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Standardization of pruning intensities and concentrations of chemical defoliants in pomegranate (*Punica granatum* L.) cv. *Bhagwa*

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Abstract
An experiment in order to standardize the concentrations of chemical defoliants pruning intensities for maximum leaf shedding and bud sprout in pomegranate (*Punica granatum* L.) cv. *Bhagwa* was conducted during 2020-21 & 2021-22 at pomegranate orchard under hi-tech horticulture, College of Agriculture, Khandwa (M.P.). The experiment was laid out in Randomized Block Design with three replications with pomegranate plants planted at a distance of 3m X 2.5 m. The experiment comprised of 16 treatments consisting of different levels of chemical defoliants and pruning intensities. Defoliation percentage at 5, 10 and 15 days after spray and Bud sprout percentage at 7, 14 and 21 days after defoliation were significantly affected by pruning intensities and concentrations of chemical defoliants in pomegranate. Maximum defoliation percentage at 5, 10 and 15 days after spray (29.67, 54.50 and 96.83%) was observed under the treatment T_{15} – Spray of Thiourea @1g/L+ Retention of 30 cm fruiting shoots while maximum sprout percentage at 7, 14 and 21 days after defoliation (77.58, 83.58 and 87.17%) was observed under the treatment T_{15}.

Keywords: Pomegranate, Bhagwa, ethephon, thiourea, pruning, defoliants

Introduction
Pomegranate is among the favourite fruits of the tropical and subtropical region. It is a non-climacteric fruit and the plants are drought resistant. It has proved to be the most profitable crop under dry land conditions. Pomegranate is grown commercially for its sweet and acidic fruits that are mostly used as dessert. The fruits may also be processed into syrup, jelly and wine owing to its fast-fermenting action (Chace *et al*. 1930). Apart from medicinal properties due to anthocyanins like Cyanidin 3 – glucoside, Cyanidin 3, 5 - diglucoside, Delphinidin 3 – glucoside, Delphinidin 3, 5- diglucoside,, Pelargonidin 3, 5 – diglucoside and Pelargonidin 3 - glucoside (Du *et al*., 1975), Pomegranate is also a rich source of ellagic acid and punicalgins, that are believed to be potent antioxidants.

It is widely cultivated throughout the drier parts of South-East Asia, Malaysia, the East Indies tropical Africa and India. Solapur, Nasik, Ahmed Nagar, Dhule, and Latur districts of Maharashtra are major pomegranate growing states In India. To a smaller extent, it is grown in Madhya Pradesh, Gujarat, Andhra Pradesh and Tamil Nadu too.

Pomegranate is emerging as a valuable crop in Madhya Pradesh also. In terms of productivity, India ranks 5th in the country with a productivity of 9.75 MT per hectare. (National production data: NHB, Horticulture statistics at a glance, 2017). Important Pomegranate growing districts of Madhya Pradesh are Shajapur, Khargone, Agar Malwa, Dhar, Ujjain, Khandwa, Dewas, Vidisha, Barwani and Burhanpur. The major varieties being grown throughout the state are Bhagwa, Jyoti, Ruby and Mridulla.

If pomegranate is watered regularly, it tends to flower continuously. Thus, the plants may continue bearing flowers and fruits irregularly throughout the year, which is not at all desired by farmers taken this crop on a commercial scale. To overcome this problem, trees are given *bahar* treatment.

As the fruits develop during the rainy season and mature during winter, the colour and sweetness of the fruit is compromised. The fruits from *Hasta bahar* are harvested during the months of March to April. They have very attractive rind with dark-coloured arils. Since the availability of the fruits during this season is limited, they fetch high value. Optimum water stress cannot be developed during this period as withholding of irrigation coincides with the rainy season. This leads to poor flowering and thus affects the yield.

Ethephon- (2-chloroethyl) phosphoric acid is a plant growth regulator with systemic properties. It penetrates into the tissues and later gets Trans located and decomposed to ethylene, which has a positive effect on the growth process of the plant. It has a vast variety of use including promotion of fruit ripening, abscission, flower induction and various other responses. It has been tested by various scientists for defoliation and better flowering and yield in case of pomegranate.

Thiourea- CH_4N_2S has been extensively used in various fruit crops for defoliation. Though the chemical has not been used in case of pomegranate to a great extent. It has given promising results as far as defoliation is concerned. It has a bright future as a defoliating agent in case of pomegranate. The popularity of the chemical may be attributed to its non-toxicity and less residual effect on the crop.

Pruning operations- Pruning of the pomegranate plants for canopy management is pre-requisite that develops and maintains the structure of the plant that has a positive effect on the size, quality and number of fruits. Pruning is mostly done for manipulating the vigor of the tree for increasing the availability of sunlight and heat for increasing the productivity of the plants owing to enhanced rate of photosynthesis. The intensity of pruning the branches plays an important role in the movement of food material in the aerial portion of the plant.

