

**STUDIES ON CROP POPULATION DENSITY IN PINEAPPLE
VAR. 'KEW' (*Ananas comosus* MERR)**

S. BALAKRISHNAN, N. K. NAYAR, VALSAMMA MATHEW &
T. R. GOPALAKRISHNAN

College of Horticulture, Vellanikkara—680 654, Trichur, Kerala

Yield increase in pineapple due to higher planting densities has been reported by several workers (Briant and Tidbury 1942; Cannon, 1957 and Chadha *et al.* 1973). Chadha *et al.* (1973) have recommended a crop population density of 63,758 plants per hectare for pineapple cultivation in the Karnataka State. Balakrishnan *et al.* (1978) have recommended a population density of 53,333 suckers per hectare for Kerala conditions, allowing a spacing of 90 cm between trenches, 60 cm between rows and 25 cm between plants. As it was felt that the recommended spacing of 90 cm between trenches would pose problems in agronomic operations, particularly, due to heavy vegetative growth of plants, studies were conducted at the Pineapple Research Centre, Kerala Agricultural University Main Campus, Vellanikkara, Trichur during the year 1976–78 to ascertain the optimum population density for pineapple cultivation based on cost-benefit analysis for getting high yield and to ensure easiness in agronomic operation in crop-cycle period.

Materials and Methods

The trial was laid out in September, 1976 using suckers of uniform age and size possessing 15 to 20 leaves. The design of the experiment was split plot with 18 treatments and seven replications in which method of planting was taken as the main plot factor and spacing as subplot factor. The treatments were as follows

Spacing between plants, rows and trenches (cm)	Density of population/ha	
	Two row bed P ₁	Three row bed P ₂
S ₁ 30 x 60 x 90	44,444	47,619
S ₂ 25 x 60 x 90	53,333	57,142
S ₃ 30 x 45 x 90	49,383	55,555
S ₄ 25 x 45 x 90	59,259	66,666
S ₅ 30 x 45 x 105	44,444	51,282
S ₆ 25 x 45 x 105	53,333	61,538
S ₇ 30 x 60 x 105	40,404	44,444
S ₈ 25 x 60 x 105	48,484	44,444
S ₉ 45 x 60 x 180	18,518	22,222
(Control—Local practice)		

The suckers were planted in trenches of 45 cm depth and were grown under rainfed conditions. To induce high and uniform flowering growth regulator comprising of the combination of 25 ppm Ethrel, 2% urea and 0.04% calcium carbonate was applied when the plants were 16 month old in plant crop season.

Observation on leaf production per plant, percentage of flowering, fruit weight with and without crown, crown weight and L/B ratio of the fruit were recorded. The per hectare yield and cost benefit ratio of treatments for two row system of planting were also computed.

Results and Discussion

The data on growth, flowering and yield characteristics (Table 1) revealed that differences in plants vigour as expressed by the number of leaves per plant were not significant. These findings are in agreement with those of Chadha *et al.* (1973) and Balakrishnan *et al.* (1978). In respect of percentage of flowering also, the treatment differences were not significant. Chadha *et al.* (1973) have also reported similar results.

The data on yield characters such as per plant fruit weight with and without crown also revealed that the treatment differences were not significant for the population densities tried. The computed figures on cost-benefit analysis pertaining to different treatments for two row system of planting are only presented in Table 2 since three row system was found to be unmanageable for the adoption of agronomical and manurial practices. Since fruits are marketed with crown, cost-benefit analysis without crown was also not done. The data indicated that treatments P_1S_7 (40,404 suckers/ha) P_1S_6 (53,333 suckers/ha) and P_1S_8 (48,484 suckers/ha) were superior having yielded satisfactory cost-benefit ratios. Pineapple is a crop which is ratooned for 2 more harvests and hence, spacing in all directions is an important factor for easiness in the adoption of agronomic practices. The cost-benefit analysis data of P_1S_7 and P_1S_8 were superior. Therefore, from the point of view of the high yield and easiness in adopting management practices, a population density of 48,484 suckers/ha providing spacings of 25 cm between plants, 60 cm between rows and 105 cm between trenches (two row system) would be ideal for pineapple under Kerala conditions.

Summary

Studies on growth and yield of pineapple variety 'Kew' as influenced by planting densities were conducted at the Pineapple Research Centre, Kerala Agricultural University, Vellanikkara, Trichur during 1976-78 years. Based on cost benefit analysis it was found that a population density of 48,484 suckers/ha, with a spacing of 25 cm between plants, 60 cm between rows and 105 cm between trenches was the best for pineapple under Kerala conditions. This population density recorded a yield of 62.54 tons with crown and 50.91 tons without

Table 1
Growth and yield characteristics in plant crop season in different planting densities

