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Effect of different level of fertilizers on growth and yield of F_1 hybrids of watermelon (*Citrullus lanatus* Thunb.)

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Abstract
The field experiment entitled, "Effect of different level of fertilizers on growth and yield of F_1 hybrids of watermelon (*Citrullus lanatus* Thunb.)" in Split plot design with 3 replications. There were two factors studied in an experiment *viz.* a) Fertilizer levels: F_1 (150:50:50 NPK kg/ha), F_2 (200:50:50 NPK kg/ha) and F_3 (250:50:50 NPK kg/ha) as main plot treatments and b) F_1 Hybrids: V_1 (Madhubala), V_2 (Augusta), V_3 (N.S. 295), V_4 (Vigro-286) and V_5 (Andaman) as sub plot treatments.

In yield attributing characters and yield, Significantly highest fruit yield per vine (5.18 kg), and per hectare (34.53 t) was recorded in the F_1 hybrid Andaman. Significantly, the highest total soluble solids (9.32 ºB), total sugars (6.45%), reducing sugars (4.69%), non-reducing sugar (1.69%) and the average sensory score (7.41) was recorded in the F_1 hybrid Andaman.

The highest values for yield attributing characters and yield were noticed in F_3 (250:50:50 NPK kg/ha). These were number of fruits per vine (1.64), fruit yield per vine (5.50 kg), fruit yield per hectare (36.72 t), fruit weight (3.31 kg), However, the lowest fertilizer dose F_1 recorded the highest total soluble solids (8.97 ºB), total sugars (6.24%), reducing sugars (4.31%), non- reducing sugar (1.83%) and the highest average sensory score (7.25).

A treatment combination V_5xF_3 recorded the highest number of fruits per vine (1.73), the highest fruit weight (3.46 kg), fruit yield per vine (6.00 kg), and per hectare (40.01 t). The highest total soluble solids (10.10 ºB), highest total sugars (7.22%), reducing sugars (5.01%) and non-reducing sugar (2.10%) were recorded in the treatment combination V_5xF_1. However, the treatment combination V_5xF_2 secured the highest average score (7.50) in sensory evaluation.

Taking into consideration above these two factors and their interaction the F_1 hybrid Andaman showed better performance for the important characters i.e. fruit weight, fruit yield per vine, and ha when fertilized with 250:50:50 NPK kg/ha under Konkan agroclimatic condition. Thus, F_1 hybrid Andaman with fertilizer dose F_3 (250:50:00 NPK kg/ha) was found to be the best combination for maximization of yield of watermelon under Konkan agro-climatic condition.

Keywords: Fertilizers, growth, yield, F_1 hybrids, watermelon, *Citrullus lanatus* Thunb.

Introduction
Among the various cucurbits grown in Maharashtra, watermelon is an important member of cucurbits grown for it's sweet juicy fruits for quenching the thirst especially during the summer. Botanical name of watermelon is *Citrullus lanatus (*Thunb); (2n = 22) and belongs to family cucurbitaceae. It is one of the most important cucurbitaceous crops grown all over the world. Botanically, watermelon fruit is pepo type. The fresh fruit is relished by many people across the world because it is known not only to be low in calories but highly nutritious, sweet and thirst-quenching (Mangila *et al*., 2007) [8]. In India, it is grown commercially in tropical and subtropical states and is a major river-bed crop of Uttar Pradesh, Rajasthan, Gujarat, Madhya Pradesh, Maharashtra and Andhra Pradesh. However, Madhya Pradesh and Rajasthan are the leading states in watermelon cultivation. In Konkan region, watermelon is becoming popular due to its quick pay back ability in short duration as compared to other vegetable crops. Hence, area under this crop in entire Konkan region is increasing day-by-day and has become popular as 'vegetable cash crop'. Agroclimatic conditions during *rabi* season of Konkan region is ideal for watermelon cultivation. The area under watermelon cultivation in Konkan region is about 936 ha (230 ha in Thane, 400 ha in Raighad, 260 ha in Ratnagiri, 46 ha Sindhudurga) (Anon, 2009) [3]. In North Konkan region, watermelon has tremendous potential for cultivation in rice based cropping system due to nearness of metropolitan cities like Mumbai and Thane.

