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STANDARDIZATION OF DIFFERENT LEVELS OF PRUNING AND GROWTH REGULATORS ON THE PERFORMANCE OF IXORA (*IXORA COCCINEA* L.*)* CV. RED

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ABSTRACT

A field experiment was conducted to study the "Standardization of different levels of pruning and growth regulators on the performance of Ixora (*Ixora coccinea* L.*)* Cv. Red" at Manickapuram village, Thiruchirappalli District, Tamil Nadu during the year 2020 - 21. The treatment comprises of three different levels of pruning at 30 cm, 45 cm and 60 cm along with three different growth regulators *viz.,* GA_3 @ 150 ppm, NAA @ 150 ppm and Ethrel @ 150 ppm alone and without application of growth regulator to pruned plants (Control). The experiment was laid out in Factorial Randomized Block Design (FRBD) with three replications consists of twelve treatments. Considering all the treatments, observation recorded on growth, physiological and flower yield parameters, the treatment (T_5) was significantly increased when compare to control (with out application of growth regulators to the pruned plants). Growth parameters *viz.,* plant height (93.62 cm and 105.23 cm), number of branches (82.96 and 90.66), number of leaves (3038.19 and 3197.04) at 240 and 300 days after pruning and canopy spread N-S (133.04 cm), E-W (135.01 cm) at 240 DAP respectively. With regard to physiological and yield parameters *viz.,* leaf length (8.01 cm), leaf width (5.21 cm), leaf area index (2.64 cm^2), chlorophyll content index (CCI) (11.85 mg g^{-1}), dry matter production (44.65 g $plant^{-1}$), number of flower heads $plant^{-1}$ (36.73), number of florets flower $head^{-1}$ (54.18), fresh weight of flower head (9.01 g) and flower yield (330.93 g $plant^{-1}$) it was recorded maximum when pruning was done at 45 cm height above the ground level along with foliar application of GA_3 @ 150 ppm. From the above studies, it is revealed that pruning at 45 cm along with foliar application of GA_3 @ 150 ppm were found to be the best in increasing the plant growth, physiological and flower yield attributes in *Ixora coccinea* .

Keywords : Pruning, Growth regulator, Ixora

INTRODUCTION

Floriculture also known as flower farming refers to the cultivation of flowering and foliage plants. Horticultural crops particularly growing of flower crops is preferred by the farmers due to quick and high return per unit area. Although, flowers have been an integral part of the Indian society and were cultivated for various purposes ranging from aesthetic to social and religious purposes, the commercial floriculture has been recent origin. In recent decades, there has been increasing interest in floriculture and its products. Ixora (Flame of woods) botanically named as *Ixora coccinea* belongs to the Rubiaceae family. Now, it is identified as one of the commercial loose flower crop grown in India. *Ixora coccinea* is a dense, multi-branched evergreen shrub comprises more than 500 species of shrubs found worldwide. *Ixora coccinea* L. is a perennial hedging plant common in the most parts of tropical and subtropical regions. The plants are notable for its bright coloured flowers which are composed of small blooms massed together into dense, flat topped flower heads. It bears flowers which are numerous having bright scarlet colour in dense, sessile corymbiform cymes (Baliga and Kurian, 2012). They have tiny conspicuous and colorful shades of white, yellow, pink and scarlet orange. Though flowers are not fragrant and they are very popular due to its attractive color and good keeping quality. In Tamilnadu, among the growers community, traditional Ixora flowers are commercially grown as "loose flower" to multipurpose use especially garland makeovers for spiritual and religious offerings, decoration purpose and in landscape gardening which are mainly used for making hedges, foundation planting, potted plants, massed in flowering beds or grown as a specimen plant. It also has a good export potential and popularity on account of wide adaptability and increasing demand during the festival occasions. Pruning, it is an essential method since antique times for restarting growth of plants. Pruning is an invigorating process which promotes growth by releasing a plant's internal chemical substances it allows new branches to grow. Moreover it drives energy towards to sprout multiple new shoots to get increased, as a resulted in maximized canopy spread and flower production by activation of physiological activity. Plant growths are regulated by phytohormones that presumably exert their influence on particular metabolic reactions in the target tissue via receptor molecules. Besides those natural phyto-hormones, the group of growth regulators that modify a plant in its growth and developmental behavior without inducing phyto-toxic or malformative effects includes synthetic substances such as the growth regulators. According to the PGR's have quicker effect on flower plants to modify growth, foliage colour as well as flower yield (Mukesh kumar *et al.,* 2021). At the same time concluding the right level of pruning is very important in maximizing more number of branches hitherto production of flowers is enhanced due to pruning along with appropriate quantity of growth regulators as foliar application which modifies the flower yield. Regulation of flowering in Ixora has immense practical value. In these aspect pruning with appropriate height in addition to this utilization of plant growth regulators with right quantity for maximizing the growth and yield of Ixora. Keeping this in view, the present investigation was therefore taken to standardize the different levels of pruning and foliar application of growth regulators on growth and yield of Ixora (*Ixora coccinea* L.).

