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Original Research Article

Effect of Crop Load Manipulation by Thinning and Summer Pruning on Yield and Physical Parameters in Kiwi Fruit (*Actinidia deliciosa* Chev.) cv. Hayward

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A B S T R A C T

A field explore was carried out to study about the impact of distinctive thinning and summer pruning treatments on growth, yield and quality of Kiwi fruit cv. Hayward. Among the diverse hand, chemical thinning and summer pruning treatments, the foremost critical thinning were gotten with severest concentrated (thinning to 2 blooms or fruitlets/fruiting shoot). NAA (25 and 50ppm) sprinkled at petal fall and ethephon @ 150ppm showered at two stages (full bloom and fruitlet stage) shown basic effect on fruit thinning where as summer pruning did not display any noteworthy impact on thinning. Among all treatments (T_1) thinning to 2 flowers/fruiting shoot at petal drop observed most vital leaf area and number of leaves per shoot. The overall number of fruit and yield per vine altogether diminished with the increment with the concentrated of hand thinning. Rate of grade 'A' fruit was most extraordinary in (T_1) thinning to 2 flowers/fruiting shoot. The physical characteristics fruit weight, length and diameter were basically influenced by T_1. The study revealed that (T_1) thinning to 2 flowers/fruiting shoot were the foremost great treatments for altering the crop load and to move estimate the yield and physical parameters of fruits.

Keywords

Crop load management, Thinning, Leaf area, Yield, Hayward

Introduction

Kiwifruit (*Actinidia deliciosa* Chev.) has risen as a victory story in temperate fruit developing ranges of India. It could be a incredible developing deciduous fruiting vine local to Yangtze Valley of South and Central China. All through history kiwifruit has been assigned by different names. It was known as Mihoutoa or monkey peach since wild monkeys were known to expend the ready natural product. It was moreover known as the Chinese gooseberry due to its beginning, and gooseberry due to its characteristic enhance association with the European gooseberry. The kiwi may be an image of

Modern Zealand, the put where kiwifruit got its current title, not since of any similitudes between the Kiwi winged creature and the kiwifruit (Ferguson, 3). In spite of the fact that kiwifruit originated in china its full financial potential was exploited by the Modern Zealanders. The foremost common kiwifruit cultivar developed commercially could *be A. deliciosa* 'Hayward' (Ferguson, 8). It accounts for 75% of the worldwide kiwifruit generation (Ferguson, 2) and picked up ubiquity due to its expansive natural product estimate, inside green color, tasteful appearance, prevalent enhance, and amplified capacity life that's advantageous for universal shipment and exchange (Ferguson, 9). It was chosen by Mr. Hayward Wright, a Modern Zealand nurseryman, from the 1st or 2nd era of a little seedling populace taken from the wild Adjusting crop load is another strategy of creating fruits with craved quality properties (Link, 6) as over-cropped trees deliver little, delicate fruits due to restricted carbohydrate and supplement supply (Whiting and Lang, 14). As of now, the development of kiwifruit cv. Hayward requires the improvement of technique to increase efficiency making strides fruit estimate, quality, by pollination and crop load management practices hones which are essential necessities for its commercialization.

Materials and Methods

The try was conducted within the departmental orchard of Division of Horticulture at Fruit Nursery Zangam (Pattan) which is found between 34.1980^{o} North scope and 74.3636^{o} East longitude at anormal rise of 1578 m above mean sea level. Pattan is arranged at a remove of 29 km from state capital Srinagar. The explore was conducted in a block of 11-year ancient Kiwifruit with 'Hayward', as pistillate cultivar and 'Matua', and 'Tomuri', as staminate cultivar. The vines were dispersed 6 x 5 m separated inside lines and lines were 5 m separated. Canopies were prepared on T-bar framework. The vines were flooded utilizing drip water system. All the vines were over seen beneath uniform agronomic conditions. The experiment was laid out in a randomized block design having ten hand, chemical thinning and summer pruning treatments viz., Hand thinning treatments ;T_1 = Thinning to 2 flower/fruting shoot (full bloom), T_2 = Thinning to 4 flower/fruting shoot (full bloom), T_3 = Thinning to 2 fruitlets/fruiting shoot (8 days after petal fall), T_4 = Thinning to 4 fruitlets/fruiting shoot (8 days after petal fall) Chemical thinning treatments; T_5 = Thinning with 25 ppm NAA (sprayed at petal fall), T_6 = Thinning with 50 ppm NAA (sprayed at petal fall), T_7 = Thinning with ethephon 150 ppm (sprayed at full bloom), T_8 = Thinning with ethephon 150 ppm (sprayed at fruitlet stage) and Summer pruning T_9 = Summer pruning (Pruning out the terminal part of shoot distal to the last fruit), T_{10} = Control. The treatments were replicated thrice with plot size two vines per treatment. Hand thinning was carried out by thinning blossoms and fruitlets. As it were 2 and 4 well divided, blooms and fruitlets per fruiting shoot beneath diverse treatments were held and remaining blooms and fruits were evacuated with the assistance of secateurs. For the most part, the horizontal blossoms and fruits were expelled. Bloom thinning was carried out at full bloom and fruit thinning was done eight days after petal fall. Naphthalene acetic acid (NAA) and ethephon was utilized to initiate chemical thinning. The NAA shower was done at petal drop arrange. The ethephon was specifically showered on the vine at full sprout and fruit let arrange. Spraying was performed early within the morning to dodgefast drying of the shower arrangement, due to transpiration. The fruit samples were collected when the natural products had accomplished full