The several factors controlling the yield and profit from crops, plant nutrient is an important factor. Nitrogen helps to promote the leaf, stem and vegetative growth. Phosphorus stimulates early root development and growth and helps to establish seedling quickly. Potassium helps in translocation of carbohydrates and disease resistance in plants. These nutrient are necessary not only for crop yield but for the maintenance of soil nutrients and quality of produce. The growth and yield of watermelon is highly influenced by the fertilizer application, the dose depend on the soil type, climate and system of planting.

Material methods

The field experiment entitled, "Effect of different level of fertilizers on growth and yield of F_1 hybrids of watermelon (*Citrullus lanatus* Thunb.)" was carried out at Department of Horticulture, College of Agriculture, Dapoli, Dist. Ratnagiri, Maharashtra State (India) in the year 2014-2015 in Split plot design with 3 replications. There were two factors studied in an experiment *viz.* a) Fertilizer levels: F_1 (150:50:50 NPK kg/ha), F_2 (200:50:50 NPK kg/ha) and F_3 (250:50:50 NPK kg/ha) as main plot treatments and b) F_1 Hybrids: V_1 (Madhubala), V_2 (Augusta), V_3 (N.S. 295), V_4 (Vigro-286) and V_5 (Andaman) as sub plot treatments. Broad ridge method was laid out for growing the different F_1 hybrids of watermelon under study. The pits of the size of 30 cm^3 were dug at 1.0 meter spacing at the side of furrow irrigation channel of 60 cm in a triangular fashion and a subsequent row of same plot was spaced at 3.6 meter so as to maintain the recommended spacing of 1.5 x 1 meter. After 3-4 days, each pit were refilled with mixture of soil, FYM and fertilizers dose as per treatments before sowing the seeds. The recommended doses of manures in the form of vermiphos @ 15 tonnes per hectare and fertilizers were applied as per treatment at pits and mixed thoroughly with soil with the help of spade for better crop stand. The nitrogen, phosphorus, and potash were applied in the form of urea, single super phosphate and muriate of potash, respectively. Nitrogen was given in split doses. 1/3rd nitrogen, full dose of P_2O_5, K_2O and manures were supplied as basal dose at the time of sowing. While the remaining quantity of nitrogen (2/3rd) was applied at 30 and 60 days after sowing at the time of vining and flower and fruiting initiation in two equal splits in the form of top dressing. Fruits were harvested by judging their maturity with various maturity indices.

Results and discussion

Fruit yield per vine (kg)

Similarly, the interaction effect of watermelon hybrids and fertilizer levels for fruit yield per vine was also found to be significant. Among the interaction, a treatment combination V_5xF_3 (Andaman x 250:50:50 NPK kg/ha) produced the highest fruit yield per vine (6.00 kg) and was at par with the treatment combinations V_1xF_3 (Madhubala x 250:50:50 NPK kg/ha) and V_2xF_3 (Augusta x 250:50:50 NPK kg/ha). However the lowest fruit yield per vine (3.71 kg) was observed in treatment combination V_1xF_1 (Madhubala x 150:50:50 NPK kg/ha).

There was a significant variation in fruit yield per vine among hybrids. This variation in fruit yield per vine might be due to their own genetic makeup and interaction with environmental factors, which had resulted into vigour of the crop in relation to fruit set percentage, number of fruits per vine, fruit weight and fruit diameter. These findings are in close conformity with Bahari *et al.*, (2012) [4], Sawratkar (2014) [15] and Adhikari (2015) [2] in watermelon.

Different levels of NPK fertilizers have a significant effect in fruit yield per vine (kg), increased fertilizer treatment produced the highest fruit yield per vine and it was might be due to the highest fruit length, fruit weight and number of fruits per vine. Similar results were also reported by Shinde (2014) [16] in cucumber.

