

IMPACT OF PRUNING INTENSITY AND NUTRIENTS ON GROWTH, YIELD AND QUALITY ATTRIBUTES OF BER (*ZIZIPHUS MAURITIANA* LAMK.) CV. THAI APPLE

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ABSTRACT

The investigation was carried out to study the impact of pruning intensity and nutrients on growth, yield and quality attributes of ber (*Ziziphus mauritiana* Lamk.) cv. Thai Apple, with 10 treatments replicated thrice under Factorial Randomized Block Design (FRBD) during 2023-24. The treatments investigated the effects of varying pruning intensities (40% and 60%) combined with nutrient application, including nano urea @ 0.5% and 1.0%, calcium chloride @ 0.5% and 1.0%, and water as a control. The treatment P₁F₂ (40% pruning + nano urea @ 1.0%) demonstrated the most significant increase in vegetative growth, showing such as a maximum plant height (4.325 m), plant spread (4.113 m), leaf length (8.22 cm), leaf width (4.89 cm), leaf area index (42.22 cm²) and minimum days taken to sprouting (20.90 days). This treatment also led to the highest fruit retention rate (33.03%) lowest fruit drop rate (41.53%) and highest fruit yield (51.02 kg/plant). Additionally, treatment P₁F₂ was superior in physical parameters viz. highest polar diameter (50.72 mm), equatorial diameter (40.29 mm), fruit weight (50.52 g), and pulp: stone ratio (10.26%). Conversely, the treatment P₁F₄ (40% pruning + calcium chloride @ 1.0%) was found to be superior in quality attributes, viz. highest TSS (14.03 °Brix), lowest titratable acidity (0.25%), maximum ascorbic acid (24.16 mg/100g fruit pulp), and the highest levels of total sugars (8.94%) and reducing sugars (5.86%), respectively. The study provides valuable insights into optimizing ber fruit growth, yield, and quality through targeted pruning and nutrient management practices.

KEYWORDS: Pruning intensity, nutrients, growth, yield, quality and ber etc.

INTRODUCTION

Ber (*Ziziphus mauritiana* Lamk.), is a deciduous tree that belongs to the family Rhamnaceae. Originating in South Asia, this fruit-bearing tree has spread its roots across various continents, adapting to diverse climates. The botanical characteristics of the ber tree make it a fascinating subject for study, encompassing aspects of morphology, reproduction, and adaptability (Singh and Singh, 2023). Macdonell and Keith (1958) noted the mention of ber in Vedic sources such as the Yajurveda. The ber tree is characterized by a medium to large size, typically reaching heights between 5 to 12 meters. Its rounded or spreading crown provides ample space for the growth of leaves, flowers, and fruits. The trunk, covered in smooth, grey bark, serves as the primary support structure for the extensive branching system. The glossy green leaves of the ber tree are alternately arranged, showcasing an ovate shape with serrated margins. These leaves play a crucial role in photosynthesis and contribute to the overall aesthetic appeal of the tree. Ber trees produce small, fragrant flowers that bloom in clusters. The flowers are typically hermaphroditic, possessing both male and female reproductive organs (Bal, J.S., 2006). The ber grows well under varying climatic conditions from mean sea level to an elevation of 1000m (Singh *et al.*, 2023). Although it produces best below 600m, it can be grown to altitudes up to 1500m. Low temperatures and frost cause damage to young twigs and developing fruits, resulting in considerable crop loss and a decline in tree growth. Natural groves of ber grow and produce well in subtropical and tropical regions receiving over 400mm annual rainfall. Ber fruit is small to medium sized, round or oval, typically measuring around 2-3 centimeters in diameter. It has thin, edible skin that ranges in color from yellow to pale green, and its flesh is sweet and juicy. The taste of ber can be described as a delightful blend of sweetness and tanginess, making it a favorite among many fruit enthusiasts. The fruit contains a single, hard stone-like seed within it. The fruit is a good source of vitamins A and C, essential minerals, and dietary fiber, making it a valuable component of a healthy diet. Ber fruit contains 0.80 g protein, 25.6 mg calcium, 26.8 mg phosphorus, 0.76-1.8 mg iron, 0.021 mg carotene, 0.02- 0.024 mg thiamine, 0.02-0.038 mg riboflavin, 0.70-0.873 mg niacin, 0.2-1.1 mg citric acid, 65.8-76 mg ascorbic acid, 0.1-0.2 mg fluoride, 2.2-3.4% dry basis pectin (Chattopadhyay, T.K., 2020).

