Journal of Advances in Biology & Biotechnology

Volume 27, Issue 8, Page 588-595, 2024; Article no.JABB.120460
ISSN: 2394-1081

Influence of Organic Manure and Inorganic Fertilizers on Growth, Yield and Quality of Muskmelon (*Cucumis melo* L.)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/jabb/2024/v27i81173

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/120460

Original Research Article

Received: 22/05/2024
Accepted: 24/07/2024
Published: 27/07/2024

ABSTRACT

A field investigation was carried out in randomized block design with nine treatments and three replications during summer 2023 at PG research block, department of Horticulture, SHUATS Prayagraj Uttar pardesh. The treatments comprising of integrated nutrient management viz., T1: Control (RDF), T2: 75% RDF + 25% FYM + Azotobactor 2 kg/ha, T3: 50% RDF + 50% FYM+ Azotobactor 2 kg/ha, T4: 75% RDF + 25% Vermicompost +Azotobactor 2 kg/ha, T5 :50% RDF + 50% Vermicompost + Azotobactor 2 kg/ha, T6: 75% RDF + 25% FYM + Azotobactor 2 kg/ha +Bio-Capsules, T7: 50% RDF + 50% FYM + Azotobactor 2 kg/ha +Bio-Capsules, T8: 75% RDF+

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Cite as: *Akram, Vasim, Vijay Bahadur, and S.K. Choudhary. 2024. "Influence of Organic Manure and Inorganic Fertilizers on Growth, Yield and Quality of Muskmelon (Cucumis Melo L.)". Journal of Advances in Biology & Biotechnology 27 (8):588-95. https://doi.org/10.9734/jabb/2024/v27i81173.*

25% Vermicompost + Azotobactor 2 kg/ha + bio-capsules, T9: 50% RDF +50%Vermicompost + Azotobactor 2 kg/ha + Bio-Capsules of treatment were evaluated in randomized block design with concept with three replications. Among these treatments T9 was found to be best in the terms of germination percentage growth parameter and yield parameters. The benefit to cost ratio for T9 is also found to be highest.

Keywords: FYM; vermicompost; Azotobactor; bio-capsules.

1. INTRODUCTION

Cucumis melo L. (Inodorus group) commonly called as yellow melon or canary melon (2n=24) belongs to the botanically Cucurbitaceae family. *Cucumis melo* L. is a wide polymorphic taxon that includes several different horticultural and botanical varieties and groupings. Nine groups, including Agrestis (wild melon), Flexuosus (snake melon), Conomon (pickling melon), Cantalupensis (cantaloupe or muskmelon), Inodorus (winter melon, honeydew, and casaba), Chito (mango melon), Dudaim (queen's pocket melon), and Momordica (phoot or snap-melon), were able to be formed due to the species' diversity in morphology.

India is the second largest producer of vegetables in the world next to China. In India the vegetables are grown in an area of 10.24 million ha with an annual production of 178.92 million metric tons and the productivity is 17.30 tons per ha. India accounts for an about 13.90 per cent of the world's vegetable production (Anon., 2017; [1,2]. According to the recommendations of ICMR, consumption of vegetables in India should be 300 g per day per adult whereas; the per capita intake is only 145 g per day per adult. Therefore, there is a need for increasing the production of vegetables by growing high yielding genotypes or varieties or hybrids with high nutritive value by adopting improved production technologies.

Biocapsule - The capsule contains the microorganism in an immobilized/inactive condition and the cells can be activated by dissolving the capsule in water. This suspension can be diluted and the seeds or seedlings or rhizomes are soaked in the suspension for 30 minutes before sowing/ transplanting into the main field. The remaining suspension can be used as soil drench. This encapsulation technique can be used for delivering all kinds of agriculturally important micro-organisms, *viz.*, N fixers, nutrient solubilizers/mobilizers, Plant Growth Promoting Rhizobacteria (PGR), *Trichoderma*, *Burkholderia*, etc. (ICAR 2017).