Table 1: Effect of different levels of fertilizer on fruit yield per vine (kg) on watermelon F_1 hybrids

Fruit yield per vine (kg)				
Var/Fer	**F_1**	**F_2**	**F_3**	**Mean**
V_1	3.71	4.31	5.70	4.57
V_2	4.58	5.13	5.58	5.09
V_3	4.50	4.38	5.27	4.71
V_4	4.17	4.55	4.99	4.57
V_5	4.63	4.91	6.00	5.18
Mean	4.31	4.65	5.50	4.82
	'F' test	**SE(m)±**	**C.D at 5%**	
F	Sig	0.01	0.06	
V	Sig	0.10	0.31	
VXF	Sig	0.18	0.55	

Fruit yield per hectare (t)

The effect of interaction between watermelon hybrids and fertilizer levels was also found to be significant. A treatment combination V_5xF_3 (Andaman x 250:50:50 NPK kg/ha) produced the highest fruit yield per hectare (40.01 t) and was at par with the treatment combinations V_1xF_3 and V_2xF_3. But, the lowest fruit yield per hectare (24.72 t) was observed in treatment combination V_1xF_1 (Madhubala x 150:50:50 NPK kg/ha).

There was a significant variation in fruit yield per hectare among hybrids. This variation might be due to the fruit set percentage, number of fruits per vine, fruit length, fruit weight, fruit diameter, genetic makeup, environmental factors and vigour of the crop.

These findings are in close conformity with Inamdar (2009) [5], Venugopalan and Pitchaimuthu (2009) [17], Sawratkar (2014) [15] and Adhikari (2015) [2] in watermelon, reported variation in fruit yield per hectare among different varieties.

Different levels of NPK fertilizers have a significant effect in fruit yield per hectare (t), increased fertilizer treatments produced highest fruit yield per vine, which might be due to increase in number of fruits per vine, fruit yield per plot and eventually the highest fruit yield per hectare.

Similar results were reported by Kolekar (2012) [7] and Sabo *et al.*, (2013) [17] in watermelon, Shinde (2014) [16] in cucumber, Kirnak *et al*., (2005) [6] in muskmelon.

Table 2: Effect of different levels of fertilizer on fruit yield per hectare (t) on watermelon F_1 hybrids

Yield per hectare (t)				
Var/Fer	**F_1**	**F_2**	**F_3**	**Mean**
V_1	24.72	28.72	38.02	30.48
V_2	30.54	34.17	37.19	33.96
V_3	30.00	29.22	35.12	31.44
V_4	27.82	30.33	33.29	30.48
V_5	30.88	32.70	40.01	34.53
Mean	28.79	31.02	36.72	32.18
	'F' test	**SE(m)±**	**C.D at 5%**	
F	Sig	0.11	0.44	
V	Sig	0.72	2.12	
VXF	Sig	1.26	3.68	

Total soluble solids (T.S.S.) ºB

The interaction between watermelon hybrids and fertilizer levels, a treatment combination V_5xF_1 (Andaman x 150:50:50 NPK kg/ha) recorded the highest total soluble solids (10.1 ºB) and was significantly superior over rest of the treatment combinations except V_1xF_1 which was at par with it. However, the lowest total soluble solids (6.6 ºB) were observed in treatment combination V_2xF_3 (Augusta x 250:50:50 NPK kg/ha).

The significant variation in T.S.S. in different hybrids might be due to genetic character of hybrid, hormonal character and the effect of environmental factors. The similar variation in relation to the above character have been reported by different researchers *viz.* Mohite (2007) [9] in snapmelon, Nirmal *et al.*, (2008) [11] in muskmelon, Inamdar (2009) [5], Muhammad *et al*., (2014) [10], Sawratkar (2014) [15] and Adhikari (2015) [2] in watermelon.

The highest T.S.S. was found in the lowest fertilizer dose i.e. F_1 (150:50:50 NPK kg/ha). The variation in T.S.S. among different fertilizer doses have also been reported by Paulo *et al.*, (2007) [13], Parmar *et al.*, (2013) [12] in watermelon.

