fruit (g), average weight of seed per fruit (g), average length of fruit (cm), average diameter of fruit (cm), average rind thickness of fruit (cm), average pulp thickness of fruit (cm), Days required for 1st harvest of fruits, Days required for total fruits harvesting, Number of fruits per vine, Yield of fruit per vine (kg) and Yield of fruit per hectare (t/ha).

Results and Discussion

Yield attributing Character

The data presented in table 1 revealed that, the treatment T_6 [RDF 100% through FYM + Biofertilizer (*Azotobacter*)] registered significantly maximum fruit weight (1.81 kg) and it was found statistically at par with the treatment which was at par with the treatment T_4 [RDF 100% through FYM + Jeevamrut 3 Application] with fruit weight (1.78 kg) followed by treatment T_5 [RDF 100% through vermicompost + Jeevamrut 3 Application], T_8 [RDF 100% through FYM + Panchagavya 3 Application], T_3 [RDF 50% through FYM + RDF 50% through Vermicompost] and treatment T_9 [RDF 100:50:50 N:P: K (Control) Kg/ha] with fruit weight (1.75 kg), (1.73 kg), (1.71 kg) and (1.62 kg) respectively. However, significantly the minimum fruit weight (1.42 kg) was recorded in treatment T_2 [RDF 100% through vermicompost] and Significantly maximum weight of pulp per fruit (1.47 kg) was recorded with the treatment T_6 [RDF 100% through FYM + Biofertilizer (*Azotobacter*)] which is at par with treatment T_8 [RDF 100% through FYM + Panchagavya 3 Application] with (1.42 Kg) weight of pulp followed by treatment T_4 [RDF 100% through FYM + Jeevamrut 3 Application] with (1.39 kg) pulp weight of fruit of watermelon. However, the minimum weight of pulp per fruit (1.08 kg) was recorded in treatment T_2 [RDF 100% through vermicompost].

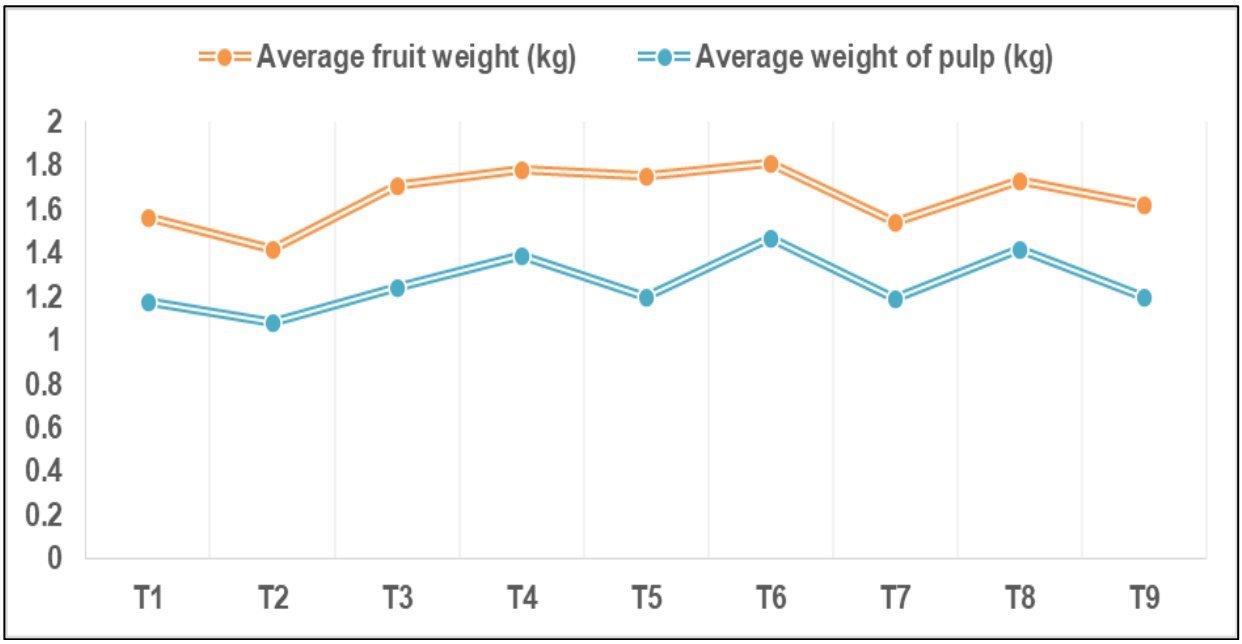

Fig 1: Effect of different organic sources on fruit & pulp weight of watermelon.