Methods and Materials

The experiment was conducted at pomegranate orchard under hi-tech horticulture, College of Agriculture, Khandwa (M.P.). Three concentrations of ethephon were required for foliar spray – 600 ppm, 800 ppm and 1000 ppm. 6 ml of ethephon was added to 1000 ml of water to obtain 600 ppm solution, 8 ml for 800 ppm and 10 ml for getting 1000 ppm solution. 3 litre solution was required for spray in one plant. Three levels of thiourea were studied for defoliation effect on the pomegranate plant – 1g/litre, 3g/litre and 5g/litre. 3 litre solution was required for spray in one plant. Defoliation percentage at 5, 10 and 15 days was recorded by observing the percentage of green foliage on the canopy of the plant (Ground assessment with binoculars) and bud sprout percentage at 7, 14 and 21 days after defoliation was recorded by observing the number of buds sprouted out of the total number of buds visible.

Results

Defoliation % at 5 DAS: The maximum defoliation percentage at 5 days after the spray was 29.67, 29.67 and 29.67 during the 1st, 2nd and pooled years, respectively under the treatment T_{15} (Spray of Thiourea @ 1g/L+ Retention of 30 cm fruiting shoots) which was followed by T_{12} (Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 30 cm fruiting shoots) with defoliation percentage of 27.33, 27.67 and 27.50. The minimum defoliation percentage 0.33, 0.67 and 0.50 during the 1st, 2nd and pooled years, respectively was observed under control.

Table 1: Defoliation percentage at 5 DAS as affected by pruning intensities and concentrations of chemical defoliants

SL	Treatments	5 DAS		
		I Year	II Year	Pooled
1	T_1 – Control (Untreated)	0.33	0.67	0.50
2	T_2 – Spray of Ethephon, 39% S.L. @ 600 ppm	11.67	11.33	11.50
3	T_3 – Spray of Ethephon, 39% S.L. @ 800 ppm	17.33	16.67	17.00
4	T_4 – Spray of Ethephon, 39% S.L. @ 1000 ppm	24.67	25.00	24.83
5	T_5 – Spray of Thiourea @ 1 g/L	12.33	12.67	12.50
6	T_6 – Spray of Thiourea @ 3 g/L	18.33	18.00	18.17
7	T_7 – Spray of Thiourea @ 5 g/L	25.00	25.33	25.17
8	T_8 – Retention of 15 cm fruiting shoots	1.33	1.67	1.50
9	T_9 – Retention of 30 cm fruiting shoots	1.67	2.00	1.83
10	T_{10} – Retention of 45 cm fruiting shoots	2.00	2.33	2.17
11	T_{11} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 15 cm fruiting shoots	13.67	13.33	13.50
12	T_{12} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 30 cm fruiting shoots	27.33	27.67	27.50
13	T_{13} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 45 cm fruiting shoots	22.33	21.67	22.00
14	T_{14} – Spray of Thiourea @ 1g/L+ Retention of 15 cm fruiting shoots	17.00	16.67	16.83
15	T_{15} – Spray of Thiourea @ 1g/L+ Retention of 30 cm fruiting shoots	29.67	29.67	29.67
16	T_{16} – Spray of Thiourea @ 1g/L+ Retention of 45 cm fruiting shoots	24.00	24.33	24.17
S.E.(M) ±		0.826	0.895	0.609
C.D.		2.382	2.581	1.722

Defoliation % at 10 DAS: At 10 days after spray, maximum defoliation percentage was recorded to be 55.00, 54.00 and 54.50 during the 1st, 2nd and pooled years, respectively under the treatment T_{15} (Spray of Thiourea @1g/L+ Retention of 30 cm fruiting shoots) followed by T_{12} (Spray of Ethephon, 39% S.L. @600 ppm + Retention of 30 cm fruiting shoots) with defoliation percentage of 53.33, 52.67 and 53.00. The minimum defoliation percentage 5.00, 5.33 and 5.17 during the 1st, 2nd and pooled years, respectively was observed under control.

Table 2: Defoliation percentage at 10 DAS as affected by pruning intensities and concentrations of chemical defoliants

SL	Treatments	10 DAS		
		I Year	II Year	Pooled
1	T_1 – Control (Untreated)	5.00	5.33	5.17
2	T_2 – Spray of Ethephon, 39% S.L. @ 600 ppm	26.00	27.33	26.67
3	T_3 – Spray of Ethephon, 39% S.L. @ 800 ppm	34.33	34.67	34.50
4	T_4 – Spray of Ethephon, 39% S.L. @ 1000 ppm	44.67	44.00	44.33
5	T_5 – Spray of Thiourea @ 1 g/L	27.67	28.00	27.83
6	T_6 – Spray of Thiourea @ 3 g/L	38.67	39.00	38.83
7	T_7 – Spray of Thiourea @ 5 g/L	47.00	46.67	46.83
8	T_8 – Retention of 15 cm fruiting shoots	7.33	7.00	7.17
9	T_9 – Retention of 30 cm fruiting shoots	9.00	9.33	9.17
10	T_{10} – Retention of 45 cm fruiting shoots	9.67	10.00	9.83
11	T_{11} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 15 cm fruiting shoots	30.67	31.00	30.83
12	T_{12} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 30 cm fruiting shoots	53.33	52.67	53.00
13	T_{13} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 45 cm fruiting shoots	40.33	41.00	40.67
14	T_{14} – Spray of Thiourea @ 1 g/L+ Retention of 15 cm fruiting shoots	30.67	31.00	30.83
15	T_{15} – Spray of Thiourea @ 1 g/L+ Retention of 30 cm fruiting shoots	55.00	54.00	54.50
16	T_{16} – Spray of Thiourea @ 1 g/L+ Retention of 45 cm fruiting shoots	42.67	43.00	42.83
S.E.(M) ±		1.079	1.378	0.875
C.D.		3.112	3.975	2.475