Table 3: Effect of different levels of fertilizer on Total soluble solids (ºB) on watermelon F_1 hybrids

TSS				
Var/Fer	**F_1**	**F_2**	**F_3**	**Mean**
V_1	10.03	9.53	7.53	9.03
V_2	8.43	7.07	6.60	7.36
V_3	8.90	8.40	8.03	8.44
V_4	7.43	6.97	6.73	7.04
V_5	10.10	9.43	8.43	9.32
Mean	8.97	8.28	7.46	8.24
	'F' test	**SE(m)±**	**C.D at 5%**	
F	Sig	0.08	0.32	
V	Sig	0.09	0.26	
VXF	Sig	0.15	0.46	

Total Sugar and reducing sugar

Interaction effect between hybrids and fertilizer levels was also found to be significant in respect to total sugars. But, the treatment combination V_5xF_1 (Andaman x 150:50:50 NPK kg/ha) recorded the highest total sugars (7.22%) and was significantly superior over rest of the treatment combinations, while the lowest total sugars (5.01%) was observed in V_4xF_3 (Vigro-286 x 250:50:50 NPK kg/ha).

The significant variation in total sugars (%) in different hybrids might be due to its genetic character, hormonal character, T.S.S. and the effect of environmental factors under which it was grown. The similar results in relation to the above character had been reported by different researchers, Mohite (2007) [9] in snap melon, Muhammad *et al*., (2014) [10] and Adhikari (2015) [2] in watermelon.

Maximum total sugars were found in the lowest fertilizer dose F_1 (150:50:50 kg kg/ha) than other higher doses. Paulo *et al.*, (2007) [13], Abou *et al.*, (2011) [1] and Parmar *et al.*, (2013) [12] in watermelon also reported the similar variation in different fertilizer doses.

In contrast, interaction effect between hybrids and fertilizer levels was found to be significant in respect to reducing sugars. But, the treatment combination V_5xF_1 (Andaman x 150:50:50 NPK kg/ha) recorded the highest reducing sugars (5.01%), while the treatment combination V_4xF_3 (vigro-286 x 250:50:50 NPK kg/ ha) observed the lowest reducing sugar (3.21%).

The significant variation in reducing sugars (%) in different hybrids might be due to its genetic character, hormonal character, TSS, total sugars and the effect of environmental factors. Mohite (2007) [9] in snap melon and Muhammad *et al*., (2014) [10] in watermelon had also reported the similar variation in the above character.

The significant variation in reducing sugars was found in different fertilizer levels. The highest reducing sugars were found in the lowest fertilizer dose i.e. F_1 (150:50:50 NPK kg/ha). Paulo *et al.*, (2007) [13], Abou *et al.*, (2011) [1] and Parmar *et al.*, (2013) [12] in watermelon also reported the variation in reducing sugars with different fertilizer levels.

Table 4: Effect of different levels of fertilizer on total soluble solids, total sugars (%), reducing sugars (%) non-reducing sugars (%) on watermelon F_1 hybrids

Total sugar (%)					Reducing sugars (%)					
Var/Fer	**F_1**	**F_2**	**F_3**	**Mean**	**Var/Fer**	**F_1**	**F_2**	**F_3**	**Mean**	**Mean**
V_1	6.48	6.34	5.57	6.13	V_1	4.60	4.24	4.02	4.28	1.74
V_2	6.00	5.22	5.09	5.43	V_2	4.10	3.79	3.53	3.80	1.54
V_3	5.92	5.64	5.46	5.67	V_3	4.14	3.85	3.88	3.95	1.66
V_4	5.60	5.16	5.01	5.25	V_4	3.73	3.48	3.21	3.47	1.68
V_5	7.22	6.29	5.84	6.45	V_5	5.01	4.28	4.78	4.69	1.85
Mean	6.24	5.73	5.39	5.78	Mean	4.31	3.92	3.88	4.04	1.69
	'F' test	**SE(m) ±**	**C.D at 5%**			**'F' test**	**SE(m)±**	**C.D at 5%**		
F	Sig	0.03	0.14		F	Sig	0.05	0.22		
V	Sig	0.08	0.24		V	Sig	0.08	0.25		
VXF	Sig	0.14	0.42		VXF	Sig	0.15	0.44		

Conclusion

Thus, while ranking five F_1 hybrids of watermelon under study for the yield attributing characters and yield and physico-chemical parameters, the F_1 hybrid V_5 (Andaman) showed better performance in yield characters *viz*., fruit yield per vine, fruit yield per hectare and chemical parameters *viz.*, total soluble solids, total sugars and reducing sugars.