Treatments	Leaf product- ion per plant	Percentage of flower- ing	Average fruit weight with crown (kg)	Average fruit weight without crown (kg)	Average weight of crowns (kg)	L/B ratio of fruits
P ₁ S ₁	35.63	94.00	1.30	1.04	0.27	1.15
P ₁ S ₂	36.20	85.24	1.24	0.93	0.31	1.09
P ₁ S ₃	33.77	89.05	1.31	1.00	0.25	1.10
P ₁ S ₄	36.93	87.60	1.32	1.03	0.26	1.12
P ₁ S ₅	38.27	83.86	1.22	0.93	0.29	1.12
P ₁ S ₆	34.48	83.70	1.32	1.04	0.27	1.14
P ₁ S ₇	37.24	85.60	1.37	1.10	0.27	1.13
P ₁ S ₈	35.68	96.13	1.29	1.05	0.23	1.15
P ₁ S ₉	36.97	88.90	1.22	0.97	0.24	1.10
P ₂ S ₁	34.21	84.44	1.22	0.95	0.26	1.13
P ₂ S ₂	32.39	86.90	1.25	1.01	0.24	1.11
P ₂ S ₃	35.84	88.70	1.28	0.90	0.25	1.09
P ₂ S ₄	35.75	81.73	1.20	0.96	0.25	1.12
P ₂ S ₅	31.03	83.50	1.25	1.03	0.24	1.14
P ₂ S ₆	31.27	83.71	1.29	1.03	0.25	1.16
P ₂ S ₇	35.56	83.00	1.22	0.97	0.26	1.12
P ₂ S ₈	32.60	84.81	1.20	0.90	0.26	1.11
P ₂ S ₉	35.85	93.90	1.08	0.86	0.22	1.08
Significance	NS	NS	NS	NS	NS	NS

crown as against a yield of 22.59 tons of fruits/ha from the system of cultivation now in vogue involving spacings of 45 cm between plants, 60 cm between rows and 180 cm between trenches accommodating a plant population of 18518 suckers/ha.

സംഗ്രഹം

കേരള കാർഷിക സർവകലാശാലയുടെ ആഭിമുഖ്യത്തിൽ വെള്ളാനിക്കര കൈതച്ചക്ക ഗവേഷണ കേന്ദ്രത്തിൽ ഉൽപാദനക്ഷമത, മുടക്കുചിലവ്, ലാഭവിഹിത വിശ്ലേഷണം എന്നിവ അടിസ്ഥാനമാക്കി കൈതച്ചക്കയ്ക്ക് ഒരു ഹെക്ടറിൽ ഉപയുക്തമാവുന്ന സംഖ്യാസാന്ദ്രതയെക്കുറിച്ച് ഒരു പുനർപഠനം 1976-78-ൽ നടത്തുകയുണ്ടായി. ഉൽപാദനക്ഷമത, ചിലവ്, ലാഭവിഹിത വിശ്ലേഷണം എന്നിവ പരിഗണിച്ച് ഹെക്ടറിന് 48,484 ചെടികൾ ഉൾക്കൊള്ളുന്ന സംഖ്യാസാന്ദ്രത ഉത്തമമാണെന്ന് കണ്ടു. കർഷകരുടെ നാടൻ കൃഷി

Table 2. Cost benefit analysis

Details	Local Practice P ₁ S ₉ (18,518)	P ₁ S ₈ (48,484)	P ₁ S ₇ (40,404)	P ₁ S ₆ (53,333)	P ₁ S ₅ (44,444)	P ₁ S ₄ (59,259)	P ₁ S ₃ (49,383)	P ₁ S ₂ (53,333)	P ₁ S ₁ (44,444)
1 Additional expenditure for in Rs.									
a) Suckers									
b) Fertilizers		5761.90	4145.73	7339.00	5601.40	8564.20	6589.00	7339.00	5601.40
c) Growth regulator									
2 a) Yield of fruits with crown in ton/ha	22.59	62.54	55.35	70.40	54.22	78.22	64.69	66.13	57.78
b) Extra yield obtained in tons/ha		39.95	32.76	47.81	31.63	55.63	42.10	43.54	35.19
c) Cost in Rs. for extra yield @ Rs. 600/ton	23970.00	19656.00	28686.00	18978.00	33378.00	25260.00	26124.00	21114.00	
3 a) Yield of suckers for harvesting	9259	24242	20202	26666	22222	29629	24691	26666	22222
b) Extra yield of suckers		14983	10943	17407	12963	20370	15432	17407	12963
c) Cost in Rs. for extra yield of suckers @ Rs. 18/-		2696.94	1969.74	3133.26	2333.34	3666.60	2777.76	3133.26	2333.34
4 Extra receipt (Total)	26666.94	21625.75	31819.26	21311.34	37044.60	28037.76	29257.26	23447.34	
5 Cost benefit ratio	1:4.63	1:5.22	1:4.34	1:3.81	1:4.3	1:4.26	1:3.99	1:4.19	

രീതിമൂലം ഹെക്ടറിന് 22,59 ടൺ മാത്രം വിളവ് ലഭിക്കുമ്പോൾ ചെടികൾ തമ്മിൽ 25 സെന്റിമീറ്ററും, വരികൾ തമ്മിൽ 60 സെന്റിമീറ്ററും കിടങ്ങുകൾ തമ്മിൽ 105 സെന്റിമീറ്ററും അകലത്തിൽ നട്ട് 48,484 ചെടികളെ ഒരു ഹെക്ടറിൽ ഉൾക്കൊള്ളിച്ചപ്പോൾ 62.54 ടൺ വിളവ് ലഭിക്കുകയുണ്ടായി.

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