The cultivar “Thai Apple” developed in Thailand is making significant changes in the lives of farmers owing to its profuse bearing, high yielder, fruit color, quick return, and size of the fruits. This hybrid is a cross between

Green Apple and Jujube. Its name signifies the size and appearance of the green apple fruit, which is why it is named 'Green Apple' or 'Thai Apple'. Thai Apple fruits are sweet, crispy, juicy and delicious similar to apples (Mansuri *et al.*, 2022). Pruning is a crucial horticultural practice that plays a vital role in maintaining plant health, shape and productivity. When it comes to the pruning of ber trees, careful and strategic pruning techniques can greatly benefit the overall growth and development of the tree. Pruning for trees involves the selective removal of specific branches and foliage to achieve desired outcomes such as improved fruit production, shape control, enhanced airflow, light penetration and overall tree vigor. Pruning is necessary for ber to maintain the fruit trees productivity and improve the quality of fruits. The productivity of the tree is thus maintained because about 98% of the fruit produced on any pruned branches are borne on vigorous shoots and only 2% on the other shoots (Mathangi and Maran, 2020). Growth of the shoots was faster in pruned trees than in un-pruned trees. Pruning treatment decreased the number of shoots. Awasthi and Mishra (1969) found a decreased number of new sprouts as severity increased by pruning branches from 40 to 60 cm in height. Dhaliwal and Sandhu (1982) reported that not much difference was noted in the rate of shoot growth due to different pruning treatments. The un-pruned tree produces more leaves but the leaf area was more under 25 cm pruning treatment. Dev *et al.* (2017) reported that there were no significant differences in the numbers of the new branches that emerged from the cut end. Nutrients like nano urea a nanotechnology based revolutionary agricultural input that provides nitrogen to plants. When compared to conventional urea prill, it has a desirable particle size of about 20-50 nm and more surface area (10,000 times over 1 mm urea prill) and several particles (55,000 nitrogen particles over 1 mm urea prill) (Meena *et al.*, 2022). IFFCO nano urea (liquid) is the world's first nano fertilizer, notified by the Fertilizer Control Order (FCO, 1985), Government of India. Nano urea contains 4% total nitrogen (w/v). Its application to crops as foliar fertilization enhances crop productivity to the tune of 8% with commensurate benefits in terms of better soil, air, water and farmer's profitability (<https://nanourea.in>). Calcium is a nutritional element that differs from others by being imported into fleshy fruit only in small amounts, much less than into leaves. Although Ca is sufficiently available in most orchards' soil due to its immobility within plant cells. Ca deficiency may become a problem in several fruits causing large economic losses. Foliar applications of calcium imply absorption by the fruit. To be effective, foliar applications must be followed several times during the fruit growth and development phenological stages (Bandari *et al.*, 2018).

MATERIALS AND METHODS

The experiment was conducted at the Instructional Farm, Department of Fruit Science, College of Horticulture, Banda University of Agriculture and Technology, Banda (between latitude 24° 53' and 25° 55'N and longitudes 80° 07' and 81° 34' E and has an altitude of 214.96 meters from sea level) during the year 2023-24. Five year old uniform ber cv. Thai Apple trees with spacing 6 m × 6 m were selected for the experiment. Uniform sized fruits free from bruises, mechanical damage, and insect/pest attack were chosen. The experiment was laid out in Factorial Randomized Block Design (FRBD) with three replications and ten treatments.