Defoliation % at 15 DAS: Maximum defoliation percentage at 15 days after spray, was observed to be 96.67, 97.00 and 96.83 during the 1st, 2nd and pooled years, respectively under the treatment T_{15} (Spray of Thiourea @ 1 g/L+ Retention of 30 cm fruiting shoots). T_{15} was followed by T_{12} (Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 30 cm fruiting shoots) that recorded defoliation percentage of 94.33, 93.33 and 93.83. The control recorded the minimum defoliation percentage of 10.33, 11.00 and 10.67 during the 1st, 2nd and pooled years, respectively.

Table 3: Defoliation percentage at 15 DAS as affected by pruning intensities and concentrations of chemical defoliants

SL	Treatments	15 DAS		
		I Year	II Year	Pooled
1	T_1 – Control (Untreated)	10.33	11.00	10.67
2	T_2 – Spray of Ethephon, 39% S.L. @ 600 ppm	50.00	50.33	50.17
3	T_3 – Spray of Ethephon, 39% S.L. @ 800 ppm	63.33	63.67	63.50
4	T_4 – Spray of Ethephon, 39% S.L. @ 1000 ppm	89.67	90.00	89.83
5	T_5 – Spray of Thiourea @ 1 g/L	61.00	61.67	61.33
6	T_6 – Spray of Thiourea @ 3 g/L	72.33	73.00	72.67
7	T_7 – Spray of Thiourea @ 5 g/L	92.33	92.00	92.17
8	T_8 – Retention of 15 cm fruiting shoots	30.33	30.67	30.50
9	T_9 – Retention of 30 cm fruiting shoots	32.00	31.67	31.83
10	T_{10} – Retention of 45 cm fruiting shoots	42.67	43.00	42.83
11	T_{11} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 15 cm fruiting shoots	61.00	61.33	61.17
12	T_{12} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 30 cm fruiting shoots	94.33	93.33	93.83
13	T_{13} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 45 cm fruiting shoots	82.33	81.67	82.00
14	T_{14} – Spray of Thiourea @ 1 g/L+ Retention of 15 cm fruiting shoots	62.33	62.00	62.17
15	T_{15} – Spray of Thiourea @ 1 g/L+ Retention of 30 cm fruiting shoots	96.67	97.00	96.83
16	T_{16} – Spray of Thiourea @ 1 g/L+ Retention of 45 cm fruiting shoots	86.67	86.33	86.50
S.E.(M) ±		1.322	1.452	0.982
C.D.		3.813	4.190	2.777

Bud sprout percentage at 7 days after defoliation: the maximum bud sprout percentage at 7 days after defoliation during the 1st, 2nd and pooled year, respectively (77.00, 78.17 and 77.58) was recorded under treatment T_{15} (Spray of Thiourea @1g/L+ Retention of 30 cm fruiting shoots) which was followed by T_{12} (Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 30 cm fruiting shoots) that recorded bud sprout percentage of 74.00, 74.67 and 74.33. The control recorded the minimum bud sprout percentage of 30.00, 29.67 and 29.83 during the 1st, 2nd and pooled years, respectively.

Table 4: Bud sprout percentage at 7days after defoliation as affected by pruning intensities and concentrations of chemical defoliants

SL	Treatments	7 DAD		
		I year	II Year	Pooled
1	T_1 – Control (Untreated)	30.00	29.67	29.83
2	T_2 – Spray of Ethephon, 39% S.L. @600 ppm	63.33	63.67	63.50
3	T_3 – Spray of Ethephon, 39% S.L. @800 ppm	69.33	70.67	70.00
4	T_4 – Spray of Ethephon, 39% S.L. @1000 ppm	71.33	71.67	71.50
5	T_5 – Spray of Thiourea @ 1 g/L	68.33	68.67	68.50
6	T_6 – Spray of Thiourea @ 3 g/L	69.00	69.83	69.42
7	T_7 – Spray of Thiourea @ 5 g/L	74.33	73.33	73.83
8	T_8 – Retention of 15 cm fruiting shoots	51.67	52.00	51.83
9	T_9 – Retention of 30 cm fruiting shoots	54.00	54.33	54.17
10	T_{10} – Retention of 45 cm fruiting shoots	57.33	57.67	57.50
11	T_{11} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 15 cm fruiting shoots	67.00	67.67	67.33
12	T_{12} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 30 cm fruiting shoots	74.00	74.67	74.33
13	T_{13} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 45 cm fruiting shoots	70.33	70.50	70.42
14	T_{14} – Spray of Thiourea @ 1 g/L+ Retention of 15 cm fruiting shoots	68.33	69.33	68.83
15	T_{15} – Spray of Thiourea @ 1 g/L+ Retention of 30 cm fruiting shoots	77.00	78.17	77.58
16	T_{16} – Spray of Thiourea @ 1 g/L+ Retention of 45 cm fruiting shoots	70.67	71.67	71.17
S.E.(M) ±		0.892	0.832	0.610
C.D.		2.572	2.402	1.725

