

Nutritional studies in kinnow

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Abstract

The study on "Nutritional studies conducted in Kinnow" at Agriculture Research Station, Sri Ganganagar during 1993-1997 revealed that the nitrogen doses at 60g, 120g, 180g, 300g and 500g from 1st, 2nd, 3rd, 4th and 5th year, respectively in three split doses in February, April and August-September gave significantly better effect on the growth parameters viz., plant height, plant spread, root stock and scion growth and quality parameters of Kinnow fruit as compared to state recommendation.

Key words : Growth parameters, nitrogen levels, nutritional

Introduction

Kinnow (*Citrus nobilis* x *Citrus deliciosa*) is a highly preferred mandarin hybrid in Northern India for its precocity in bearing and good quality juice. Sri Ganganagar district of North Western Rajasthan is one of the potentially rich area for Kinnow cultivation in arid irrigated canal region. Previously, no nutritional study was undertaken for Kinnow crop in the region. The present study was therefore undertaken at Agriculture Research Station (Rajasthan Agriculture University), Sri Ganganagar (Rajasthan) on a newly established Kinnow orchard during 1992 to determine the effect of nitrogen levels on single tree basis in Kinnow for first five years.

Materials and methods

An experiment on "Nutritional trial in Kinnow plants budded on Jatti Khatti (*Citrus jambhiri*) at a pre bearing stage was laid out in square system and the planting distance was 6 x 6 m. The doses of nitrogen applied were 30g, 60g, 90g in the first year; 60g, 120g, 180g in the second year; 90g, 180g, 270g in the third year; 150g, 300g, 450g in the 4th year and 250g, 500g, 750g in the 5th year on a single tree basis. In the first set, nitrogen was given in two splits i.e. ½ in February + ½ in April while in other set 1/3rd was given in February + 1/3rd in April + 1/3rd in August. Four replications and four trees per replications were taken for

study. The experimental soil was analyzed for its physico-chemical characteristics up to the depth of 1.5 m and the profile soil samples were taken at a depth interval of 0-15, 15-30, 30-60, 60-90, 90-120 and 120-150 cm at four sites in trial. These samples were analyzed for pH, organic carbon and calcium carbonate. The pH, organic carbon and calcium carbonate varied from 8.20 to 8.35, 0.08 to 0.36% and 2.00 to 5.50%. For recording physico-chemical characteristics four fruits per tree were taken from all the four directions of the tree. The experiment was laid out in randomised block design.

Observations were recorded for cumulative plant growth, rootstock and scion girth, number of fruits per tree, fruit weight, fruit size, juice percentage, rag percentage, total soluble solids and titratable acidity of juice. The per cent acidity was determined by titrating the juice against 0.1 N NaOH using phenolphthalein as indicator and has been expressed in terms of citric acid (A.O.A.C., 1970).

Results and discussion

The data pertaining to effect of different levels of nitrogen on cumulative growth parameters of Kinnow mandarin in the first five years of growth in the prebearing stage are presented in Table 1. The results clearly indicated that application of different nitrogen doses (N_3 to N_7) caused a marked increase in the plant height as compared to state recommendation. Likewise, plant spread (East-West) and (North-South) was also statistically significant in N_6 and N_7 levels, respectively. The rootstock girth of N_2 to N_7 levels and scion girth of N_3 to N_7 was also found statistically significant as compared to recommendation made by the state. In general, tree girth came to be a better

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index of plant growth. Similar findings were confirmed by Katyal (1977) who reported that application of N at 200 to 600 g/plant caused a marked increase in growth of mandarin trees in Darjeeling district.

