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Performance of apricot cv. New Castle under intensive system in mid hills of Himachal Pradesh

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Abstract

To optimize the density stand under intensive cultivation, apricot cultivar New Castle raised on seedling rootstock were spaced at 5x5m, 3x5m, 3x4m, 3x3m and 3x2m apart accommodating 400, 666, 833, 1111 and 1666 trees per hectare and were compared for growth, yield and fruit quality. The trunk girth and annual extension growth were maximum under 5x5m spacing and minimum values were recorded under 3x2m spacing. However, tree height was highest under 3x2m spacing. Irrespective of planting distances, year also had significant effect on the growth parameters of apricot. Trunk girth, tree height, tree spread and annual shoot growth were significantly higher during the year 2000. Maximum yield per plant was recorded in planting distance of 5x5m while lowest being in 3x2m. However, calculated yield per hectare basis was maximum in 3x2m (1666 trees/ha) followed by 3x3m. Regarding the quality parameters viz. fruit size, weight and volume of fruits were significantly higher under 5x5m spacing as compared to fruits under other planting distances. Minimum values of these were recorded under 3x2m. Other quality parameters viz. total soluble solids, acidity and total sugars were not significantly affected by planting distances and years of study.

Introduction

Apricot is an important fruit among the stone fruits under mid hills of Himachal Pradesh and being grown in an area of 2897 hectare (Anonymous, 2004). It plays a dominating role in the economy of mid hills as it fetches good price in the market. High density systems consistently increased in popularity and acreage particularly with small land holdings world wide. With the adoption of high density plantings phenomenal changes in the orchard plantations have occurred and traditional orchards with 100-200 trees per hectare have been or are being replaced by orchards at higher densities. However, in Himachal Pradesh, the high density orchards are not common yet but the initial results obtained in apple and peaches are most encouraging. Increase in tree density from 400-5000 trees per hectare increased the yield proportionately in peach. The highest yield (32.5 tonnes/ha) was recorded in bed system but the fruit quality deteriorated when compared to the trees trained on tatura trellis system with 2500 trees per hectare and yield of 31.5 tonnes per hectare. Encouraged with these findings, the present study was under taken to study the performance of apricot cultivar New Castle under different planting distances.

Material and Methods

The present investigations were carried out in apricot cultivar New Castle grafted on to seedling rootstock at Horticultural Research Station, Kandaghat, Solan The trees were planted at five planting distances (5x5m, 3x5m, 3x4m, 3x3m and 3x2m) resulting in density stand of 400, 666, 833, 1111 and 1666 trees per hectare respectively. The treatments were replicated four times under randomized block design.

Growth parameters of the plants in terms of trunk girth, annual shoot growth, tree height and spread were measured at the end of growing season when the growth ceased. Fruit yield per plant was recorded at the time of harvest and the quality parameters (fruit weight, size, volume and total soluble solids were assayed as per standard method. The fruit acidity and sugars were estimated as per A.O.A.C. (1980).

Results and Discussion

Data pertaining to the effect of different planting distances on the growth parameters of apricot are presented in Table 1. It is evident from the data that the maximum trunk girth (70.60mm) and annual

Table 1. Effect of different spacing on the growth parameters of apricot cultivar New Castle

Spacing	Trunk girth (mm)			Tree height (m)			Tree spread (m) EW			Tree spread (m) NS			Shoot extension growth (cm)		
	1999	2000	Pooled	1999	2000	Pooled	1999	2000	Pooled	1999	2000	Pooled	1999	2000	Pooled
5x5 m	66.05	75:15	70.6	2.87	3.25	3.06	1.43	2.36	1.9	1.51	2.02	1.85	36.75	40.38	38.57
3x5m	64.3	73.55	68.92	2.89	3.29	3.09	1.6	2.4	2	1.81	2.6	2.2	24.55	31.96	28.25
3x4 m	64.07	65.78	64.92	3.06	3.54	3.3	1.61	1.94	1.77	1.74	2.35	2.04	26.15	30.85	28.5
3x3 m	52.61	63.66	58.14	3.28	3.58	3.43	1.43	1.75	1.59	1.52	1.5	1.51	24.78	28.89	26.83
3x2 m	48.49	57.13	52.81	3.42	3.69	3.56	1.55	1.61	1.58	1.65	1.57	1.61	23.17	28.49	25.83
Mean	59.1	67.05		3.1	3.47		1.52	2.01		1.64	2.04		27.08	32.11	
CD (P=0.05)															
Spacing	0.45			0.05			0.18			0.15			0.37		
Year	0.28			0.03			0.11			0.09			0.23		
Spacing x Year	0.63			NS			0.25			0.21			0.52		