Table 1: Yield attributing character influenced by different organic sources

Treatments	Average fruit weight (kg)	Average weight of pulp (kg)	Average weight of rind (g)	Average weight of seed (g)	Average length of fruit (cm)	Average diameter of fruit (cm)	Average rind thickness (cm)	Average pulp thickness (cm)	Days required for 1st harvest	Days required for total harvest
T_1 - RDF 100% through FYM	1.56	1.18	350.48	29.52	23.2	13.33	1.277	12.056	81.93	99.47
T_2 - RDF 100% through vermicompost	1.42	1.08	309.42	30.58	23.07	13	1.307	11.693	82.73	100.13
T_3 - RDF 50% through FYM + RDF 50% through Vermicompost	1.71	1.24	440.7	29.30	24.87	14.13	1.247	12.887	82.20	99.13
T_4 - RDF 100% through FYM + Jeevamrut 3 Application	1.78	1.39	363.8	26.20	23.47	13.67	1.256	12.411	80.47	98.20
T_5 - RDF 100% through vermicompost + Jeevamrut 3 Application	1.75	1.20	519.65	30.35	24.07	14.4	1.307	13.093	80.20	99.67
T_6 - RDF 100% through	1.81	1.47	310.78	29.22	25.67	15.27	1.259	14.007	78.00	97.93

FYM + Biofertilizer (*Azotobacter*)										
T_7 - RDF 100% through Vermicompost + Biofertilizer (*Azotobacter*)	1.54	1.19	319.18	30.82	24.8	14.27	1.349	12.917	79.27	99.27
T_8 - RDF 100% through FYM + Panchagavya 3 Application	1.73	1.42	281.12	28.88	23.47	13.47	1.333	12.133	82.33	99.93
T_9 - RDF 100:50:50 N:P: K (Control) Kg/ha	1.62	1.20	389.55	30.45	23.8	13.53	1.279	12.255	80.40	99.13
SE ±	0.066	0.068	0.1056	0.001099	0.070	0.093	0.0378	0.741	0.141	0.103
CD at 5%	0.199	0.205	NS	NS	0.211	0.281	NS	NS	0.423	0.309

Maximum weight of fruit and pulp was recorded with application of FYM along with biofertilizer (*Azotobacter*) which might be due to availability of nutrient which helps in accumulation dry matter content along with absorption of moisture and application of FYM helps in maintaining soil moisture which helps in increased in fruit and pulp weight of watermelon. These results found are in accordance with the findings of Eifediyi and Remison (2010) [7] in cucumber, Anjanappa *et al*. (2012) [2] in cucumber, Das *et al*. (2015) [6] in bottle gourd, Thriveni *et al*. (2015) [16] in bitter gourd, Baghel *et al*. (2018) [5] in bottle gourd and Kaur and Kaur (2018) [10] in cucumber.

The significantly maximum length of fruit (25.67 cm) was recorded with the treatment T_6 [RDF 100% through FYM + Biofertilizer (*Azotobacter*)]. However, the minimum length of fruit (23.07 cm) was recorded in treatment T_2 [RDF 100% through vermicompost] and the maximum diameter of fruit (15.27 cm) was recorded with the treatment T_6 [RDF 100% through FYM + Biofertilizer (*Azotobacter*)]. However, the minimum diameter of fruit (13.00 cm) was recorded in treatment T_2 [RDF 100% through vermicompost]. This might be possible due to FYM is rich source of beneficial microorganism and growth promoting substances which might lead to increase fruit development characters along with biofertilizer (*Azotobacter*). The maximum diameter of fruit recorded in T_6 over other treatment. These results found are in accordance with the findings of Sarhan *et al*. (2011) [14] in summer squash, Anjanappa *et al*. (2012) [2] in cucumber, Das *et al*. (2015) [6] in bottle gourd, Kaur and Kaur (2018) [10] in cucumber, Judith and Joseph (2019) [9] in cucumber.