development. Leaf area was measured with the assistance of LICOR-Model 3100 leaf area meter and expressed in square centimetre. Four shoots were chosen within the month of July completely different headings and the whole number of takes off was checked per shoot. The normal leaf number per shoot was calculated. Total number of fruits were tallied at the time of gather and expressed as number of number of fruits per vine. The yield of fruits was determined by weighing of fruits harvested from the vine under each treatment and average yield per vine was calculated. The yield was expressed in kilograms per vine (kg/vine). The fruits were separated into 3 grades on the basis of weight viz A >70 G, B 50-70, C<50 g. Percent average yield of different grades per vine was calculated by using the following formula (Thakur and Chandel, 13). The weight fruits per vine was measured by pan balance and average weight was expressed in grams (g). The length and diameter of fruits per vine was measured with the help of digital vernier calliper (12 x 300 mm).

Results and Discussion

The data on leaf area (cm^2), number of leaves per shoot and number of fruits per vine as impacted by distinctive crop load manipulation methods amid pooled examination are displayed in Table-1 amid Fig. 1. The investigation uncovered that amid pooled examination (T_1) Thinning to 2 flowers/fruiting shoot) watched greatest leaf area (190.91cm^2) taken after by (T_6) Thinning with 50 ppm NAA at petal drop (187.21 cm^2). The control recorded least leaf area (155.84 cm^2).The comes about uncovered that the number of leaves per shoot was essentially impacted amid pooled investigation. Amid pooled examination the most elevated number of leaves per shoot were watched in (T_6) Thinning with 50 ppm NAA at petal drop (37.32) which was at par with (T_1) Thinning to 2 flowers/fruiting shoot (36.13) and slightest was taken note in control (19.70). The comes about are in understanding with the discoveries of Mousavizadeh *et al.*, (7) who detailed that splashing with 1mgl^{-1} NAA increased leaves per plant to 4.3 compared to control (3.6 leaves per plant) and stated that it can be the incitement of leaf bud's start and development with auxins and cytokinins. The data relating to number of fruits per vine and yield per vine as impacted by distinctive crop load control procedures at gather amid pooled information is displayed in Tabl-1. All thinning treatments diminished number of fruits per vine altogether compared to untreated control amid both seasons. Amid pooled examination, greatest number of fruits per vine (575.72) was watched in control taken after by (552.92) recorded in (T_9) summer pruning. The least number of fruits per vine (349.03) was recorded in (T_1) Thinning to 2 flowers/fruiting shoot taken after by (T_3) Thinning to 2 fruitlets/fruiting shoot (378.26). These perceptions are in understanding with those of Samanci (11), who gotten crop load of 700 fruits/vine in unthinned vines and 369 fruits/vine in thinnig treatment of thinning to 2 fruits/shoot in kiwifruit cv. Hayward.

Yield was essentially influenced by severity of hand thinning as well as by chemical thinning treatments is presented in Table 2. Amid pooled examination, the most elevated fruit yield (48.88kg/vine) was recorded within the control which was measurably at standard with (T_6) Thinning with 50 ppm NAA at petal drop (44.28kg/vine) and (T_9) summer pruning (47.56 kg/vine). In any case the lowest yield was gotten within the treatment (T_1) Thinning to 2 flowers/fruiting shoot (28.56 kg/vine) taken after by (T_3) Thinning to 2 fruitlets/fruiting shoot (30.96 kg/vine). The diminish in yield taking after

an increment within the concentrated of thinning is in assention with the discoveries of Park and Park (8), who detailed that yield per vine diminished as the severity of thinning was expanded in kiwifruit.