The pruning time was the same for all the plants 2nd week of June. Trees were pruned on two pruning intensities 40% (P₁) and 60% (P₂) of secondary branch growth (Nikumbhe *et al.*, 2023). Foliar applications of nutrients were as follows: nano urea @0.5% (F₁), nano urea @1.0% (F₂), calcium chloride @0.5% (F₃), calcium chloride @1% (F₄) and water control (F₅) application. Nutrient application was done after 60 days of pruning. Treatment combinations viz. P₁F₁ (40% pruning + nano urea @ 0.5%), P₁F₂ (40% pruning + nano urea @ 1.0%), P₁F₃ (40% pruning + calcium chloride @ 0.5%), P₁F₄ (40% pruning + calcium chloride @1.0%), P₁F₅ (40% pruning + water), P₂F₁ (60% pruning + nano urea @ 0.5%), P₂F₂ (60% pruning+ nano urea @ 1.0%), P₂F₃ (60% pruning + calcium chloride @0.5%), P₂F₄ (60% pruning + calcium chloride @1.0%) and P₂F₅ (60% pruning + water). The observations were recorded on five randomly selected plants from each treatment on growth and yield attributes like plant height (m) days taken to first sprouting, plant spread (m) (N-S & E-W), leaf length (cm), leaf width (cm), leaf area index (cm²), initial fruit set (%), fruit drop (%), fruit retention (%), fruit yield/plant (kg), polar diameter (mm), equatorial diameter (mm), fruit weight (g), fruit volume (cc), stone length (mm), stone width (mm), stone weight (g), pulp weight (g), pulp: stone ratio (%). While the quality parameters like TSS (°Brix), titratable acidity (%), TSS: Acid ratio (%), ascorbic acid (mg/100g fruit pulp), total sugars (%), reducing sugars (%), non-reducing sugars (%) and shelf life study are physical loss in weight (PLW) (%) on the 5th day, and 10th day reported by Gupta and Gill, 2015 in ber and Shashi *et al.* (2022) in ber.

The TSS was recorded using Erma Hand Refractometer (range 0-32 °Brix). Titratable acidity was determined by using standard method of Ranganna, S. (1986). Ascorbic acid was determined by using 2, 6-dichlorophenol-indophenol dye method (Freed, 1966). Total sugars content of the fruits were determined by the method described by Dubois *et al.* (1956) and Estimation of reducing sugar by Nelson (1944). The data recorded during the course of investigation were subjected to the statistical analysis as described by Panse and Sukhatne (1985). It determined the critical difference and standard error of the difference in mean (SEd) between the treatments at a 5% level of significance.

RESULTS AND DISCUSSION

The data presented in the Table 1 and Fig. 1 revealed that the growth characters viz. maximum plant height (4.29 m) was observed in treatment P₁F₂ and minimum plant height (3.62 m) recorded in treatment P₂F₅. Similar

results were observed by Mandal *et al.* (2009). Days taken to first sprouting were significantly affected by pruning intensity. P₁ showed early sprouting (20.69 days) than P₂ (22.21 days). Pruning intensity and nutrients also significantly affect the plant spread. The maximum plant spread (4.11 m) was recorded in treatment P₁F₂ and the minimum plant spread (3.27 m) was recorded in treatment P₁F₂. Similar results were observed by Jareda *et al.* (2024). Leaf length, leaf width, and leaf area index were not significantly affected by pruning intensity and nutrients. Maximum leaf length (8.22 cm), leaf width (4.89 cm) and leaf area index (4.89 cm²) were recorded in treatment P₁F₂ while, minimum leaf length (7.11 cm), leaf width (3.72 cm) and leaf area index (26.46 cm²) were seen in treatment P₂F₅. Similar results were observed by Mandal *et al.* (2009). Both pruning intensity and nutrients significantly affected the initial fruit set, fruit drop and fruit retention. The maximum initial fruit set (74.57%), minimum fruit drop (41.53%) and maximum fruit retention (33.03%) were seen in treatment P₁F₂, whereas the minimum initial fruit set (67.76%), fruit drop (45.64%) and fruit retention (22.19%) were recorded in treatment P₂F₅. Similar results were observed by Patel *et al.* (2023).