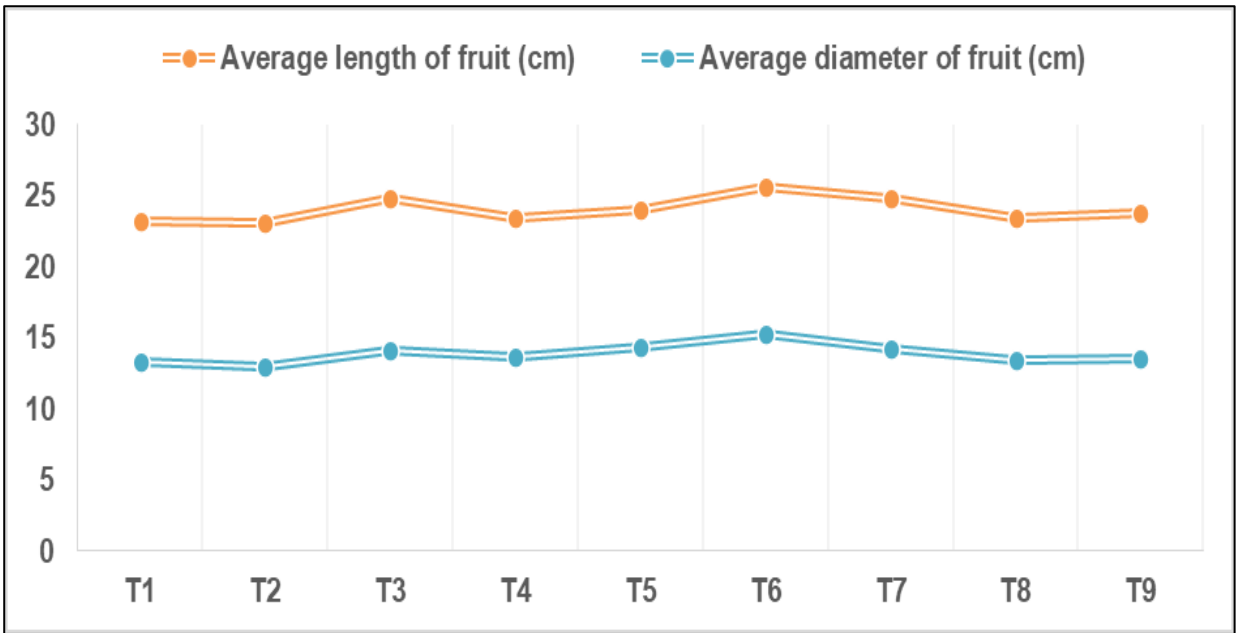

Fig 2: Effect of different organic sources on size of fruit of watermelon.

Days required for 1st harvest of fruit of watermelon (78.00 days) was found significantly minimum under the treatment T_6 [RDF 100% through FYM + Biofertilizer (*Azotobacter*)]. However, Days required for 1st harvest of fruit of watermelon (82.73 days) were found significantly maximum in the treatment T_2 [RDF 100% through Vermicompost] and Days required for total harvest of fruit of watermelon (97.93 days) was found significantly minimum under the treatment T_6 [RDF 100% through FYM + Biofertilizer (*Azotobacter*)]. However, Days required for total harvest of fruit of watermelon (100.13 days) were found significantly maximum in the treatment T_2 [RDF 100% through Vermicompost]. It might be possible due to availability of nitrogen, phosphorus and potassium in easier and available form through FYM and Biofertilizer (*Azotobacter*) at early stage of life of vine which it helps in foliage growth and early flowering in watermelon leads to early harvest of fruit of watermelon. These results found are in compliance with the findings Prasad *et al*. (2009) [13]in bitter gourd, Thriveni *et al*. (2015) [16] in bitter gourd, Baghel *et al*. (2018) [5] in bottle gourd Singh *et al*. (2018) in cucumber, Kharga *et al*. (2019) in cucumber.