MATERIALS AND METHODS

A study was conducted with three levels of pruning heights along with three growth regulators *viz.,* GA_3, NAA and Ethrel were taken up for enhancing growth and yield of Ixora (*Ixora coccinea* L.) cv. Red. This experiment was carried out in the farmer's field at Manickapuram village, Mannachanallur Taluk, Thiruchirappalli District, Tamil Nadu during the period of 2020-21. The experiment was laid out in Factorial Randomized Block Design (FRBD) with 12 treatments and replicated thrice. Two years old Ixora plants with the spacing of 2 m × 2 m were taken for this research. Conventional pruning at different heights *viz.,* 30 cm, 45 cm and 60 cm is carried out during second fortnight of April, 2020. After pruning, when the new shoots were developed with sufficient number of leaves, the freshly prepared Gibberllic acid (GA_3), Naphthalene acetic acid (NAA), Ethrel each @ 150 ppm were sprayed and without application of growth regulator to pruned plants (Control) is followed as per the treatment schedule. The data on vegetative and physiological parameters were taken at periodic intervals. Observations are recorded on the selected tagged plants for each treatment in each replication and the mean data is statistically analyzed by adopting the standard procedure given by Panse and Sukhatme (1985). The treatment details are presented in Table 1.

RESULT AND DISCUSSION

The findings of the investigation undertaken with a view to study the effect of different levels of pruning height and foliar application of certain growth regulators on growth and physiological parameters of Ixora (*Ixora coccinea* L.) are presented in Table 2 and Table 3.The factor responsible for growth in a plant is depending upon climate, soil, cultural manipulations and their interactions. On that way optimum pruning height play a prime role in deciding the growth and yield of Ixora. Acquiring Knowledge on this aspect, it's very necessary to manipulate the plants physiology, which may eventually lead to the maximum production. In Table 2, among the different levels of pruning heights clearly shows that the maximum growth performed in P_2 in all vegetative parameters *viz.,* plant height (90.87 cm and 102.20 cm), number of branches (65.77 and 71.72), number of leaves (2242.94 and 2382.12) at 240 and 300 days after pruning and canopy spread N-S (124.12 cm) , E-W (125.29 cm) at 240 DAP respectively. In Table 3, physiological characters *viz.* Leaf length (7.38 cm), Leaf width (3.88 cm), Leaf area index (2.09 cm^2), Chlorophyll content index (CCI) (11.34 mg g^{-1}) and Dry matter production (41.10 g $plant^{-1}$). This increase in growth might be due to higher accumulation of polysaccharide content, reduced apical dominance, increased light intensity, good aeration thus results in improved plant growth parameters. It was reported by Raghuram Pawar *et al.,* (2019) in Jasmine and Zekavati (2013) in Rose. . In Table 4, yield parameters *viz.,* number of flower heads (34.50 $plant^{-1}$), number of florets (44.06 flower $head^{-1}$), fresh weight of single flower head (7.46 g) and flower yield (259.39 g $plant^{-1}$) was recorded as superior when Pruning has been carried out at 45 cm height respectively. Pruning is an important horticulture techniques that determines growth, yield and quality performance of a crop when all other inputs are adequately supplied. The branches should be pinched to maintain short stature for easy plucking of flowers. At the same time concluding the right level of pruning is very important in maximizing more number of branches hitherto production of flowers is enhanced due to pruning along with right quantity and appropriate application of growth regulators which modifies the growth and developement. Pruning height significantly increased the number of branches which may be due to accumulation of cytokinin which are the source to produce new shoots, which might in turn leads to more number of flowers. This might be due to the accelerated photosynthetic mobility from the source to the sink as influenced by growth hormones are diverting its energy for production of new shoots and that leads to produce more nodes resulted from maximizing the number of flower heads. This increase in flower heads could be due to the fact that pruning helps to broaden the uptake of C:N ratio, thus stimulates the flowering and increasing the vigor of plant. These results are coinciding with Ghulam *et al.,* (2004) in Rose, Sushree Choudhury *et al.,* (2019) in Jasmine and Vijai ananth and Rameshkumar (2012) in Nerium.