The yield attributes viz. maximum fruit yield/plant (51.02 kg) were observed in treatment P₁F₂ whereas, the minimum fruit yield/plant (40.53 kg) were recorded in treatment P₂F₅. Similar results were observed by Patel *et al.* (2023). Both pruning intensity and nutrients significantly affected the polar diameter and equatorial diameter. Maximum polar diameter (50.72 mm) and equatorial diameter (40.29 mm) were seen in treatment P₁F₂ while, minimum polar diameter (32.39 mm) and equatorial diameter (26.46 mm) were recorded in treatment P₂F₅. Similar results were observed by Patel *et al.* (2023). Pruning intensity and nutrients significantly influenced the fruit weight (g). Maximum fruit weight (50.52 g) and fruit volume (51.33 cc) was observed in treatment P₁F₂ while minimum fruit weight (34.49 g) and fruit volume (35.51 cc) observed in treatment P₂F₅. Similar results were observed by Patel *et al.* (2023) and Kumar *et al.* (2016). The stone length was not significantly affected by pruning intensity and nutrients. The maximum stone length (28.74 mm) and stone width (12.52 mm) was recorded in treatment P₂F₅ and the minimum stone length (23.35 mm) and stone width (10.16 mm) was recorded in treatment P₁F₂. Pruning intensity and nutrients significantly influenced the stone weight (g). Maximum stone weight (2.99 g) was observed in treatment P₂F₅ and minimum stone weight (2.52 g) was seen in treatment P₁F₂. The pulp weight and pulp: stone ratio was found significantly affected by pruning and nutrients. However, the highest pulp weight (47.99 g) and pulp: stone ratio (19.04%) were noted with treatment P₁F₂. Whereas, the lowest pulp weight (31.49 g) and pulp: stone ratio (10.51%) were measured with treatment P₂F₅.

Total soluble solids and titratable acidity have been enhanced significantly by pruning and nutrients. The maximum TSS (14.03 °Brix) was recorded in treatment P₁F₄ and the minimum TSS (9.20 °Brix) was recorded in treatment P₂F₅. While, maximum titratable acidity (0.53%) was observed in treatment P₂F₅ and minimum titratable acidity (0.25%) was seen in treatment P₁F₄. Similar results were seen by Saritha *et al.* (2021) and Kumar *et al.* (2016). Pruning intensity and nutrients significantly affected the TSS: acid ratio and ascorbic acid. Where maximum TSS: acid ratio (56.99%) was observed in treatment P₁F₄ and minimum TSS: acid ratio (16.92%) was seen in treatment P₂F₅. While, highest ascorbic acid (47.5 3mg/100g fruit pulp) was recorded in treatment P₂F₅ and the lowest ascorbic acid (24.16 mg/100g fruit pulp) was recorded in P₁F₄. Similar results were seen by Saritha *et al.* (2021). Pruning intensity and nutrients significantly affected the total sugars, reducing sugar and non-reducing sugar. The maximum total sugars (8.94%) were observed with treatment P₁F₄. Conversely, the treatment P₂F₅ resulted in the minimum total sugars (5.80%). While, maximum reducing sugars (5.86%) and non-reducing sugars (3.06%) was observed with treatment P₁F₄. Conversely, the P₂F₅ resulted in the minimum reducing sugars (3.94%) and non-reducing sugars (1.85%). Similar results were seen by Saritha *et al.* (2021), Baloda *et al.* (2019) and Patel *et al.* (2023) in ber. Physiological loss in weight on the 5th day were not significantly influenced by pruning but was affected significantly by the nutrients. The treatment P₁F₄ recorded minimum physiological loss in weight (17.35%) while the highest physiological loss in weight (26.62%) was recorded in treatment P₁F₅. Whereas, on the 10th day minimum physiological loss in weight were observed with treatment P₁F₄ (24.70%). Conversely, the P₂F₅ resulted in a maximum physiological loss in weight (36.60%). Similar results were seen by Mathangi and Maran (2020).

