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Performance of mango (*Mangifera indica* L.) cv. KESAR in relation to physical and organoleptic qualities under different plant spacing and sunlight direction

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Abstract : Broad spacing (10 x 10 m), medium (10 x 5 m) and Small (5 x 5m) in East, South, West and North directions influenced the growth as well as qualitative characters in mango cv. KESAR. The bigger length of fruit was found in north direction and in closer spacing of 5 x 5m while higher breadth was found in 10 x 5m spacing. Higher fruit weight was gained in S₃ spacing. The fruits obtained from east and south location of tree in 10 x 5m spacing trees found to be better in quality parameters.

Key words : Plant spacing, Direction, Length, Breadth, Organoleptic

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In India, mango is a national fruit and pride of our fruit industry from which we can get more foreign exchange, which help us to stand our national economy (Goswami *et al.*, 1999). Besides it is considered as one of the most exotic, delicious, nutritious and popular fruit. Its taste, flavour and aroma are very fascinating built in terms of qualities and now gradually gaining the global popularization during last two decades.

Available information suggest that the concept of high density planting in mango took practical shape after development of dwarf and regular bearer mango hybrid viz., Amrapali at IARI, New Delhi (Majumdar *et al.*, 1983). In other parts of India the concept of high density in Amrapali and Dashehari was found superior (Majumdar and Sharma, 1988 and Sant *et al.*, 1997).

The environmental factors influence under different densities of planting on yield and quality production whereas the producers view is to achieve domestic and export market with good price. So keeping this in mind, the maximum utilization of land, light and canopy with quality produce, the rare experiment on effect of different

spacings in different directions on fruit physical quality of mango cv. KESAR was carried out.

RESEARCH METHODS

An investigation was carried out at Regional Horticultural Research Station, ASPEE college of Horticulture and Forestry, Navsari Agricultural University, Navsari during the year 2003-2004. The experiment was carried out in Randomized Block Design with factorial concept in three spacing treatments and four directions with seven replications. The main treatment was allowed according to spacing which was at 5 x 5m (S₁), 10 x 5m (S₂), and 10 x 10m (S₃). The sub-treatments were four directions per tree viz., East (D₁), South (D₂), West (D₃) and North (D₄).

The fruit quality observations were taken after the harvesting of well matured fruits. The length and breadth of each fruit were measured in centimeter (cm) with the help of digital varner calipers. With the help of digital balance, the fresh weight as well as the skin weight, stone

weight and pulp weight were measured in gram (g) after fruit ripening. The organoleptic evaluation for assessing the colour of skin, pulp colour, taste, aroma and overall acceptability were done by a panel of five judges by using 10 points scale.

RESEARCH FINDINGS AND DISCUSSION

The results and their discussion are given here according to observation :

Length of fruit:

The data presented in Table 1 revealed that only spacing affected the fruit length. Significantly the maximum length (11.04 cm) of fruit was found in S_1 (5 x 5m) spacing treatment and no significant results were found to direction and interaction of spacing and direction. The higher length in closer spacing might be due to maximum vegetative growth and microclimate favoured increment of fruit length. This finding is in agreement with the finding of Reddy *et al.* (2002).

Breadth of fruit :

It is evident from Table 1 that the significant higher breadth (7.21 cm) was found in 10 x 5m (S_2) spacing and the minimum (6.86 cm) in 5 x 5m (S_1) which was statistically at par with S_3 (10 x 10 m) treatment. The similar result was found in guava fruit by Singh and Bal (2002) and Reddy *et al.* (2002) in mango. The fruits got maximum width in S_2 (medium) spacing may be due to proper vegetative growth and favourable nutrition for fruit width increment. The similar results were received by Ingle and Athawale (1999) in mandarin as well as Dhaliwal and Dhillon (2003) in guava.

Fruit weight:

The data regarding fresh weight of fruit are presented in Table 2. The results were significant only due to the spacing. Higher fruit weight (290.95 g) was found in S_3 treatment followed by S_2 (273.37g) and S_1 (262.90 g) treatments. The weight of fruits obtained from S_3 treatment of spacing might be due to maximum nutrition availability to tree at wider spacing which leads to better

Table 1 : Response on length of fruit and Breadth (cm) to planting distance and sunlight direction

Treatments	D ₁ (East)		D ₂ (South)		D ₃ (West)		D ₄ (North)		Mean (S)	
	L	B	L	B	L	B	L	B	L	B
S_1 (5x5m)	10.78	6.89	10.45	6.83	11.02	6.84	11.91	6.87	11.04	6.86
S_2 (5x10m)	10.44	7.29	10.20	7.37	10.58	7.08	11.02	7.07	10.56	7.21
S_3 (10x10m)	10.87	6.68	11.31	6.98	10.80	7.02	10.76	6.98	10.93	6.92
Mean (D)	10.69	6.95	10.65	7.06	10.80	6.98	11.23	6.98	-	-

	S.E. \pm		C.D. (P=0.05)		CV%	
	L	B	L	B	L	B
S	0.062	0.062	0.176	0.176	4.717	4.717
D	0.071	0.071	NS	NS		
S x D	0.124	0.124	NS	NS		