Bud sprout percentage at 14 days after defoliation: 14 days after defoliation, during the 1st, 2nd and pooled year, respectively, the maximum bud sprout percentage was recorded to be 83.00, 84.17 and 83.58 under treatment T_{15} (Spray of Thiourea @1g/L+ Retention of 30 cm fruiting shoots). T_{12} (Spray of Ethephon, 39% S.L. @600 ppm + Retention of 30 cm fruiting shoots) followed it with bud sprout percentage of 80.67, 80.00 and 80.33. Minimum bud sprout percentage of 35.67, 36.00 and 35.83 was recorded under control during the 1st, 2nd and pooled years, respectively.

Table 5: Bud sprout percentage at 14 days after defoliation as affected by pruning intensities and concentrations of chemical defoliants

SL	Treatments	14 DAD		
		I Year	II Year	Pooled
1	T_1 – Control (Untreated)	35.67	36.00	35.83
2	T_2 – Spray of Ethephon, 39% S.L. @ 600 ppm	70.00	69.67	69.83
3	T_3 – Spray of Ethephon, 39% S.L. @ 800 ppm	75.00	76.67	75.83
4	T_4 – Spray of Ethephon, 39% S.L. @ 1000 ppm	77.67	78.00	77.83
5	T_5 – Spray of Thiourea @ 1 g/L	73.33	74.67	74.00
6	T_6 – Spray of Thiourea @ 3 g/L	75.33	76.50	75.92
7	T_7 – Spray of Thiourea @ 5 g/L	79.67	79.33	79.50
8	T_8 – Retention of 15 cm fruiting shoots	58.33	58.00	58.17
9	T_9 – Retention of 30 cm fruiting shoots	59.33	61.00	60.17
10	T_{10} – Retention of 45 cm fruiting shoots	63.00	64.67	63.83
11	T_{11} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 15 cm fruiting shoots	73.67	74.00	73.83
12	T_{12} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 30 cm fruiting shoots	80.67	80.00	80.33
13	T_{13} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 45 cm fruiting shoots	77.00	75.83	76.42
14	T_{14} – Spray of Thiourea @ 1 g/L+ Retention of 15 cm fruiting shoots	75.00	75.33	75.17
15	T_{15} – Spray of Thiourea @ 1 g/L+ Retention of 30 cm fruiting shoots	83.00	84.17	83.58
16	T_{16} – Spray of Thiourea @ 1 g/L+ Retention of 45 cm fruiting shoots	76.67	78.33	77.50
S.E.(M) ±		0.860	0.928	0.633
C.D.		2.482	2.676	1.789

Bud sprout percentage at 21 days after defoliation: The maximum bud sprout percentage was recorded to be 88.67, 85.67 and 87.18 under treatment T_{15} (Spray of Thiourea @1g/L+ Retention of 30 cm fruiting shoots) followed by T_{12} (Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 30 cm fruiting shoots) that recorded bud sprout percentage of 88.00, 85.67 and 86.83 during 1st, 2nd and pooled year, respectively. Minimum bud sprout percentage at 21 DAD of 43.00, 42.67 and 42.83 was recorded under control during the 1st, 2nd and pooled years, respectively.

Table 6 Bud sprout percentage at 21 days after defoliation as affected by pruning intensities and concentrations of chemical defoliants