CONCLUSION

The present investigation revealed that impact of pruning intensity and nutrients have a significant effect on the growth, yield and quality attributes of Thai Apple ber. On the basis of present study the treatment P₁F₂ (40% pruning + nano urea @1.0%) showed the best performance in ber concerning plant height, plant spread, polar diameter, equatorial diameter and fruit weight as well as the lowest stone length, stone width and stone weight. Treatment P₁F₄ (40% pruning + calcium chloride @1.0%) recorded highest TSS, total sugars, reducing sugar, lowest ascorbic acid and titratable acidity, so the treatment P₁F₄ (40% pruning + calcium chloride @1.0%) performed best in fruit quality attributes. Therefore, it is considered that treatment P₁F₂ (40% pruning + nano urea @1.0%) in ber fruit cultivation under the agro-climatic condition of Banda may be recommended followed by treatment P₁F₄ (40% pruning + calcium chloride @ 1.0%) to farmers and researchers.

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Table 1. Impact of pruning intensity and nutrients on vegetative growth and yield attributes of ber cv. Thai Apple

Treatment s	Plant height (m)	Days taken to first sprouting (days)	Plant spread (m)	Leaf length (cm)	Leaf width (cm)	Leaf area index (cm ²)	Initial fruit set (%)	Fruit drop (%)	Fruit retention (%)	Fruit yield/plant (kg)
Pruning (P)										
P ₁	4.053	20.69	3.801	7.41	4.30	32.31	72.49	42.92	29.60	46.30
P ₂	3.898	22.21	3.611	7.66	4.42	33.87	71.34	43.72	27.63	43.83
SEm (±)	0.007	0.083	0.008	0.07	0.08	0.79	0.078	0.073	0.065	0.071
CD (p=0.05)	0.020	0.248	0.025	0.22	NS	NS	0.234	0.219	0.194	0.214
Foliar application (F)										
F ₁	4.165	21.13	3.962	7.49	4.63	34.83	73.56	42.28	31.27	47.79
F ₂	4.235	21.15	4.017	8.54	4.88	41.08	74.25	42.11	32.14	49.03
F ₃	3.878	21.53	3.562	7.70	4.42	34.07	71.50	43.72	27.78	43.41
F ₄	3.938	21.54	3.655	7.31	4.33	31.67	71.91	43.76	28.26	44.57
F ₅	3.662	21.92	3.335	6.64	3.56	23.78	68.34	44.74	23.63	40.53
SEm (±)	0.011	0.131	0.013	0.12	0.13	1.25	0.123	0.116	0.103	0.113
CD (p=0.05)	0.032	0.393	0.039	0.36	0.39	3.74	0.369	0.346	0.307	0.338
Interaction (P x F)										
P ₁ F ₁	4.217	20.90	4.093	7.66	4.66	35.85	74.05	41.79	32.26	49.38
P ₁ F ₂	4.293	20.03	4.113	8.22	4.89	42.22	74.57	41.53	33.03	51.02
P ₁ F ₃	3.997	20.65	3.657	7.71	4.48	34.61	72.37	43.91	28.46	44.60
P ₁ F ₄	4.060	20.83	3.742	7.30	4.07	31.77	72.53	43.55	29.21	45.33
P ₁ F ₅	3.700	21.06	3.399	6.18	3.41	21.10	68.92	43.84	25.07	41.17
P ₂ F ₁	4.113	21.36	3.830	7.32	4.61	33.81	73.07	42.77	30.29	46.21
P ₂ F ₂	4.177	22.27	3.921	8.87	4.86	41.94	73.94	42.68	31.25	47.03
P ₂ F ₃	3.760	22.41	3.467	7.69	4.36	33.54	70.63	43.53	27.10	42.23
P ₂ F ₄	3.817	22.25	3.567	7.31	4.58	33.58	71.30	43.98	27.32	43.81
P ₂ F ₅	3.623	22.78	3.270	7.11	3.72	26.46	67.76	45.64	22.19	39.88
Mean	3.975	21.45	3.705	7.53	4.36	33.48	71.91	43.32	28.61	45.06
SEm (±)	0.015	0.185	0.018	0.17	0.18	1.76	0.175	0.164	0.145	0.160
CD (p=0.05)	0.046	0.555	0.055	0.51	NS	NS	NS	0.490	0.435	0.478