L = Length (cm) B = Breadth (cm)

NS=Non-significant

Table 2 : Response on fresh weight (g) and stone pulp ratio of fruits to planting distance and sunlight direction

Treatment	D ₁ (East)		D ₂ (South)		D ₃ (West)		D ₄ (North)		Mean (S)	
	W	S/P	W	S/P	W	S/P	W	S/P	W	S/P
S_1 (5x5m)	263.33	0.843	263.16	0.822	264.11	0.737	261.03	0.755	262.90	0.789
S_2 (5x10m)	273.77	0.897	270.06	0.858	279.87	0.778	269.78	0.708	273.37	0.810
S_3 (10x10m)	293.07	0.905	287.35	0.869	291.62	0.765	291.73	0.748	290.95	0.821
Mean (D)	276.72	0.881	273.52	0.849	278.54	0.760	274.18	0.736	-	-

	S.E. \pm		C.D. (P=0.05)		CV%	
	W	S/P	W	S/P	W	S/P
S	1.340	0.004	3.784	0.011	2.572	2.625
D	1.548	0.004	NS	0.013		
S x D	2.681	0.008	NS	0.023		

W = Weight (g) S/P = Stone Pulp ratio

Treatment	East direction				South direction				West direction				North direction			
	D ₁	D ₂	D ₃	Mean	D ₁	D ₂	D ₃	Mean	D ₁	D ₂	D ₃	Mean	D ₁	D ₂	D ₃	Mean
S ₁ (5x5 m)	6.75	7.32	7.25	7.11	7.19	7.21	7.23	7.21	7.27	7.61	7.77	7.28	7.10	7.03	7.09	7.23
S ₂ (5x6 m)	8.00	7.87	7.73	7.87	7.38	7.37	6.92	7.39	7.59	7.82	7.58	7.39	7.10	7.53	7.37	7.33
S ₃ (5x10 m)	7.57	7.35	7.52	7.48	7.11	7.33	7.37	7.39	7.56	7.58	7.32	7.17	7.35	7.58	7.32	7.35
Mean	7.32	7.50	7.13	7.17	7.32	7.32	7.15	7.32	7.39	7.37	7.28	7.17	7.28	7.35	7.38	7.28
S.D.	0.0503	0.172	0.0503	0.129	0.050	0.171	0.050	0.171	0.050	0.171	0.050	0.171	0.050	0.171	0.050	0.171
C.V.	0.058	0.167	0.058	0.179	0.058	0.167	0.058	0.167	0.058	0.167	0.058	0.167	0.058	0.167	0.058	0.167
S x D	0.007	0.287	0.007	0.259	0.007	0.287	0.007	0.259	0.007	0.287	0.007	0.287	0.007	0.287	0.007	0.287
D ₁ x S, D ₂ x S, D ₃ x S	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

growth of the fruit weight (Sorbrino, 2004 and Ghawde *et al.*, 2002).

Stone pulp ratio:

The Table 2 denotes that the stone pulp ratios were found significant due to different spacings and directions. The significantly minimum score (0.789) for spacing was found in S₁ while maximum (0.821) in S₃ and S₂ (0.810) spacing. The directionally effect also showed clarity with stone pulp ratio. The higher stone pulp ratio (0.881) was noted in D₁ direction followed by D₂ (0.849), D₃ (0.760) and D₄ (0.736). In interaction the significantly minimum (0.708) stone-pulp ratio was found in D₄S₂ treatment which was followed by D₃S₁ and D₄S₃.

The lower stone-pulp ratio in closer spacing might be due to impact of spacing and shade effect. The 'Baneshan' mango was also showed the lower stone pulp ratio in less specific gravity fruits (Narayana *et al.*, 1999).

Organoleptic score:

The Table 3 reveals the quality characters of 'Kesar' mangoes as a organoleptic score. In case of skin colour of fruit highest score (7.64) received by S₂ spacing, in direction (7.50) in D₂ directions and interactionally maximum score (8.00) received by D₁ direction of S₂ spacing. The pulp colour also got maximum score (7.391) under S₂ spacing and in (7.53) D₁ direction and in interaction D₁ direction and D₂ spacing gave maximum score (7.89). The taste character was scored maximum (7.53) in S₂ spacing and in D₁ direction at 7.41. In aroma only spacing significantly received maximum score (7.425) in S₂ spacing. The overall acceptability score was maximum (7.473) in S₂ spacing, (7.468) in D₁ direction and ultimately the interaction effect was significant in S₂ spacing and in D₁ direction of score 7.82. All the qualitative characters found maximum in S₂ spacing and in D₁ direction might be due to availability of suitable medium of environment in spacing S₂ and in D₁ directions. The temperature around the fruit and sunlight would be helpful in termination B-carotene (a colour pigment) (Gunjate *et al.*, 2004, Sorbrino, 2004; Singh and Bal, 2002). The microclimatic effect on East and South direction and maximum exposure to sunlight (Sharma *et al.*, 1997) might improved the quality of fruits. The medium spacing S₂ (5 x 10 m) and D₁ (East) direction gave maximum response to all physical quality characters and was supported in other fruits also (Sharma *et al.*, 1997).

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