It is explicit from the data in (Table 2 and 3), clearly shows that increase in growth, physiological and yield of Ixora were obtained in the treatment G_1 with the foliar application of gibberellic acid (GA_3) @ 150 ppm. The increase in growth and physiological characters viz. plant height (93.42 cm and 104.91 cm), number of branches (79.11 and 86.42), number of leaves (2860.73 and 3015.16) at 240 and 300 days after pruning and canopy spread N-S (131.04 cm) , E-W (132.85 cm) at 240 DAP, leaf length (7.86 cm), Leaf width (4.71 cm), Leaf area index (2.51 cm^2), Chlorophyll content index (CCI) (11.73 mg g^{-1}) and Dry matter production (43.84 g $plant^{-1}$) When compare to other growth harmones like NAA and Etheral application of gibberellic acid significantly increased in terms of all the growth parameters. These increases in growth parameters are due to the early production of florigin in gibberellins. GA_3 is component of florigin which initiates the growth in various ways. This, results are in the conformity with the findings of Dhanasekaran (2019) in Jasmine and Anil K Singh *et al.,* (2019) in Rose. The maximum plant height, number of branches, number of leaves and leaf area might be attributed to the enhanced vegetative growth in early phase attributed by exogenous application of GA_3 which would have favored the increased photosynthesis and CO_2 fixation ultimately it increased the number of leaves and increased photosynthetic efficiency of the plant. These results are coinciding with Rakshana *et al.,* (2020) in Carnation and Kadam *et al.,* (2020) in Gaillardia. Increase in Physiological parameters was noticed with the increased dose of foliar application of GA_3 at 150 ppm. These findings are coincided with the results of Pragnya Paramita Mishra *et al.,* (2018) in China aster. The increase in flower yield parameters (Table 4) *viz.,* number of flower heads (35.38 $plant^{-1}$), number of florets (50.33 flower $head^{-1}$), fresh weight of single flower head (8.47 g) and flower yield (300.15 g $plant^{-1}$) were obtained with the foliar application of Gibberellic acid (GA_3) @ 150 ppm. The maximum yield were obtained due to the production of more number of secondary shoots at early stage, with this foliar application of GA_3 @ 150 ppm profusely increased all the yield parameters. These findings are coinciding with Shobana (2014) and Sridhar *et al.,* (2013) in Jasmine. The individual effect of different levels of pruning and growth regulators significantly influenced the growth and yield parameters of Ixora (Table 2 and 3). This influence was reflected in interaction also. In the present study revealed that the increasing in vegetative parameters was occurred in the treatment when pruning is carried out at 45 cm height along with foliar application of GA_3 @ 150 ppm. Whereas minimum performance in growth was significantly ineffectiveness is observed in untreated of growth regulators in different levels of pruning.