2. MATERIALS AND METHODS

The present investigation entitled "Influence of organic manure and inorganic fertilizers on growth, yield and quality of Muskmelon (*Cucumis melo* L.)" was carried out during the year 2023 in the Department of Horticulture, Sam Higginbottom University of Agriculture Technology & Sciences Prayagraj. The experiment was conducted on Muskmelon (*Cucumis melo* L.). The virgin field was used for experimentation and cluster bean was cropped for two years prior to conduct of experiment. A composite soil sample was collected from 0-30 cm depth prior to incorporation of treatments to determine the chemical properties of soil. The soil of experimental field was loamy sand having pH of 8.7, EC 0.20 dS m-1 and organic carbon 0.07 per cent. - N:P.K.- 100:25:50 kg/ha (source: ICAR), FYM- 20 t/ha respectively.

3. RESULTS AND DISCUSSION

3.1 Growth Parameters

3.1.1 Vine length (cm)

The maximum Vine length of muskmelon 90 days of (202.05) was recorded with treatments 9 (50% RDF +50%Vermicompost + *Azotobactor* 2 kg/ha + Bio-Capsules) while the minimum Vine length 90 days of (167.12) was recorded under control. Further, the interaction effect of 50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules significantly influenced the Vine length of muskmelon. Increase in growth parameters vine length use of RDF may be due to its effect in cell division and cell enlargement [3] in cucumber and Campagnol et al. (2012) in watermelon.

3.1.2 Number of branches per vine.

The maximum Number of branches per vine of muskmelon 90 days of (3.46) was recorded with treatments 9 (50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio- Capsules) while the minimum Number of branches per vine 90 days of (3.12) was recorded under control. Further, the

interaction effect of 50% RDF +50% Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules significantly influenced the Number of branches per vine of muskmelon. Increase in growth parameters Number of branches per vine use of RDF may be due to its effect in cell division and cell enlargement [4].

3.2 Floral Parameters

3.2.1 Day to first male flower

The minimum Day to first male flower of muskmelon (32.74) was recorded with treatments 9 (50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules) while the maximum Day to first male flower (38.11) was recorded under control. Further, the interaction effect of 50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules significantly influenced the Day to first male flower of muskmelon. Increase in the growth parameters Use of RDF in day to first male flower may be related to its impact on cell expansion and division [5,6].

3.2.2 Day to first female flower

The data reveals that the Day to first female flower of muskmelon increased significantly by the application of organic manure and inorganic fertilizers under experiment over the control. The minimum Day to first female flower of muskmelon (38.36) was recorded with treatments 9 (50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules) while the maximum Day to first female flower (44.98) was recorded under control. Further, the interaction effect of 50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules significantly influenced the Day to first female flower of muskmelon. Increase in growth parameters Day to first female flower use of RDF may be due to its effect in cell division and cell enlargement Islam et al., [6].

3.3 Yield Parameters

3.3.1 Number of fruits per vine

The data reveals that the Number of fruits per vine of muskmelon increased significantly by the application of organic manure and inorganic fertilizers under experiment over the control. The maximum Number of fruits per vine of muskmelon (3.96) was recorded with treatments 9 (50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules) while the minimum Number of fruits per vine (2.12) was recorded under control. Further, the interaction effect of 50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules significantly influenced the Number of fruits per vine of muskmelon. Increase in growth parameters Number of fruits per vine use of RDF may be due to its effect in cell division and cell enlargement Hossain et al., [7].

3.3.2 Fruit diameter (cm)

The data reveals that the Fruit diameter of muskmelon increased significantly by the application of organic manure and inorganic fertilizers under experiment over the control. The maximum Fruit diameter of muskmelon (12.78 cm) was recorded with treatments 9 (50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules) while the minimum Fruit diameter (9.18 cm) was recorded under control. Further, the interaction effect of 50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules significantly influenced the Fruit diameter of muskmelon. Increase in growth parameters Fruit diameter use of RDF may be due to its effect in cell division and cell enlargement Hossain et al., [7].

3.3.3 Fruit weight (g)

The data reveals that the Fruit weight of muskmelon increased significantly by the application of organic manure and inorganic fertilizers under experiment over the control. The maximum Fruit weight of muskmelon (823.80 g) was recorded with treatments 9 (50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules) while the minimum Fruit weight (650.25) was recorded under control. Further, the interaction effect of 50% RDF+50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules significantly influenced the Fruit weight of muskmelon. increased availability of nutrients eventually leading to better canopy coverage, better photosynthesis and translocation of photosynthates to the different plant parts. The results obtained are also in line with the findings of Nagalakshmi et al. [8] in sweet pepper, Singh et al. (2002) and Anjanappa et al. [3] in cucumber, Goreta et al. [9] and Sabo et al. [10] in watermelon.