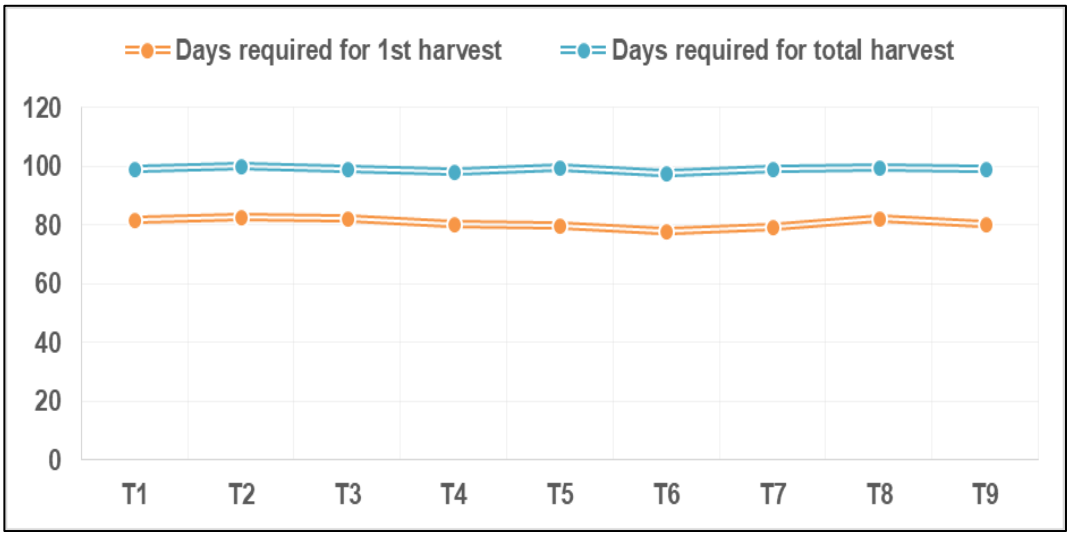

Fig 3: Effect of different organic sources on days required for harvesting of fruits of watermelon

Yield Character

The data presented in table 2 revealed that, the number of fruits per vine (1.80) in the treatment T_6 [RDF 100% through FYM + Biofertilizer (*Azotobacter*)] which was at par with the treatment T_4 [RDF 100% through FYM + Jeevamrut 3 Application] (1.73) followed by treatments T_7 [RDF 100% through Vermicompost + Biofertilizer (*Azotobacter*)] (1.67). However, the treatment T_2 [RDF 100% through vermicompost] recorded significantly minimum fruits per vine (1.33). It might be due to high bearing of female flowers and less fruit and flower drop and readily availability of nutrient like potassium and phosphorus through farmyard manure in combination of biofertilizer (*Azotobacter*) with the help of micro-organism. The above results are in compliance with those studied by Prasad *et al*. (2009) [13] in bitter gourd, Sarhan *et al*. (2011) [14] in summer squash, Anjanappa *et al*. (2012) [2] in cucumber, Das *et al*. (2015) [6] in bottle gourd, Singh *et al*. (2018) [15] in cucumber and Judith and Joseph (2019) [9] in cucumber.

Table 2: Effect of different organic sources on yield characters of watermelon

Treatment	Treatment details	Number of fruits per vine	Yield of fruits per vine (kg)	Average yield of fruit /ha (t/ha)
T_1	RDF 100% Through FYM	1.40	2.184	38.825
T_2	RDF 100% Through vermicompost	1.33	1.889	33.5736
T_3	RDF 50% Through FYM + RDF 50% Through Vermicompost	1.47	2.514	44.686
T_4	RDF 100% Through FYM + Jeevamrut 3 Application	1.73	3.079	54.7425
T_5	RDF 100% Through vermicompost + Jeevamrut 3 Application	1.60	2.800	49.7756
T_6	RDF 100% Through FYM + Biofertilizer (*Azotobacter*)	1.80	3.258	57.9175
T_7	RDF 100% Through Vermicompost + Biofertilizer (*Azotobacter*)	1.67	2.572	45.7189
T_8	RDF 100% Through FYM + Panchagavya 3 Application	1.53	2.647	47.0539
T_9	RDF 100:50:50 N:P: K (Control) Kg/ha	1.47	2.381	42.3341
S. E (±)		0.053	0.133	2.358
C. D at 5%		0.158	0.398	7.07