The treatment T_5 (P_2 G_1) with the interaction effect of different levels of pruning at 45 cm along with foliar spray of gibberellic acid @ 150 ppm was revealed as the best treatment in terms of growth and flower yield characters over the rest of other treatment combinations. Table 2 and 3 shows the result of interaction effect of different levels of pruning and foliar application of GA_3, increases the plant height (93.62 cm and 105.23 cm), number of branches (82.96 and 90.66), number of leaves (3038.19 and 3197.04) at 240 and 300 days after pruning and canopy spread N-S (133.04 cm) , E-W (135.01 cm) at 240 DAP, physiological characters *viz.,* leaf length (8.01 cm), leaf width (5.21 cm), leaf area index (2.64 cm^2), chlorophyll content index (CCI) (11.85 mg g^{-1}) and dry matter production (44.65 g $plant^{-1}$) Among the different cultural operations pruning is one of the fruitful horticulture technique which is being followed in many flower crops. It is a useful method since antique times for restarting growth of plants (Kumaresan *et al.,* 2017). As a result of pruning, number of new shoots get increased which resulted in increased flower yield by activation of physiological activity. When the developing new shoots appears from the plants which are simultaneously sprayed with application of growth regulators especially. Pruning at 45 cm height enhanced maximum growth in Ixora which might be due to the accelerated mobility of photosynthetic from the source to the sink as influenced by growth hormone released or synthesized due to higher plant growth and its allocating energy for production of new shoots and due to increase in nodes resulted from cell elongation and cell division. Similarly these findings are coincided with Vijai ananth and Rameshkumar (2012) in Nerium and Maske *et al.,* (2018) in Mogra. These increased vegetative characters are significantly influenced due to the foliar application of plant growth regulators were absorbed by the leaves and these are immediately translocated into xylem and phloem tissues in which it is distributed to all parts of the plants. Among all the growth regulators *viz.,* GA_3, NAA and Ethrel, the effect of GA_3 increased a significant role in all the characters, when compared to foliar application of NAA and Ethrel. GA_3, it is a perfect plant growth regulator has been used to change the entire plant growth and its specific plant responses to growth and yield. These are evolved by the way of application of GA_3 at various right intervals. Gibberllic acid also play an important role in modifying the growth and flowering pattern in Ixora plants and its utilization of optimum quantity of GA_3 can promote, inhibits or quantitatively modifies growth and development in plants. Application of gibberellic acid induce active cell division and cell elongation increase the auxin level of tissues and enhances the conversion of tryptophan to IAA, which in turn cause active cell division and cell elongation. Growth might also be increased due to osmotic uptake of water and nutrients under the influence of gibberellins which maintain swelling force against the softening of cell wall and thereby increasing the maximum of growth in all vegetative characters. Similar findings are revealed by Nomita Laishram *et al.,* (2020) in Marigold and Sendhilnathan *et al.,* (2020) in Carnation.

Table 4 shows the results of yield parameters, *viz.,* number of flower heads (36.73 $plant^{-1}$), number of florets (54.18 flower $head^{-1}$), fresh weight of single flower head (9.01 g) and flower yield (330.93 g $plant^{-1}$) are recorded as superior than all other treatments with respect to optimum pruning height along with application of gibberellic acid which enhances the yield parameters. Growth regulators are valuable in floriculture for manipulating growth and flowering of many ornamental plants. Growth promoting chemicals at on optimum concentration improve the efficiency of the plants by modifying the various process such as photosynthesis, transpiration, photorespiration, water and nutrient uptake in a beneficial way. In recent years, notable plant growth regulators like GA_3, NAA and Ethrel etc., have been found to enhance more branches, stem elongation and profuse flowering in many ornamental plants. Their effect varies with plant species, variety, concentration used, frequency of application and various other factors which influence the uptake and translocation of the chemical. The increase in yield might be due to accumulation of initial higher polysaccharide content in plants. On the other hand gibberellic acid caused rapid cell elongation and improved source sink relation resulting in enhanced vigorous vegetation in Ixora. Maximum number of flower heads and number of florets increased might be due to the application of gibberellic acid stimulates the endogenous gibberellins level in the plants. The major changes in flower yield can be explained by the fact that gibberellic acid reducing the juvenile period of plants because of its higher capacity of cell division and cell elongation which caused early maturity in plants. Similar results were reported by Sendhilnathan *et al.,* (2019) in Rose and Harkulkar *et al.,* (2022) in Jasmine

CONCLUSION

Based on the present investigation findings, it can be concluded that, Pruning at 45 cm height along with foliar application of gibberellic acid (GA_3) @ 150 ppm concentration served as a best treatment with respect to performance of all growth, physiological and flower yield parameters in Ixora (*Ixora coccinea* L.) Cv. Red.

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Treatment Details

Table 1: The Details of the treatments are furnished below.

F_1	PRUNING HEIGHTS	F_2	GROWTH REGULATORS
P_1	Pruning at 30 cm height	G_1	GA_3 @ 150 ppm
P_2	Pruning at 45 cm height	G_2	NAA @ 150 ppm
P_3	Pruning at 60 cm height	G_3	Ethrel @ 150 ppm
		G_4	Control