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References

1. Abou EY, Kassas AI, Abdalla MY, Moslemany MZ. Response of Cantaloupe Hybrids to Nitrogen Fertilization Levels. International J of Sciences: Basic and Applied Research. 2011-2012; 6(3):1-11.
2. Adhikari R. Effect of different levels of fertilizer on growth and yield of F_1 hybrids of watermelon (*Citrullus*

lanatus Thunb.). A. M.Sc. (Agri) thesis submitted to Dr. B.S.K.K.V, Dapoli. (Unpublished), 2015.
3. Anonymous. Krishi Utpadana Karyakrama Chirupresha Gov. of Maharashtra, Division of Agriculture, 2009, 22-24.
4. Bahari M, Rafii MY, Saleh GB, Latif MA. Combining ability in complete diallel cross of watermelon (*Citrullus lanatus* Thunb.) Matsum and Nakai). The Scientific world Journal. Article ID 543158. 2012, 6.
5. Inamdar VG. Growth yield and quality performance of different varieties of watermelon (*Citrullus lanatus* Thunb.). A. M.Sc (Agri) thesis submitted to Dr. B.S.K.K.V, Dapoli. (Unpublished), 2009.
6. Kirnak H, David H, Cengiz K, Tas I. Effects of irrigation and nitrogen rates on growth, yield, and quality of muskmelon in semiarid regions. J of Plant Nutrition. 2005; 28(4):20-24.
7. Kolekar AB. Response of watermelon (*Citrullus lanatus* Thunb.) to spacing and levels of N, P_20_5, K_2O and manure, grown with drip and black polythene under lateritic soils of Konkan. A M.Sc. thesis submitted to Dr. B.S.K.K.V., Dapoli (Unpublished), 2012.
8. Mangila E, Tabiliran FP, Naguit MRA, Malate R. Effects of Organic Fertilizer on the Yield of Watermelon. Threshold 2. 2007, 27-35.
9. Mohite KR. Evaluation of elite types of snap melon (*Cucumis melo* var. momordica) under Konkan region of Maharashtra. A M.Sc (Agri) thesis submitted to Dr. B.S.K.K.V., Dapoli, (Unpublished), 2007.
10. Muhammad M, Labban L. Comparison of Different Types of Fertilizers on Growth, Yield and Quality Properties of Watermelon (*Citrllus lanatus*). Agricultural Sciences. 2014(5):475-482.
11. Nirmal De Danger Ram, Sudhakar Pandey. Physiological traits as determinant of yield in muskmelon under field conditions. Indian J Hort. 2008; 65(1):40-43.
12. Parmar HN, Polara ND, Viradiya RR. Effect of Mulching Material on Growth, Yield and Quality of Watermelon (*Citrullus lanatus* Thunb) Cv. Kiran. Universal Journal of Agricultural Research. 2013; 1(2):30-37.
13. Paulo SL, Vera LP, Boanerges F, Jose F, Silva J. Response of melon plants to nitrogen and phosphorus application. Revista Caatinga. 2007; 20(1):43-49.
14. Sabo MU, Wailare MA, Shuaibu YM. Effect of NPK fertilizer and spacing on growth and yield of watermelon (*Citrillus lanatus* L.) in Nigeria. Journal of Agricultural Science. 2013; 3(8):325-330.
15. Sawaratkar SM. Evaluation of F_1 hybrids of watermelon (*Citrullus lanatus* Thunb.) under Konkan Agroclimatic conditions. A M.Sc. (Horti) thesis submitted to Dr. B.S.K.K.V, Dapoli, 2014.
16. Shinde SJ. Evaluation of F_1 hybrids of cucumber and their nutrition management under Konkan agroclimatic condition. A. M.Sc thesis Dr. B. S. K. K. V., Dapoli, (Unpublished), 2014.
17. Venugopalan R, Pitchaimuthu M. Statistical model for stability analysis in watermelon. J of Hort. Sci. 2009; 4(2):153-157.