The information on rate of grade A, B and C fruits at collect as affected by distinctive thinning treatments amid pooled investigation is displayed in Table-2 and Fig. 2. The higher rate of grade "A" grade fruits was gotten in treatment (T_1) Thinning to 2 flowers/fruiting shoot (53.63%). Least rate of grade "A" fruits was gotten in control (21.13%). The information is played demonstrates that most extreme percentage of grade B fruits (40.49%) was watched in control. The least percentage of grade B fruits was watched in (T_7) Thinning with 150 ppm ethephon at full blossom (27.29%).

Scrutiny of information uncovered that the most note worthy rate of grade C fruits (38.36%) was recorded in control that were cleared out un thinned amid pooled examination. In any case the least rate of grade "C" fruits was recorded in (T_1) Thinning to 2 flowers/fruiting shoot (15.34%). The higher generation of grade 'A' fruits taking after thinning is ascribed to the increment in fruit estimate and weight, which may well be due to translocation of more acclimatizes and metabolites to the remaining creating natural products as detailed by (Fontanazza and Preziosi, 5). Cooper and Marshall (1) too detailed that the increment within the extent of attractive grades can be credited to the expanded fruit size and weight which may be due to the increment in leaf/fruit proportion taking after thinning the kiwifruit.

Information relating to fruit weight, fruit length and diameter as impacted by diverse crop load control procedures is displayed in Table-3 and Fig. 3. Amidpooled examination, most extreme fruit weight (87.71 g) was watched in vines treated with (T_1) Thinning to 2 flowers/fruiting shoot. Least weight (69.91 g) was recorded in control.

It is obvious from Table-3, that all the treatments have critical impact on fruit length. Greatest fruit length was gotten in (T_1) Thinning to 2 flowers/fruiting shoot (7.32 cm) taken after by (T_7) Thinning with 150 ppm ethephon at full sprout and (T_3) Thinning to 2 fruitlets/fruiting shoot (7.19 and 7.12 cm), separately. Be that as it may least fruit length was recorded in control (5.65 cm). Amid 2012, the most noteworthy fruit length was watched with (T_1) Thinning to 2 flowers/fruiting shoot (7.31 cm). Least fruit length was watched in control (5.62 cm). Within the pooled investigation comparative slant was watched.

Scrutiny of the Table-3, uncovers that all the treatments had critical impact on fruit diameter across. Amid pooled examination, the greatest fruit diameter across was watched in (T_1) Thinning to 2 flowers/fruiting shoot (5.32 cm). The least fruit diameter was recorded in control (4.63 cm).

The increment in fruit length, weight and volume beneath these treatments may be due to less number of fruits per vine and higher leaf/fruit proportion which brought about within the accessibility of higher sum of photosynthates, supplements and water for the improvement of the remaining fruits after thinning.

The display discoveries are in understanding with Pescie and Strik (9) who more over detailed change in fruit weight with hand thinning. Thakur (12) has moreover reappeared a noteworthy change in fruit measure and weight in kiwi by diverse hand thinning and NAA treatments.

Table.1 Effect of crop load manipulation by thinning and summer pruning on leaf area, number of leaves/shoot and number of fruits/vine in kiwifruit cv. Hayward

Treatment No.	Treatments	Leaf area (cm^2)	Number of leaves/shoot	No of fruits /vine
		Pooled	Pooled	Pooled
T_1	Thinning to 2 flowers/fruiting shoot	190.91	36.13	349.03
T_2	Thinning to 4 flowers/fruiting shoot	172.90	31.00	453.31
T_3	Thinning to 2 fruitlets/fruiting shoot	178.155	33.10	378.26
T_4	Thinning to 4 fruitlets/fruiting shoot	170.11	27.99	470.72
T_5	Thinning with 25 ppm NAA at petal fall	175.60	32.50	508.24
T_6	Thinning with 50 ppm NAA at petal fall	187.21	37.32	474.25
T_7	Thinning with ethephon 150 ppm at full bloom	182.95	35.63	479.43
T_8	Thinning with ethephon 150 ppm at fruitlet stage	178.68	29.67	529.20
T_9	Summer pruning	168.95	23.26	552.99
T_{10}	Control	158.44	19.70	575.72
CD (P≤0.05)		1.15	1.84	1.26