Treatments	Details
T_1 (P_1 G_1)	Pruning at 30 cm height + GA_3 @ 150 ppm
T_2 (P_1 G_2)	Pruning at 30 cm height + NAA @ 150 ppm
T_3 (P_1 G_3)	Pruning at 30 cm height + Ethrel @ 150 ppm
T_4 (P_1 G_4)	Pruning at 30 cm height + Control
T_5 (P_2 G_1)	Pruning at 45 cm height + GA_3 @ 150 ppm
T_6 (P_2 G_2)	Pruning at 45 cm height + NAA @ 150 ppm
T_7 (P_2 G_3)	Pruning at 45 cm height + Ethrel @ 150 ppm
T_8 (P_2 G_4)	Pruning at 45cm height + Control
T_9 (P_3 G_1)	Pruning at 60 cm height + GA_3 @ 150 ppm
T_{10} (P_3 G_2)	Pruning at 60 cm height + NAA @ 150 ppm
T_{11} (P_3 G_3)	Pruning at 60 cm height + Ethrel @ 150 ppm
T_{12} (P_3 G_4)	Pruning at 60 cm height + Control

Table 2: Effect of different levels of pruning height and growth regulators on growth parameters in Ixora (*Ixora coccinea* L.). Cv. Red

Treatments	Plant height (cm)		Number of branches plant^{-1}		Number of leaves plant^{-1}		Canopy spread (cm)	
	240 (DAP)	300 (DAP)	240 (DAP)	300 (DAP)	240 (DAP)	300 (DAP)	N-S	E-W
Pruning height (P)								

P1	76.5	87.88	56.59	61.65	1839.44	1966.72	117.38	118.7
P2	90.87	102.2	65.77	71.72	2242.94	2382.12	124.12	125.3
P3	106.12	117.9	61.94	67.51	2066.09	2200.86	122.13	123.1
S.Ed	**0.74**	**0.82**	**0.57**	**0.62**	**19.6**	**20.82**	**1.12**	**1.12**
C.D (p=0.05)	**1.48**	**1.65**	**1.15**	**1.25**	**39.21**	**41.64**	**2.24**	**2.26**
Growth regulators (G)								
G1	93.42	104.9	79.11	86.42	2860.73	3015.16	131.04	132.9
G2	91.82	103.3	56.07	61.04	1796.03	1923.94	119.16	119.9
G3	90.64	102.2	67.82	73.98	2336.34	2477.99	125.11	126.4
G4	88.78	100.3	42.74	46.4	1204.86	1315.86	109.52	110.4
S.Ed	**0.96**	**1.06**	**0.66**	**0.72**	**22.64**	**24.04**	**1.3**	**1.3**
C.D (p=0.05)	**1.91**	**2.13**	**1.33**	**1.45**	**45.28**	**48.08**	**2.58**	**2.61**
Interaction (P×G)								
T1 (P1 G1)	79.29	90.5	75.28	82.2	2683.29	2833.3	129.06	130.7
T2 (P1 G2)	77.48	88.82	52.23	56.81	1618.58	1742.07	117.2	117.7
T3 (P1 G3)	75.1	86.52	63.76	69.51	2150.94	2287.69	123.14	124.2
T4 (P1 G4)	74.14	85.7	35.12	38.08	904.97	1003.84	100.12	102.3
T5 (P2 G1)	93.62	105.2	82.96	90.66	3038.19	3197.04	133.04	135
T6 (P2 G2)	91.77	103	59.9	65.26	1973.47	2105.8	121.14	122.1
T7 (P2 G3)	90	101.4	71.67	78.21	2514.18	2660.25	127.1	128.5
T8 (P2 G4)	88.07	99.18	48.56	52.76	1445.94	1565.41	115.21	115.6
T9 (P3 G1)	107.34	119	79.1	86.41	2860.72	3015.15	131.04	132.9
T10 (P3 G2)	106.22	117.9	56.08	61.05	1796.04	1923.95	119.16	119.9
T11 (P3 G3)	106.81	118.6	68.05	74.23	2343.91	2486.02	125.11	126.4

T_{12} (P_3 G_4)	104.13	116	44.56	48.36	1263.69	1378.34	113.24	113.4
S.Ed	**1.65**	**1.85**	**1.15**	**1.25**	**39.21**	**41.64**	**2.25**	**2.25**
C.D (p=0.05)	**3.3**	**3.7**	**2.3**	**2.51**	**78.43**	**83.28**	**4.48**	**4.52**

Table 3: Effect of different levels of pruning height and growth regulators on Physiological parameters in Ixora (*Ixora coccinea* L.). Cv. Red