shoot extension growth (38.57cm) were recorded under 5x5m distance which were significantly higher than the other planting distances. Tree spread (EW 2.00 and NS 2.20m) was higher under 3x5 m distance which was closely followed by 5x5m and superior to the rest of the planting distances tried. Similar observations were also recorded by Kanwar and Singh (2004) in peach, Draganescu *et al.* (2002) in apricot, Caruso *et al.* (1999) in peach and apple, Grzyb *et al.* (1998) in plum planted at different densities.

Tree height (3.56 m) was highest under 3x2 m planting distance and the plants spaced at 5x5m distance recorded the lowest value of tree height (3.06 m). It may be attributed to the reason that in close plantations plants tend to grow towards the light in upward direction.

Irrespective of the planting distances, year also had significant effect on the growth parameters of apricot. Maximum trunk girth (75.15 mm), tree height (3.69m), tree spread (EW 2.40 and NS 2.60m) and annual shoot growth (40.38 cm) were recorded during the year 2000 and similar trend was also observed in the previous year of study. Interaction between planting distances and year was also found significant for all the growth parameters except tree height.

Data in Table 2 revealed that planting distances significantly influenced the fruit yield and physical quality parameters of apricot. The highest yield (34.72 kg/tree), fruit weight (32.43 g), fruit length (34.41mm), fruit diameter (32.66 mm) and fruit volume (31.45cc) were observed under 5x5m distance which was significantly higher than the other planting distances. Lowest values of all these parameters were recorded under 3x2 m planting. However, the yield calculated per hectare basis was maximum in 3x2 m planting distance (Fig. 1). Present findings are in line with those of Draganescu *et al.* (2002), Singh *et al.* (2004), Yastass (1989), Marini and Sowers (2000) and Kim *et al.* (1999) who reported that fruit yield and quality lowered with the planting density. Fruit quality in closely planted tree might be due to the less interception of light for photosynthesis due to shading effect that lowered the production of requisite metabolism needed for quality constituents. In contrast, wider spacing enhanced photosynthesis and more availability of metabolites improved quality.

Years of study also had significant effect on the yield and quality parameters of apricot. Maximum yield (35.97 kg/tree), fruit weight (34.12 g), fruit length (36.05 mm), fruit diameter (34.06 mm) and fruit volume (33.02 cc) were recorded during the year 1999

Fig. 1 Effect of tree density on yield of apricot calculated on per hectare basis