SL	Treatments	21 DAD		
		I Year	II Year	Pooled
1	T_1 – Control (Untreated)	43.00	42.67	42.83
2	T_2 – Spray of Ethephon, 39% S.L. @ 600 ppm	77.33	77.00	77.17
3	T_3 – Spray of Ethephon, 39% S.L. @ 800 ppm	82.00	82.33	82.17
4	T_4 – Spray of Ethephon, 39% S.L. @ 1000 ppm	84.00	84.00	84.00
5	T_5 – Spray of Thiourea @ 1 g/L	80.00	79.67	79.83
6	T_6 – Spray of Thiourea @ 3 g/L	86.33	83.00	84.67
7	T_7 – Spray of Thiourea @ 5 g/L	84.00	84.67	84.33
8	T_8 – Retention of 15 cm fruiting shoots	64.00	64.67	64.33
9	T_9 – Retention of 30 cm fruiting shoots	65.00	67.00	66.00
10	T_{10} – Retention of 45 cm fruiting shoots	69.67	70.33	70.00
11	T_{11} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 15 cm fruiting shoots	79.00	81.33	80.17
12	T_{12} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 30 cm fruiting shoots	88.00	85.67	86.83
13	T_{13} – Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 45 cm fruiting shoots	82.33	83.17	82.75
14	T_{14} – Spray of Thiourea @ 1 g/L+ Retention of 15 cm fruiting shoots	80.33	82.17	81.25
15	T_{15} – Spray of Thiourea @ 1 g/L+ Retention of 30 cm fruiting shoots	88.67	85.67	87.17
16	T_{16} – Spray of Thiourea @ 1 g/L+ Retention of 45 cm fruiting shoots	83.67	83.67	83.67
S.E.(M) ±		0.934	1.007	0.687
C.D.		2.694	2.905	1.943

Discussion

Leaf shed (%): The maximum defoliation percentage at 5, 10 and 15 days after the spray during the 1st, 2nd and pooled years, was recorded under the treatment T_{15} (Spray of Thiourea @ 1 g/L+ Retention of 30 cm fruiting shoots) followed by T_{12} (Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 30 cm fruiting shoots). The minimum defoliation percentage during the 1st, 2nd and pooled years, respectively was observed under control. The defoliation may be attributed to the destruction of chlorophyll and hinderance in the photosynthetic activities of the leaves due to Thiourea and Ethephon. The pruning operation however had no significant effect on the lead shedding. The findings are in line with the work done by Carlos *et al*. (1990) [2], Tongumpai *et al*. (1997) [11], Nanra *et al*. (2001) [6], Chandra *et al*. (2009) [3], Chandra *et al*. in 2011 [4]. Shankara Swamy (2012) [8], Sheikh (2014) [9], Sheikh (2015) [10], Atawia *et al*. (2017) [1] and Jhade *et al*. (2019) [5].

Bud sprout percentage: The maximum bud sprout percentage at 7, 14 and 21 days after defoliation during the 1st, 2nd and pooled year, was recorded under treatment T_{15} (Spray of Thiourea @ 1 g/L+ Retention of 30 cm fruiting shoots) which was followed by T_{12} (Spray of Ethephon, 39% S.L. @ 600 ppm + Retention of 30 cm fruiting shoots). The control recorded the minimum bud sprout percentage during the 1st, 2nd and pooled years. The chemicals inducted defoliation and pruning of the shoots caused the retention of the food material in the shoots causing maximum bud sprout percentage. Retention of longer fruiting branches diluted the effect hence maximum bus sprout was seen when 30 cm of the fruiting shoots were retained. The lower and higher retention of the shoots had negative effects. Similar findings have been reported by Pramaniek *et al*. (2001) and Chandra *et al*. (2009) [3].

Conclusion

Defoliation percentage at 5, 10 and 15 days after spray and Bud sprout percentage at 7, 14 and 21 days after defoliation were significantly affected by pruning intensities and concentrations of chemical defoliants in pomegranate. Maximum defoliation percentage at 5, 10 and 15 days after spray (29.67, 54.50 and 96.83%) was observed under the treatment T_{15} – Spray of Thiourea @1g/L+ Retention of 30 cm fruiting shoots while maximum sprout percentage at 7, 14 and 21 days after defoliation (77.58, 83.58 and 87.17%) was observed under the treatment T_{15}.