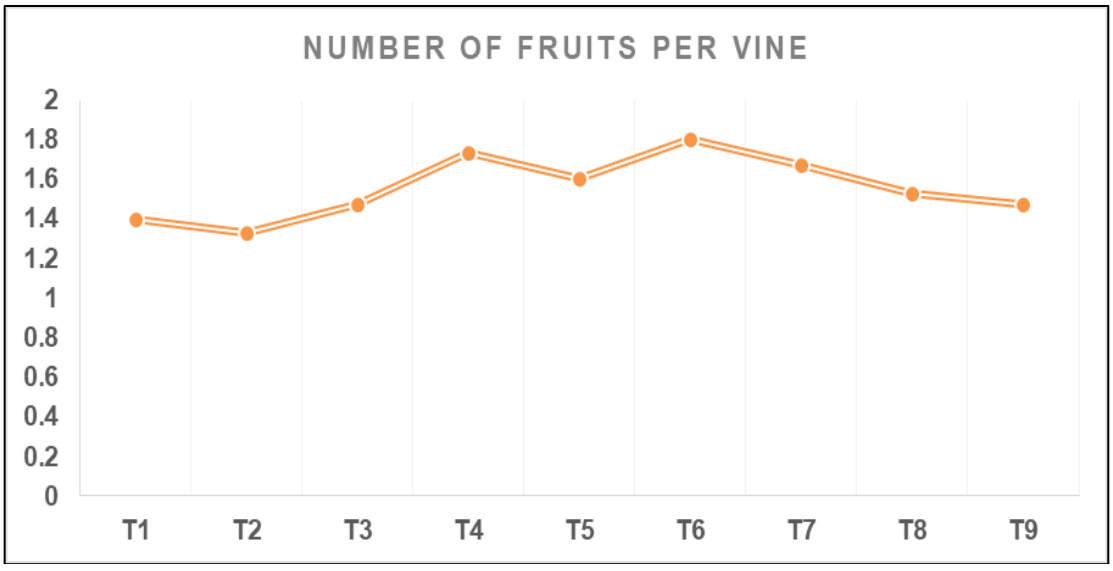

Fig 4: Effect of different organic sources on number of fruits of watermelon.

Yield of fruit per vine of watermelon found significantly maximum (3.258 kg) in the treatment T_6 [RDF 100% through FYM + Biofertilizer (*Azotobacter)*] which was at par with treatments T_4 [RDF 100% through FYM + Jeevamrut 3 Application] (3.079 kg). However, treatment T_2 [RDF 100% through vermicompost] found significantly minimum yield of fruit per vine (1.889 kg). Yield of fruit per vine in T_6 is found to be superior as it was found that the number of fruits per vine were maximum which corelated with and influenced the yield character. The results are in conformity with those observed by Prasad *et al*. (2009) [13] in bitter gourd, Eifediyi and Remison (2010) [7] in cucumber, Gosavi *et al*. (2011) [8] in tomato, Narayanamma *et al*. (2010) [12] in cucumber, Anjanappa *et al*. (2012) [2] in cucumber.

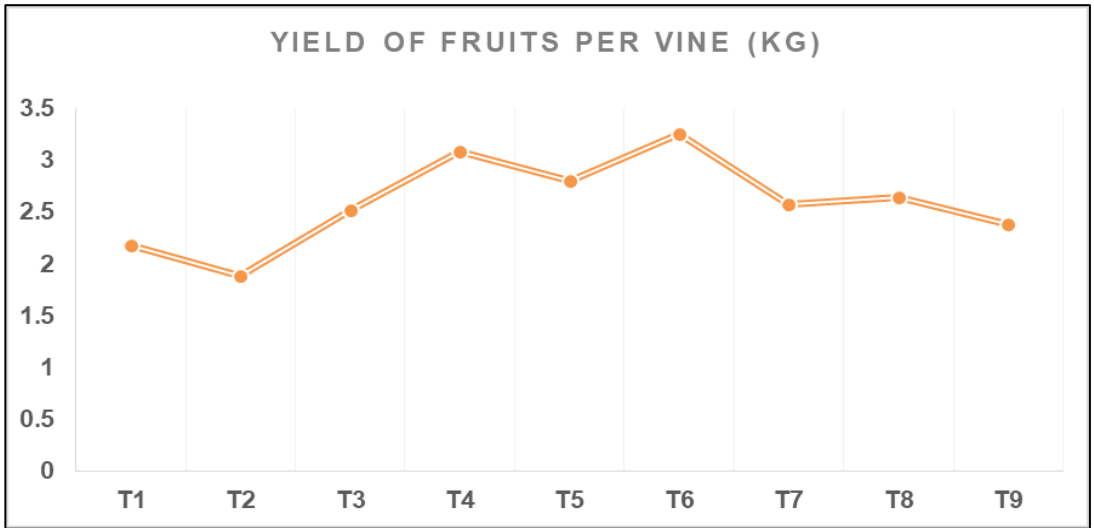

Fig 5: Effect of different organic sources on yield of fruit per vine of watermelon**.**