Table 2. Impact of pruning intensity and nutrients on physical characters of ber cv. Thai Apple

Treatments	Polar diameter (mm)	Equatorial diameter (mm)	Fruit weight (g)	Fruit volume (cc)	Stone length (mm)	Stone width (mm)	Stone weight (g)	Pulp weight (g)	Pulp: Stone ratio (%)
Pruning (P)									
P ₁	43.20	35.50	43.58	44.70	25.89	11.22	2.73	40.78	15.05
P ₂	39.50	32.13	40.28	41.20	27.37	11.71	2.83	37.45	13.28
SEm (±)	0.18	0.10	0.160	0.11	0.12	0.08	0.004	0.49	0.08
CD (p=0.05)	0.54	0.32	0.479	0.33	NS	NS	0.012	0.16	0.23
Foliar application (F)									
F ₁	46.18	37.19	46.40	47.33	25.40	10.83	2.66	43.58	16.40
F ₂	48.39	38.95	48.57	49.42	24.42	10.47	2.60	45.97	17.68
F ₃	38.26	32.23	39.20	40.54	27.95	11.92	2.86	36.33	12.68
F ₄	40.66	33.18	40.64	41.53	28.10	12.28	2.83	37.80	13.35
F ₅	33.41	27.53	34.86	35.96	27.29	12.32	2.97	31.89	10.73
SEm (±)	0.28	0.17	0.253	0.17	0.19	0.13	0.006	0.77	0.12
CD (p=0.05)	0.85	0.51	0.757	0.52	NS	NS	0.018	0.25	0.36
Interaction (P x F)									
P ₁ F ₁	48.15	38.37	48.37	50.39	24.15	10.16	2.60	45.43	17.43
P ₁ F ₂	50.72	40.29	50.52	51.33	23.35	10.26	2.52	47.99	19.04
P ₁ F ₃	39.97	34.68	41.25	42.91	27.43	11.68	2.82	38.43	13.62
P ₁ F ₄	42.74	35.58	42.54	43.69	28.71	12.50	2.79	39.74	14.20
P ₁ F ₅	34.43	28.60	35.23	36.40	25.84	12.13	2.94	32.29	10.95
P ₂ F ₁	44.20	36.02	44.43	45.46	26.65	11.11	2.71	41.72	15.37
P ₂ F ₂	46.06	37.62	46.62	47.51	25.50	10.69	2.69	43.95	16.31
P ₂ F ₃	36.56	29.78	37.14	38.16	28.48	12.16	2.91	34.23	11.73
P ₂ F ₄	38.59	30.78	38.73	39.37	27.49	12.07	2.87	35.86	12.49
P ₂ F ₅	32.39	26.46	34.49	35.51	28.74	12.52	2.99	31.49	10.51
Mean	41.38	33.81	41.93	43.07	26.63	11.52	2.78	39.11	14.16
SEm (±)	0.40	0.24	0.358	0.24	0.26	0.19	0.009	1.09	0.17
CD (p=0.05)	1.21	0.73	1.071	0.73	NS	NS	0.026	0.36	0.51