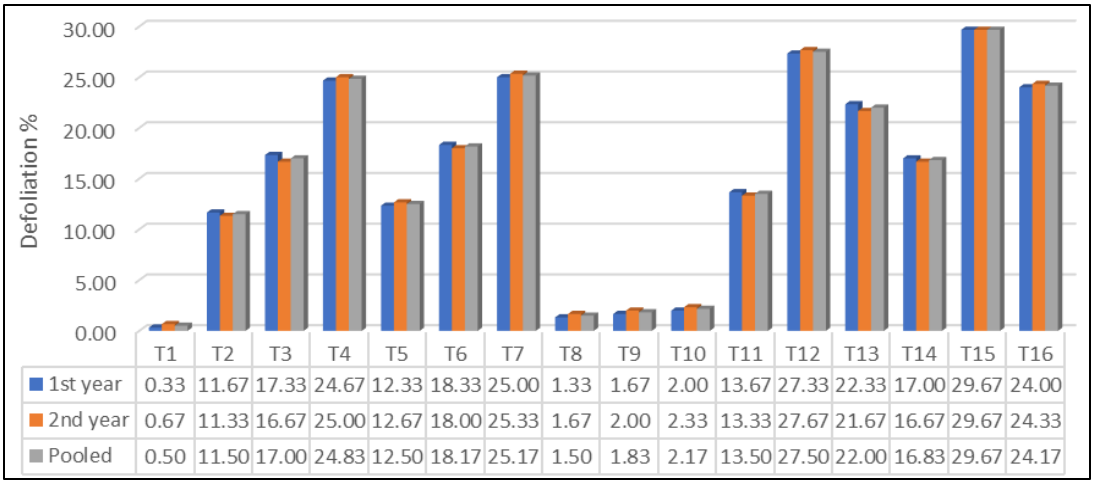
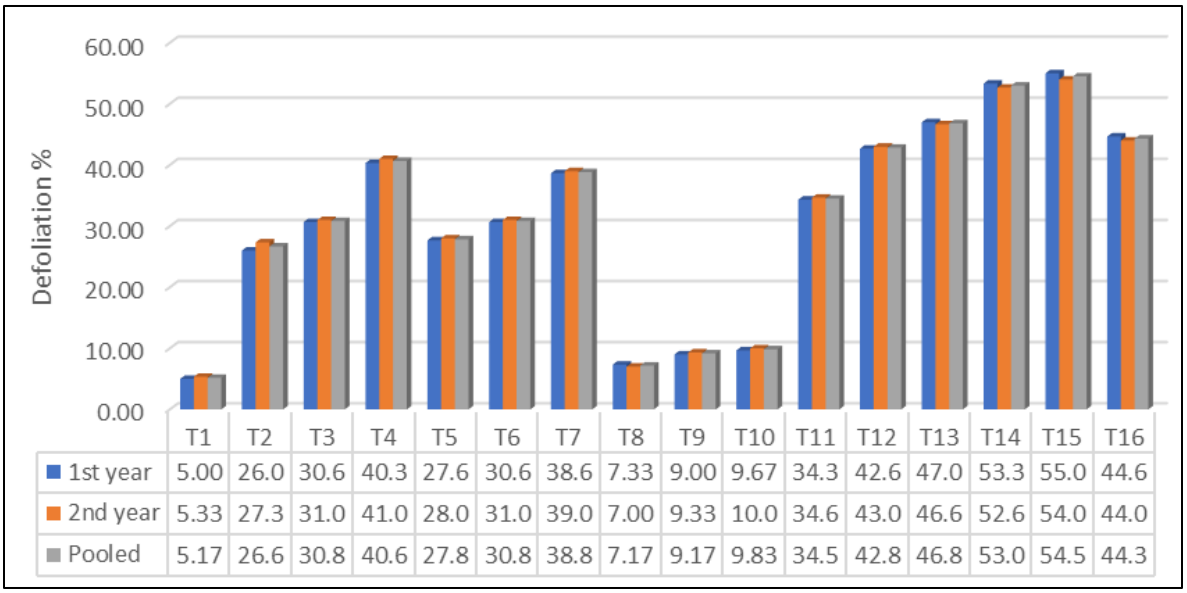
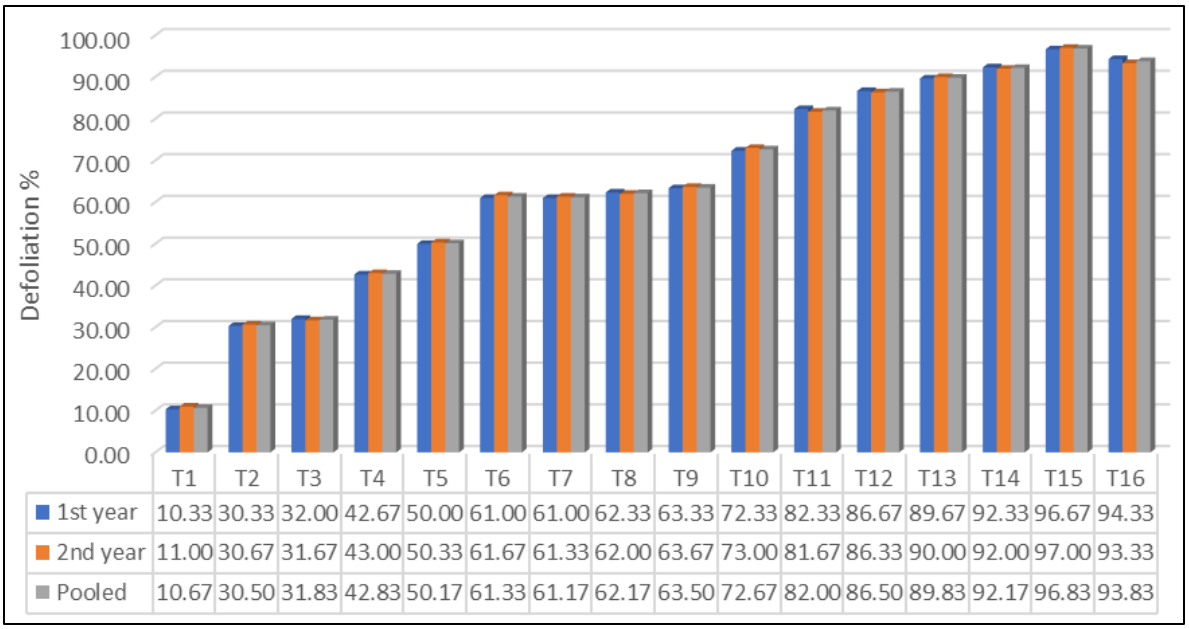