Yield of fruit per hectare of watermelon found significantly maximum (57.9175 t/ha) in the treatment T_6 [RDF 100% through FYM + Biofertilizer (*Azotobacter*)] which was at par with treatments T_4 [RDF 100% through FYM + Jeevamrut 3 Application] (54.7425 t/ha). However, the treatment T_2 [RDF 100% through vermicompost] found significantly minimum yield of fruit per hectare (33.5736 t/ha). Yield of fruits per hectare is found higher over other as it was observed that the number of fruits per vine and yield of fruits per vine was higher than other and it significantly influenced the yield character. The results are in conformity with those observed by Prasad *et al*. (2009) [13] in bitter gourd, Narayanamma *et al.* (2010) [12] in cucumber, Anjanappa *et al*. (2012) [2] in cucumber.

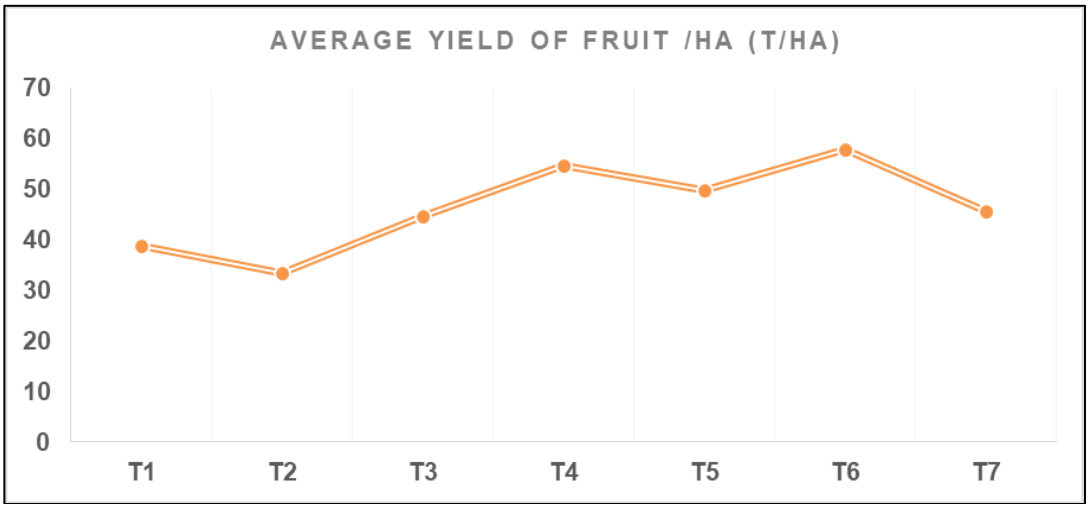

Fig 6: Effect of different organic sources on yield of fruit of watermelon

Conclusion

The overall assessment of the result of present investigation on the "Effect of different organic sources on yield and yield attributing character of watermelon (*Citrullus lanatus* Thunb.)" concluded that use of treatment T_6 [RDF 100% through FYM + Biofertilizer (*Azotobacter*)] was found superior yield attributing character viz. average weight of fruit, average weight of pulp per fruit, average length and diameter of fruit also with minimum days for first and total harvest of fruit of watermelon. The treatment also finds with superior yield character viz. number of fruits, maximum yield of fruits per vine (kg) and maximum yield of fruits per hectare (t/ha). Hence, for study the "Effect of different organic sources on yield and yield attributing character of watermelon (*Citrullus lanatus* Thunb.)" It is evident that the use of (RDF 100% through FYM + Biofertilizer (*Azotobacter*)) as a best for increasing yield of watermelon. The results are on the basis of one season trial therefore need to conduct two or more trials so that conclude proper conclusion.

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