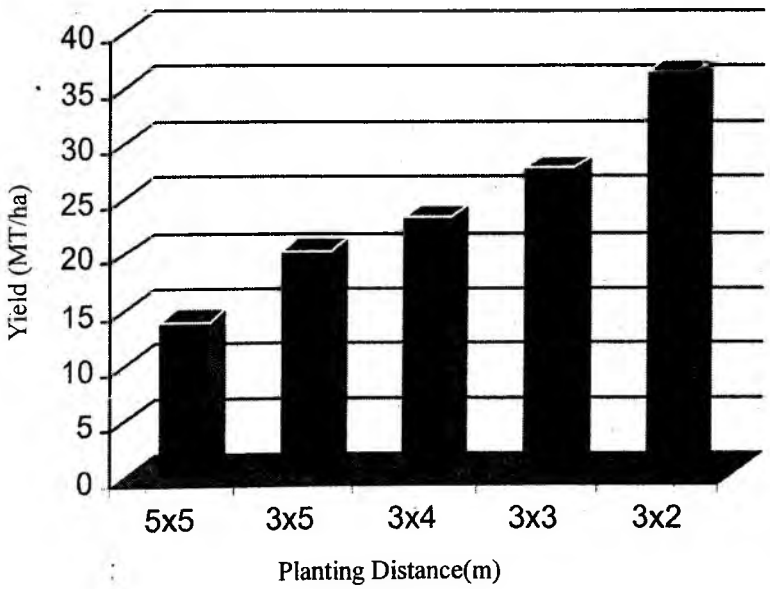


Table 2. Effect of different spacing on yield and physical quality parameters of apricot cultivar New Castle

Spacing	Yield (kg/tree)			Fruit weight (g)			Fruit length (mm)			Fruit diameter (mm)			Fruit volume (cc)		
	1999	2000	Pooled	1999	2000	Pooled	1999	2000	Pooled	1999	2000	Pooled	1999	2000	Pooled
5x5 m	35.97	33.47	34.72	34.12	30.75	32.43	36.05	32.77	34.41	31.4	33.92	32.66	33.02	29.87	31.45
3x5m	32.91	28.88	30.6	30.93	29.07	30.06	34.32	31.62	32.97	34.06	29.26	31.66	29.42	29.1	29.26
3x4 m	28.2	27.9	28.05	30.85	28.9	29.88	31.67	30.9	31.29	30.25	29.86	30.05	27.88	29.75	27.92
3x3 m	25.17	24.88	25.02	26.98	26.9	26.94	30.55	30.6	30.57	28.87	29.17	29.02	26.15	25.8	25.98
3x2 m	20.83	21.67	21.25	25.96	24.35	25.15	29.16	28.8	28.98	28.1	26.77	27.44	23.28	23.35	23.32
Mean	28.62	27.44		29.77	27.99		32.35	30.94		30.53	29.8		27.95	27.22	
CD (P=0.05)															
Spacing	0.46			1.13			0.27			0.31		0.28			
Year	0.29			0.71			0.17			0.19		0.17			
Spacing x Year	0.66			NS			0.03			0.44		0.39			

and similar observations were recorded in the following year of study. Interaction between planting distance and years of study was also found significant during both the years of study.

Data in Table 3 indicated that planting distances significantly affected the total soluble content of apricot whereas fruit acidity and total sugars were not significantly affected by the planting distances. The total soluble content (14.48 °B) was highest under 3x3m which was at par with 5x5m and 3x5m planting distances and lowest total soluble content (13.71 °B) was observed under 3x2m distance. Lower total soluble content in the fruits harvested from 3x2 m planted trees may be due to upright shoot growth and compact canopy which interfered with radiation penetration during critical period of fruit development and affected fruit quality traits adversely.

The effect of different plant distances on the fruit acidity and total sugars content were found to be non-significant. Singh and Kanwar (2001), Szewczuk and Licznar- Maanczuk (2004) also reported similar results in peach under high density plantations. Combined effect of years and planting distances on the chemical quality parameters of apricot was found to be non- significant.

Table 3. Effect of different spacing on chemical quality parameters of apricot cultivar New Castle

Spacing	TSS (°B)			Acidity (%)			Total sugar (%)		
	1999	2000	Pooled	1999	2000	Pooled	1999	2000	Pooled
5x5 m	13.98	14.58	14.28	1.1	1.09	1.1	6.61	6.55	6.59
3x5m	14.17	14.2	14.19	1.11	1.11	1.11	6.58	6.59	6.58
3x4 m	13.98	14.1	14.04	1.12	1.08	1.1	6.67	6.61	6.64
3x3 m	14.5	14.45	14.48	1.14	1.07	1.11	6.67	6.6	6.63
3x2 m	14.02	13.4	13.71	1.1	1.07	1.09	6.67	6.6	6.64
Mean	14.13	14.14		1.11	1.08		6.64	6.59	
CD (P=0.05)									
Spacing			0.26			NS			NS
Year			NS			NS			0.03
Spacing × Year			0.37			NS			NS

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