Fig 1: Defoliation percentage at 5 DAS as affected by pruning intensities and concentrations of chemical defoliants



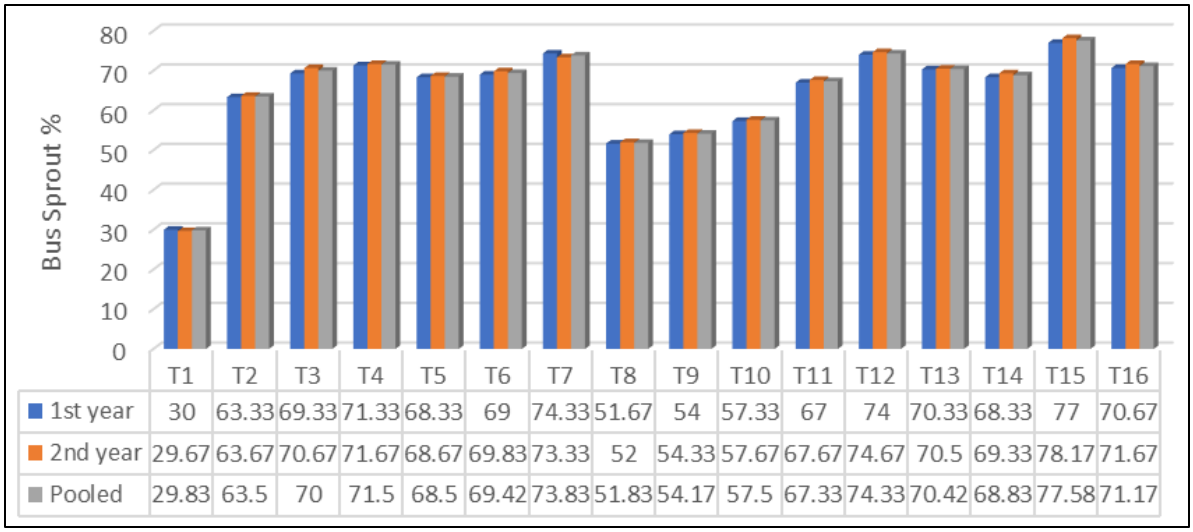
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16
1st year	5.00	26.0	30.6	40.3	27.6	30.6	38.6	7.33	9.00	9.67	34.3	42.6	47.0	53.3	55.0	44.6
2nd year	5.33	27.3	31.0	41.0	28.0	31.0	39.0	7.00	9.33	10.0	34.6	43.0	46.6	52.6	54.0	44.0
Pooled	5.17	26.6	30.8	40.6	27.8	30.8	38.8	7.17	9.17	9.83	34.5	42.8	46.8	53.0	54.5	44.3

Fig 2: Defoliation percentage at 10 DAS as affected by pruning intensities and concentrations of chemical defoliants



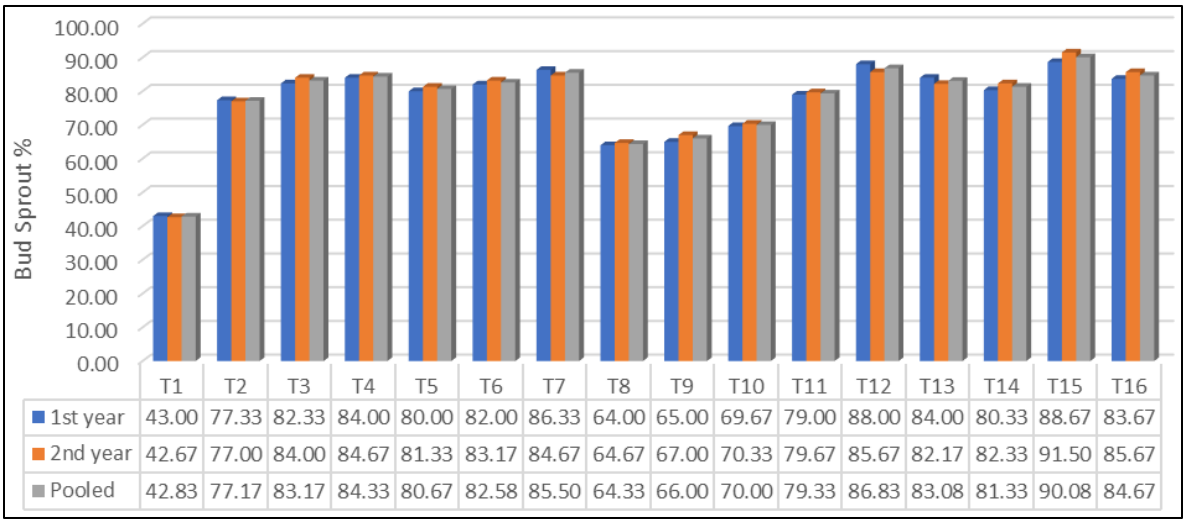
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16
1st year	10.33	30.33	32.00	42.67	50.00	61.00	61.00	62.33	63.33	72.33	82.33	86.67	89.67	92.33	96.67	94.33
2nd year	11.00	30.67	31.67	43.00	50.33	61.67	61.33	62.00	63.67	73.00	81.67	86.33	90.00	92.00	97.00	93.33
Pooled	10.67	30.50	31.83	42.83	50.17	61.33	61.17	62.17	63.50	72.67	82.00	86.50	89.83	92.17	96.83	93.83