Table 3. Impact of pruning intensity and nutrients on quality attributes of ber cv. Thai Apple

Treatments	TSS (°Brix)	Titratable acidity (%)	TSS: acid ratio (%)	Ascorbic acid (mg/100g fruit pulp)	Total sugars (%)	Reducing sugars (%)	Non-reducing sugars (%)	PLW (%) on the 5 th day	PLW (%) on the 10 th day
Pruning (P)									
P ₁	12.10	0.36	36.94	35.70	7.66	5.09	2.57	21.12	29.60
P ₂	11.07	0.43	26.72	38.02	7.06	4.70	2.35	21.55	32.40
SEm (±)	0.03	0.01	1.462	0.16	0.008	0.008	0.008	0.24	0.24
CD (p=0.05)	0.08	0.029	4.377	0.50	0.024	0.020	0.02	NS	NS
Foliar application (F)									
F ₁	10.81	0.44	24.16	39.88	6.87	4.59	2.28	21.98	31.40
F ₂	11.31	0.41	27.90	36.95	7.20	4.79	2.40	21.33	33.00
F ₃	12.85	0.31	40.89	34.33	8.20	5.37	2.86	19.67	27.90
F ₄	13.48	0.29	48.33	26.87	8.59	5.63	2.95	18.24	27.20
F ₅	9.46	0.53	17.88	46.30	5.96	4.11	1.83	25.45	35.60
SEm (±)	0.04	0.015	2.311	0.26	0.013	0.013	0.013	0.390	0.39
CD (p=0.05)	0.14	0.046	6.921	0.79	0.038	0.040	0.040	1.172	1.172
Interaction (P x F)									
P ₁ F ₁	11.33	0.41	26.98	37.46	7.19	4.80	2.38	21.22	30.20

P ₁ F ₂	11.83	0.37	31.84	35.00	7.56	4.97	2.56	21.21	32.10
P ₁ F ₃	13.56	0.28	50.06	36.83	8.52	5.55	2.95	19.20	26.30
P ₁ F ₄	14.03	0.25	56.99	24.16	8.94	5.86	3.06	17.35	24.70
P ₁ F ₅	9.73	0.52	18.84	45.06	6.12	4.29	1.82	26.62	34.60
P ₂ F ₁	10.30	0.47	21.34	42.30	6.55	4.38	2.16	22.75	32.60
P ₂ F ₂	10.80	0.45	23.95	38.90	6.84	4.62	2.24	21.45	33.90
P ₂ F ₃	12.13	0.35	31.72	31.84	7.88	5.20	2.68	20.14	29.50
P ₂ F ₄	12.94	0.32	39.67	29.56	8.25	5.40	2.84	19.13	39.70
P ₂ F ₅	9.20	0.54	16.92	47.53	5.80	3.94	1.85	24.29	36.60
Mean	11.58	0.39	31.83	36.86	7.36	4.90	2.45	21.33	32.02
SEm (±)	0.06	0.022	3.269	0.37	0.018	0.019	0.018	0.550	0.550
CD (p=0.05)	0.19	NS	NS	1.12	0.053	0.050	0.050	1.657	1.657