Table.2 Effect of crop load manipulation by thinning and summer pruning on number of yield/vine (kg) and percent of marketable fruit in kiwifruit cv. Hayward

Treatment No.	Treatments	Yield /vine (kg)	Grade A (%)	Grade B (%)	Grade C (%)
		Pooled	Pooled	Pooled	Pooled
T_1	Thinning to 2 flowers/fruiting shoot	28.56	53.63	30.63	15.34
T_2	Thinning to 4 flowers/fruiting shoot	37.10	42.95	33.38	22.47
T_3	Thinning to 2 fruitlets/fruiting shoot	30.96	52.45	30.50	16.66
T_4	Thinning to 4 fruit lets/fruiting shoot	37.12	44.16	34.40	20.87
T_5	Thinning with 25 ppm NAA at petal fall	43.29	35.32	37.89	26.13
T_6	Thinning with 50 ppm NAA at petal fall	44.28	51.72	27.94	20.10
T_7	Thinning with ethephon 150 ppm at full bloom	38.52	52.11	27.29	20.59
T_8	Thinning with ethephon 150 ppm at fruitlet stage	43.39	32.20	31.37	35.33
T_9	Summer pruning	47.56	27.68	38.98	32.83
T_{10}	Control	48.88	21.13	40.49	38.36
CD (P≤0.05)		2.43	1.89	1.27	1.06

A= >70g, B = 70-50g, C = <50g

Table.3 Effect of crop load manipulation by thinning and summer pruning on physical characters of kiwifruit cv. Hayward

Treatment No.	Treatments	Fruit weight (g)	Fruit length (cm)	Fruit diameter (cm)
		Pooled	Pooled	Pooled
T_1	Thinning to 2 flowers/fruiting shoot	87.71	7.32	5.32
T_2	Thinning to 4 flowers/fruiting shoot	77.17	6.74	4.95
T_3	Thinning to 2 fruitlets/fruiting shoot	82.18	7.12	4.98
T_4	Thinning to 4 fruitlets/fruiting shoot	74.62	6.78	4.94
T_5	Thinning with 25 ppm NAA at petal fall	72.69	6.62	4.91
T_6	Thinning with 50 ppm NAA at petal fall	74.58	6.64	4.92
T_7	Thinning with ethephon 150 ppm at full bloom	85.67	7.19	5.18
T_8	Thinning with ethephon 150 ppm at fruitlet stage	73.92	6.23	4.77
T_9	Summer pruning	71.15	6.20	4.93
T_{10}	Control	69.91	5.62	4.63
CD ($P \leq 0.05$)		2.49	0.21	0.11

Fig.1 Effect of crop load manipulation by thinning and summer pruning on leaf area, number of leaves/shoot and number of fruits/vine in kiwifruit cv. Hayward