Fig 3: Defoliation percentage at 15 DAS as affected by pruning intensities and concentrations of chemical defoliants



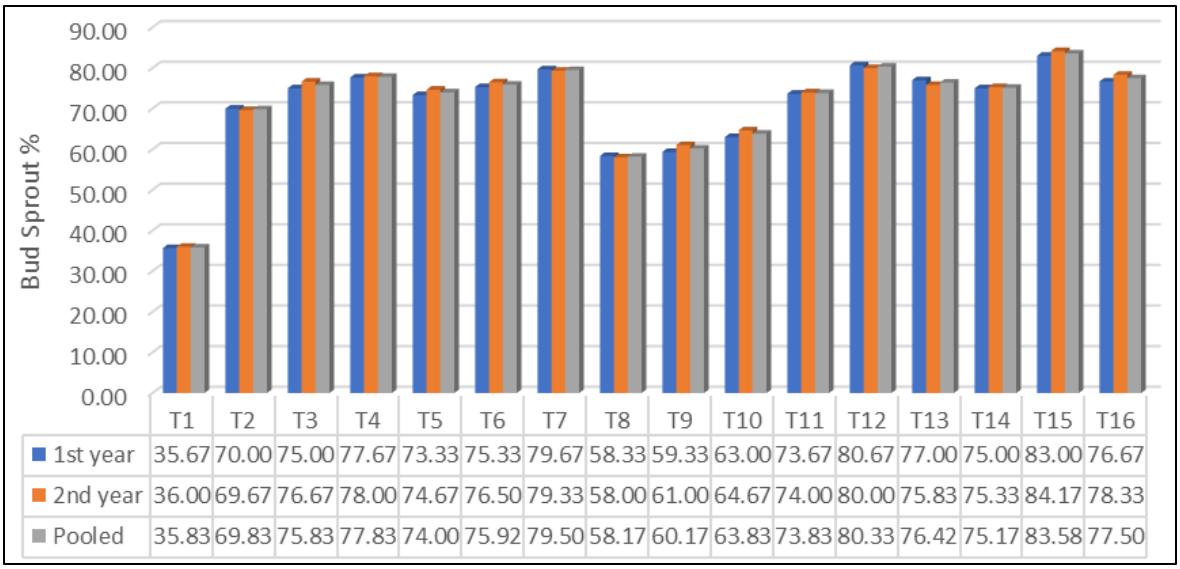
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16
1st year	30	63.33	69.33	71.33	68.33	69	74.33	51.67	54	57.33	67	74	70.33	68.33	77	70.67
2nd year	29.67	63.67	70.67	71.67	68.67	69.83	73.33	52	54.33	57.67	67.67	74.67	70.5	69.33	78.17	71.67
Pooled	29.83	63.5	70	71.5	68.5	69.42	73.83	51.83	54.17	57.5	67.33	74.33	70.42	68.83	77.58	71.17

Fig 4: Bud Sprout percentage at 7 DAD as affected by pruning intensities and concentrations of chemical defoliants



	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16
1st year	43.00	77.33	82.33	84.00	80.00	82.00	86.33	64.00	65.00	69.67	79.00	88.00	84.00	80.33	88.67	83.67
2nd year	42.67	77.00	84.00	84.67	81.33	83.17	84.67	64.67	67.00	70.33	79.67	85.67	82.17	82.33	91.50	85.67
Pooled	42.83	77.17	83.17	84.33	80.67	82.58	85.50	64.33	66.00	70.00	79.33	86.83	83.08	81.33	90.08	84.67

Fig 5: Bud Sprout percentage at 14 DAD as affected by pruning intensities and concentrations of chemical defoliants



	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16
1st year	35.67	70.00	75.00	77.67	73.33	75.33	79.67	58.33	59.33	63.00	73.67	80.67	77.00	75.00	83.00	76.67
2nd year	36.00	69.67	76.67	78.00	74.67	76.50	79.33	58.00	61.00	64.67	74.00	80.00	75.83	75.33	84.17	78.33
Pooled	35.83	69.83	75.83	77.83	74.00	75.92	79.50	58.17	60.17	63.83	73.83	80.33	76.42	75.17	83.58	77.50

Fig 6: Bud Sprout percentage at 21 DAD as affected by pruning intensities and concentrations of chemical defoliants

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