Treatments	**Leaf length (cm)**	**Leaf width (cm)**	**Leaf area index (cm^2)**	**Chlorophyll content index (CCI) ($mg\ g^{-1}$)**	**Dry matter production ($g\ plant^{-1}$)**
Pruning height (P)					
P_1	6.85	3.33	1.81	10.89	38.59
P_2	7.38	3.88	2.09	11.34	41.1
P_3	7.24	3.78	1.97	11.23	40.31
S.Ed	**0.06**	**0.03**	**0.02**	**0.1**	**0.37**
C.D (p=0.05)	**0.13**	**0.07**	**0.03**	**0.2**	**0.73**
Growth regulators (G)					
G_1	7.86	4.71	2.51	11.73	43.84
G_2	7.02	3.33	1.79	11.07	39.04
G_3	7.47	3.64	2.15	11.4	41.58
G_4	6.29	2.96	1.38	10.42	35.55
S.Ed	**0.07**	**0.04**	**0.02**	**0.12**	**0.43**
C.D (p=0.05)	**0.15**	**0.08**	**0.04**	**0.23**	**0.85**
Interaction (P×G)					
T_1 (P_1 G_1)	7.73	3.84	2.4	11.63	43.05
T_2 (P_1 G_2)	6.88	3.23	1.67	10.96	38.24
T_3 (P_1 G_3)	7.31	3.54	2.04	11.3	40.65
T_4 (P_1 G_4)	5.51	2.71	1.15	9.67	32.45
T_5 (P_2 G_1)	8.01	5.21	2.64	11.85	44.65
T_6 (P_2 G_2)	7.15	3.42	1.9	11.17	39.83
T_7 (P_2 G_3)	7.6	3.74	2.27	11.51	42.38
T_8 (P_2 G_4)	6.77	3.15	1.55	10.85	37.56
T_9 (P_3 G_1)	7.85	5.09	2.5	11.72	43.83
T_{10} (P_3 G_2)	7.03	3.34	1.8	11.08	39.05
T_{11} (P_3 G_3)	7.49	3.66	2.15	11.4	41.71

T_{12} (P_3 G_4)	6.61	3.04	1.44	10.75	36.65
S.Ed	**0.12**	**0.07**	**0.04**	**0.21**	**0.74**
C.D (p=0.05)	**0.26**	**0.14**	**0.07**	**0.41**	**1.47**

Table 4: Effect of different levels of pruning height and growth regulators on yield parameters in Ixora (*Ixora coccinea* L.). Cv. Red

Treatment	Number of flower heads ($plant^{-1}$)	Number of florets (flower $head^{-1}$)	Fresh weight of single flower head (g)	Flower yield $plant^{-1}$ (g)
Pruning height (P)				
P_1	33.64	39.68	6.66	225.00
P_2	34.50	44.06	7.46	259.39
P_3	33.87	41.54	7.07	240.56
S.Ed	**0.12**	**0.38**	**0.06**	**2.22**
C.D (p=0.05)	**0.21**	**0.77**	**0.13**	**4.45**
Growth regulators (G)				
G_1	35.38	50.33	8.47	300.15
G_2	33.54	38.83	6.63	222.65
G_3	34.17	44.22	7.54	258.83
G_4	32.92	33.66	5.61	184.97
S.Ed	**0.13**	**0.44**	**0.07**	**2.57**
C.D (p=0.05)	**0.24**	**0.89**	**0.15**	**5.14**
Interaction (P×G)				
T_1 (P_1 G_1)	34.59	47.53	8.10	280.17
T_2 (P_1 G_2)	33.32	37.02	6.33	210.91
T_3 (P_1 G_3)	33.95	42.33	7.22	245.11
T_4 (P_1 G_4)	32.70	31.87	5.01	163.82
T_5 (P_2 G_1)	36.73	54.18	9.01	330.93
T_6 (P_2 G_2)	33.76	40.61	6.94	234.29
T_7 (P_2 G_3)	34.40	45.96	7.84	270.58
T_8 (P_2 G_4)	33.13	35.49	6.07	201.76
T_9 (P_3 G_1)	34.82	49.29	8.31	289.35

T_{10} (P_3 G_2)	33.55	38.87	6.64	222.77
T_{11} (P_3 G_3)	34.18	44.37	7.58	260.80
T_{12} (P_3 G_4)	32.93	33.63	5.75	189.34
S.Ed	**0.22**	**0.77**	**0.13**	**4.45**
C.D (p=0.05)	**0.42**	**1.54**	**0.26**	**8.91**