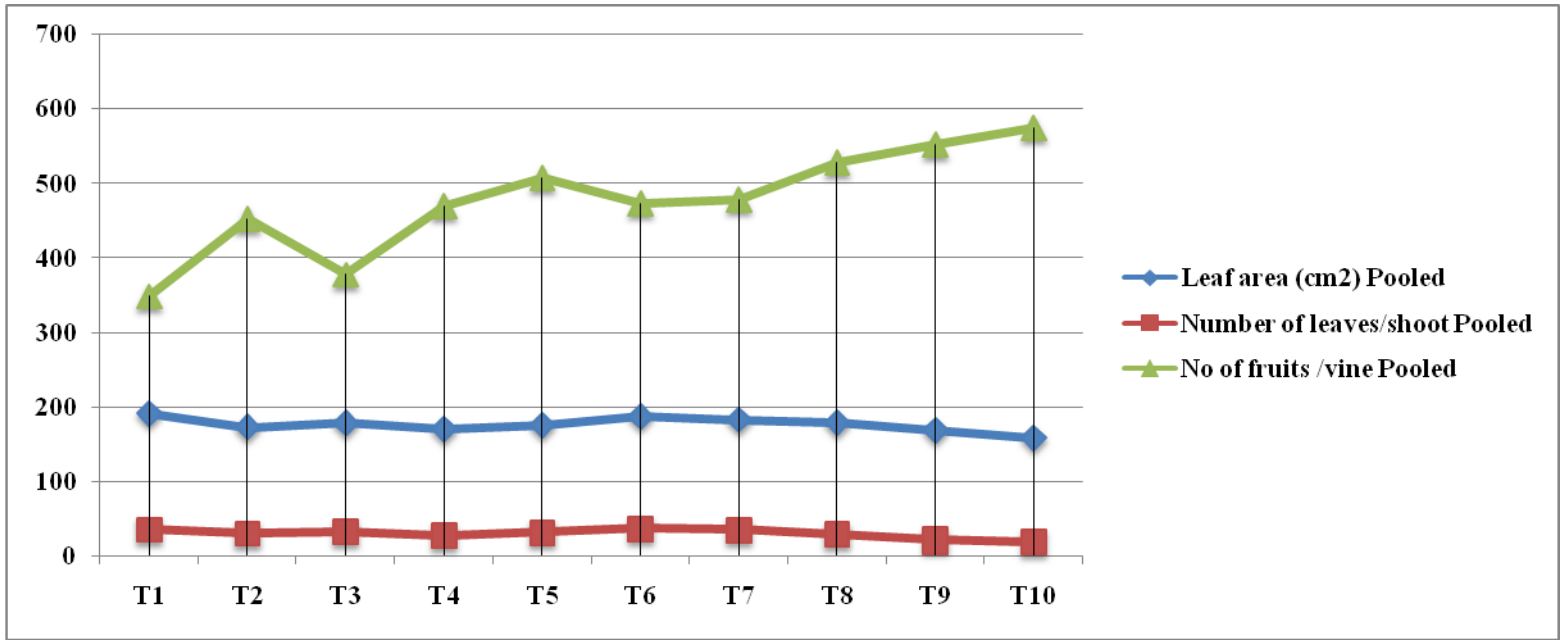


Fig.2 Effect of crop load manipulation by thinning and summer pruning on percent of marketable fruit in kiwifruit cv. Hayward