3.3.4 Fruit yield (kg/vine)

The data reveals that the Fruit yield of muskmelon increased significantly by the

application of organic manure and inorganic fertilizers under experiment over the control. The maximum Fruit yield of muskmelon (3.20 kg/vine) was recorded with treatments 9 (50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules) while the minimum Fruit yield (1.38 t/ha) was recorded under control. Further, the interaction effect of 50% RDF+50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules significantly influenced the Fruit yield of muskmelon. Fruit weight and the number of fruits per plant have an inverse relationship, variations in average fruit weight between hybrid plants may result from variations in vine length and branch count. It significantly positively correlated with both the length of the vine and the number of branches per plant in the current study. Similar results were reported by Vijayakumari et al. (1991) in cucumber, Kutty and Dharmatti [11] in bitter gourd and Celine et al. [12] in snake gourd.

3.3.5 Fruit yield (kg/plot)

The data reveals that the Fruit yield of muskmelon increased significantly by the application of organic manure and inorganic fertilizers under experiment over the control. The maximum Fruit yield of muskmelon (24.54 kg/plot) was recorded with treatments 9 (50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules) while the minimum Fruit yield (9.97 kg/plot) was recorded under control. Further, the interaction effect of 50% RDF+50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules significantly influenced the Fruit yield of muskmelon. increase in total soluble solid is associated with accelerated ripening, due to which starch gets converted to sugars. These results are in confirmation with studies conducted by Erdem et al. [13] and Parmar et al. [14] in watermelon and Mirabad et al. [15] in cantaloupe.

3.4 Quality Parameter

3.4.1 Chlorophyll content (SPAD value)

The data reveals that the Chlorophyll content (SPAD value) of muskmelon increased significantly by the application of organic manure and inorganic fertilizers under experiment over the control. The maximum Chlorophyll content (SPAD value) of muskmelon (27.26) was recorded with treatments 9 (50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules) while the minimum Chlorophyll content (SPAD value) (11.08) was recorded under control. Further, the interaction effect of 50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules significantly influenced the Chlorophyll content (SPAD value) of muskmelon. Increase in growth parameters Chlorophyll content (SPAD value) use of RDF may be due to its effect in cell division and cell enlargement Sharma et al. [16].

3.4.2 Total soluble solids (^{0}Brix)

The data reveals that the Total soluble solids (^{0}Brix) of muskmelon increased significantly by the application of organic manure and inorganic fertilizers under experiment over the control. The maximum Total soluble solids (^{0}Brix) of muskmelon (11.75) was recorded with treatments 9 (50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules) while the minimum Total soluble solids (^{0}Brix) (9.15) was recorded under control. Further, the interaction effect of 50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules significantly influenced the Total soluble solids (0Brix) of muskmelon. Increase in growth parameters Total soluble solids (0Brix) use of RDF may be due to its effect in cell division and cell enlargement Kumar et al. [17].

3.4.3 Ascorbic acid

The data reveals that the Ascorbic acid of muskmelon increased significantly by the application of organic manure and inorganic fertilizers under experiment over the control. The maximum Ascorbic acid of muskmelon (7.32) was recorded with treatments 9 (50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules) while the minimum Ascorbic acid (6.04) was recorded under control. Further, the interaction effect of 50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules significantly influenced the Ascorbic acid of muskmelon. Increase in growth parameters Ascorbic acid use of RDF may be due to its effect in cell division and cell enlargement Miglani et al. [18].

3.4.4 Total sugar (reducing and non-reducing)

The data reveals that the Total sugar (reducing and non-reducing) of muskmelon increased significantly by the application of organic manure and inorganic fertilizers under experiment over the control. The maximum Total sugar (reducing and non-reducing) of muskmelon (46.64) was

Table 1. Impact of organic manure and inorganic fertilizers on growth parameters, floral parameters, yield parameters of muskmelon