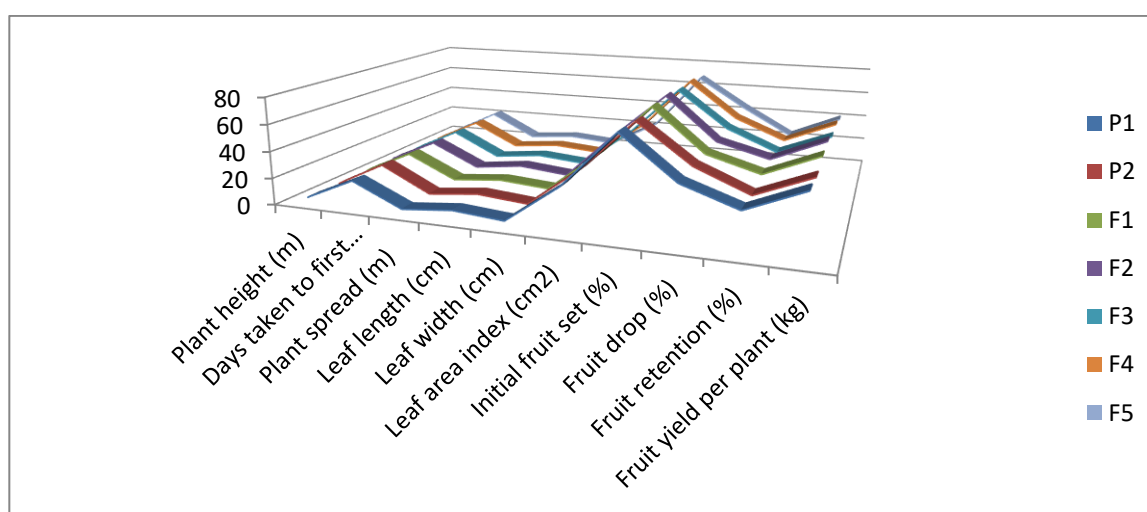


Fig. 1. Impact of pruning intensity and nutrients on vegetative growth and yield attributes of ber cv. Thai Apple

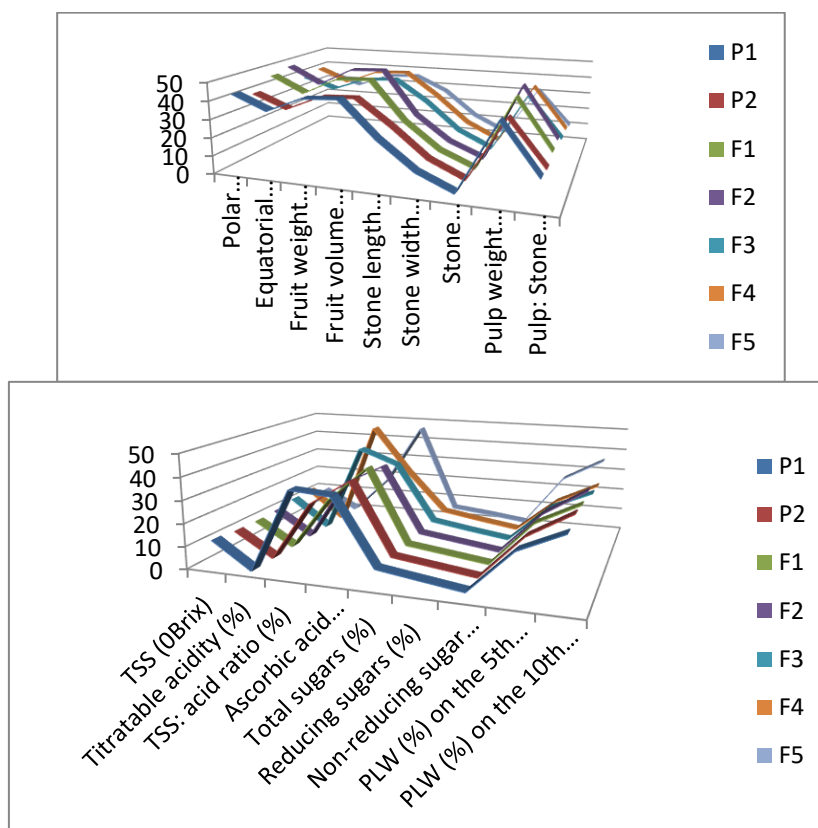


Fig. 2. Impact of pruning intensity and nutrients on physical and quality attributes of ber cv. Thai Apple