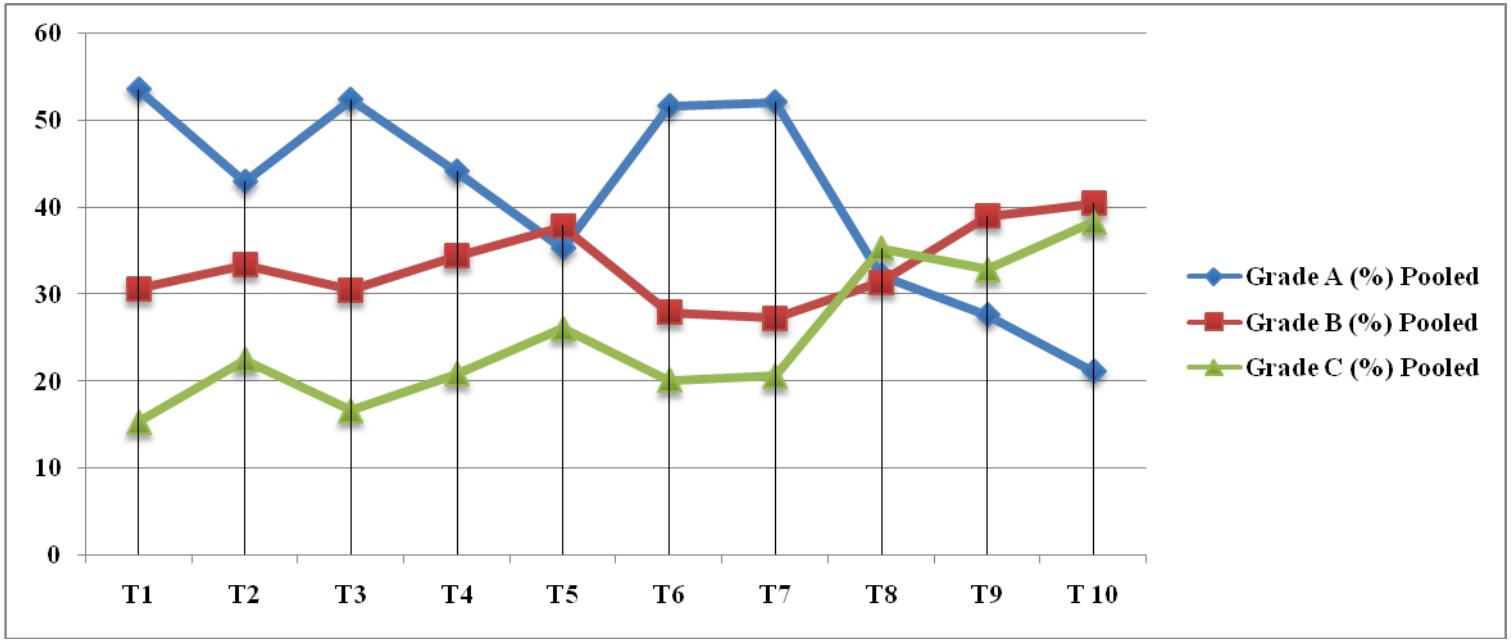
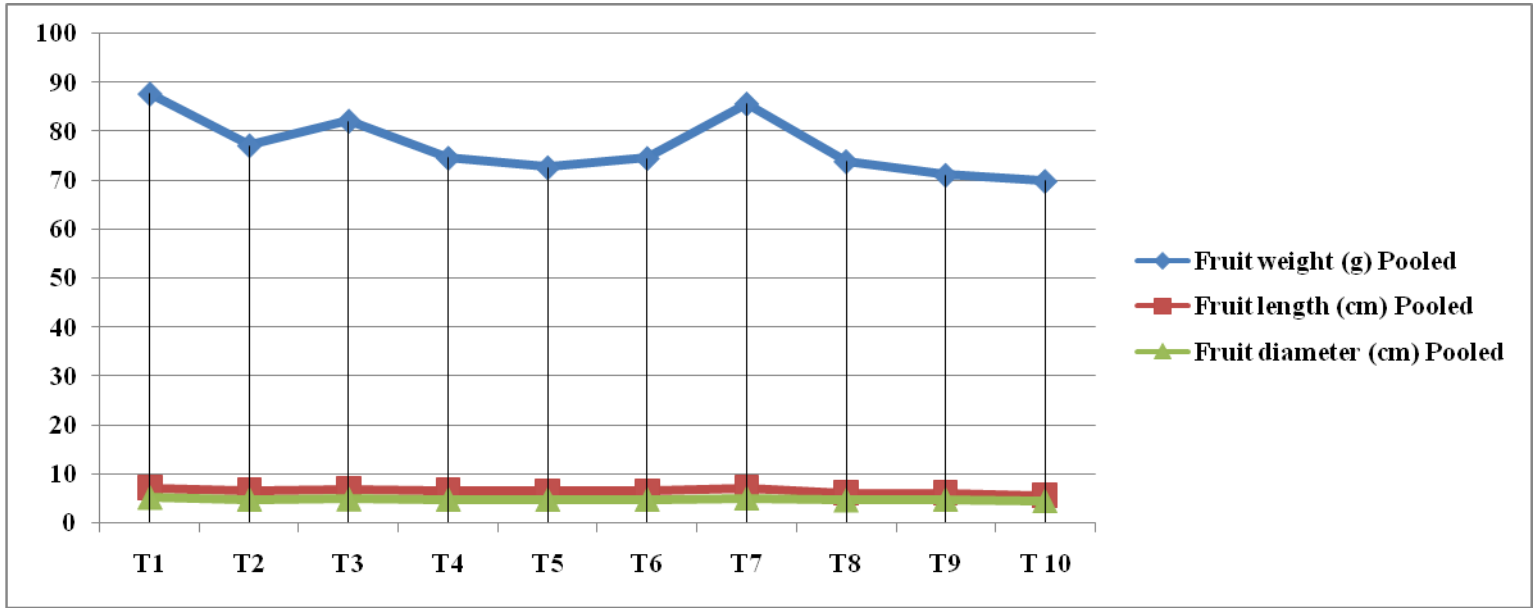


Fig.3 Effect of crop load manipulation by thinning and summer pruning on physical characters of kiwifruit cv. Hayward



Adjusting crop load by hand thinning to 2 flowers/fruiting shoot and thinning with ethephon @150 ppm showered at full bloom was superior in comparison to other hand and chemical thinning treatments because it brought about within the most extreme generation of grade 'A' fruits with good and prevalent quality. Since hand thinning may be a time expending and work seriously hone and as it were a little portion of the orchard may be best thinned at the ideal time, subsequently thinning with 150 ppm ethephon at full bloom speaks to the finest strategy for getting great size fruits of better quality.

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