Treatments	Vine length (cm) 90 days	Number of branches per vine 90 days	Day to first male flower	Day to first female flower	Fruit diameter (cm)	Fruit weight (g)	Fruit yield (kg/vine)	Fruit yield (kg/plot)
T1	167.12	2.12	38.11	44.98	9.18	650.25	1.38	9.97
T2	171.45	2.45	37.44	44.65	9.45	679.78	1.67	12.04
T3	175.47	2.78	37.77	43.57	10.48	698.89	1.94	14.05
T4	179.84	2.86	36.31	42.35	10.57	734.99	2.12	15.36
T5	183.11	2.89	36.65	42.78	11.65	745.80	2.18	15.74
T6	187.21	2.95	35.97	41.52	11.71	768.80	2.55	18.46
T7	191.12	3.04	34.24	40.58	12.14	794.35	2.90	20.96
T8	195.69	3.23	34.57	39.39	12.45	812.58	3.13	22.62
T9	202.05	3.46	32.74	38.36	12.78	823.80	3.20	24.54
F-test	S	S	S	S	S	S	S	S
SEm(±)	6.28	0.10	1.03	1.33	0.72	22.23	22.23	1.47
C.D at 0.5%	18.84	0.33	3.10	3.98	1.40	6.63	6.63	4.39
C.V.	5.9	5.7	5.00	5.50	7.2	5.2	5.2	14.9

Table 2. Impact of organic manure and inorganic fertilizers on quality parameter of muskmelon

Treatments	Total soluble solids(^{0}Brix)	Ascorbic acid (mg/ g fresh wt)	Total sugar (reducing and nonreducing) (mg/ g fresh wt)
T1	9.15	6.04	41.12
T2	9.72	7.14	42.45
T3	9.79	7.16	42.78
T4	10.85	7.16	43.23
T5	10.92	7.18	43.56
T6	10.98	7.18	43.89
T7	11.15	7.19	44.32
T8	11.45	7.21	44.65
T9	11.75	7.32	46.64
F-test	S	S	S
SEm(±)	0.38	0.23	0.93
C.D at 0.5%	1.15	0.70	2.80
C.V.	6.2	5.7	3.7

Table 3. Impact of organic manure and inorganic fertilizers on economic of muskmelon

Treatments	Cost of cultivation	Gross return (INR/ha)	Net return (INR/ha)	B: C Ratio
T1	102000	221572.54	119572.54	1.17
T2	107500	267506.53	160006.53	1.48
T3	111000	312132.61	201132.61	1.81
T4	113500	341216.74	227716.74	2.00
T5	119000	349792.24	230792.24	1.93
T6	115500	410084.47	294584.47	2.55
T7	123000	465773.28	342773.28	2.78
T8	116500	502519.16	386019.16	3.31
T9	125000	545254.81	420254.81	3.36

recorded with treatments 9 (50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules) while the minimum Total sugar (reducing and non-reducing) (41.12) was recorded under control. Further, the interaction effect of 50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules significantly influenced the Total sugar (reducing and non-reducing) of muskmelon. increase in the growth parameters The whole amount of sugar (reducing and non-reducing) that RDF uses might be attributed to its impact on cell growth and division. Ghosh and Associates [19-21].

3.4.5 Economic

In Table 3 data pertaining to economics of growing as effect of vermicompost and zinc on green gram has been exhibited. The common and variable cost of productionhas been given in Table 3.

The average gross realization, net return, benefit cost ratio derived from treatment 9 (50% RDF +50%Vermicompost + *Azotobactor* 2kg/ha + Bio-Capsules) give the highest gross return (INR 545254.81/ha), net return (INR 420254.81/ha), benefit cost ratio (3.36), whereas the lowest gross return (INR 77802.98/ha), net return (INR 49630.98/ha), benefit cost ratio (1.76) in the treatment control.

The average gross realization, net return, benefit cost ratio derived from different T1 (control) give the lowest gross return (INR 92213.82/ha), net return (INR 62466.82/ha), benefit cost ratio (2.09), whereas the lowest gross return (INR 221572.54/ha), net return (INR 119572.54/ha), benefit cost ratio (1.17) in the treatment control.

4. CONCLUSION

On the basis of our experimental findings it can be concluded that the treatment T_9 (50% RDF +50%Vermicompost + *Azotobactor* 2 kg/ha + Bio-Capsules) was found to be best in the terms of germination percentage growth parameters and Yield Parameters.

The highest B:C ratio was also found in T_9 (50% RDF +50%Vermicompost + *Azotobactor* 2 kg/ha + Bio-Capsules) with 3.36.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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