The data on effect of different levels of nitrogen on the quantity and quality parameters of Kinnow fruits during first three years of fruiting are given in Table 2. Maximum number of fruits per tree were found statistically significant from N₃ (183.6) to N₇ (247.6) levels against state recommendation. These results are in close conformity to

Table 1. Effect of different levels of nitrogen on the cumulative growth parameters of Citrus deliciosa during Pre-bearing Stage

Nitrogen Levels	Plant Height (cm)	Plant Spread (E-W) (cm)	(N-S) (cm)	Rootstock Girth (cm)	Scion Girth (cm)
Control	273.3	260.7	261.7	43.5	38.1
N ₁ *	293.0	309.0	283.7	44.3	41.2
N ₂	294.0	290.3	290.0	45.0	40.7
N ₃	307.7	308.0	286.3	47.0	43.6
N ₄	317.3	309.3	306.0	47.5	44.3
N ₅	287.3	301.7	300.7	48.1	43.6
N ₆	311.7	321.7	315.3	49.0	46.1
N ₇	312.7	322.3	314.3	49.2	46.2
CD(5%)	8.9	11.9	9.2	1.1	0.9

the findings of Singh and Aggarwal (1960) who reported that in trials at Butwal, Nagpur and Srinagar with hill cultivars of mandarin improved fruit yield by nitrogen levels.

Average fruit weight was observed to be statistically

Table-2. Effect of Different Levels of Nitrogen on the Quality Parameters of Fruits of Citrus deliciosa in the three years of fruiting (1995-1997)

Nitrogen Levels	Average no. of Fruits/tree	Average Fruits Weight (g)	Fruits Length (cm)	Fruits Diameter (cm)	Per cent Juice	Per cent Rag	TSS (°Brix)	Per cent Acidity
N ₀ (Control)	112.7	115.7	6.18	7.09	48.37	51.6	12.37	1.14
*N ₁	158.3	143.0	6.26	7.21	48.29	50.7	12.83	1.21
N ₂	151.0	142.0	6.24	7.13	47.68	52.3	12.73	1.17
N ₃	183.6	163.7	6.38	7.37	44.40	55.6	12.33	1.07
N ₄	183.0	166.3	6.40	7.39	39.20	60.8	12.97	1.10
N ₅	191.3	149.3	6.24	7.25	49.75	50.2	13.20	1.16
N ₆	244.0	153.3	6.36	7.39	49.40	50.6	13.36	1.19
N ₇	247.6	151.7	6.36	7.37	46.00	54.0	12.83	1.14
CD (5%)	12.3	6.8	0.08	NS	1.19	0.95	0.06	NS

*N₁ = State Recommendation

the N₁ level (state recommendation) to minimum (1.07%) in the N₃ level which shows that the percentage acidity was found maximum with the state recommendation and minimum with the N₃ level of two split doses.

References

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significant in N₃, N₄, N₅ and N₆ levels of nitrogen compared to state recommendation which might be due to the fact that flower production and initial fruit set was highest in N₃ treatment but fruit weight remained maximum with N₄ level (166.3g). These results are in accordance with the findings of Carranca *et al.* (1992) who reported that flower production and initial fruit set in mandarins were the highest with the highest level of N but total fruit weight was maximum with medium nitrogen level.

The Kinnow fruit length was found to be statistically higher with higher nitrogen levels (i.e. from N₃ to N₇) as compared to state recommendation. Per cent juice content was found maximum and statistically significant (49.75%) in the N₅ treatment i.e. low nitrogen application favours high juice content. Similar findings were reported by Carranca *et al.* (1992) who reported an increased juice content with low nitrogen.

Rag percentage was found minimum (50.2%) in the N₅ treatment i.e. low doses of nitrogen favours to reduce rag percentage whereas at higher doses i.e. N₄ and N₇, the rag percentages are comparatively higher.

The total soluble solids was found statistically significant from N₁ to N₇ levels being maximum (13.36° brix) in the N₆ level i.e. three split doses of 60, 120, 180, 300 and 500g from 1993 to 1997 gave better on results. Likewise, Singh and Aggarwal (1960) in trials at Butwal, Nagpur and Srinagar with hill cultivars of mandarin showed that fruit quality improved by N levels.

The titratable acidity varied from maximum (1.21%) in

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